California Energy Commission

FINAL STAFF REPORT

2019 California Energy Efficiency Action Plan

2019 California Energy Efficiency Action Plan

Gavin Newsom, Governor
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FOREWORD

It is an understatement to say that California is living in a time of rapid transformation of the energy sector, driven by climate change, technology, economics, consumer preferences and a host of other factors. Wildfires continue to threaten our communities and public safety power shutoffs are a new reality for thousands of citizens. We must adapt to the climate change impacts already upon us and redouble efforts to decarbonize our energy systems. As energy generation becomes steadily cleaner and the number of electric vehicles increases, electricity will have a greater role in our lives. Equally clear is that the gas system must evolve toward a much-reduced carbon footprint, through some combination of efficiency and a shift to non-fossil alternatives. Along with the transition and modernization of our energy systems, the possibilities for improved air quality, enhanced public health and a stronger economy are becoming evident.

California has long placed efficiency at the center of its energy policy. Energy codes, standards and programs have saved Californians well over one hundred billion dollars since the mid-1970s. The open market for energy services in our buildings and beyond saves billions more each year. California's tremendous successes include strong and robust building codes, transformed markets for efficient lighting and a suite of other nation-leading efforts. Our commitment to energy efficiency persists, stronger than ever.

As we begin the third decade of the 21st century, it is time to reflect on that deep and pioneering history, to revisit – and in part to redefine – what energy efficiency is and does. Going forward toward full decarbonization of our economy, efficiency can and must play a central role. It continues to make perfect sense for customers, simply as good management to reduce costs. Every new construction and building upgrade project should incorporate efficient, integrated system design and equipment. Every appliance should minimize wasted energy. Yet as this *2019 California Energy Efficiency Action Plan* reports, if we are to reach our aggressive goals of doubling efficiency and reducing greenhouse gas emissions, the program structures through which California has historically encouraged efficiency will comprise only part of the solution.

With apologies to Shakespeare: The grid is the thing! As we transform our energy systems to minimize greenhouse gas emissions, efficiency will be a bedrock resource, creating headroom in the electricity grid for new loads from transportation and buildings. Further, it is no longer sufficient to utilize energy efficiency only as a static resource. Energy systems – new homes, replacement heating and cooling equipment, industrial processes and the like – must be both highly efficient *and* flexible to the maximum extent possible. Flexibility means interactivity with the grid: the ability to manage energy usage, *proactively and situationally*, to minimize both its cost drivers and its carbon content.

This new, combined update of the *Existing Buildings Energy Efficiency Action Plan* and *Doubling of Energy Efficiency Savings by 2030 Report* reflects a renewed promise of and commitment to efficiency both as a traditional, common-sense energy management strategy and as an active, dynamic grid resource. Buildings are the platform for integrating demand-side services and other DERs alongside all utility resources, generating value in a coherent way from the customer upward. California possesses a formidable and expanding array of advanced technological and analytical tools - the most comprehensive toolbox in the world. The *2019 California Energy Efficiency Action Plan* describes the workshop in which, together, we construct components of the clean energy systems that will power and sustain our great state into the future.

J. Andrew McAllister, Ph.D.

Commissioner, California Energy Commission

ABSTRACT

The *2019 California Energy Efficiency Action Plan* covers issues, opportunities, and savings estimates pertaining to energy efficiency in California's buildings, industrial, and agricultural sectors. The 2019 EE Action Plan fulfills the mandates in California Public Resources Code Sections 25310(c) and 25943(f). The 2019 EE Action Plan is separated into three goals that drive energy efficiency: doubling energy efficiency savings by 2030, removing and reducing barriers to energy efficiency in low-income and disadvantaged communities, and reducing greenhouse gas emissions from the buildings sector. The energy efficiency savings estimates included in this Action Plan have been updated from the 2017 values.

Keywords: Energy efficiency, existing buildings, SB 350, building decarbonization, equity, AB 758, SB 1477, AB 3232, low-income, disadvantaged, local government, industry, agriculture

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Executive Summary

The *2019 California Energy Efficiency Action Plan* (2019 EE Action Plan) is the state's roadmap for an energy-efficient and low-carbon future for buildings. Energy efficiency is a key piece of California's efforts to lessen the impacts of climate change, reduce the economic burden of energy consumption on low-income populations, and complement sustainability efforts in the state. The California Energy Commission's (CEC) 2019 EE Action Plan charts the progress toward doubling energy efficiency savings in buildings, industry, and agriculture; achieving increased energy efficiency in existing buildings; and reducing greenhouse gas emissions (GHGs) from buildings. Through robust, sustainable marketplaces, California can achieve its energy and climate goals and deliver benefits to California residents.

Major Policy Shift

In 2018, two major pieces of legislation signaled the state's evolution from a relatively narrow focus on traditional energy efficiency to one that also embraces building decarbonization. Building decarbonization is the effort to reduce or eliminate GHG emissions from buildings. Senate Bill 1477 (Stern, Chapter 378, Statutes of 2018) allocates $50 million per year through 2023 to two new programs: Building Initiative for Low-Emissions Development and Technology and Equipment for Clean Heating. These two programs offer incentives to install building decarbonization technologies into new and existing homes. Assembly Bill 3232 (Friedman, Chapter 373, Statutes of 2018) requires the CEC, in consultation with the California Public Utilities Commission (CPUC), California Air Resources Board (CARB), and the California Independent System Operator (California ISO), to assess by January 1, 2021, the potential to reduce GHGs in buildings by 40 percent below 1990 levels by 2030. That assessment will illustrate the state's pathways to decarbonization, including recommended strategies to reduce the carbon content of buildings, estimate the impact of those efforts on the electricity grid, and calculate a cost comparison of the pathways to decarbonization.

California's Energy Efficiency Goals

Goal 1: Double Energy Efficiency Savings by 2030

In 2015, California set an ambitious goal to achieve a statewide cumulative doubling of energy efficiency savings and demand reductions in electricity and natural gas end uses, relative to 2015 estimates, by January 1, 2030. Senate Bill 350 (De León, Chapter 574, Statutes of 2015) codified this goal and directed the CEC to set annual targets to accomplish it. The CEC has collaborated with state agencies, utilities, and other stakeholders to identify and quantify the energy savings potential. The state will need to harness emerging technologies, develop progressive program designs, and promote innovative market solutions as part of this effort. The state can assist by establishing efficiency policies, regulations, and financing opportunities. The critical path for success

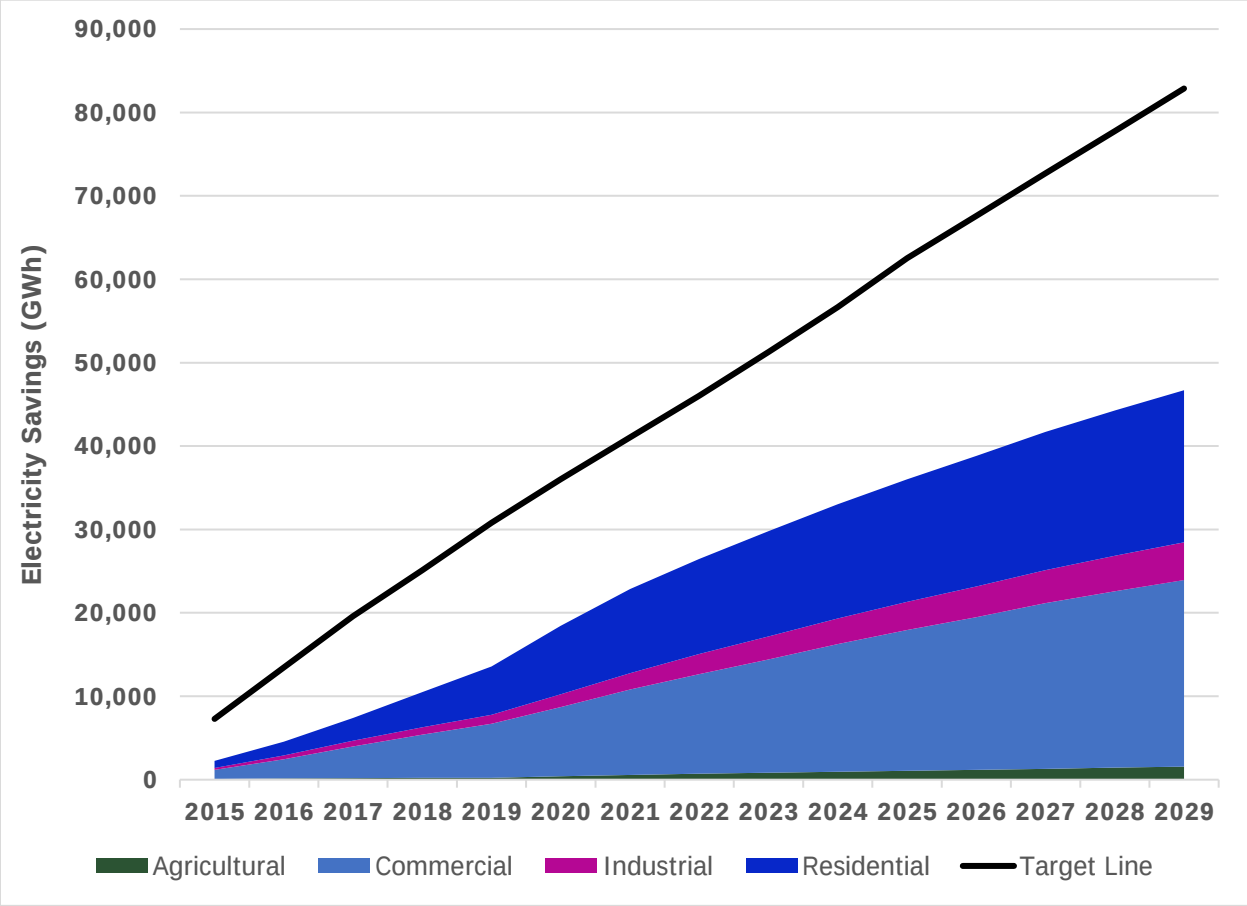
will lie with the state, stakeholders, and utilities encouraging and working with the marketplace, including leveraging private capital and accelerating the transformation.

2019 SB 350 Target Updates

SB 350 Doubling Efficiency Targets—Electricity

The updated statewide cumulative savings targets for electricity are in Figure ES-1. Most savings are expected to come from the residential and commercial sectors. The state is expected to fall about 44 percent short of the 2030 doubling goal for electricity savings. The utilities are capturing most of the savings through codes and standards support, as well as incentive programs.

Figure ES-1: SB 350 Electricity Savings

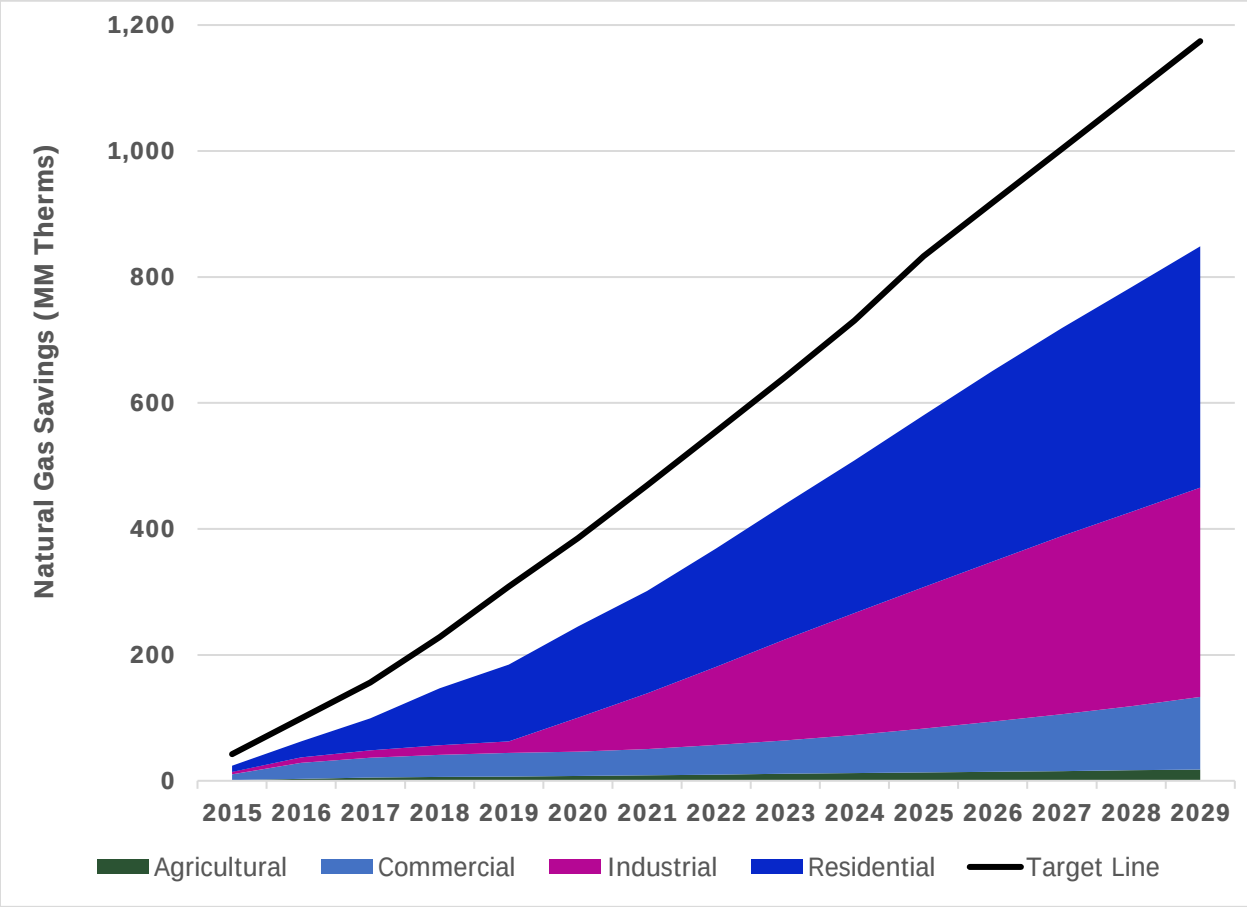


Source: CEC

SB 350 Doubling Efficiency Targets—Natural Gas

Figure ES-2 presents the statewide cumulative savings for natural gas. Most savings come from the residential sector, followed by the industrial sector. The savings are driven by industrial sector efficiency programs that are a mix of ratepayer and beyond ratepayer based codes and standards support, and IOU incentive programs. The savings are 28 percent short of the 2030 goal for natural gas.

Figure ES-2: SB 350 Natural Gas Savings

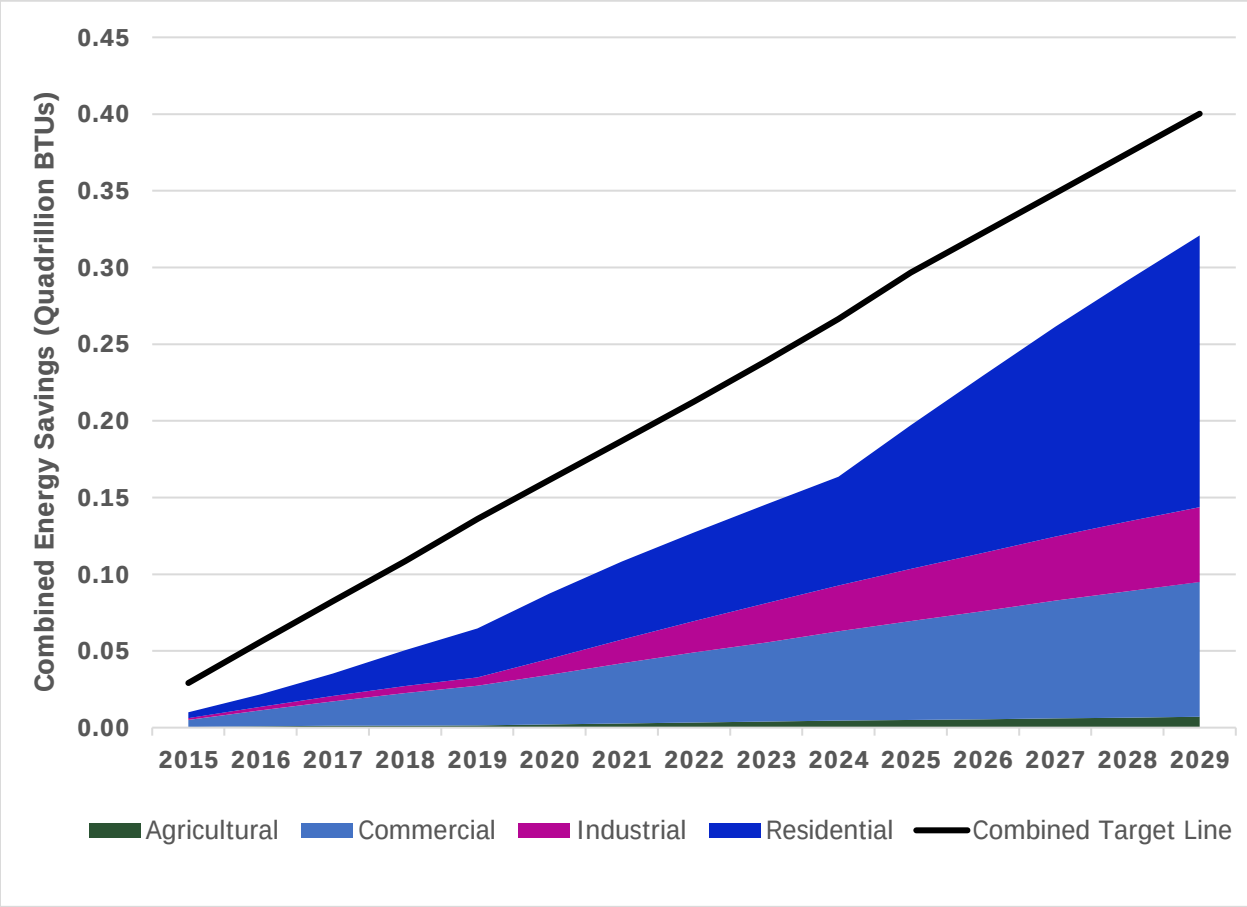


Source: CEC

SB 350 Doubling Efficiency Targets—Combined

The updated combined electricity and natural gas savings continue to show the state will miss the overall 2030 efficiency goal (Figure ES-3). The savings are driven by residential and commercial sector programs, in particular utility incentive programs, and codes and standards updates. The combined energy savings are about 20 percent short of the 2030 goal.

Figure ES-3: SB 350 Combined Energy Savings

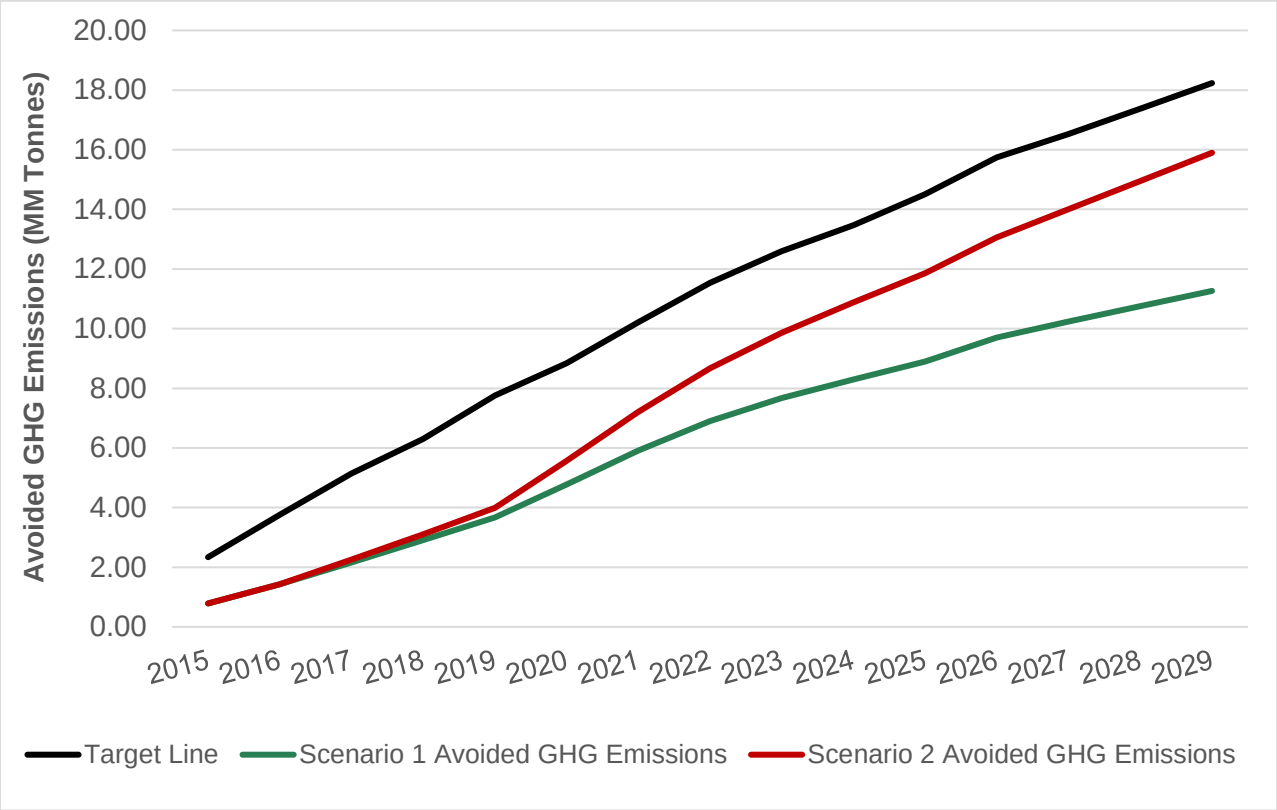


Source: CEC

Conversion of Efficiency Savings to Avoided Greenhouse Gas Emissions

The CEC develops forecasted values for the GHG content of the electric grid. These values are used to calculate the avoided GHG emissions from SB 350 energy efficiency savings. The SB 350 targets are converted into avoided GHG emissions in Figure ES-4. With current efficiency savings projections, the state also misses the 2030 goal in terms of avoided GHG emissions. Even in an aggressive scenario, the state falls short of the goal. This missed benchmark highlights the need for new and redesigned programs to reduce and shift energy use when the GHG content of electricity is highest. Demand flexibility technologies offer an opportunity to avoid GHG emissions and need to be assessed accordingly. An example of a demand flexible technology is a heat-pump water heater that can receive signals from a utility company to reduce or shift electricity use. The CEC supports development of hourly electricity savings data to more accurately capture the GHG emissions impacts.

Figure ES-4: Avoided GHG Emissions From SB 350 Targets



Source: CEC

SB 350 Results Discussion

The updated SB 350 doubling efficiency data show that the state will not achieve its 2030 doubling goal unless additional action is taken. Recent changes in the investor-owned utility (IOU) program portfolio and available technologies for incentives decreased projected efficiency savings. Compared to the 2017 estimates, the current projected savings in 2030 are lower in all sectors: electricity savings by 20 percent, natural gas savings by 50 percent, and combined savings by 17 percent. The reductions in savings projections are also due to improvements in the CEC's work relative to 2017. Thus the lower projections are only partially due to the changes mentioned prior. However, both electricity and natural gas programs, ratepayer and nonratepayer, need to increase program participation, along with stimulating new market activity. In addition, the state needs to increase levels of codes and standards compliance to achieve and build upon estimated savings. Redesigning and introducing new programs into the market may contribute the savings needed to reach the 2030 goal.

Goal 2: Expanding Energy Efficiency in Low-Income and Disadvantaged Communities

California is working to ensure that clean energy transformation benefits are realized by all Californians, especially those in low-income, disadvantaged, or rural communities. In

the *SB 350 Low-Income Barriers Study, Part A* (Barriers Study), the CEC studied the barriers to energy efficiency and weatherization investments for low-income customers, including those in disadvantaged communities, and made recommendations on how to increase access. The CEC and its partner agencies have since taken steps to implement the recommendations in the Barriers Study, including convening the Disadvantaged Communities Advisory Group in 2018, adopting a Clean Energy in Low-Income Multifamily Buildings (CLIMB) Action Plan, and tracking and updating key metrics to better understand energy barriers. The CEC developed an online interactive map to display energy equity indicators and highlight key opportunities to advance clean energy in low-income and disadvantaged communities. More work is needed to remove financing barriers, and to develop the local workforce needed to implement clean energy solutions.

Goal 3: Reducing Greenhouse Gas Emissions From Buildings

For California to achieve its ambitious goals to combat climate change, the state must decarbonize its buildings. Building decarbonization must be built from three components: a clean supply of energy, high levels of energy efficiency, and demand flexibility. Former Governor Edmund G. Brown Jr.'s set the foundation for the state's future clean energy supply with the signing of Senate Bill 100 (De León, Chapter 312, Statutes of 2018), which increased the state's Renewables Portfolio Standard and mandated a 100 percent of all retail electricity sales be provided by renewable energy and zero-carbon resources by December 31, 2045. Coupled with his Executive Order B-55-18, calling for economywide carbon neutrality by 2045, Brown's policies will continue the downward trend of GHG emissions from the electricity sector. Carbon neutrality is achieved by eliminating or offsetting any carbon emissions related to energy use. Renewable gas, which is produced from renewable byproducts like agricultural waste and algae, may also be a part of the solution to reducing GHG emissions from buildings. However, the role of renewable gas is likely constrained by availability, cost, and ongoing methane leakage concerns.

The gap between projected efficiency savings and the doubling energy efficiency target in Figure ES-3 shows the continued need for energy efficiency programs and the effect they can have in reducing demand and emissions. Deeper energy efficiency must be unlocked to achieve a low-cost, clean energy future. Demand flexibility technologies must be promoted and supported across the state to limit peak demands and GHG emissions. Senate Bill 49 (Skinner, Chapter 697, Statutes of 2019) requires the CEC to establish standards that promote the addition of flexible demand technologies into the marketplace.

To decarbonize California's buildings, it is necessary to allocate more funds and implement new financing mechanisms to mobilize the large investment required. In addition, California must adapt current and future energy efficiency programs to tackle decarbonization.

Recommendations

The following recommendations will further the goals laid out in the 2019 EE Action Plan. These recommendations are meant to supplement, not replace, the recommendations previously published in plans such as the Barriers Study and the CLIMB Action Plan, and to inform or complement the building decarbonization assessment under AB 3232 and the incentive programs being developed under SB 1477. The recommendations are grouped together based on common themes.

All recommendations should be considered and acted on through an energy equity lens. As leads and partners implement these recommendations, it is crucial to involve the communities that will be affected the most.

A complete description of the leads, supports, and the timeframe under which recommendations should be done is presented in Chapter 4 of the 2019 EE Action Plan. The following is condensed from that material.

A. Funding Source Beyond Ratepayer Portfolio

1. Offer financing or grant funds for energy efficiency, renewable energy, electric vehicles, and energy storage
2. Provide technical support to customers
3. Gear programs to customers in the residential, commercial, local government, industrial, and agricultural sectors
4. Provide consistent program requirements and funding levels
5. Leverage programs from state agencies, utilities, air districts, and local governments to maximize funding
6. Fund early adoption of appliances that enable flexible demand
7. Compile and publish program design best practices, including guidance for direct-installation programs and tariffed on-bill financing

B. Energy Efficiency Data

1. Develop hourly energy efficiency savings profiles based on actual customer data across each climate zone
2. Create a common data visualization tool for use in state agencies, local governments, tribal governments, research institutes, and utility programs
    - Pool data and modeling methods among state agencies
    - Establish guidelines for sharing aggregated, or combined, energy data with stakeholders

3. Combine energy information with available building, health, and economic datasets, such as CalEnviroScreen 3.0 and California Building Resilience Against Climate Effects
4. Use the California Technical Forum to review published values of energy efficiency and building decarbonization cobenefits. Such cobenefits may include improved indoor air quality and working conditions. The CalTF can assist in determining values to incorporate into cost-effectiveness tests across any program implementer. This effort should leverage work completed by California Air Resources Board for the Climate Change Investment programs
5. Use meter-based energy efficiency program results to improve utility potential and goal studies
6. Through the California Technical Forum, study the gaps among market, economic, and technical potential, including how the cost-effectiveness tests used by different program administrators affect the gaps
7. Use hourly energy efficiency savings estimates to verify and forecast energy efficiency targets under SB 350

C. Program Designs and Energy Efficiency as a Resource

1. Incorporate aggregations of energy efficiency and demand flexibility into long-term planning at the CPUC for IOUs
2. Develop similar methods to integrate aggregations of energy efficiency and demand flexibility into each integrated resource plan for publicly owned utilities
3. Expand and foster the use of meter-based savings programs in incentive-based programs and resource procurement
4. Encourage pay-for-performance approaches outside the ratepayer portfolio. Leverage aggregated, normalized energy consumption data and open-source methods to enable new markets and unlock more private capital
5. Implement tariffed on-bill repayment programs statewide to open new financing mechanisms for low-to-middle-income households and multifamily units, with eligibility not based on credit score or income

D. Workforce Development and Standards Compliance

1. Support locally led outreach and education programs and leverage local community groups and expertise
2. Use ongoing workforce development activities at the Employment Training Panel, Employment Development Department, and Governor's Office of Planning and Research

3. Work with workforce educators at community colleges, vocational schools, and workforce agencies to understand and remove barriers to a well-trained, energy efficiency workforce

E. Demand Flexibility and Building Decarbonization

1. Initiate a rulemaking to determine the best means of incorporating demand flexibility into the building and appliance standards
2. Research and demonstrate the most effective demand-flexible appliances and plug loads
3. Partner with the CPUC, utilities, California Independent System Operator, and others to develop effective, equitable demand flexibility tariffs that positively drive consumers to cheaper, cleaner energy usage
4. Establish a California low-to-zero-emission building policy
5. Implement the findings of the AB 3232 assessment and evaluate SB 1477 program impacts
6. Continue to evaluate technologies and programs that achieve building decarbonization
7. Provide building decarbonization pathways in the building standards for new construction and retrofits
8. Develop a statewide plan for the future of the natural gas system that protects workers, communities, and ratepayers

CHAPTER 1: Introduction

Overview of 2019 California Energy Efficiency Action Plan

Under Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009) and Senate Bill 350 (De León, Chapter 574, Statutes of 2015), the California Energy Commission (CEC) is required to provide regular updates on the state's progress toward increasing energy efficiency in existing buildings and doubling energy efficiency savings from electricity and natural gas end uses by 2030, relative to a 2015 base year. Energy efficiency is key to supporting California's efforts to lessen the impacts of climate change, reducing the economic burden of energy on low-income populations, and complementing numerous statewide sustainability efforts.

AB 758 directed the CEC to develop the *Existing Buildings Energy Efficiency Action Plan* (EBEE Action Plan), adopted in 2015 and updated in 2016, which provided a framework for state and local governments, building industries, and other stakeholders, to increase energy efficiency in existing residential, commercial, and public buildings.[1] SB 350 subsequently updated this legislation and, among other directives, mandated the state achieve a cumulative doubling of energy efficiency savings by 2030, relative to a 2015 base year. The report S*enate Bill 350 Doubling of Energy Efficiency by 2030* (Doubling Report) expanded the focus from existing buildings to include agriculture, industry, newly constructed buildings, conservation voltage reduction,[2] and fuel substitution.[3]

As California turns its focus to a 100 percent clean energy future, the CEC has consolidated the EBEE Action Plan, Doubling Report, and energy efficiency equity efforts to form a comprehensive roadmap to achieving the state's energy efficiency and building decarbonization goals, the *2019 California Energy Efficiency Action Plan*. This 2019 EE Action Plan applies key energy efficiency principles to California's energy vision and climate goals to support the development of robust, sustainable efficiency marketplaces that deliver multiple benefits to California residents. The anticipated results are a consistent increase in energy efficiency savings through 2030, much more widespread customer adoption of energy efficient practices and equipment, and overall reduction of greenhouse gas (GHG) emissions from buildings. Figure 1 brings together the vision, principles, and goals of the 2019 EE Action Plan.

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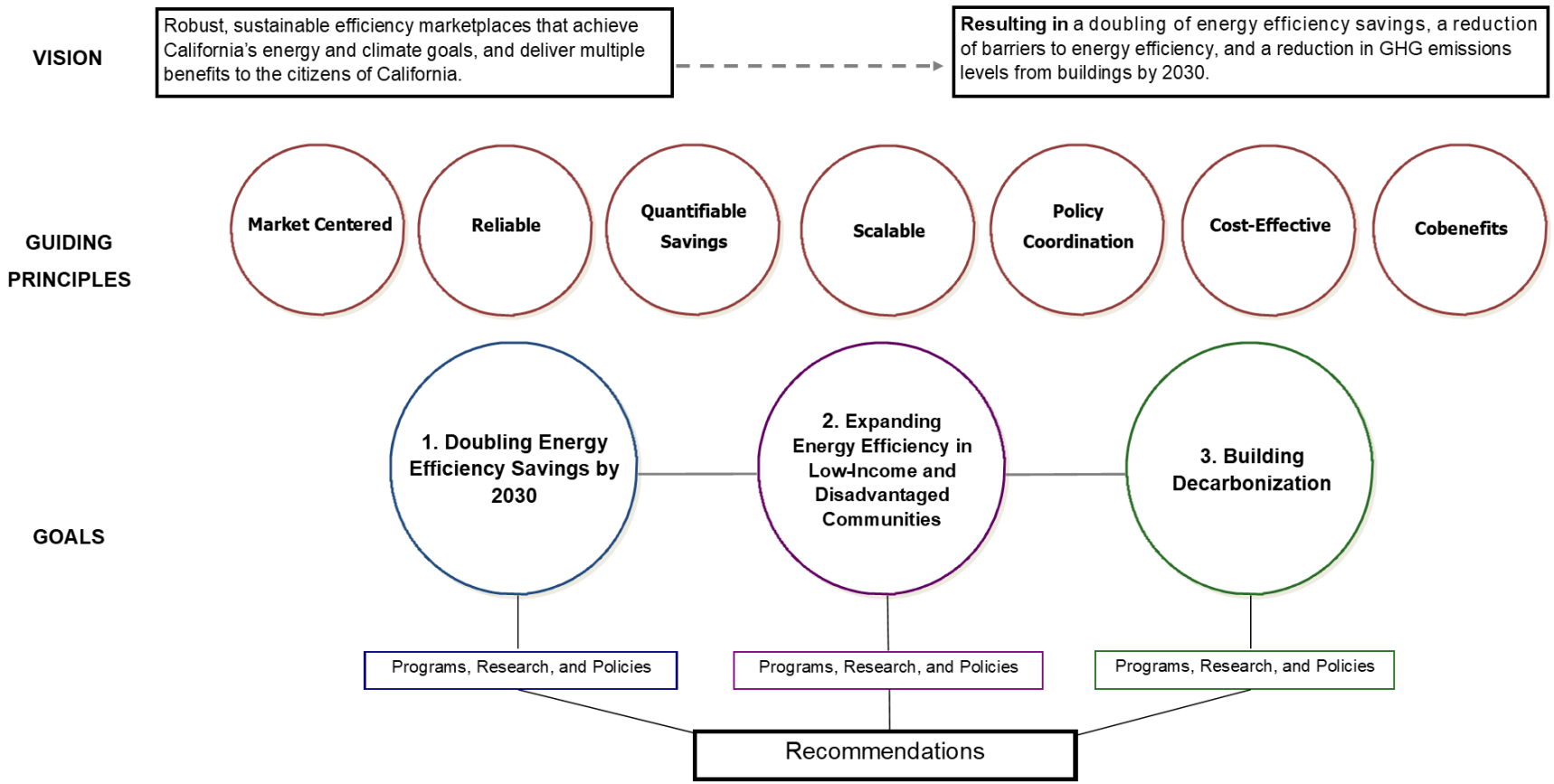
1 California Energy Commission. Existing Buildings Energy Efficiency Action Plan, https://ww2.energy.ca.gov/efficiency/existing_buildings/16-EBP-01/.
2 More information about conservation voltage reduction is in Appendix A,on page A-34.
3 Jones, Melissa, Michael Jaske, Michael Kenney, Brian Samuelson, Cynthia Rogers, Elena Giyenko, and Manjit Ahuja. 2017. Senate Bill 350: Doubling Energy Efficiency Savings by 2030. California Energy Commission. Publication Number: CEC-400-2017-010-CMF.

Figure 1: Vision and Goals 2019 California Energy Efficiency Action Plan



Source: CEC

Key Definitions

The 2019 EE Action Plan uses specific terms that require definition.

SB 350 Target—SB 350 directed the CEC to set targets resulting in a cumulative doubling of energy efficiency savings by 2030 relative to the expected savings projected in 2015. The targets consist of energy efficiency savings from programs operated by utilities, governments, and private entities.

Fuel Substitution—SB 350 language allows for fuel substitution, which the CEC defines as the substitution of one utility-supplied or interconnected energy source for another, such as electricity and natural gas. The CEC estimates the impacts of fuel substitution only if net source energy is reduced, measured in British thermal units (Btus).

Electrification—When the uses in a building are converted to consume only electricity, then the building has undergone electrification. The most common path for electrification is through electrified heating, cooking, and clothes drying.

Building Decarbonization—Buildings produce GHG emissions through the onsite burning of fossil fuels and electricity produced from fossil sources. “Building decarbonization” refers to a variety of activities that reduce GHG emissions from buildings including cleaning the energy supply, implementing deep energy efficiency, and installing demand flexibility technology.

Ratepayer Programs—Refers to the broad category of programs funded through rates collected on customer utility bills. These programs are operated by investor-owned utilities (IOUs), publicly owned utilities (POUs), regional energy networks (RENs), and community choice aggregators (CCAs).

Beyond-Ratepayer Programs—Refers to programs funded by tax and private dollars, as well as by the California Cap-and-Trade Program. These programs are operated by state agencies, local governments, air districts, federal agencies, and private companies.

Cost-Effectiveness—Various metrics are used to determine the cost-effectiveness of energy efficiency programs and measures for inclusion in the SB 350 energy efficiency doubling targets, many of which are established by statute or regulation. For this, the CEC relied on the cost-effectiveness calculations performed by program administrators. Therefore, the efficiency targets are savings summed from different cost tests.[4]

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4 “Cost tests” are calculations performed to show that a program or technology has a positive economic impact. For example, a “total resource cost test” calculates the costs and benefits to the customer and utility, whereas a “societal cost test” incorporates societal benefits and costs.

Feasible—Determined by how technically achievable the energy efficiency program is, how likely participation is in an energy efficiency program, and how realistic savings projections are, given economic, social, technological, and environmental constraints.

Adversely Impact Public Health and Safety—The CEC interprets the clause "will not adversely impact public health and safety" to mean primarily ensuring reliability of electricity supply.[5] Energy efficiency savings are relied upon in the generation, transmission, and distribution system planning of utilities and state entities. If energy efficiency program savings do not materialize as expected, reliability could be adversely impacted. Furthermore, the CEC believes the term covers the need to reduce GHGs and other air pollutants, which can impact health and safety of the public.

Additional Achievable Energy Efficiency (AAEE)—Energy savings in addition to the committed energy efficiency savings embedded in the CEC demand forecast. AAEE is the incremental energy savings from future market potential identified in utility potential studies not included in the baseline demand forecast but reasonably expected to occur. This includes future updates of building energy efficiency standards, appliance efficiency standards, and new or expanded utility energy efficiency programs.[6]

Energy Efficiency Principles

This 2019 EE Action Plan brings forth important touchstones from the original EBEE Action Plan to ensure that strategies, initiatives, and objectives align with achieving the state's goals and stakeholder values. The following adopted principles from the EBEE Action Plan have been carried forth to this 2019 EE Action Plan.

Market-Centered—The market consumers, property owners, tenants, and industry constitute the primary focus of the 2019 EE Action Plan. Associated requirements, interests, and objectives inform and direct the strategies.

Reliable—The 2019 EE Action Plan supports pathways that balance risk to ensure that the reliability of the electricity and natural gas systems are not compromised. Energy efficiency savings are relied upon in the generation, transmission, and distribution system planning of utilities and state entities. If energy efficiency program savings do not materialize as expected, reliability could be adversely impacted.

Quantifiable Savings—To successfully set a path to achieve the state's energy and climate goals, the 2019 EE Action Plan must have accurate data from which to calculate

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5 Public Resources Code Section 25300 asserts that "reliable supply of energy [be] consistent with protection of public health and safety"

6 California Energy Commission. 2015. *2015 Integrated Energy Policy Report.* Pp. 138-139. Publication Number: CEC-100-2015-001-CMF. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-01/TN212017_20160629T154354_2015_Integrated_Energy_Policy_Report_Small_File_Size.pdf.

electricity, natural gas, and GHG savings. To the extent such data are available, they are leveraged in determining California's progress toward its goals.

Cost-Effective—The 2019 EE Action Plan considers energy savings that are deemed cost-effective for the entity responsible for delivering them. Any recommendations made to achieve additional energy efficiency are also considered through a cost-effectiveness lens.

Scalable—The strategies and activities of the 2019 EE Action Plan must be developed to allow expansion and implementation at a large scale.

Policy Coordination—The 2019 EE Action Plan will support and encourage ongoing coordination among state agencies, particularly the CEC, California Public Utilities Commission (CPUC), and California Air Resources Board (CARB), as well as support and expand coordination of policy direction with federal, state, regional, and local governments.

Cobenefits—Energy efficiency and building decarbonization not only save money on customers' bills or ease the strain on the utility infrastructure, but result in added benefits like improved air quality, improved health[7], increased comfort, and better working conditions. These cobenefits must be considered when determining the value or impact of an efficiency and decarbonization program.

Feasible—Feasibility includes how technically achievable the energy efficiency program is; how likely participation is in an energy efficiency program; and how realistic savings projections are given economic, social, technological, and environmental constraints.

Historical Progress

California has been a national leader in energy efficiency since the late 1970s, with appliance and building standards saving consumers more than $100 billion in utility bills.[8] Today, energy efficiency is a tool to combat climate change by reducing demand from appliances that are powered by natural gas and GHG-producing power plants.

In 2008, California targeted zero-net-energy use in all new homes by 2020 and commercial buildings by 2030. Compared to the *2016 Building Energy Efficiency Standards* (Energy Standards), homes built to the 2019 Energy Standards will use roughly 53 percent less grid energy due to the solar requirement for new homes. Electricity produced for the grid is already cleaner than a decade ago because of the increased amounts of utility-procured renewable energy generation.

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7 *Part One: The Multiple Benefits of Energy Efficiency and Renewable Energy.* United States Environmental Protection Agency. 2018. https://www.epa.gov/statelocalenergy/part-one-multiple-benefits-energy-efficiency-and-renewable-energy.

8 "2018 Energy Efficiency Tracking Progress." California Energy Commission, https://www.energy.ca.gov/sites/default/files/2019-05/energy_efficiency.pdf.

California's Appliance Efficiency Regulations (appliance standards) and federal appliance efficiency standards set minimum efficiency levels for energy and water consumption in products such as consumer electronics and household appliances to support transition toward a cleaner market. In January 2018, the CEC adopted light bulb energy efficiency standards that require a minimum efficacy of 45 lumens per watt, making California the first state to mandate efficient lighting alternatives like light-emitting diode (LED) bulbs.[9] The state led the nation again at the end of 2018 in setting efficiency standards for computers and driving down energy consumption when computers are idle.[10] The CEC continues to pursue water and energy efficiency measures, such as sprinkler and irrigation controller efficiency, that reduce pumping demand and save water in light of the state's risk for extreme weather and drought.

As the nation's per-capita energy use has grown, California's expanding energy efficiency efforts have played a critical role in leveling growth. As the most populous state, California ranks second in the United States for total energy consumption; yet our state ranks forty-eighth in consumption per capita (Figure 2).[11] Not only is California strong in energy efficiency, but it is striving to improve energy equity. In response to SB 350, the CEC recommended ways to increase energy efficiency accessibility in the *2016 Low-Income Barriers Study, Part A* (Barriers Study) and continues to expand on this conversation.[12]

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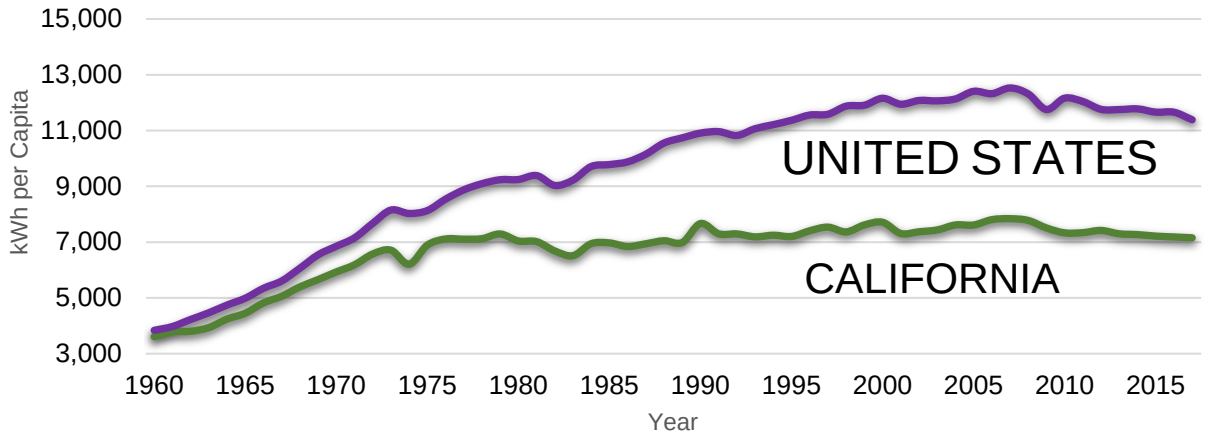
9 Natural Resources Defense Council. "California Shift to More Efficient Light Bulbs Effective Jan. 1, 2018." December 2017. https://www.nrdc.org/sites/default/files/ca-efficient-lightbulbs-fs.pdf

10 Saxton, Patrick. 2019. *Supplemental Staff Analysis for General Service Lamps (Expanded Scope).* California Energy Commission. https://efiling.energy.ca.gov/GetDocument.aspx?tn=229471&DocumentContentId=60864.

11 U.S Energy Information Administration. California Consumption. https://www.eia.gov/state/data.php?sid=CA#ConsumptionExpenditures.

12 Scavo, Jordan, Suzanne Korosec, Estaban Guerrero, Bill Pennington, and Pamela Doughman. 2016. Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities. California Energy Commission. Publication Number: CEC-300-2016-009-CMF. https://efiling.energy.ca.gov/getdocument.aspx?tn=214830

Figure 2: Electricity Demand per Capita in United States and California



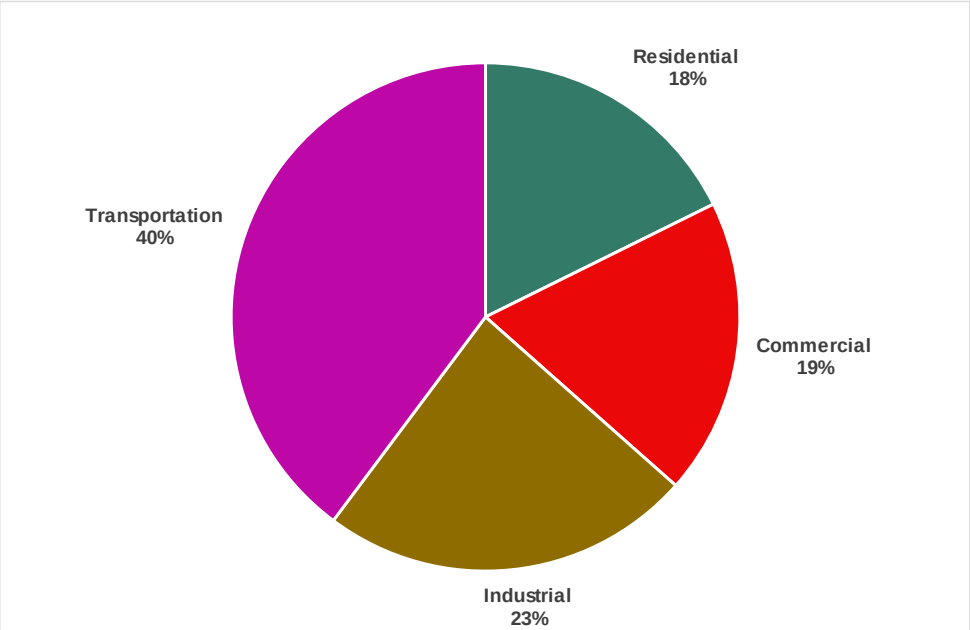
Source: CEC

Energy Savings and Emission Reductions

Energy Consumption Breakdown

The most recent California energy consumption statistics show the transportation sector as the highest energy user at 40 percent annually – not covered by this 2019 EE Action Plan. Commercial and residential buildings represent about 37 percent. Industry rounds out use at 23 percent. Agriculture is included in commercial and industrial end uses by the Energy Information Administration (EIA). Thus this 2019 EE Action Plan addresses roughly 60 percent of the state's energy consumption.

Figure 3: Statewide Energy Consumption by Sector, 2016

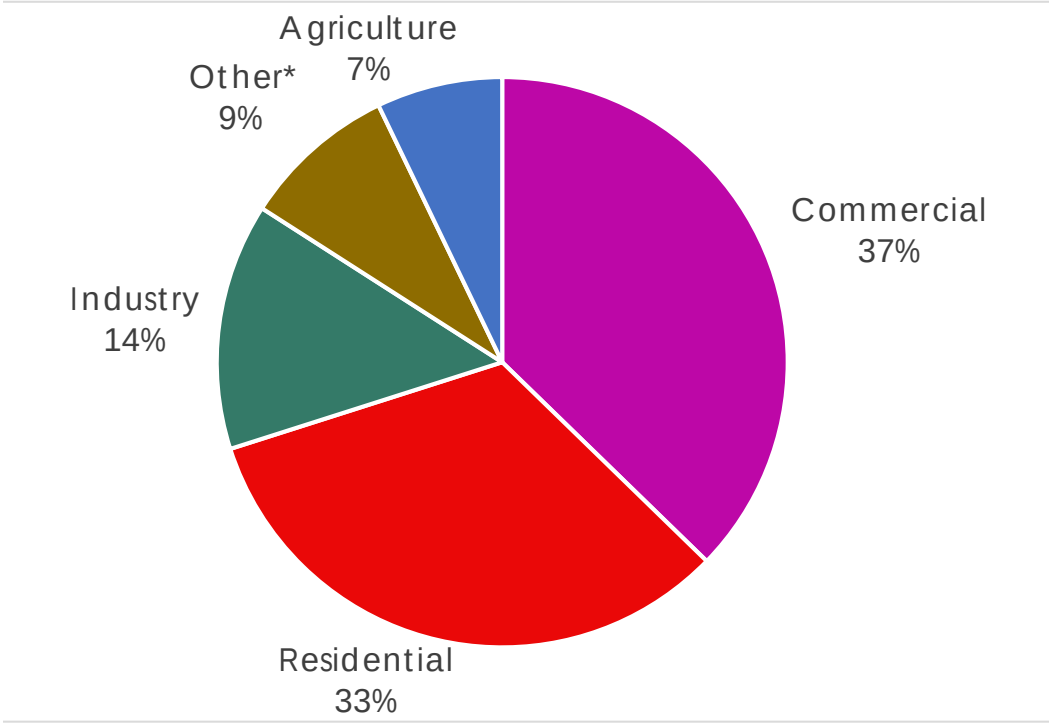


Source: EIA 2016

Electricity Consumption

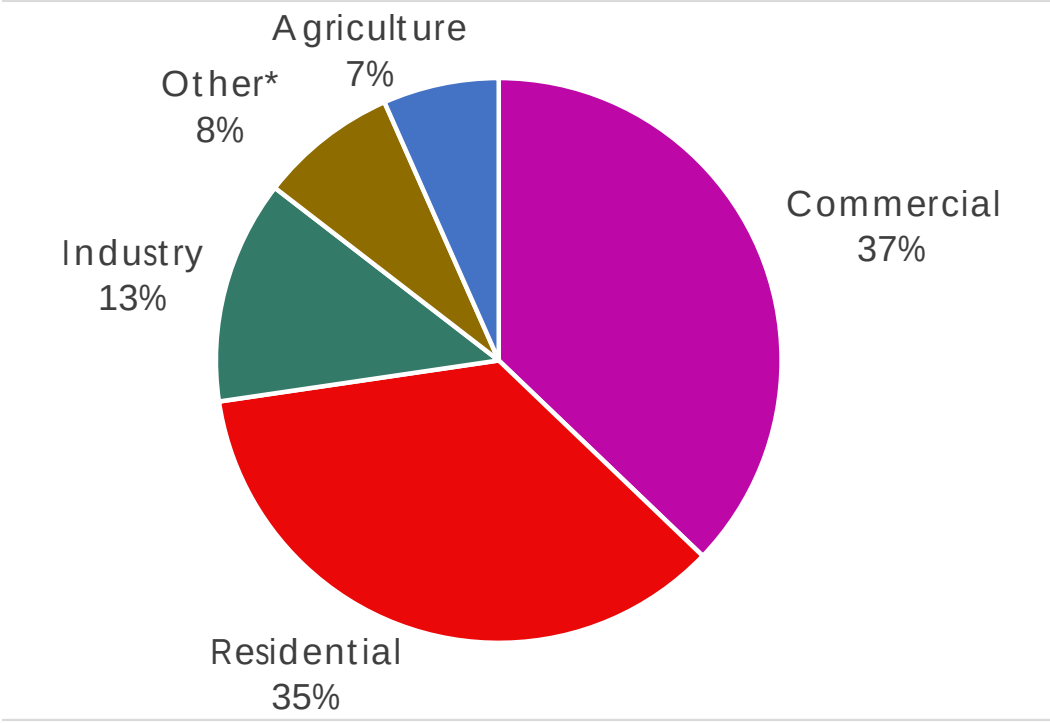
In 2020, the CEC expects commercial buildings to consume the most electricity, followed by housing (Figure 4). The portion of the figure labeled *other* includes mining, street lighting, transportation, communications, and utilities electricity consumption. Overall, statewide consumption is expected to grow by 15 percent between 2020 and 2030, with the residential share increasing and the industrial shrinking slightly. (Figure 5). Energy efficiency is key to managing that increased demand and optimizing costly infrastructure investments.

Figure 4: Forecasted Electricity Consumption per Sector, 2020



Source: CEC

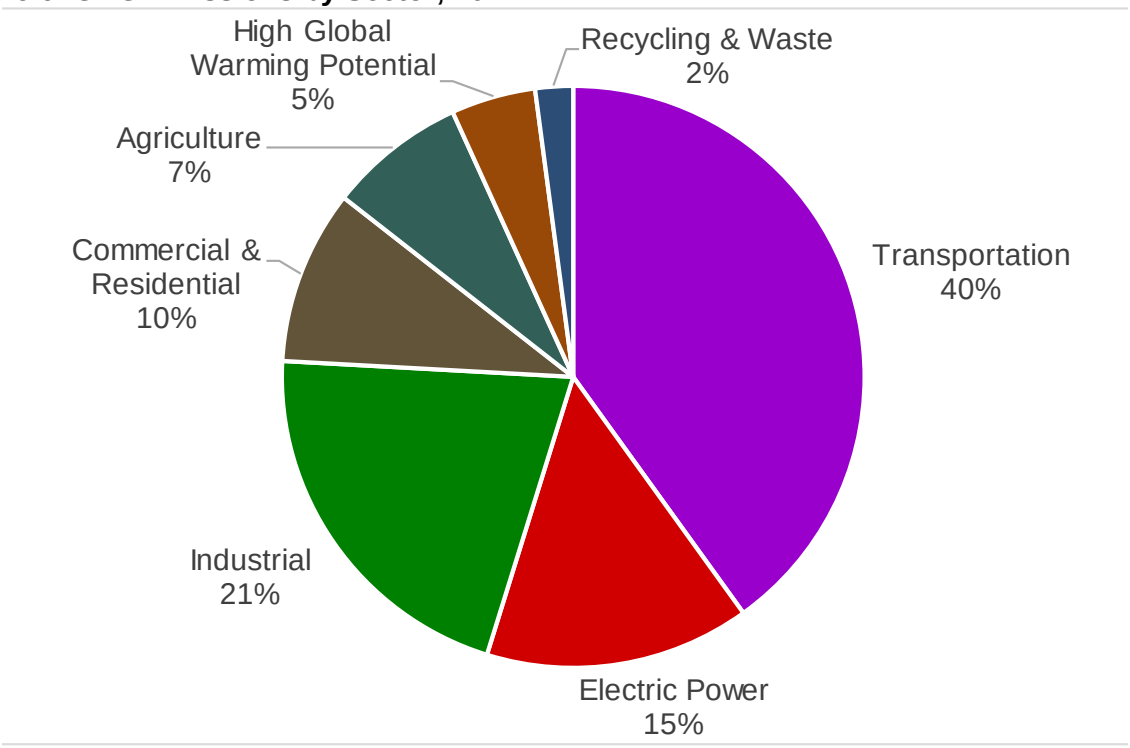
Figure 5: Forecasted Electricity Consumption per Sector, 2030



Source: CEC

Buildings account for about 12 percent of statewide direct emissions, primarily from on-site natural gas combustion for space and water heating. This 2019 EE Action Plan also includes industrial and agricultural sector emissions, as well as the percentage of electricity generation emissions related to use in buildings. Thus the 2019 EE Action Plan covers about 50 percent of the state's emissions (Figure 6).

Figure 6: GHG Emissions by Sector, 2017



Source: California Air Resources Board

Demand Flexibility

The decarbonization of California's economy will drive significant new load onto the electric grid, primarily from electric vehicles and substitution of compressor-driven heating systems in place of direct combustion. New loads will drive the addition of clean, renewable energy generation resources well beyond what would be required for simple replacement of retiring, end-of-life fossil generation. Such wholesale transformation of the electric system presents a tremendous opportunity to enhance system reliability through long-term resilience planning and optimization. Demand flexibility is an essential tool for integrating clean generation resources into the grid, avoiding curtailment and overbuild, transmitting the values and costs of the grid more directly to the customer, and minimizing the overall costs of electric service. Distributed energy resources (DERs), including behind-the-meter solar generation, energy efficiency, demand response (DR), electricity storage, and electric vehicles (EVs), represent significant opportunities for demand flexibility, especially when coupled with advanced communications and automated controls.

Research is helping guide the potential use of EVs both for routine grid flexibility services as well as for emergency use during blackouts or in the aftermath of natural disasters.[13] Behind-the-meter batteries in microgrids can provide load-leveling and other flexibility services routinely during nonemergency periods.

Multiple tools can drive demand flexibility via DERs, for example via dynamic retail rates, customer targeted load-shift incentives such as the CPUC's Demand Response Auction Mechanism, and integration of aggregated DR resources into the California Independent System Operator (California ISO) wholesale market. The CPUC's Load Shift Working Group report proposes six models, including both California ISO market-integrated approaches, and load-modifying proposals to move load to periods of high renewable generation, low cost, and low emissions.[14]

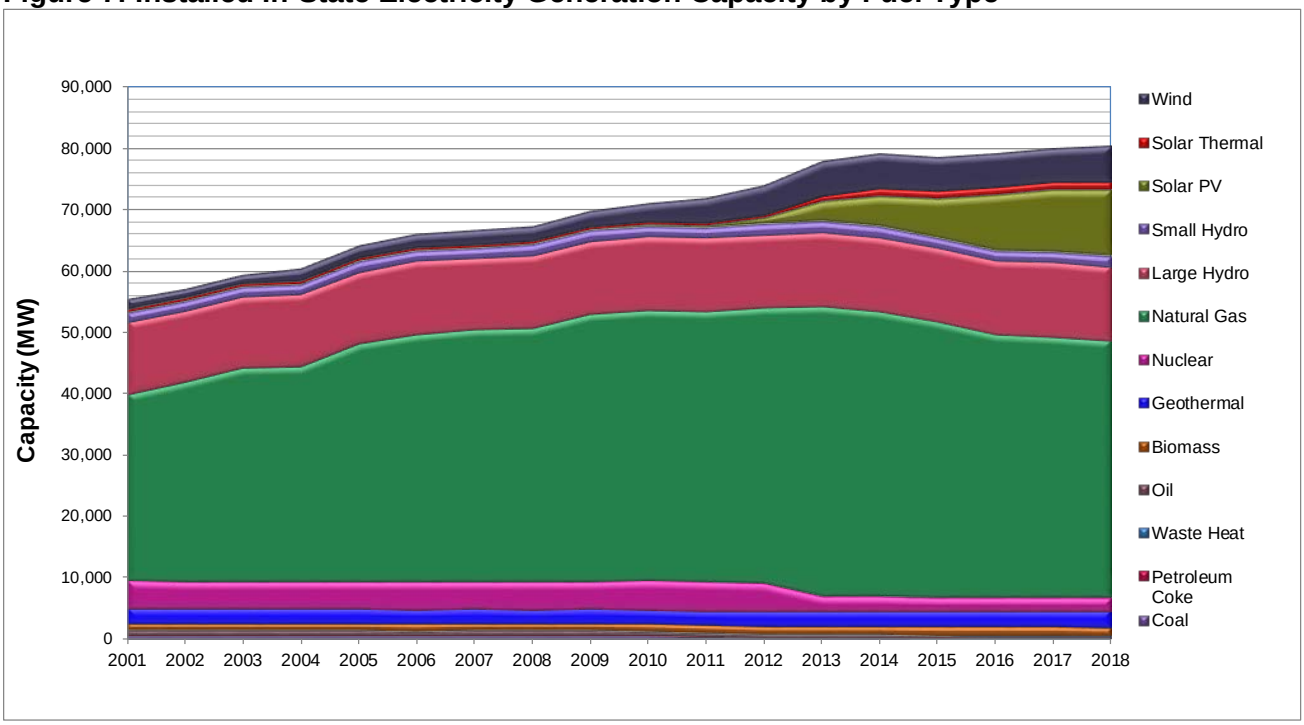
Finally, in late 2018, the IOU third-party energy efficiency solicitations began seeking proposals for up to $20 million to promote load flexibility through active control of energy efficient lighting and heating, ventilation, and air-conditioning (HVAC) systems. In late 2019 the Lawrence Berkeley National Laboratory expects to publish the results of its modeling for the CPUC of the cost-based potential for residential, commercial and industrial end uses including EVs, and electric water and space heating, to shift load using advanced communications and automated controls.

Renewable Energy Curtailment and Integration

California's electric grid has been reshaped in the last decade as the amount of renewable energy capacity, largely from solar plants, has grown (Figure 7). Solar generation energy is predominantly available in the middle of the day, leading to excess energy in the daytime that must be sold or curtailed. In addition, there are significant energy demand increases each afternoon/evening as solar energy generation drops and people move from their workplaces to their homes and turn on lights and appliances. This increase is met by electricity primarily from natural gas power plants.[15]

13 See National Renewable Energy Lab study on Integrated Network Testbed for Energy Grid Research and Technology Experimentation, https://www.nrel.gov/transportation/project-ev-grid-integration.html.
14 https://gridworks.org/wp-content/uploads/2019/02/LoadShiftWorkingGroup_report-1.pdf
15 "Net demand" is the electricity demand remaining after subtracting renewable energy.

Figure 7: Installed In-State Electricity Generation Capacity by Fuel Type



Source: CEC

Expansion of Electric Vehicles on the Grid

By 2030, energy consumed by EVs is expected to grow fourfold, to more than 14,000 gigawatt-hours (GWh).[16] This added load will require new generation, offset by energy efficiency, storage, or a combination. Research into the ability of EV to provide grid flexibility through DR features can help ensure grid reliability.

The CPUC plays a critical role in the state's transportation electrification efforts. As regulators of the state's electric IOUs, the CPUC has jurisdiction over electric rate design, system infrastructure development, grid management, and safety in IOU territories. The CPUC's activities in the electric transportation arena fall into four main categories:

1. Electric rates and cost of fueling
2. Vehicle-grid integration policy and pilots
3. Charging infrastructure development and incentives
4. Program evaluation and interagency coordination

In December 2018, the CPUC launched a rulemaking (R.18-12-006), consolidating efforts to implement directives from the Legislature and the Governor's Office to

16 California Energy Commission. *2018 Integrated Energy Policy Report Demand Forecast.* 2018. https://ww2.energy.ca.gov/2018_energypolicy/documents/#cedu.

accelerate transportation electrification. To date, the CPUC has authorized nearly $1 billion of investment in transportation electrification, with roughly another $1 billion under review.

Energy Efficiency as a Resource

New tools combining metering, analytics and controls are enabling robust assignment of temporal and locational value to efficiency as a grid system resource. For example, normalized metered energy consumption (NMEC) methods can calculate actual time-specific energy savings from real consumption data with statistical rigor. Pervasive – and increasingly automated – use of NMEC methods will allow efficiency programs and the broader energy services marketplace to target locales, customer classes and measures most effectively, and cost-effectively – that is, when and where energy savings are most valuable. Further, matched with real-time data on the carbon content of grid supply, these methods can optimize demand, moving it up or down, to achieve active emissions reduction. Such approaches hold great promise for cost optimization – from customer to system – as well as for informing program portfolio development, emissions-related goalsetting, long-term procurement, and transmission and distribution system planning. If properly supported by the energy agencies, these tools will enable demand-side resources to contribute centrally to California's energy and climate transition.

Wildfires, Resiliency, and Energy Efficiency

California is experiencing larger and more destructive wildfires as a result of climate change.[17] The fires in Sonoma and Napa Counties in 2017, followed by the devastating Camp Fire in Paradise in 2018 and the 2019 Kincaid fire in Sonoma County, show that California needs to build and rebuild homes and businesses both to minimize their emissions footprint and to be resilient to the impacts of climate change. Among the strategies for resilience are improved building materials and envelopes, on-site renewable energy generation and storage, and inclusion in a microgrid. Future state and local building standards and targeted programs can play a significant role in preparing California's existing and new buildings for our unfolding climate reality.

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17 Westerling, A. L. and Bryant, B.P. P. "Climate Change and Wildfire in California." *Climatic Change* (2008) 87(Suppl 1): 231. https://doi.org/10.1007/s10584-007-9363-z.

Market and Building Sector Characterization

Single Family

California's single-family residential sector consists of more than 10 million buildings. Nearly half of these homes were constructed before 1970, and about 80 percent were built before 1990.[18] Figures 8 through 11 show the energy consumed in single-family homes. Plug loads such as appliances, electronics, and lighting (Figure 8) use most of the energy. In single-family homes, 27 percent of energy is used for space heating, 60 percent of which is provided by natural gas (Figure 9). Similarly, water heating in single-family homes is 25 percent of usage, of which 85 percent is provided by natural gas (Figure 10). Air conditioning within single-family homes is growing as the climate warms; thus, the values in Figure 11 are likely to change in the next residential energy consumption survey in 2021.

Single Family Sector (1-4 units)

Number of Buildings

- 9,185,660 attached and detached
- 1,132,562 two-unit to four-unit homes

Total: 10,318,222 (72 percent of residential buildings)

Source: CA Dept. of Finance, ES File, May 2019

Annual Energy Use

- 18 percent of energy use in California
- About 74 percent of all residential energy use

Source: EIA, Annual Electric Power Industry Report, 2017

In 2018, residential buildings, including multifamily, consumed 92,640 GWh and 4,393 million therms

Source: California Energy Commission. 2018 Integrated Energy Policy Report – Demand Forecast. https://ww2.energy.ca.gov/2018_energypolicy/documents/#cedu

Key Stakeholders

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

18 U.S. EIA. Consumption and Efficiency. https://www.eia.gov/consumption/

Opportunities in the Single-Family Market

Building Shell: Building envelope and other weatherization measures in existing buildings offer significant savings opportunities. Given that at least half of single-family homes were built before California approved energy standards, improving the efficiency of the shell of homes, which offers significant energy savings.

Behavioral Programs: There is a growing market for utility programs that focus on behavioral changes of occupants. Early results show promise from the Home Energy Reports Program.[19] A home energy report benchmarks homes to similar buildings nearby, offers suggestions for efficiency improvements, and tracks usage from month to month to show improvements or changes.

Pay-for-Performance Programs: Homes offer a unique resource for program implementers to bundle customers into groups for common energy efficiency retrofits. With a well-documented savings expectation, the bundle can be treated like a procurable resource.

Plug Loads: Plug loads are appliances or measures that plugs into a building. While no single plug load has major savings potential, the aggregated amount of energy consumed by plug loads is large. Ongoing research into miscellaneous electrical loads in homes is uncovering the scale of potential savings.[20] Marketplaces that provide consumers with energy efficiency scores for appliances, most prominently those supported by the IOUs, have a track record of success.[21] Continuous support and expansion of such programs will result in more achievable savings from the growing plug-load demand.

Challenges in the Single-Family Market

Benefits of Efficiency: It is not obvious to many homeowners that deep energy efficiency retrofits can create multiple benefits including bill savings and better indoor air quality, or what options are available to them to pursue deep retrofits. This issue is compounded in California's renter-heavy residential market.

Energy Standards Compliance: Current projections suggest compliance with building standards for residential HVAC permits is considered low.[22] Combined with resource-constrained building departments, there are potentially significant lost opportunities or unaccounted energy savings due to unpermitted work.

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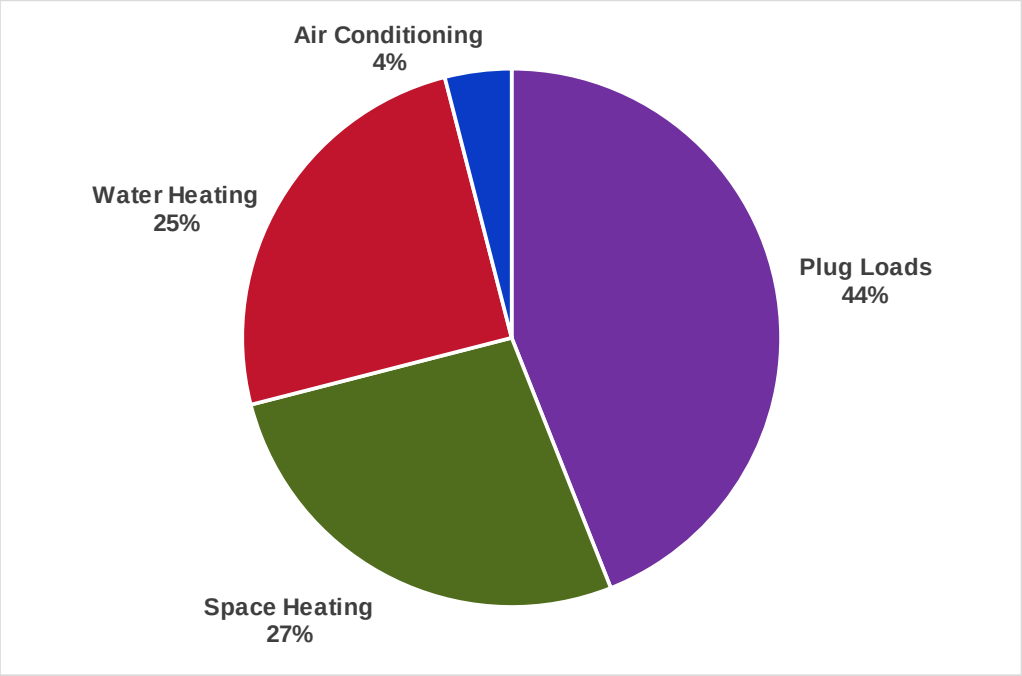
19 Sussman, Reuven and Maxine Chikumbo. *Behavior Change Programs: Status and Impacts*. Page 6. October 2016. American Council for an Energy-Efficient Economy.
20 United States Department of Energy. "Miscellaneous Electric Loads." https://www.energy.gov/eere/buildings/articles/miscellaneous-electric-loads-what-are-they-and-why-should-you-care
21 Example marketplace from Pacific Gas and Electric, https://marketplace.pge.com/
22 DNV-GL, Final Report: *2014-2016 HVAC Permit and Code Compliance Market Assessment Volume I*, Prepared for the CPUC, September 2017, calmac.org/publications/HVAC_WO6_FINAL_REPORT_VolumeI_22Sept2017.pdf.

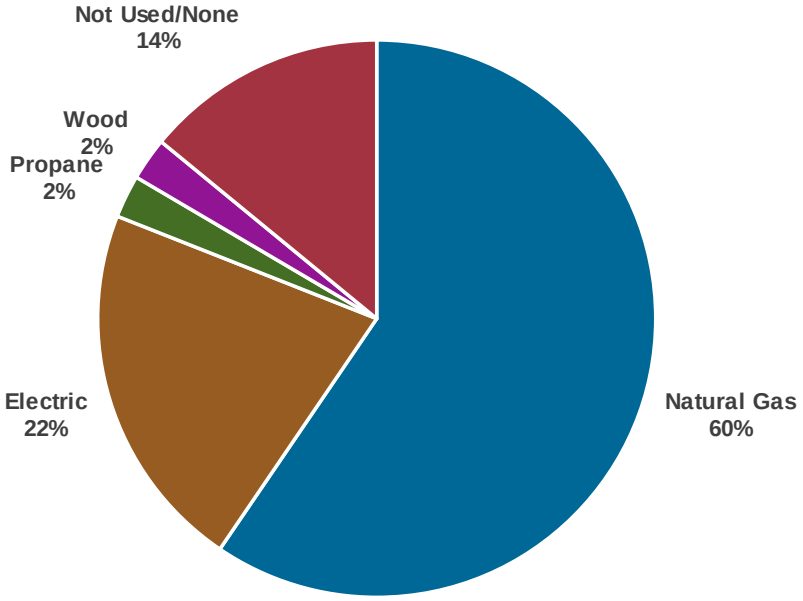
Efficiency Within Property Valuation: To real estate professionals, renters, and buyers, the value of energy efficiency in a home remains unclear. Educating the public of the value of a permit for ensuring proper, verified equipment installation must remain a priority.

Figure 8: California Residential End-Use Consumption



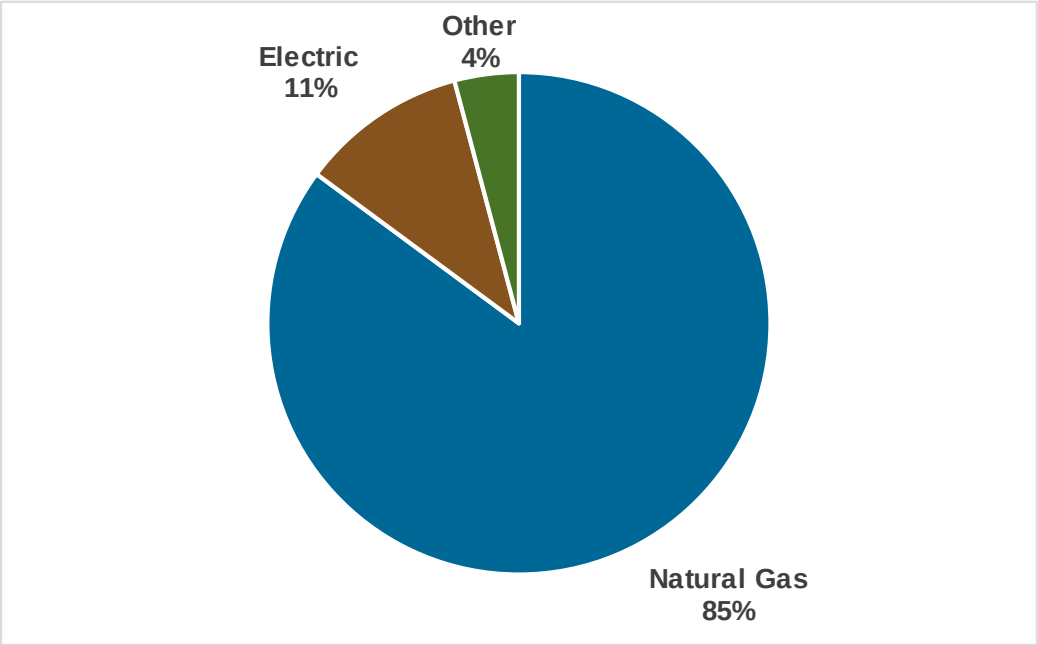
Source: EIA, 2009 Residential Energy Consumption Survey

Figure 9: California Residential Space Heating Fuel Type



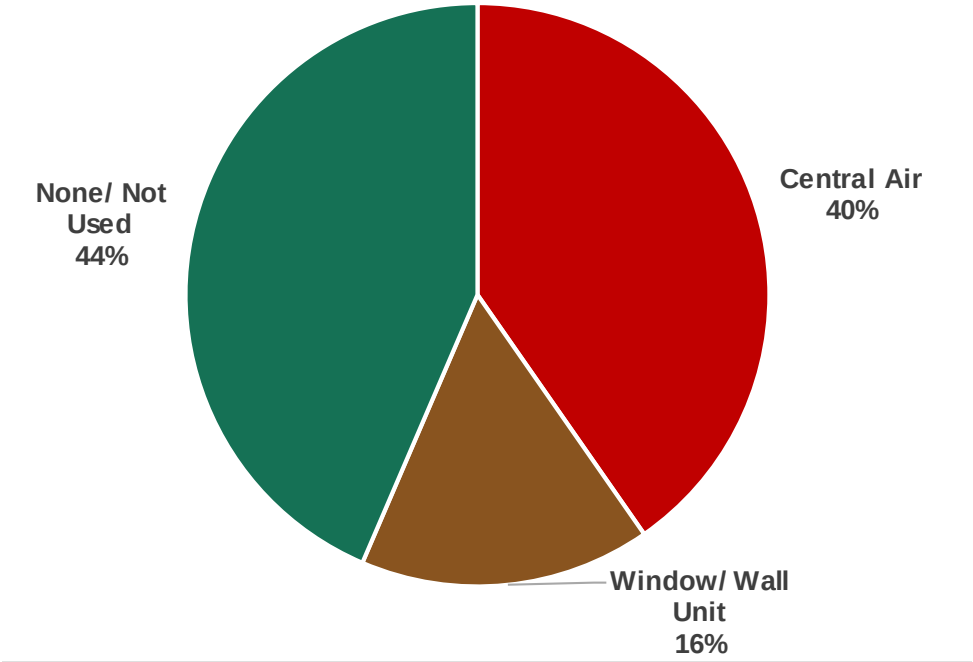
Source: EIA Office of Energy Consumption and Efficiency Statistics, Forms EIA-457 A and C of the 2009 Residential Energy Consumption Survey

Figure 10: California Residential Water Heating Fuel Type



Source: EIA, Office of Energy Consumption and Efficiency Statistics, Forms EIA-457 A and C of the *2009 Residential Energy Consumption Survey*

Figure 11: California Residential Cooling Type



Source: EIA, Office of Energy Consumption and Efficiency Statistics, Forms EIA-457 A and C of the *2009 Residential Energy Consumption Survey*

Multifamily

The multifamily sector experiences significantly different issues, opportunities, and energy consumption patterns (Figure 12) from single-family homes. The critical elements that set multifamily buildings apart include the size and complexity of buildings and systems, variability of ownership structure, split payment of utility costs between owners and tenants (split incentive), limited financing products, and varied tenant sophistication and resources. The Clean Energy in Low-income Multifamily Buildings (CLIMB) Action Plan[23] delves further into the unique building and tenant characteristics of multifamily buildings.

Multifamily Sector

Number of Buildings

Total: 3,357,051 (24 percent of residential buildings)

Annual Energy Use

- 8 percent of building energy use (not including industrial)
- Nearly 26 percent of all residential energy use

Vintage

More than 50 percent of California's existing multifamily buildings were constructed before there were building energy efficiency standards (pre-1978).

Key Stakeholders

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

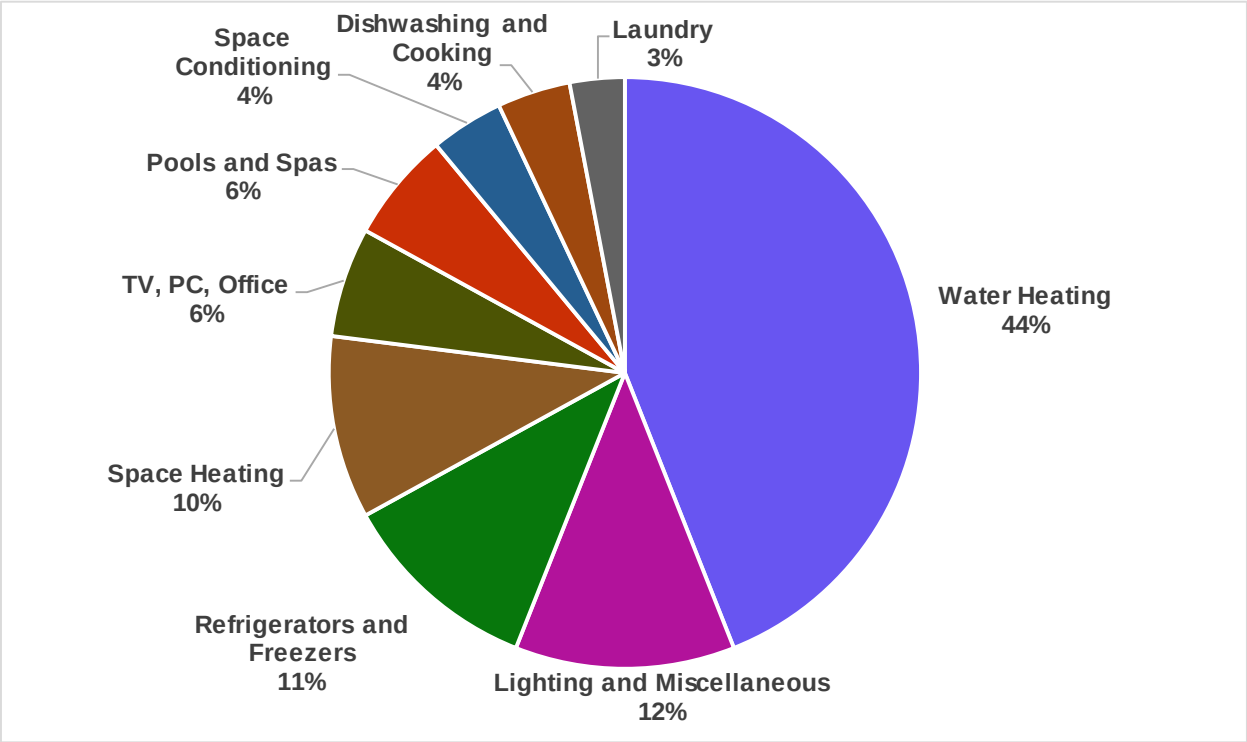
Types of Multifamily Buildings

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

Sources: CA Department of Finance, E5 File, May 2019, U.S. EIA, Annual Electric Power Industry Report, 2017, and National Multi Housing Council

23 Haramati, Mikhail, Eugene Lee, Tiffany Mateo, Brian McCollough, Shaun Ransom, Robert Ridgley, and Joseph Sit. 2018. *Clean Energy in Low-Income Multifamily Buildings Action Plan.* California Energy Commission. Publication Number: CEC-300-2018-005-SF. https://efiling.energy.ca.gov/GetDocument.aspx?tn=224513.

Figure 12: Multifamily Unit Electricity Usage by End Use



Source: EIA Office of Energy Consumption and Efficiency Statistics, Forms EIA-457 A and C of the *2009 Residential Energy Consumption Survey*

Challenges in Multifamily Market

Split Incentive: Because tenants are typically responsible for paying energy bills, the building owner does not directly benefit from performing energy efficiency upgrades. Common area upgrades are often performed that benefit the building owner, but the deeper savings are to be found within individual units.

Program Delivery: Renters rely on building owners to hire contractors to perform energy efficiency improvements. If building owners employ contractors without energy efficiency or multifamily building knowledge, then the building may not benefit from program participation. Improved contractor outreach or program delivery models that do not rely on contractors are needed.

Opportunities in the Multifamily Market

Trigger Events: There are specific times or “trigger events,” during the life cycle of a multifamily building when major retrofits are possible, such as during refinancing. If these events are known in advance, building owners can find and apply for funding. Performing unit, envelope, roof, and other significant upgrades are most convenient and cost-effective during trigger events.

Alternative Financing: Traditional financing tools struggle to address the split incentive issue. Renters in multifamily buildings must rely on the building owner to upgrade the envelope, appliances, and more. Alternative financing tools, like on-bill tariffs, get

around the split incentive by placing the cost on the utility bill paid by the tenant while avoiding tying the approval to credit metrics.

Plug Loads: As in single-family homes, plug loads are a major source of energy consumption in multifamily units. Since end uses like space and water heating may be maintained by owners rather than tenants, most in-unit energy savings that can be controlled by tenants are plug loads. Given the varied income levels of tenants, it is important that affordable and efficient products are available. Online marketplaces are an effective tool at making energy efficient products readily available and easily discounted.

Commercial

The commercial building sector is diverse and complex. Buildings may be used as offices, restaurants, hotels, retail, or mixed use, and the associated energy demands, ownership, and occupancy may be just as disparate (Figure 13). The latest *California Commercial End-Use Survey* is currently in process and its results will be available in 2021.[24] For now the most current California-specific figures are from the 2004 survey. Electricity in commercial spaces is primarily consumed by lighting and space conditioning (Figure 14). Natural gas usage is dominated by space heating, water heating, and cooking.[25]

Commercial Sector

Number of Buildings

More than 7.5 billion sq. ft. of commercial floor space.

Types of Buildings

- Offices
- Restaurants
- Retail
- Refrigerated/Unrefrigerated Warehouse
- Health
- Lodging
- Miscellaneous

Annual Energy Use

- 19 percent of California total energy use
- In 2018, commercial buildings consumed 2,050 million therms and 103,209 GWh

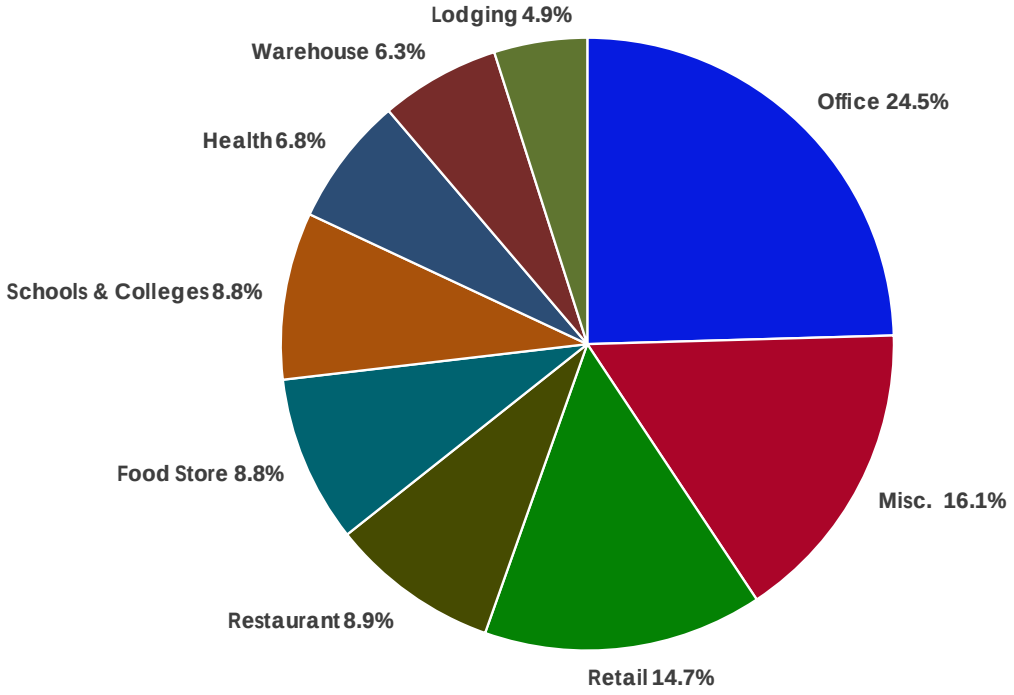
Key Stakeholders

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

24 "California Commercial End-Use Survey," CEC. 2004. https://www.energy.ca.gov/data-reports/surveys/california-commercial-end-use-survey.

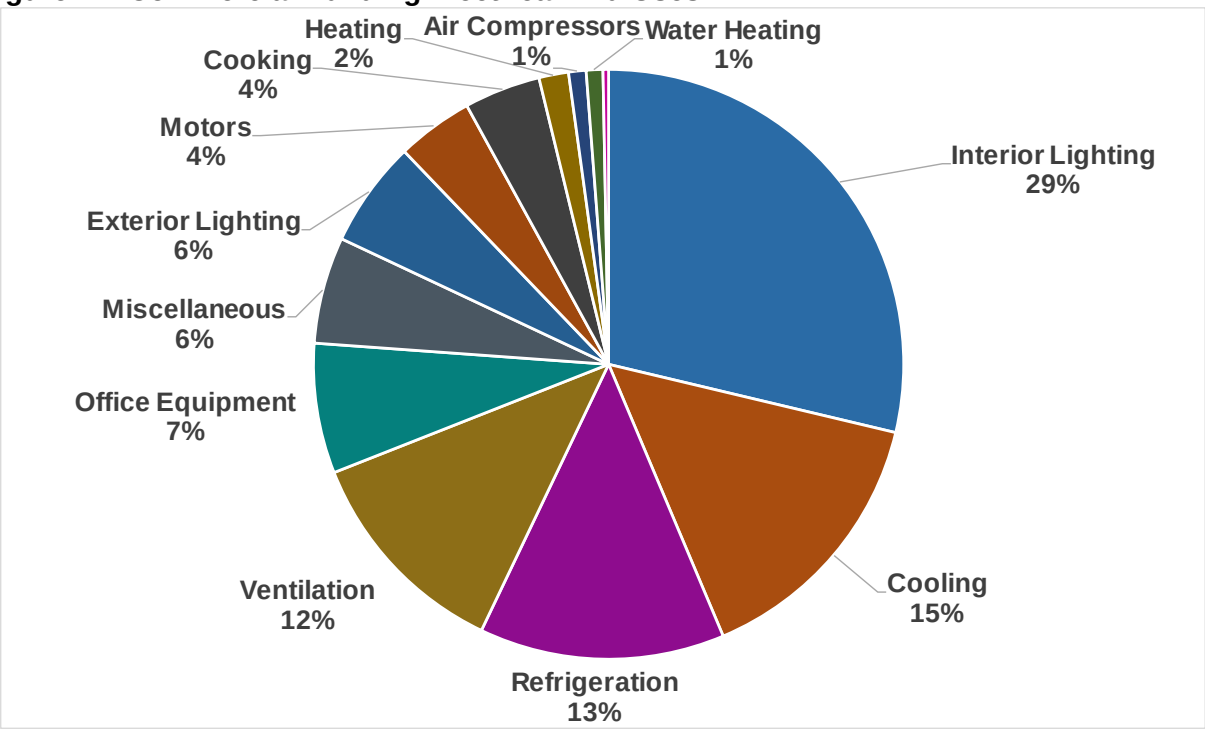
25 Itron, Inc. 2004. *California Commercial End-Use Survey.* CEC. https://ww2.energy.ca.gov/ceus/2006_enduse.html.

Figure 13: Commercial Electrical Use by Building Type



Source: California Commercial End-Use Survey, 2004

Figure 14: Commercial Building Electrical End Uses



Source: California Commercial End-Use Survey, 2004

Challenges in Commercial Buildings

Awareness of Efficiency Value: A lack of awareness from building owners or commercial building operators results in stranded savings—that is, savings that remain untapped but attainable.[26] Benchmarking, improved building energy asset scores,[27] and outreach about efficiency benefits are necessary to close the gap between market and economic potential.

Split Incentive: Just as renters in residential buildings face a split incentive issue, so do renters and owners of commercial spaces.

Opportunities in Commercial Buildings

High Savings Potential: The *2019 Energy Efficiency Potential and Goals Study* (PG Study) prepared for the CPUC indicates that HVAC and commercial refrigeration have the greatest electric savings potential (more than 70 GWh per year, depending on the selected scenario).[28] Water-heating and food-service measures are anticipated to save the most natural gas. Whole-building improvements are also expected to contribute to electric and natural gas savings.[29]

Leadership in Energy and Environmental Design (LEED) and Green Buildings: California is home to the most LEED-certified buildings. As of 2018, more than 500 buildings met the requirements, which equates to more than 112 million gross square feet.[30] There is clearly a strong market-driven incentive in the state to design and operate buildings efficiently.

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26 Swearingen, Scott Van, Tracy Scott, and Kimberly Pray. 2012. *Reach for "Stranded Savings": The Challenges and Opportunities of Energy Efficiency in Affordable Multifamily.* ACEEE https://aceee.org/files/proceedings/2012/data/papers/0193-000125.pdf.
27 U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy. "Building Energy Asset Score." https://www.energy.gov/eere/buildings/building-energy-asset-score.
28 Navigant. July 2019. 2019 Energy Efficiency Potential and Goals Study, pg. 89-92. Prepared for the California Public Utilities Commission.
29 Ibid.
30 U.S Green Building Council. February 4, 2019. Press release. "U.S. Green Building Council Announces Annual Top 10 States for LEED Green Building in 2018." https://www.usgbc.org/articles/us-green-building-council-announces-annual-top-10-states-leed-green-building-2018.

Industry

The state's industrial sector plays a significant role in making California's economy the world's fifth largest. The state also ranked first in the nation in manufacturing gross domestic product in 2018.[31] California excels at technology manufacturing, like computer and electronic products.

California's industrial sector consumes about a fifth of the total energy consumed in the state. Its energy consumption is about 70 percent natural gas. Overall, industry continues to drive energy consumption while accounting for a quarter of the gas consumption in the state.[32]

Industrial Sector

Industrial Sites

Over 700 sites are required to report to CARB through the Cap-and-Trade Program.

Source: CARB. Mandatory GHG Reporting. https://ww2.arb.ca.gov/our-work/programs/mandatory-greenhouse-gas-emissions-reporting

Types of Industry

- Food Processing
- Refining
- Cement
- Glass
- Chemicals
- Construction

Key Stakeholders

- Building managers
- Large general contractor firms
- Small contractor firms
- Specialty contractors, including HVAC, process heat, and pumping

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End Uses

Uses within the industrial sector vary due to the numerous processes and products. However, most uses rely on natural gas—about 70 percent, as noted above. Food processing, chemicals, refining, paper, and construction lead in energy consumption. These subsectors often rely on uses that require heat, like steam, justifying the significant need for natural gas.

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31 U.S. Energy Information Administration. "California State Profile and Energy Estimates." https://www.eia.gov/state/data.php?sid=CA#ConsumptionExpenditures.
32 California Energy Commission. "Supply and Demand of Natural Gas in California." https://ww2.energy.ca.gov/almanac/naturalgas_data/overview.html.

Challenges in Industrial

Disruption to Process: For the industrial sector, energy upgrades often necessitate shutting down industrial processes, thereby disrupting goods production. Such upgrades may be accomplished only in narrow periods, when the process or section of the building is shut down for maintenance. This narrow window means that efficiency upgrades and financing must be planned well in advance.

Nonstandardized Energy Efficiency Solutions: The varied uses, especially in industrial processes, mean that standard energy efficiency programs may not apply. Custom programs exist to resolve this, but barriers to defining a proper baseline or justifying the incentive often results in the window of opportunity passing.

Opportunities in Industry

Strategic Energy Management (SEM): SEM is a growing program design that targets industry energy use. SEM programs focus on supporting customers to implement ongoing behavioral, retrocommissioning, energy efficiency, and operational savings measures.[33] The California IOUs identified SEM as a key strategy to reduce energy consumption and increase efficiency savings.[34] Through this program, a utility or third-party implementer provides the processes and systems needed to incorporate energy considerations and energy management into daily operations.[35] The key is to continuously monitor and evaluate ways to improve efficiency and upgrade assets.

GHG Reduction Programs: In these programs, GHGs serve as the metric to reduce energy use as opposed to measuring kilowatt-hours (kWh) or therms reductions. Because these sectors, especially industry, are GHG-intensive, they are often targeted by state programs aimed at combating climate change, such as the Cap-and-Trade Program.[36]

Large Energy Consumers: The extensive amount of energy consumed by the industrial sector provides opportunities for increased energy efficiency savings. For example, stakeholders from the California Large Energy Consumers Association (CLECA)

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33 AESC. February 22, 2018. Press release: "AESC and Cascade Energy Bring Strategic Energy Management to Southern California," http://www.aesc-inc.com/aesc-cascade-energy-bring-strategic-energy-management-southern-california/.

34 Breitenstein, Colleen. "Doubling Energy Efficiency Savings: Industrial & Agricultural Sector·." IEPR Commissioner Workshop on Doubling Energy Efficiency Savings. June 7, 2018.
Brooks, Erin. "Agricultural and Industrial Energy Efficiency." IEPR Commissioner Workshop on Doubling Energy Efficiency Savings. June 7, 2018 http://www.energy.ca.gov/2018_energypolicy/documents/2018-06-07_workshop/2018-06-07_presentations.php.

35 U.S. Department of Energy. "Data Driven, Strategic Energy Management." https://www.energy.gov/eere/slsc/data-driven-strategic-energy-management.

36 California Air Resources Board. "Mandatory Greenhouse Gas Emissions Reporting." https://ww2.arb.ca.gov/our-work/programs/mandatory-greenhouse-gas-emissions-reporting.

described a partial list of the energy efficiency projects under consideration by CLECA members. For the 10 projects discussed, CLECA members committed or planned to invest more than $10 million in project costs. The anticipated energy savings were expected to be more than 23 million kWh, with a total demand savings of 3.1 megawatts (MW).

Industrial Assessment Centers: The U.S. Department of Energy's Industrial Assessment Centers at San Francisco State University and San Diego State University provide no-cost energy audits to medium and small industrial plants.[37] Industrial Assessment Centers (IACs) have been conducting industrial assessments since 1976.

37 U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy. "Locations of Industrial Assessment Centers." https://www.energy.gov/eere/amo/locations-industrial-assessment-centers.

Agriculture

California is first in the nation in agricultural output, bringing in roughly $50 billion annually for a wide variety of products. California agriculture is led primarily by the dairy, nut, and grape subsectors. California's agricultural sector consumes about 5 percent of the total energy consumed. In the agricultural sector, about 85 percent of energy is consumed as electricity.[38]

Agricultural Sector

Agriculture Acreage

More than 24,000,000 acres of farm land.

Source: United States Department of Agriculture, 2017 Census. https://www.nass.usda.gov/AgCensus/

Key Stakeholders

- Independent farmers and farming corporations
- Building managers
- Large general contractor firms
- Small contractors firms

Indoor Agriculture Subsector

Indoor agriculture or controlled environment agriculture is growing throughout the state, especially as cities look to source locally grown produce and communities strive to increase food security. In addition, recent California law has permitted commercial cannabis cultivation, which generally occurs indoors. Indoor cannabis growing is taking place primarily within retrofitted commercial spaces and warehouses. Standard indoor agriculture and cannabis cultivation are energy-intensive, requiring significant space conditioning, lighting, and ventilation.

End Uses

Electricity and natural gas are used in agriculture. Most of the direct energy use in U.S. farms is for machinery, which typically runs on diesel or gasoline. These fuels are not in the scope of this 2019 EE Action Plan. Electricity use is dominated by heating and cooling livestock, operating dairies, and pumping water for irrigation.[39] In California, some farmers are switching to electric pumps often subsidized by incentives offered by local air quality control districts and CARB programs like the Carl Moyer Memorial Air Quality Standards Attainment Program.[40]

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38 California Energy Commission. "Energy Consumption Data Management System," http://ecdms.energy.ca.gov/, Demand Analysis Office, Data Collection and Analysis Unit.
39 United States Department of Agriculture. May 2013. *Agriculture's Supply and Demand for Energy and Energy Products.* https://www.ers.usda.gov/webdocs/publications/43756/37427_eib112.pdf?v=0.
40 California Air Resources Board. "Carl Moyer Memorial Air Quality Standards Attainment Program." https://ww2.arb.ca.gov/our-work/programs/carl-moyer-memorial-air-quality-standards-attainment-program.

Challenges in Agriculture

Disruption to Process: Energy upgrades often necessitate closing fields or facilities, thereby disrupting farming or other agricultural activity. Such upgrades may be accomplished only in narrow periods, when the facility or farm is dormant due to scheduled maintenance or seasonality of a crop. This narrow window means that the financing for upgrades must be in place well before.

Nonstandardized Energy Efficiency Solutions: Standard energy efficiency technologies may not apply to the varied processes used at farms and agricultural facilities. Custom programs exist to resolve this, but barriers to defining a proper baseline or justifying the incentive often results in missing the window of opportunity.

Expanding Cannabis Growth: As California cannabis cultivation grows, the result will be significant electric load increases. Utilities will need to work with indoor agriculture businesses on energy efficiency measures and become familiar with predictable load increases to prepare the local distribution and transmission system.

Opportunities in Agriculture and Industry

SEM: SEM also targets agriculture energy use. Through this program, a utility or third-party implementer provides the processes and systems needed to incorporate energy considerations and energy management into daily operations.[41] The key is to continuously monitor and evaluate ways to improve efficiency and upgrade assets.

GHG Reduction Programs: Similar to the industrial sector, agriculture operations can be GHG-intensive. GHG reduction programs that focus on reducing GHG as opposed to measuring kWh or therms reductions may be appropriate.

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41 U.S. Department of Energy. "Data Driven, Strategic Energy Management." https://www.energy.gov/eere/slsc/data-driven-strategic-energy-management.

Public Buildings

The 2019 EE Action Plan separates public sector buildings, those owned by local and state governments, from other commercial buildings. These buildings play a unique role in showcasing energy efficiency possibilities while saving on operating costs. To date, California state buildings have been used to demonstrate the feasibility of zero-net-energy design. As of July 2019, 28 state buildings have been approved as zero-net energy, with another 28 going through various stages of certification.[42] Moving forward, public buildings can be the living labs for zero-carbon buildings and demand-flexible technologies.

Public Buildings

Number of Buildings

State Buildings

Department of General Services (DGS) reports about 25,000 state-leased or state-owned structures, totaling more than 230 million square feet of floor space.

Local Government Buildings

Definitive data are not available for the number of local government buildings in California, though they are estimated at 35,000 to 40,000.

Schools

- K-12: About 12,800 schools; more than 714 million square feet.
- California Community Colleges: 112 campuses; 5,281 buildings; 75.6 million square feet.
- California State Universities: More than 2,000 buildings; 90 million square feet.
- University of California System: 5,775 buildings; 129 million square feet.

Key Building Industry Stakeholders

- DGS
- Local government agencies
- Local government IOU partnerships
- Energy services companies

Sources: U.S. EIA, California Energy Commission, and Department of Finance Based on 2010 data

Challenges in Public Buildings

Financial Constraints: Many local governments lack the capital to upgrade buildings or do not view retrofits as a priority. Moreover, any cost savings from implemented upgrades may go to the general operating fund, not reinvested back into building upgrades.

42 California Department of General Services. Office of Sustainability. Zero-Net Energy Policy. https://www.dgs.ca.gov/OS/Resources/Page-Content/Office-of-Sustainability-Resources-List-Folder/Zero-Net-Energy.

Expert Knowledge: Many local governments lack the capacity to hire staff focused on energy efficiency or GHG reduction improvements. This constraint limits the municipalities' ability to identify upgrades beyond standard maintenance. Relying on technical assistance may not be a long-term solution for small local governments with limited capital.

Opportunities in Public Buildings

Models for Success: Governments can direct upgrades to their building stock to showcase energy efficiency and clean energy. Through demonstration, policy makers can show the broader cost savings and benefits to upgrades. The CEC offers funding for energy efficiency upgrades via the Energy Conservation Assistance Act (ECAA) loan program.

Purchasing Power: Just as policy makers can require upgrades to government buildings, they can also direct resources to purchase clean energy measures. The buying power of governments should unlock lower costs for more efficient uses. It may be possible for smaller governments to purchase new equipment or bundle building upgrades jointly to lower costs.

Updated Milestones and Outcomes

The following updated implementation timeline, based on the *2016 EBEE Plan Update,* includes goals and outcomes summarizing progress. These are the primary milestones CEC will use to assess and adapt the 2019 EE Action 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. Accomplished.
- 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. In progress.
- By 2017, energy and cost savings information for state and school building retrofits is publicly available. Accomplished.[43]
- Every two years, starting in 2017, the CEC, in conjunction with the partners identified in the *EBEE Action Plan* and *2016 EBEE Plan Update*, evaluates plan progress and reports findings in the *Integrated Energy Policy Report (IEPR).* Accomplished.
- By 2018, a time-certain benchmarking program is in place for nonresidential buildings more than 50,000 square feet. Accomplished.

43 The Citizens Oversight Board is a public board that oversees the progress of the Proposition 39 energy efficiency grant program.

- By 2018 to 2019, energy asset ratings are considered in real estate appraisals and included in property listings. In progress.
- By 2018, establish baseline code compliance rate for residential HVAC replacements. By 2021, improve compliance to 80 percent. In progress.
- By 2019, state 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. In progress.
- The 2019 Energy Standards provide directed guidance and simplified approaches for compliance and enforcement of code requirements for existing building alterations. Accomplished.
- By 2020, retrofit project compliance with the energy standards is at 90 percent and is achieved at lower cost. In progress.
- 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. In progress.
- 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. In progress.
- By 2020, industry quality assurance is a routine job completion practice. In progress.
- By 2020, a certified, high-performing workforce is enabled to support California's energy efficiency industry. In progress.
- By 2020, utility resource procurement programs play an increased role in achieving energy savings. In progress.
- The 2022 Energy Standards provide pathways to building decarbonization and approaches to improve energy efficiency within multifamily buildings. In progress.
- By 2030, California has doubled energy efficiency savings, relative to a 2015 base year, as mandated under SB 350. In progress.
- By 2030, renewable energy resources supply 60 percent of the retail sales of electricity in California. In progress.
- By 2030, California reduces GHG emissions 40 percent below 1990 levels. In progress.

- By 2045, California achieves carbon neutrality across all sectors. Former Governor Edmund G. Brown Jr. directed state agencies to put the state on a path to achieve net-zero-carbon emissions by 2045 and negative GHG emissions thereafter. In progress.
- By December 31, 2045, renewable energy resources and zero-carbon resources supply 100 percent of retail sales of electricity and 100 percent of electricity procured to serve all state agencies. In progress.

CHAPTER 2: Policy Updates

Policy and Action Drivers

California energy affordability, demand reduction, and GHG emissions reduction policies and legislation have driven energy efficiency, building decarbonization, and energy equity goals. The primary policy and legislative drivers are detailed below.

Assembly Bill 758

AB 758 (Skinner, Chapter 470, Statutes of 2009) required the development of the Existing Buildings Program, which resulted in the triennial *EBEE Action Plan*, now incorporated into this biennial 2019 EE Action Plan. Specifically, AB 758 required the CEC to consider the following to achieve greater savings in the state's existing residential and nonresidential building stock:

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

Senate Bill 350

The Clean Energy and Pollution Reduction Act of 2015 (Senate Bill 350, De León, Chapter 547, Statutes of 2015) continued, enhanced, and expanded the building energy efficiency program established by AB 758. SB 350 provided new direction, including periodic updating of the program, to achieve a doubling of the state's energy efficiency savings potential. SB 350 contains five energy efficiency mandates, most of which are in progress or have been completed:

- The CEC, in collaboration with the CPUC and local publicly owned utilities (POUs), will establish annual targets for statewide energy efficiency and demand reduction to achieve a cumulative doubling of statewide "energy efficiency savings in electricity and natural gas final end uses of retail customers" by January 1, 2030.[44] In progress.
- The CEC, 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 first report was completed, and this 2019 EE Action Plan incorporates updates. In progress.
- The CEC 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. The CEC will also establish consumer protection guidelines for energy efficiency products and services. In progress.
- The CEC develop and publish the Barriers Study. Accomplished.
- 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. In progress.

Furthermore, SB 350 directs the Existing Buildings Program to promote greater penetration of 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

Assembly Bill 802 (Williams, Chapter 590, Statutes of 2015) requires utilities to maintain energy usage records for all buildings to which they provide service, and to provide energy usage data to the owner, owner's agent, or operator of a covered building upon request. The bill also directed the CEC to adopt regulations providing for the collection and public disclosure of building energy benchmarking information. The regulations enacting the benchmarking and public disclosure program went into effect June 1, 2018, with the first batch of commercial buildings reporting. June 1, 2019, saw the first reporting deadline for covered multifamily buildings.

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44 Jones, Melissa, Michael Jaske, Michael Kenney, Brian Samuelson, Cynthia Rogers, Elena Giyenko, and Manjit Ahuja. 2017. *Senate Bill 350: Doubling Energy Efficiency Savings by 2030.* California Energy Commission. Publication Number: CEC-400-2017-010-CMD.

AB 802 directed the CPUC to include operational, behavioral, and retrocommissioning programs[45] within the portfolio of efficiency programs. It also permitted utilities to develop meter-based savings programs.

Senate Bill 1414

Senate Bill 1414 (Wolk, Chapter 678, Statutes of 2016) requires the CEC to develop and approve a plan that promotes air-conditioner and heat-pump installations that comply with the energy standards. SB 1414 authorizes the CEC to adopt regulations to support this plan and requires the CEC to evaluate the best available technological and economic information to ensure that data collection and related use are feasible and achievable at a reasonable cost to government, industry, and homeowners.

Senate Bill 1477

Senate Bill 1477 (Stern, Chapter 378, Statutes of 2018) requires the CPUC to develop two new incentive programs. These programs would provide incentives for low-emission space- and water-heating equipment for new homes and for near-zero-emission building technologies in new and existing homes to reduce GHG emissions.

Assembly Bill 3232

Assembly Bill 3232 (Friedman, Chapter 373, Statutes of 2018) requires the CEC, in consultation with the CPUC, CARB, and the California ISO, by 2021, to assess the potential to reduce GHGs from the state's residential and commercial building stock by at least 40 percent below 1990 levels by January 1, 2030. It requires the CEC to include a section in each *IEPR* starting in 2021 describing the GHG emissions associated with the supply of energy to buildings.

Senate Bill 1013

Senate Bill 1013 (Lara, Chapter 375, Statutes of 2018) directs the CPUC to develop a strategy for increasing the use of low-global-warming potential refrigerants as part of the energy efficiency portfolio.[46] This bill requires the CEC to "identify opportunities to assess" the energy efficiency of low-global warming potential alternatives that could be used in fluorine-based appliances and equipment.

Senate Bill 1131

Senate Bill 1131 (Hertzberg, Chapter 562, Statutes of 2018) requires the CPUC to authorize IOU incentives for customized industrial, agricultural, commercial, residential, and public sector energy efficiency projects based on nationally recognized

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45 Often shortened to "BROs," operational, behavioral, and retrocommissioning programs are efficiency programs that target improperly used equipment, occupant behavior improvements, and incorrectly installed or maintenance, respectively.

46 The energy efficiency portfolio is the collection of energy efficiency programs administered by the IOUs and overseen by the CPUC.

measurement and verification standards. The bill also establishes new requirements and timelines for the CPUC's review of these projects.

Senate Bill 100

Senate Bill 100 (De León, Chapter 312, Statutes of 2018) increases the Renewables Portfolio Standard (RPS) to 60 percent by 2030. Moreover, the bill sets a policy that eligible renewable resources and zero-carbon resources supply 100 percent of retail sales of electricity to end-use customers and 100 percent of electricity procured to serve all state agencies by December 31, 2045. In addition, it requires the CEC, CPUC, CARB and all other state agencies incorporate this policy into all relevant planning. Also, the CEC, CPUC and CARB are required to prepare a joint report addressing the implementation of the policy focused on technologies, forecasts, existing transmission, maintaining safety, environmental protection, affordability, and system and local reliability to the Legislature in 2021 and every four years thereafter.

Senate Bill 49

Senate Bill 49 (Skinner, Chapter 697, Statutes of 2019) expands the authority of the CEC to set energy efficiency standards to include those that also manage energy loads to help maintain electrical grid reliability. The CEC is required to adopt, by regulation, and periodically update standards for appliances to expedite the development of flexible-demand technologies. The CEC must consult with the CPUC and load-serving entities to align the demand flexibility standards with demand response programs administered by the state and load-serving entities, as well as offer incentives for demand-flexible appliances. The CEC may also use GHG emissions when determining the cost-effectiveness of the flexible demand appliance.

Assembly Bill 1232

Assembly Bill 1232 (Gloria, Chapter 754, Statutes of 2019) requires the Department of Community Services and Development (CSD), by January 1, 2021, to coordinate with the CEC and the California Department of Public Health (CDPH) to create a recommended action plan to improve existing programs for energy and healthy home improvements for low-income multifamily residents in disadvantaged communities. The bill also requires CSD to coordinate with the CEC and CDPH to assess the Low-Income Weatherization Program (LIWP).

Timeline of Major Energy Efficiency Policy Measures

2018
- Energy Commission adopts the 2019 Building EE Standards in March 2018, which increases energy efficiency for new and existing buildings. It also includes the first solar photovoltaics mandate for certain buildings
- SB 1477 passes and develops two incentive programs, BUILD and TECH, which advance building decarbonization
- AB 3232 passes and directs the Energy Commission to study the potential to reduce GHGs from building to 40% below 1990 levels by 2030

2017
- SB 350 EE doubling targets are adopted and SB 350 *Low Income Barriers Study* is adopted
- AB 802 goes into effect; the first phase requires utilities to provide building-level energy-use data to owners upon request
- AB 793 goes into effect, directing CPUC to require utilities to provide incentives for energy management technologies

2016
- SB 32 mandates GHGs reduced to 40% below 1990 levels by 2030
- 2016 Update to *Existing Building Energy Efficiency Action Plan* is prepared

2015
- Clean Energy & Pollution Reduction Act (SB 350) passes, mandating 50% renewable electricity and doubling additional EE by 2030
- In 2015, the Energy Commission adopted the *Existing Buildings Energy Efficiency Action Plan*

2013
- Air Resources Board Scoping Plan aligns goals and details regarding EE for existing buildings

2012
- CPUC approves almost $2 billion for 2 years in EE financing for utilities, local governments, and implementers
- Governor Brown issues Executive Order B-18-12, requiring state agencies to reduce GHG emissions
- Prop 39 passes, providing around $500 mil annually for EE and clean energy programs for 5 years

2009
- California begins implementation of American Recovery & Reinvestment Act EE programs
- AB 758 passes and directs Energy Commission to develop a program to increase EE in existing buildings

2008
- California adopts green building codes and CPUC publishes the California Long-term Energy Efficiency Strategic Plan
- Department of Water Resources creates climate change adaption strategies, which highlights water efficiency as part of energy efficiency
- Sustainable Communities and Climate Protection Act (SB 375) passes, directing the Air Resources Board to set regional greenhouse gas (GHG) reduction targets

2007
- Zero Net Energy is adopted into 2007 IEPR for newly constructed buildings (goals: 2020 residential and 2030 non-residential)

2006
- California Global Warming Solutions Act of 2006 (AB 32) passes
- Mandate passes for Energy Commission to report EE goals for POUs and IOUs

2005
- CPUC policy package triples IOU energy efficiency (EE) budgets and commits shareholder reward for EE performance

2002
- SB 1389 requires that the Energy Comission adopt an *Integrated Energy Policy Report (IEPR)* every two years

1987
- National Appliance Energy Conservation Efficiency Act passes

1982
- CPUC implements decoupling regulation (separating sales of electricity from IOU revenues)

1978
- Energy standards for new buildings and alterations to existing buildings (Title 24, part 6) are adopted

1976
- Efficiency standards for appliances (Title 20) are adopted

1974
- California Energy Commission is created by the Warren-Alquist Act

CHAPTER 3:
Statewide Energy Efficiency Goals

Overview

The core outcomes and recommendations of the 2019 EE Action Plan revolve around three goals:

1. Double energy efficiency savings by 2030
2. Remove barriers to energy efficiency participation within low-income households, disadvantaged communities, and rural regions
3. Reduce the GHG emissions from buildings

Together, these goals will drive California to a clean energy and equitable future while aligning with the principles established for increasing energy efficiency in existing buildings.

Goal 1: Double Energy Efficiency Savings by 2030

In 2015, California set an ambitious goal to achieve a statewide cumulative doubling of energy efficiency savings and demand reductions in electricity and natural gas end uses by January 1, 2030, relative to a 2015 base year. SB 350 directed the CEC to set annual targets that achieve this goal. The state will need to harness emerging technologies, innovative program designs, and innovative market solutions as part of this effort. Getting projects in motion will require better alignment of energy efficiency supply and implementation chains. The state can assist through efficiency policies, regulations, and codes. Although there are limitations to government intervention that other pathways can leverage, it is increasingly important to encourage and work with the private marketplace to overcome obstacles. Leveraging private capital will be important to meeting the doubling targets.

The following components discuss the areas of energy efficiency savings that the CEC analyzed to develop and update the annual targets. This first goal also explores the various research and market transformation efforts underway, or feasible, to spur additional savings.

Component 1: Ratepayer Programs and Policies

Ratepayer energy efficiency programs are significant contributors to projected energy efficiency savings. IOUs and POUs, as well as community choice aggregators (CCAs), deliver programs. In many instances, third parties carry out the administration and implementation. Historical savings are reported by the CPUC for IOU programs, while POUs report savings through public reports made available by the California Municipal Utility Association (CMUA). These same groups are responsible for producing forecasts of efficiency savings. CCAs do not have a common reporting outlet at this time.

Publicly Owned Utility Programs

During the 2018 reporting cycle, POUs spent more than $218 million on energy efficiency programs, resulting in more than 638 GWh of net annual energy savings (Table 1).[47] For the first time in more than a decade, the cost per annual kWh saved topped $0.30, which may reflect the lack of cost-effective measures and program designs on the table for utilities. Table 2 summarizes energy efficiency program savings for all POUs. Los Angeles Department of Water and Power (LADWP) alone represents more than half (54.2 percent) of the total annual energy savings for public power. Together with Sacramento Municipal Utility District (SMUD), the two largest POUs represent 71.6 percent of the total annual energy savings achieved by POUs last year. The 16 POUs subject to the integrated resource plan (IRP) requirements provided 97.8 percent of public power annual energy savings, which slightly exceeds these utilities' share of total POU customer electricity consumption (94.1 percent).[48] Most reported savings are from lighting measures, followed distantly by any other grouping of upgrades (Figure 15). POUs will need to find additional avenues for savings as LED lighting becomes the baseline for buildings.

Table 1: POU Electricity Savings and Expenditures

Fiscal Year	Net Peak Savings (kW)	Net Annual Savings (MWh)	Net Lifecycle Savings (MWh)	Total Utility Expenditures ($)
05/06	52,552	169,303	2,249,214	$54,412,728
06/07	56,772	254,332	3,062,361	$63,151,647
07/09	82,730	401,919	4,473,801	$103,907,266
08/09	117,435	644,260	6,749,912	$146,093,107
09/10	93,712	522,929	5,586,299	$123,433,250
10/11	81,121	459,459	4,604,364	$132,372,795
11/12	82,561	439,710	4,638,521	$126,936,631
12/13	89,305	521,478	5,722,100	$134,475,230
13/14	110,437	625,187	6,413,468	$169,901,735
14/15	124,807	644,703	7,836,316	$162,896,993
15/16	107,925	771,592	10,253,633	$154,796,668
16/17	113,549	861,942	11,991,602	$226,386,251
17/18	129,244	638,656	8,267,536	$218,730,235
TOTAL	**1,242,149**	**6,955,469**	**81,849,127**	**$1,817,494,536**

Source: Northern California Power Agency (NCPA), 2019 POU Energy Efficiency Report

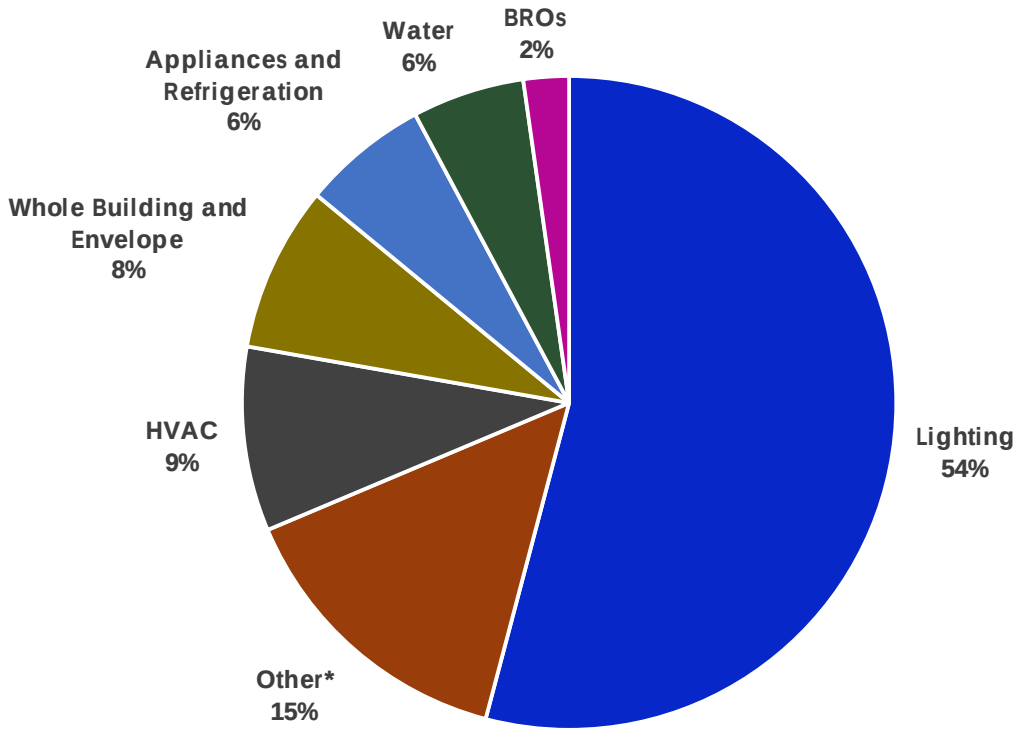
47 Expenditures and savings table, pg. 4, *2019 POU EE Report,* https://www.ncpa.com/policy/reports/energy-efficiency/
48 Ibid, Savings by utility, pg. 6.

Table 2: POU Savings, 2018

Summary by Utility	Resource Savings Summary							Cost Summary	Cost Test Ratios		
Utility	Gross Peak Savings (kW)	Gross Annual Energy Savings (kWh)	Gross Lifecycle Energy Savings (kWH)	Net Peak Savings (kW)	Net Annual Energy Savings (kWh)	Net Lifecycle Energy Savings (kWh)	Net Lifecycle GHG Reductions (Tons)	Total Utility Cost	PAC	TRC	Utility ($/kWh)
Alameda	180	1,471,579	20,741,534	162	1,362,479	19,242,186	7,687	$875,637	1.95	1.18	$0.060
Anaheim	4,361	20,136,148	233,959,277	4,361	20,136,148	233,959,277	88,626	$4,914,824	4.56	7.10	$0.027
Azusa	654	3,036,347	33,783,387	637	2,872,363	32,002,410	12,625	$731,703	4.10	5.94	$0.030
Banning	1,144	150,301	1,610,310	911	124,871	1,354,002	550	$207,194	0.81	1.20	$0.191
Biggs	-	51,216	256,080	-	46,094	230,472	117	$20,936	0.94	0.94	$0.099
Burbank	4,253	14,451,356	123,765,099	4,212	14,312,559	122,344,415	47,777	$3,635,878	3.62	1.25	$0.036
Colton	315	2,001,970	20,909,142	253	1,508,946	15,796,947	6,692	$1,413,864	27.64	29.37	$0.113
Glendale	4,455	10,201,043	39,748,649	4,414	10,133,699	38,645,052	16,032	$1,843,996	2.32	2.17	$0.061
Gridley	29	104,348	1,276,213	20	86,724	982,417	412	$92,378	1.32	0.89	$0.118
Healdsburg	102	687,772	8,255,258	85	581,351	6,966,033	2,728	$257,685	2.82	0.83	$0.038
Imperial	7,403	18,626,472	250,671,076	6,151	15,432,152	209,038,646	97,703	$5,298,497	4.15	7.01	$0.037
Lassen	35	262,065	2,935,758	27	220,118	2,450,699	976	$102,815	2.24	1.61	$0.052
Lodi	371	3,190,405	38,444,771	272	2,487,074	29,641,708	12,154	$792,018	3.67	2.11	$0.033
Lompoc	40	306,406	4,483,302	28	207,818	3,040,544	1,127	$108,541	2.78	1.68	$0.041
Los Angeles	52,710	346,408,005	5,052,753,288	52,704	346,379,055	5,052,405,888	292,162	$131,042,086	1.72	0.85	$0.034
Merced	-	2,037,395	20,405,526	-	1,624,970	16,264,098	6,549	$1,068,008	1.35	1.53	$0.081
Modesto	1,285	6,719,789	74,927,724	1,045	5,523,033	61,468,862	24,892	$2,426,614	3.16	1.43	$0.040
Moreno Valley	628	4,716,930	47,271,023	563	4,236,312	42,420,820	16,721	$183,523	22.54	22.63	$0.005
Needles	1	5,875	83,542	1	4,875	71,052	28	$148,370	0.04	0.97	$2.851
Palo Alto	415	8,988,048	100,491,731	232	5,956,736	63,217,786	21,436	$3,080,534	1.74	0.65	$0.056
Pasedena	1,536	13,526,452	81,800,786	1,504	13,353,078	79,581,441	31,029	$4,042,594	2.26	2.26	$0.059
Plumas-Sierra	33	82,921	1,116,146	24	57,730	806,337	346	$124,828	0.73	0.46	$0.208
Port of Oakland	-	648,755	7,785,060	-	519,004	6,228,048	3,042	$45,829	13.51	1.24	$0.009
Rancho Cucamonga	171	480,554	7,688,864	171	480,554	7,688,864	2,760	$87,879	7.78	21.37	$0.016
Redding	1,109	7,028,979	54,926,085	861	5,518,363	42,010,053	18,871	$2,654,740	1.91	1.15	$0.072
Riverside	3,416	23,555,710	309,433,140	2,930	22,240,608	276,855,125	110,446	$5,974,465	5.29	19.97	$0.029
Roseville	1,829	15,873,872	99,313,187	1,608	14,957,621	89,520,947	39,505	$4,001,169	1.26	1.27	$0.055
Sacramento	36,823	131,521,260	1,567,460,963	28,825	110,819,702	1,333,705,655	88,853	$30,976,348	1.15	0.26	$0.028
San Fracisco	126	4,262,300	63,934,500	126	4,262,300	63,934,500	29,487	$5,054,602	1.52	1.45	$0.106
Shasta Lake	40	166,772	2,223,528	22	130,745	1,661,188	672	$135,744	1.42	1.14	$0.105
Silicon Valley Power	1,943	15,620,586	212,107,277	1,660	13,515,623	182,846,581	68,650	$4,313,248	3.87	2.53	$0.031
Trinity	7	2,588	35,480	6	1,937	27,048	13	$128,825	0.03	0.10	$6.268
Truckee Donner	28	261,699	2,636,803	22	202,089	1,982,231	828	$411,587	0.61	0.89	$0.273
Turlock	2,726	13,802,965	159,746,452	2,691	13,599,570	157,066,969	59,345	$1,984,134	7.47	2.37	$0.016
Ukiah	17	135,780	1,711,500	13	102,789	1,267,873	549	$87,137	1.66	1.07	$0.087
Vernon	948	5,383,804	66,720,063	948	5,383,804	66,720,063	25,093	$473,988	12.57	10.89	$0.009
Victorville	110	340,831	5,112,465	88	272,665	4,089,972	1,516	$43,896	7.58	1.61	$0.015
TOTAL	**129,244**	**676,249,299**	**8,720,524,989**	**117,578**	**638,655,559**	**8,267,536,209**	**1,137,999**	**$218,786,114**	**1.99**	**0.95**	**$0.036**

Source: CMUA

Figure 15: Percentage 2018 POU Electricity Savings by Use



Source: NCPA, 2019 POU Energy Efficiency Report. Other* includes miscellaneous, process, and food service end-uses.

Investor-Owned Utility Programs

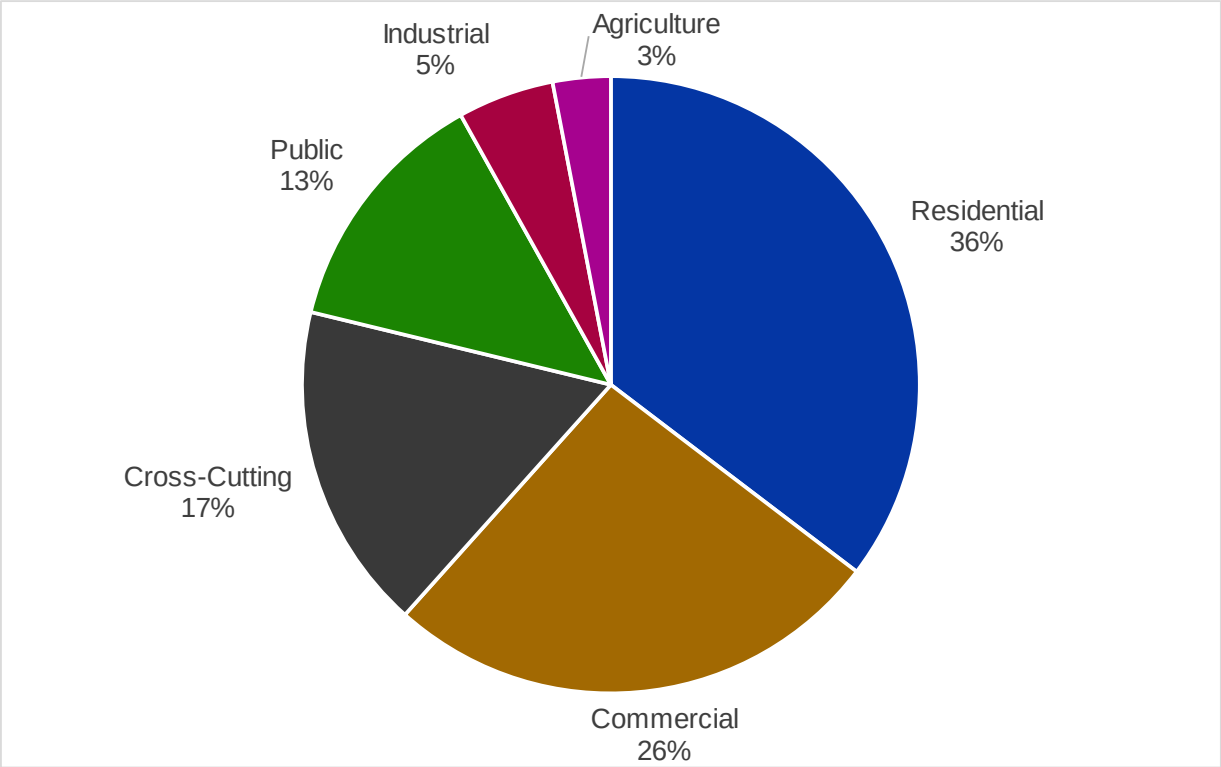
The IOU programs are funded by a small portion of electricity and gas rates included in customer bills. In 2018, IOUs, RENs, and Marin Clean Energy (MCE) spent nearly $700 million on efficiency programs (Table 3). The spending focused predominately on the residential and commercial sectors, which account for 64 percent of energy efficiency spending combined (Figure 16). Advocacy and research for new codes and standards, done in partnership with the CEC, make up most of the cross-cutting savings. Overall, the savings from the IOU portfolio are increasingly coming from codes and standards as low-hanging fruit from lighting programs are depleted (Figure 17).

Table 3: 2018 IOU Program Spending by Sector (Claimed)

Program Administrator	Agricultural	Commercial	Cross-Cutting	Industrial	Public	Residential
Southern California Edison	**$ 2,688,429**	**$ 56,498,857**	**$ 28,260,946**	**$8,341,369**	**$ 21,577,994**	**$ 80,039,410**
San Diego Gas & Electric	**$ 543,998**	**$ 24,085,220**	**$ 29,161,804**	**$ 1,875,053**	**$ 7,831,203**	**$ 19,323,683**
Pacific Gas & Electric	**$12,445,043**	**$ 79,524,652**	**$ 43,339,687**	**$21,407,084**	**$47,818,680**	**$ 90,064,483**
Southern California Gas	**$ 2,117,078**	**$ 17,525,325**	**$ 7,251,583**	**$4,921,453**	**$ 3,117,782**	**$ 52,421,025**
Bay Area REN		**$ 148,602**	**$ 2,034,844**			**$ 14,666,465**
Southern California REN		**$ 184,390**	**$ 546,219**		**$ 7,597,674**	**$ 3,966,779**
MCE		**$ 617,207**	**$ 35,114**			**$ 695,467**

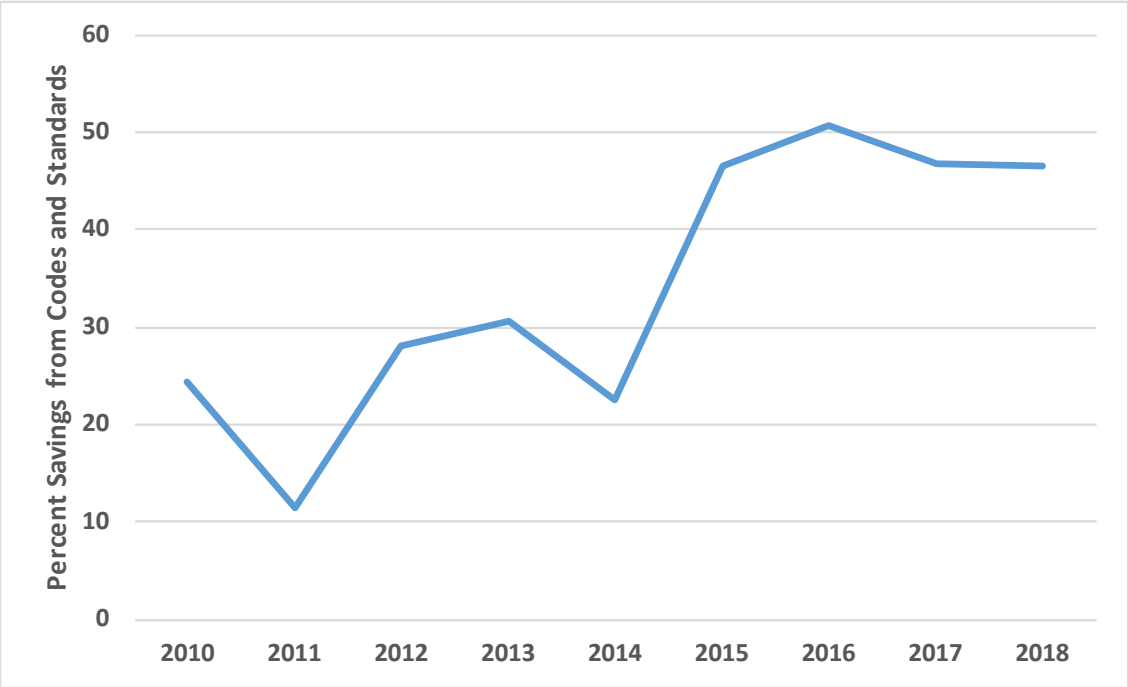
Source: CPUC

Figure 16: Percentage Spending Per Sector in 2018



Source: CPUC

Figure 17: IOU Savings, Percentage From Codes and Standards (2010-2018)



Source: CPUC, EEStats, and CEDARS

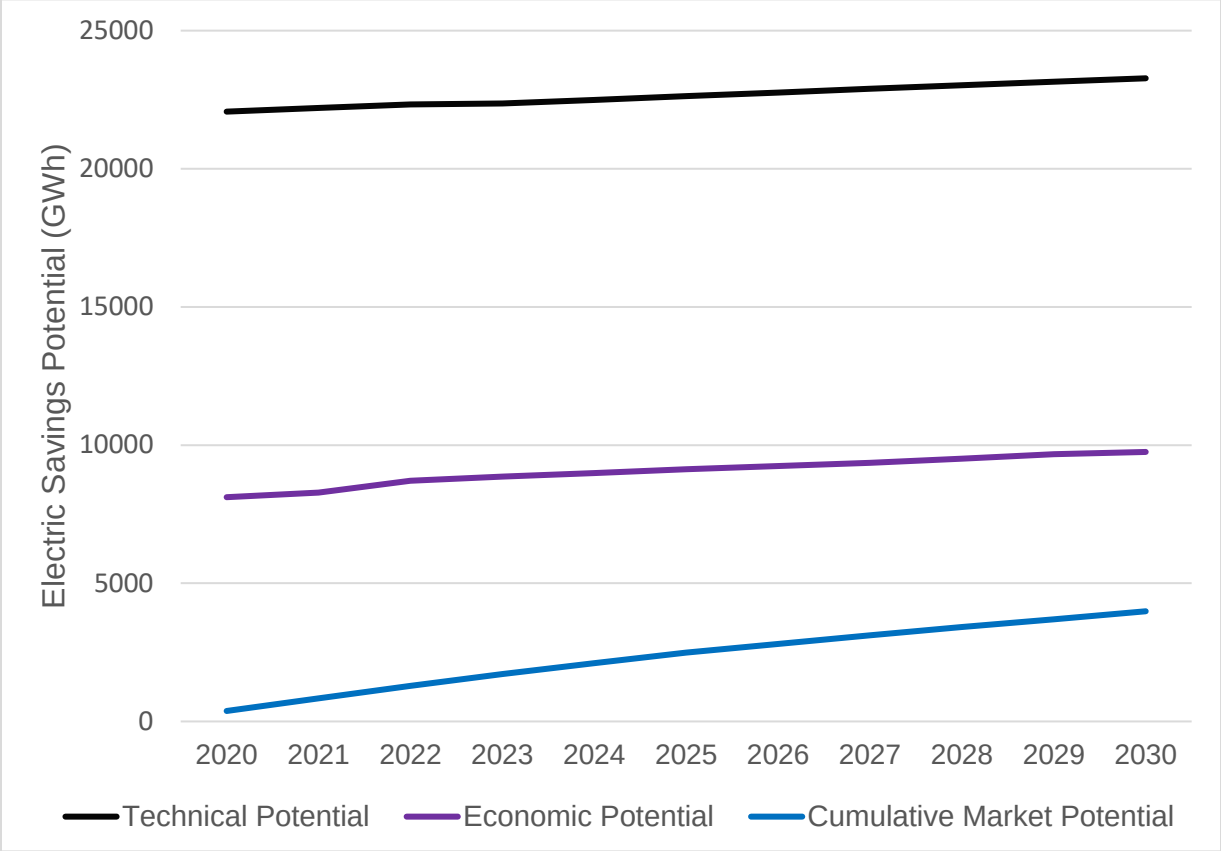
CPUC Potential and Goals Study - 2019

The CPUC's 2019 Potential and Goals Study, the 2019 PG Study, offers two market potentials: an incremental savings value and a cumulative savings value. The CPUC sets annual efficiency goals for the IOUs based on the incremental market potential found by the PG Study. The goals from the PG Study are then used to update the SB 350 targets and the demand forecast. Upon adoption by the CPUC, the ratepayer program proposals must achieve the annual incremental goals. Figure 18 breaks down the differences among the technical, economic, and market potential for electricity savings. The market potential from the chosen savings scenario is broken up by sector and service territory (Figure 19). The savings from the reference scenario indicate that the most savings are expected to come from codes and standards for the next several years, followed closely by residential and commercial sector savings. Overall, the savings expected has dropped from the 2017 study due to both the widespread adoption of LED lighting that removed the need for incentives and an overall improving baseline for lighting measures. From Figure 18, only about 10 percent of the economic potential savings become market potential savings, a difference that is worth investigating and working to close.

Stakeholders have proposed that the potential and goals study by the CPUC for IOUs use more granular customer and weather data to improve analysis of energy-saving

opportunities. They also recommend the CEC guide the CPUC, IOUs, and POUs in creating common approaches to evaluating savings potential.[49]

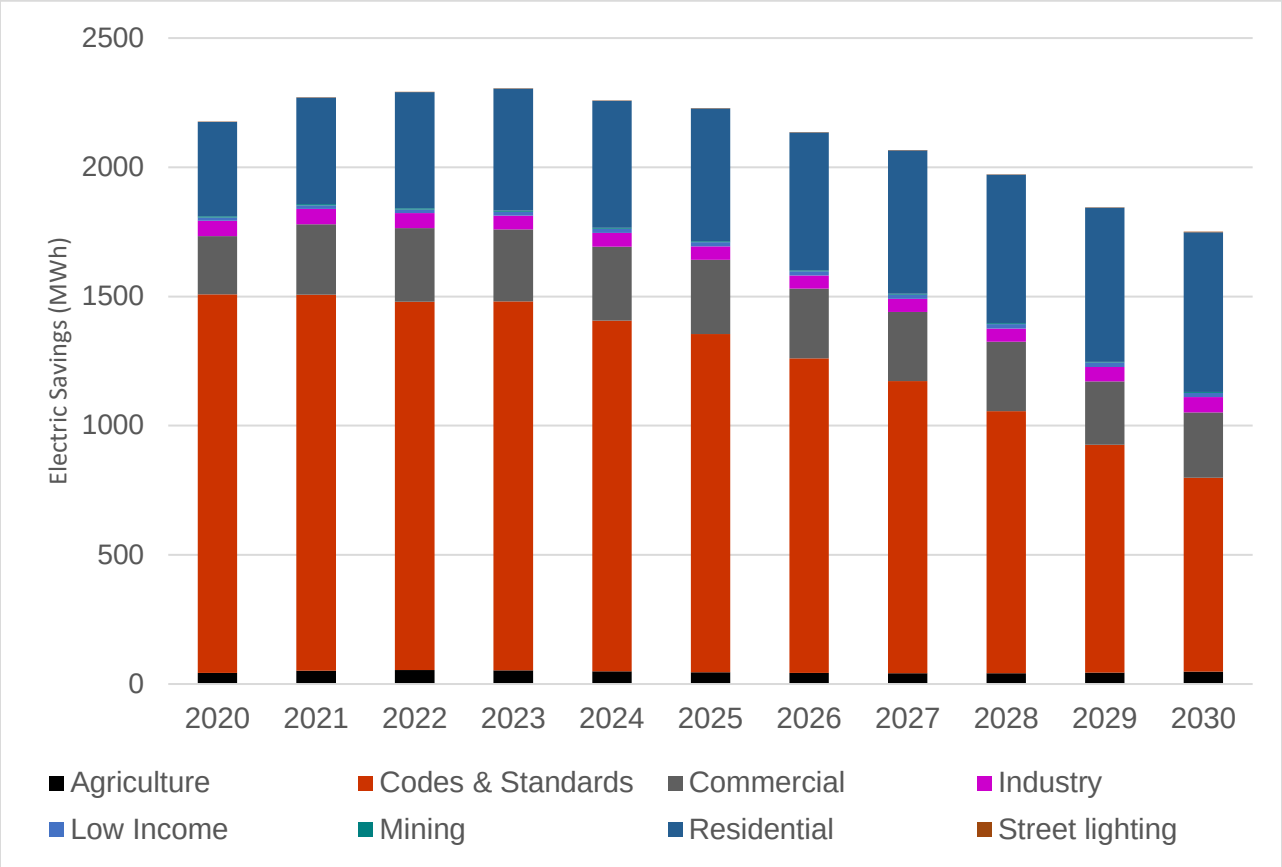
Figure 18: Electric Equipment Potential Savings



Source: Navigant, 2019 PG Study

49 Natural Resources Defense Council comments to CEC, September 2019, pg. 6, https://efiling.energy.ca.gov/GetDocument.aspx?tn=229826&DocumentContentId=61273.

Figure 19: Statewide Electric Savings Market Potential (MWh)



Source: Navigant, 2019 PG Study

Stakeholder-Proposed Utility Portfolio Changes

Given the constraints on the current utility energy efficiency portfolio, it seems time to rethink the paradigm. At the August 2019 CEC workshop on energy efficiency and building decarbonization, the Natural Resources Defense Council (NRDC) proposed that the CPUC restructure the IOU portfolio.[50] The proposal divides the existing energy efficiency portfolio into three subportfolios: resource energy efficiency, long-term energy efficiency market transformation, and equity-focused energy efficiency. The proposed subportfolios would each have a policy objective, potential study, cost-effectiveness framework, tracking metrics, programs, and evaluation. Southern California Edison also recognized the need and expressed support for the proposal.[51] The CEC supports continued analysis of the IOU portfolio and recommends the leaders in this field collaborate on this topic within an existing working group.

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50 NRDC Comments to CEC, September 2019, pg. 4-6, https://efiling.energy.ca.gov/GetDocument.aspx?tn=229826&DocumentContentId=61273.
51 Southern California Edison comments to CEC, September 24, 2019, https://efiling.energy.ca.gov/GetDocument.aspx?tn=229837&DocumentContentId=61285

Community Choice Aggregators

Community choice aggregators (CCAs) are local power purchasing entities created by local governments. These local governments can be any city, county, or combination thereof in California that is within an IOU territory. CCAs pool together a local government's electricity load to purchase or develop power projects on behalf of residents, businesses, and municipalities. As of May 2019, California has 19 active CCAs, serving customer groups ranging from just over 7,000 (Solana Energy Alliance) to 972,500 (Clean Power Alliance).[52]

To date, two CCAs run programs using ratepayer dollars collected and distributed by the CPUC. These are MCE, which operates a full plate of efficiency programs, and Lancaster Clean Energy, which was approved this year to pursue nonresource programs.[53] MCE programs saved nearly 3 GWh and 0.11 million (MM) therms between 2016 and 2018, as reported to the CPUC.[54] In addition to these community choice aggregators filing as program administrators with the CPUC, others, such as Sonoma Clean Power, are able to offer programs independently.

More detail on the effects and activities of ratepayer programs can be found in Appendix A.

Advanced Energy Rebuild Program

A collaboration among Sonoma Clean Power (SCP), Pacific Gas and Electric, and the Bay Area Air Quality Management District (BAAQMD) was formed in 2017 in response to the October 2017 firestorms. The program combines funding and knowledge from the three sources to encourage homeowners to rebuild their homes energy efficiently and sustainably, including a pathway to rebuild as all-electric homes. Sixty-six homes enrolled in the program in the first year.[55]

Component 2: Beyond-Ratepayer Programs and Policies

California state agencies, the federal government, local governments, and private industries all operate energy efficiency programs. The programs result in energy savings, reduced energy costs to consumers, efficiency market transformation, and improved living and working conditions. More detailed information on the programs can be found in Appendix A.

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52 CalCCA, https://cal-cca.org/about/.
53 Nonresource program: an energy efficiency program that has no directly attributed energy savings, but the programs support the energy efficiency portfolio through activities such as marketing or improved access to training and education.
54 California Energy Data and Reporting System, Monthly Reports, https://cedars.sound-data.com/monthly-reports/statewide-dashboard/.
55 Sonoma Clean Power. Advanced Energy Rebuild. https://sonomacleanpower.org/programs/advanced-energy-rebuild

Federal Government Programs

At the federal level, numerous departments operate programs intended to reduce energy use in homes and businesses. The agencies that direct the programs and the names of those programs are listed below. The details on the programs are available in Appendix A.

- U.S. Department of Energy
  - Federal Appliance Standards
  - Better Buildings Initiative
  - Weatherization Assistance Program
  - National Labs
- U.S. Environmental Protection Agency
  - ENERGY STAR®
- U. S. Department of Housing and Urban Development
  - Numerous programs including Community Development Block Grants, the Public Housing Environmental and Conservation Clearinghouse, and Veterans Housing Rehabilitation and Modification Pilot Program
- U.S. Department of Health and Human Services
  - Low-Income Home Energy Assistance Program

California State Agency Programs

California agencies offer several programs to reduce energy consumption and avoid GHG emissions. In addition to programs with direct savings, California agencies also operate programs that promote or achieve cobenefits to energy savings. The state also researches the cobenefits of energy efficiency, identifies new technologies to introduce into the marketplace, and pilots new programs. Complete program details are available in Appendix A.

- CEC
  - Proposition 39 – Improve Energy Efficiency and Expand Clean Energy Generation in Schools
  - ECAA Loans
  - Bright Schools and Energy Partnership Program
  - Local Government Challenge
  - Energy Standards
  - Appliance Standards
  - Benchmarking
  - Food Production Investment Program
  - Renewable Energy for Agriculture Program
  - Electric Program Investment Charge Program

    - Natural Gas Program
- DGS
    - Energy Savings Program
- CARB
    - Wood Smoke Reduction Program
    - Funding Agricultural Replacement Measures for Emission Reductions
- Department of Water Resources
    - Water-Energy Grant
- Department of Food and Agriculture
    - State Water and Energy Efficiency Program
- CSD
    - LIWP
- California Department of Housing and Community Development
- CDPH
    - California Building Resilience Against Climate Effects (CalBRACE)
- Strategic Growth Council
    - Transformative Climate Communities
    - Affordable Housing and Sustainable Communities Program
- California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA)
    - California Hub for Energy Efficiency Financing
    - Property Assessed Clean Energy Loss Reserve
    - Green Bonds

Tribal Government Programs

Native American tribes face numerous barriers to energy efficiency program participation, including local energy efficiency expertise, cost-effectiveness, program qualification, and distance from program administrators (PAs). The CEC has a tribal consultation policy that encourages cooperation with California Native American tribes and dedicates staff to working with tribes.[56] The first major step in this collaboration was the Tribal Energy Summit, held in November 2018. The summit resulted in the publication of a Tribal Energy Summit Report.[57]

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56 California Energy Commission. "Tribal Consultation Policy," https://www.energy.ca.gov/programs-and-topics/programs/tribal-program/tribal-consultation-policy.
57 Gates, Thomas, and Jessica Bonitz. 2019. Tribal Energy Summit November 26-28 2018 Summary Report. California Energy Commission. Publication Number: CEC-700-2019-001. https://ww2.energy.ca.gov/2019publications/CEC-700-2019-001/CEC-700-2019-001.pdf.

The report listed several recommendations, but a common request was that the CEC and CPUC review programmatic eligibility and improve access to energy programs for tribal governments. This request has led to the development of funding opportunities for tribal governments, starting with the Tribal Government Challenge in 2019. Soon, the state will conduct a tribal energy assessment and gap analysis to identify more ways to assist those stakeholders.

Local Government Programs

Air Districts

California law has established 35 local air pollution control districts (APCD) or air quality management districts (AQMD) in the state.[58] These range from small, single-county districts such as Lassen, to multicounty agencies, such as the South Coast Air Quality Management District (SCAQMD), BAAQMD, and San Joaquin Valley Air Pollution Control District (SJVAPCD). The three largest districts—the SCAQMD, BAAQMD, and SJVAPCD—have initiated or submitted plans to reduce energy consumption, thereby reducing GHG emissions and air pollutants. More information on the energy- and GHG-saving programs run by air districts is available in Appendix A.

Local Benchmarking

Numerous cities across California have developed building benchmarking ordinances. Cities such as San Francisco, San Jose, Los Angeles, San Diego, and Berkeley have local reporting requirements for commercial and multifamily building owners.

Reach Codes

Local governments may adopt energy standards beyond those required under the California Energy Standards (Title 24), Part 6.[59] The voluntary standards are collected under Title 24, Part 11, and referred to as the "California Green Building Standards or "CalGreen."[60] Local governments may adopt aggressive energy efficiency or renewable energy requirements under these standards. Common measures adopted include cool roofs,[61] solar thermal, and solar photovoltaic.

Private Market Programs

Residential and Commercial Property Assessed Clean Energy

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58 California Air Pollution Control Act, 1947.

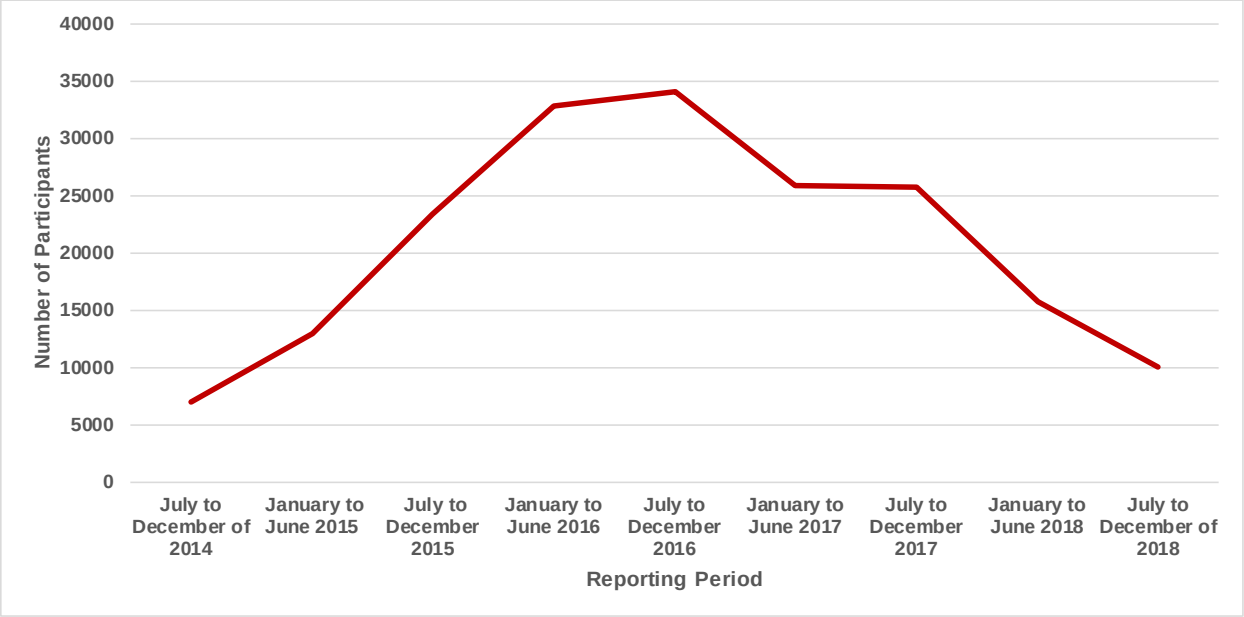
59 Public Resources Code Section 25402.1(h)2 and Section 10-106 of the energy standards establish a process that allows local adoption of energy standards that are more stringent than the statewide energy standards.

60 2019 CalGREEN options, CEC, 2019 Building Energy Efficiency Standards, https://ww2.energy.ca.gov/title24/2019standards/rulemaking/documents/calgreen-code/index.php.

61 A cool roof is a roofing system that provides high solar reflectance and high thermal radiance thus mitigating heat gains in a building.

Since 2008,[62] California law has permitted property assessed clean energy (PACE) programs that pay for property-affixed energy efficiency measures such as building insulation, HVAC, envelope improvements, windows, lighting controls, and other equipment controls. It may also pay for rooftop PV and seismic retrofits. PACE financings rely on the existing framework of residential property taxes by allowing property owners to repay the entire financing for a project through a special tax assessment made on the property. Twelve PACE providers offer financing for energy upgrades in California. California is the largest PACE market in the country, accounting for more than 80 percent of national PACE financing and representing nearly $5 billion in clean energy capital investment. This capital is spread over nearly 200,000 clean energy projects with hundreds of local government partners.[63] Recently, the number of PACE financings has declined (Figure 20). This trend began in 2017 and has continued through 2018, with about 250,000 fewer participants in 2018 than in the peak of 2016. It is unclear if the drop is due solely to legislation passed in 2017 that added more requirements to qualify for a financing,[64] or if other market factors, such as saturation, are to blame. PACE plays a major role in the SB 350 target-setting process, as it is the largest beyond-utility program in the state. The CEC needs more insight into the barriers, costs, and savings of PACE projects to account for more accurately the contributions of the costs and savings to the doubling targets. More information is available in Appendix A.

Figure 20: PACE Participation July 2014–December 2018



Source: CAEATFA, PACE Reserve Program

62 California Assembly Bill 811, Levine and Beall, Chapter 159, Statutes of 2008.
63 Ygrene Energy Fund. "Ygrene Energy Fund Comments on the 2019 California Energy Efficiency Action Plan," https://efiling.energy.ca.gov/GetDocument.aspx?tn=228290&DocumentContentId=59468.
64 Assembly Bill 1284, Chapter 475, Statutes of 2017.

Fuel Substitution

The CEC defines "fuel substitution" as replacing one end-use, utility-provided fuel for another. This substitution is most commonly a switch between natural gas and electricity. SB 350 legislation called on fuel substitution to help double energy efficiency.[65] This topic overlaps with building decarbonization (discussed in later Chapter 3).[66] Building decarbonization programs will result in a net energy decrease and fewer GHG emissions. Beyond-ratepayer programs (such as the LIWP) offer this type of efficiency upgrade.

Three-Prong Test: As a result of joint motion party led by NRDC in June 2017, the CPUC issued a decision in August 2019 to modify the three-prong test to address questions raised by parties.[67] The three-prong test has been used by IOUs since the mid-1990s to determine if an energy efficiency measure that results in fuel substitution can be implemented. The three requirements of the test were that the equipment could not result in a source BTU consumption increase, adverse environmental impacts, or fail a total resource cost test of 1.[68] The new decision renames the three-prong test the "fuel substitution test" and reduces the prongs to two. The updated test requires that the measure not increase total source energy consumption when compared with the baseline measure of the original fuel and requires that the measure not adversely impact the environment (as currently measured by GHG emissions). The prong requiring the measure to pass a cost-effectiveness test is removed.[69] This removal permits fuel substitution measures to compete within the program portfolio alongside traditional measures.

Component 3: Energy Efficiency Market Transformation

The final component of Goal 1 addresses efforts intended to increase future energy savings. These efforts include research and development; expansion of financing tools; new program designs; and expanded access to data for state agencies, local governments, and energy decision makers. More information on these market transformation efforts can be found in Appendix A.

California Research and Development

The CEC administers the Electric Program Investment Charge that funds clean energy research, demonstration, and deployment projects that support California's energy policy goals and promote greater electricity reliability, lower costs, and increased safety.

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65 Public Resources Code Section 25310(d) (10).
66 See page 83 in Goal 3 of Chapter 1
67 CPUC. August 2019. "Decision 1908009, Decision Modifying the Energy Efficiency Three-Prong Test Related to Fuel Substitution, R.13-11-005."
68 CPUC D.92-02-075
69 Ibid, pg. 2-3.

The Natural Gas Research and Development program, also administered by the CEC, prioritizes research focused on strengthening the integrity and safety of natural gas infrastructure. In recent years, the program has funded research and development aimed at GHG reduction, production of renewable gas, climate adaptation, and resiliency for the natural gas system. Together, these programs push technologies and program designs from the working-prototype stage to commercial deployment, helping California save energy and address climate impacts.[70]

California Collaborations

Stakeholders across the state move energy policy forward through collaborations. The California Energy Efficiency Coordinating Committee (CAEECC) and California Technical Forum (CalTF) are examples of these collaborations. CAEECC is made up of representatives from the program administrators, the CEC, labor unions, NRDC, the CPUC's Public Advocates Office, the Local Government Sustainable Energy Coalition, the Efficiency Council, consultants, trade groups, and local government representatives. Recent quarterly meetings have dealt with workforce contract requirements, expansion of third-party energy efficiency program implementation, market transformation strategies, and IOU budget advice letters.[71] Ad hoc meetings have covered the Database for Energy Efficiency Resources peak demand definitions, local government partnerships, and PA energy efficiency implementation plans.[72] The CalTF is a collaborative of experts who use independent professional judgment and a clear process to review and provide technical information pertaining to California's demand-side management portfolio. It consists a policy advisory committee, a technical forum, and permanent staff. The CEC recommends CalTF play a leading role in assessing technical energy efficiency recommendations moving forward.

Market Transformation Efforts

While ongoing energy efficiency work is crucial to meeting the 2030 energy efficiency doubling goal, there is additional data, market, and workforce development to be done. This section goes into the data needed for proper efficiency valuation, the tools in development or newly available to analyze efficiency, and workforce development and training improvements that are necessary for the success of all programs.

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70 Electricity and natural gas research results at CEC: "Energy Research and Development Reports and Publications," https://www.energy.ca.gov/energy-rd-reports-n-publications.
71 Quarterly Meetings, California Energy Efficiency Coordinating Committee, https://www.caeecc.org/coordinating-comm-meetings.
72 Ad-Hoc Meetings, California Energy Efficiency Coordinating Committee, https://www.caeecc.org/ad-hoc-meetings.

CEC Enterprisewide Data Effort

The CEC is in the early stages of a multiyear enterprisewide data modernization. The primary driver for this effort is the urgent need to understand the nature, patterns and trends of energy use in granular detail and through time across our large and deeply diverse state. A foundational tool for creating that knowledge base is the collection of historical customer-level interval-meter data (IMD) from the six largest utilities in California.[73] IMD provides retrospective (i.e. not real-time) high-resolution, energy billing and consumption data. Protection and security of this data is the CEC's highest priority and, along with the large volume of data, warrants the use of industry-leading data cloud services. Once fully implemented as part of the data modernization, the service will allow CEC staff to use a highly scalable and secure storage infrastructure to analyze and model IMD to meet CEC needs for demand forecasting, load shape assessment, and analysis of energy efficiency program impacts. The IMD project is estimated to be completed by June 2020.

Leverage Energy Consumption Data to Create Hourly and Locational Energy Efficiency Projections

The CEC has the opportunity, once it begins collecting and analyzing statewide hourly consumption data, to prepare aggregated datasets. These datasets can be designed for use by local governments, PAs and other stakeholders. The goal of such an effort is to reduce the unknowns commonly associated with implementing energy efficiency, especially as it is needed to reach specific locations at specific times. Secure, nondiscoverable datasets for use within state agencies can also improve the outreach and design of efficiency programs. Tools like the Energy Equity Indicator (discussed in Goal 2, Component 3) and the Energy Data Atlas (discussed in Appendix A) combine consumption data and building information with socioeconomic data to reveal where efficiency is not being implemented, reveal potentially why not, and make solutions easier to develop.

Open-Source Energy Solutions: California has been a leader in the development and use of open-source energy measurement and verification tools, for example the energy standards use an open source software to model energy use.[74] Stakeholders initiated a process in 2012 to develop transparent, empirically tested methods for tracking demand change at the utility meter. The process, known as CalTRACK Methods, is now part of the Energy Market Methods Consortium (details in box on the following page) and brings together state representatives, government agencies, and private sector stakeholders.

The CEC supplied initial funding to develop the open-source OpenEEmeter software. The software engine implements the CalTRACK methods to quantify monthly, daily, and

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73 Cal. Code Regs., Title 20, Section 1353.

74 California Building Energy Code Compliance, CEC, https://ww2.energy.ca.gov/title24/2019standards/2019_computer_prog_list.html.

hourly changes in energy consumption from utility meters.

Energy Market Methods Consortium

Under the umbrella of the Linux Foundation Energy Projects, the Energy Market Methods Consortium is a venue for industry stakeholders to collaborate on methods to reduce the costs of scaling up demand-side energy programs and procurement. The consortium is split in three sections: CalTRACK, GRID, and SEAT.

CalTRACK is the working group developing methods to standardize the way normalized meter-based changes in energy consumption are measured and reported.

GRID is working to extend the CalTRACK site-based savings methods to account for grid impacts, apply population level adjustments, standardize adjustments for nonroutine events and decay of savings, and promote investment in nonwire alternatives.

The SEAT working group deals with technical and methodological barriers to secure data sharing and privacy concerns that support demand-side energy programs and nonwire alternatives. Together, this effort is spearheading the work to properly place value on energy efficiency as a resource.

Linux Foundation—https://www.lfenergy.org/projects/

Energy Market Methods—https://www.energymarketmethods.org/

CalTRACK—https://www.caltrack.org

GRID - https://www.energymarketmethods.org/grid

Unique Building Identifiers

Managing data for physical buildings is challenging because of 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 CEC has partnered with the United States Department of Energy (DOE) through the Better Buildings Program Accelerator—Building Energy Data Analysis to develop, test, and implement unique building identifiers (UBIDs).[75] Initial testing is being conducted on the buildings reported through the statewide benchmarking program. The UBIDs are then attached to energy and building information from other sources, with the UBID acting as the bridge. The CEC will be part of the partnership through 2020 as it advances UBID improvements. The CEC is still developing UBIDs for California and will determine the best path forward for use, whether for public reporting or internal use. The development of a UBID is important not only to the CEC, but potentially to stakeholders across the nation. The UBID is more accurate than connecting data through a street address. The DOE is testing and verifying a method and tool for the public to use.

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75 U.S. DOE Better Buildings Program, Accelerator. "Building Energy Data Analysis," https://betterbuildingsinitiative.energy.gov/accelerators/building-energy-data-analysis.

Financing Opportunities

On-Bill Tariff Financing

The Barriers Study identified the need for alternative financings tools and, after reviewing numerous possible options, proposed on-bill tariffs as the primary recommendation.[76] An "on-bill tariff" is a financing tool that funds an energy efficiency measure through the customer's utility bill. The basis for receiving the funds depends on a good utility payment history, not a credit score or income level. The measure is tied to the bill at the physical address where the upgrade is performed like the way PACE attaches the financing to the property, not the owner. In a recent report by Energy and Environmental Economics, Inc., sponsored by SMUD, LADWP, and Southern California Edison on the preferred pathways to decarbonize homes, one major finding was that on-bill tariffs would allow the type of capital deployment necessary to achieve effective decarbonization.[77] The CEC supports and has offered technical assistance to public utilities seeking to implement this tool as it can address barriers to efficiency for tenants or renters, especially those in low-income or disadvantaged communities.

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76 Scavo, Jordan, Suzanne Korosec, Estaban Guerrero, Bill Pennington, and Pamela Doughman. 2016. *Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income customers and Small Business Contracting Opportunities in Disadvantaged Communities.* California Energy Commission. Publication Number: CEC-300-2016-009-CMF. https://efiling.energy.ca.gov/getdocument.aspx?tn=214830.

77 Residential Building Decarbonization in California: Consumer Economics, Greenhouse Gases, and Grid Impacts, Energy Economics Environment. 2018. https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf.

On-Bill Tariff Details

To date, there are 17 on-bill tariff programs around the country, providing energy efficiency upgrades to rural communities, low and moderate income households, and commercial building owners. The model is accessible to any utility structure, municipal, investor-owned, and cooperative.

Barriers to traditional energy efficiency program participation, like upfront costs, split-incentives, and credit-worthiness, are avoided in on-bill tariff programs. Low- and middle-income households can easily participate without issue, as well as households that are debt constrained, live on a fixed income, and rent.

Successful on-bill tariff programs, like the Pay-As-You-Save model, estimate savings to exceed charges on an annual and lifecycle basis, tie payments to location not customer, repayments occur through utility bill, offer rebates if applicable, use only proven technologies, and utilities treat uncollectable payments just as they would any other uncollectable payment.[78]

Energy Efficiency Savings From Goals

SB 350 directed the CEC, in consultation with stakeholders, to set annual energy efficiency targets that result in a cumulative doubling of 2015 energy efficiency savings by 2030, and to identify all possible cost-effective, feasible, and reliable energy efficiency savings. The initial savings identified in 2017 included those from ratepayer and beyond-ratepayer programs and market transformation efforts.[79] The savings are a mix of market potential from utility programs, economic and market potential from state agencies programs, and technical potential from new market transformation programs. Projected energy efficiency savings from ratepayer programs come from IOU and POU historical and forecast reports. Beyond-ratepayer energy efficiency savings come from multiple sources, including state agencies grant and incentive programs, PACE, and codes and standards. Staff and contractors projected energy efficiency savings for electricity in GWh and for natural gas in MM therms. The combined energy savings projections from electricity and natural gas are also represented in Btus.

Updated SB 350 Doubling Targets

Since the initial target-setting process,[80] the CEC has improved several methods. CEC staff improved and created new workbooks to track individual beyond-ratepayer

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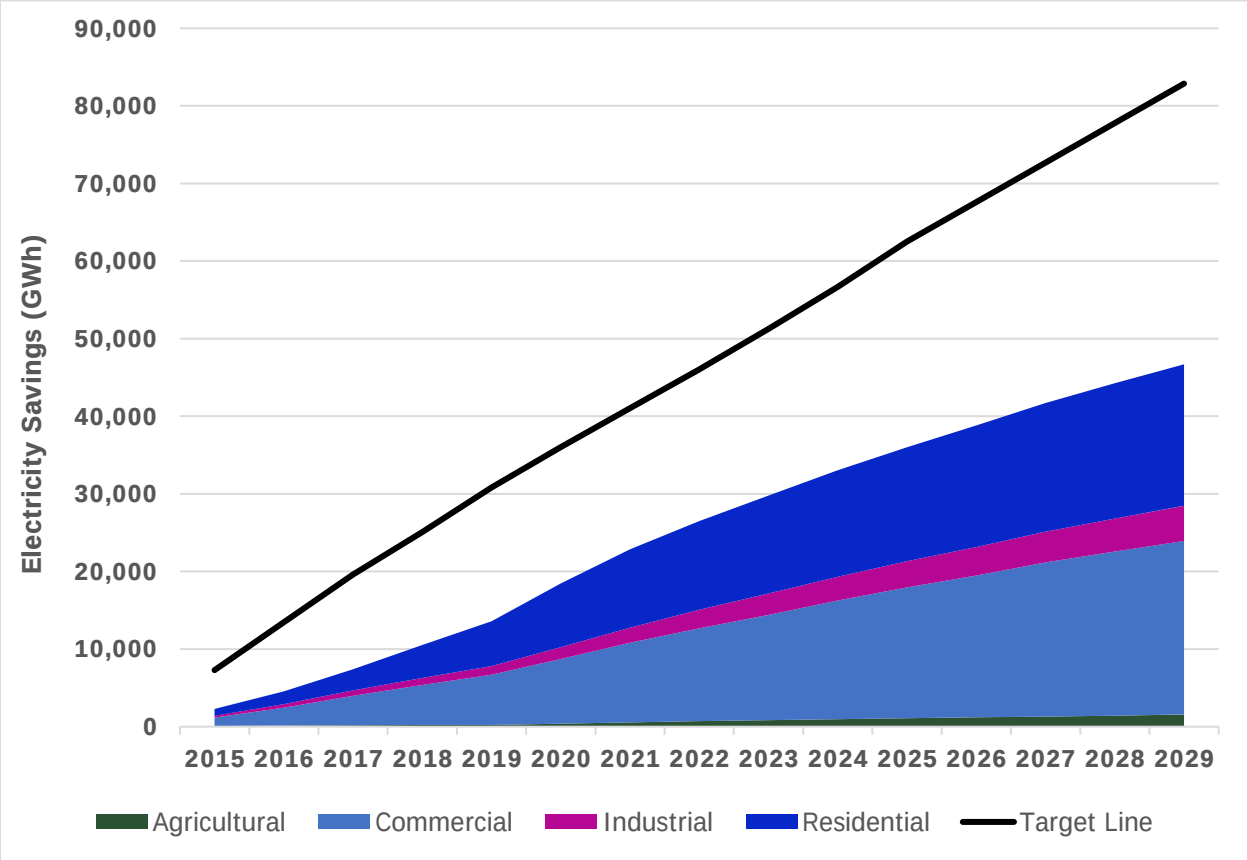
[78] Hummel, Holmes, Harlan Lachman, What is inclusive financing for energy efficiency, and why are some of the largest states in the country calling for it now?, ACEEE Summer Study, 2018.
79 Jones, Melissa, Michael Jaske, Michael Kenney, Brian Samuelson, Cynthia Rogers, Elena Giyenko, and Manjit Ahuja. 2017. *Senate Bill 350: Doubling Energy Efficiency by 2030 Report,* CEC. Page. 16-18, https://ww2.energy.ca.gov/sb350/doubling_efficiency_savings/.
80 For the complete initial target-setting process, please see Chapter 2 and Attachments in the *Senate Bill 350 Doubling Energy Efficiency by 2030 Report,*
https://ww2.energy.ca.gov/sb350/doubling_efficiency_savings/.

program savings and align them with ratepayer programs. This tracking includes estimating end-use impacts, estimating the share of savings among utility territories, and improving savings decay estimates based on effective useful life of measures installed. The targets now include improved agricultural and industrial savings forecasts, beyond those offered in ratepayer portfolios, and conservation voltage reduction estimates. Estimates of the low-income and disadvantaged community potential are also included using economic and demographic data collected in the CalEnviroScreen 3.0 tool. Two scenarios also show how different compliance, turnover, participation, and funding levels impact savings. A full report of the changes made is available in Attachment 1 (*SB 350 Doubling Energy Savings by 2030 Methodology Report*). Individual program workbooks and master target spreadsheet are also available (Attachments 2 and 3).

SB 350 Doubling Efficiency Targets- Electricity

The statewide cumulative savings target for electricity is updated in Figure 21. Most savings are expected to come from the residential and commercial sectors. The state is expected to fall about 44 percent short of the 2030 goal to double the 2015 level of efficiency. The utilities are capturing most of the savings through codes and standards and incentive programs.

Figure 21: SB 350 Electricity Efficiency Savings

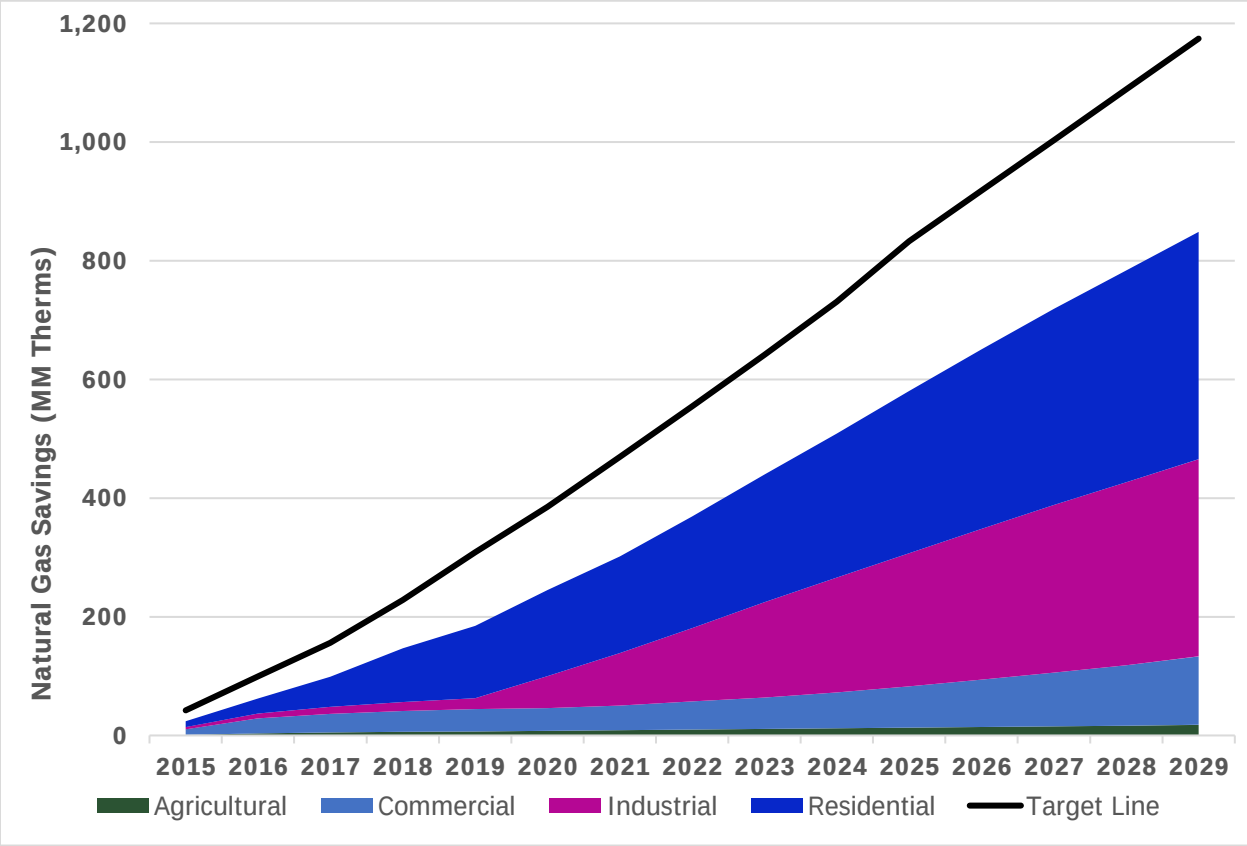


Source: CEC

SB 350 Doubling Efficiency Targets—Natural Gas

Figure 22 presents the statewide cumulative savings for natural gas. Most savings come from the residential sector followed by the industrial sector. The savings are driven by industrial sector efficiency programs, codes and standards, and IOU incentive programs. The savings are 28 percent short of the 2030 goal.

Figure 22: SB 350 Natural Gas Efficiency Savings

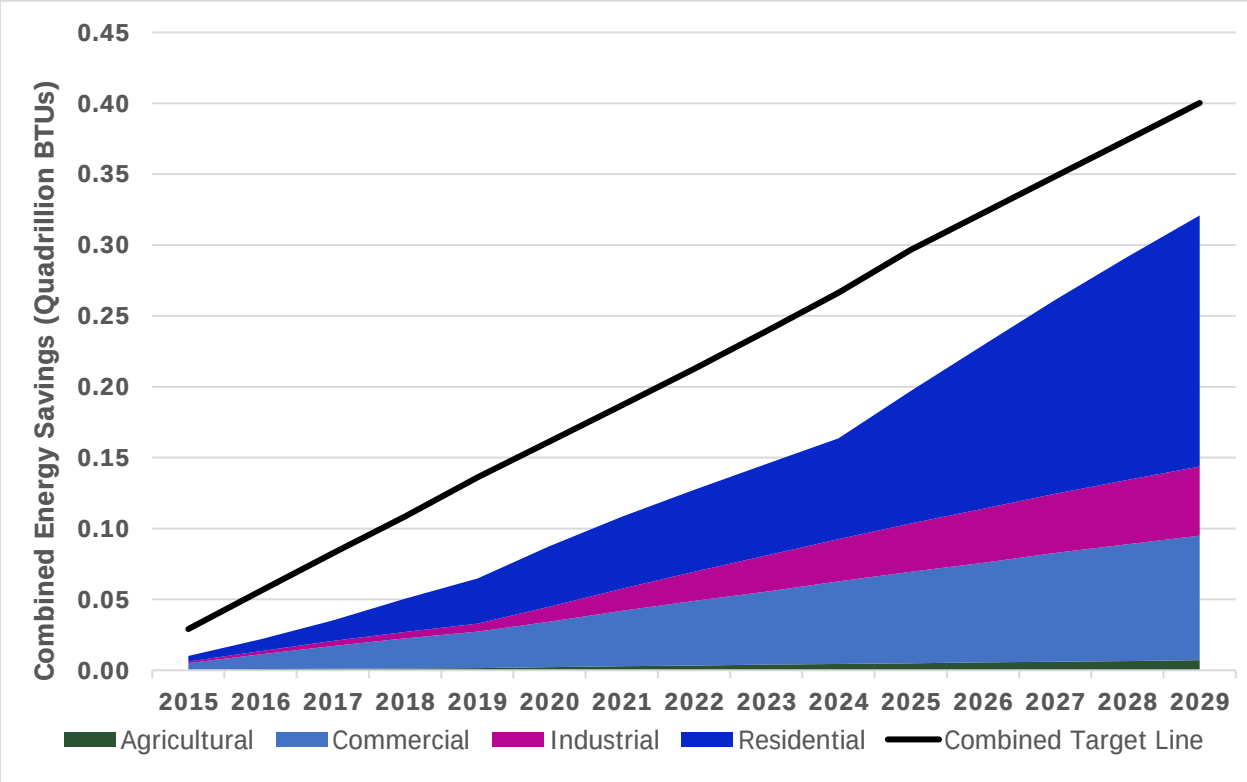


Source: CEC

SB 350 Doubling Efficiency Targets—Combined

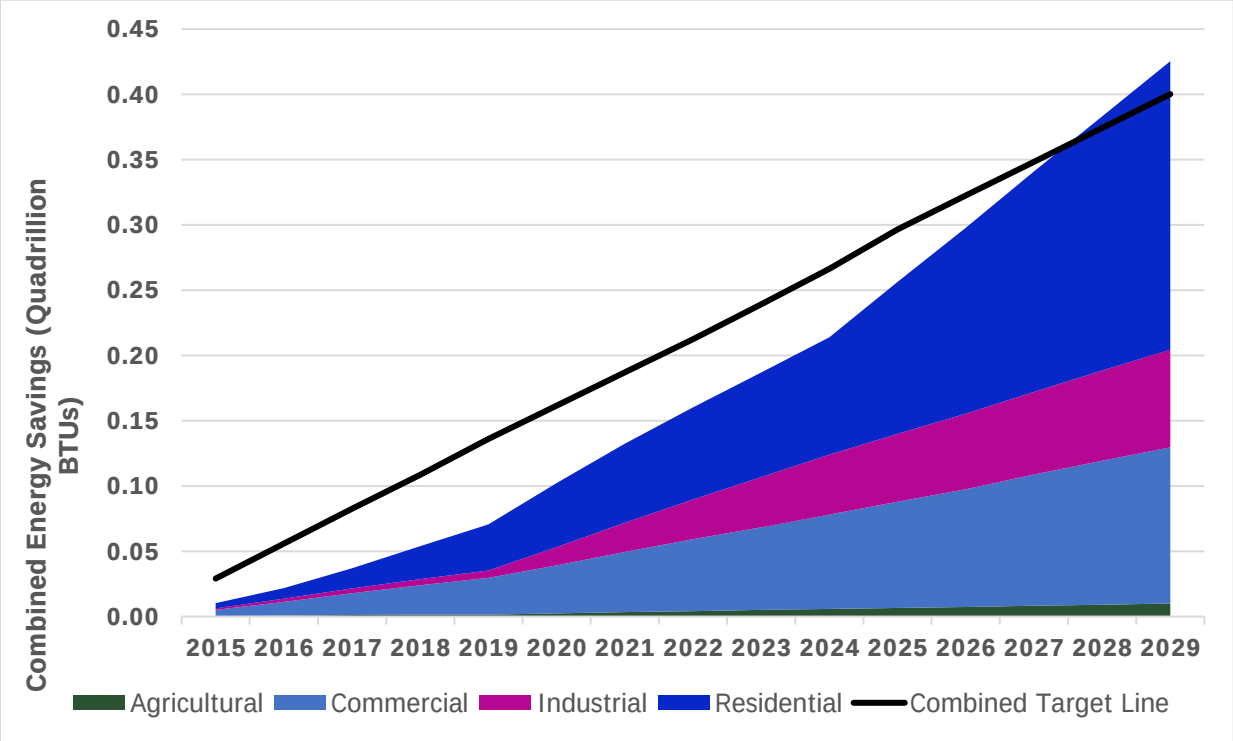
The updated combined electricity and natural savings shows the state is short of meeting its 2030 goal (Figure 23). The savings are driven by residential and commercial sector programs, in particular, utility incentive programs and codes and standards updates. Savings are about 20 percent short of the 2030 goal. In an aggressive scenario, the state can reach the 2030 goal (Figure 24) with an increase in efficiency funding, compliance rates, and participation levels across the board.

Figure 23: SB 350 Combined Energy Efficiency Savings



Source: CEC

Figure 24: SB 350 Combined Energy Efficiency Savings—Scenario 2



Source: CEC

Discussion of SB 350 Energy Efficiency Doubling Progress

The updated SB 350 reference case scenario shows the state will fall short of the 2030 goal. Compared to the 2017 results, the expected electricity savings are about 20 percent lower, natural gas savings are 50 percent lower, and combined (Btu) savings are 17 percent lower in 2030. New electricity savings barely stay ahead of the decay of older savings. California needs to assess its electricity efficiency programs to unlock the economic potential documented in the CPUC potential and goals study.[81] If only about 10 percent of the estimated economic potential electric savings are achieved each year, as Figure 18 shows, the state will not be able to achieve its goal. Natural gas savings are closer to reaching a 2030 goal. This finding highlights the success of codes and standards and utility incentive programs to reduce natural gas demand. Similar to electricity efficiency programs, new program designs and technologies should be introduced to close the natural gas savings gap. Taken together, all energy savings fall short of a 2030 goal unless new action is taken to increase standards compliance, turn over more outdated equipment, increase program participation, and infuse additional funds into the energy efficiency market.

Conversion of Efficiency Savings to Avoided Greenhouse Gas Emissions

While energy efficiency is the primary goal of this 2019 EE Action Plan, it is also becoming equally important to reduce GHG emissions through energy efficiency and demand flexibility. As described in greater detail in Goal 3, GHG emissions from energy use vary by the time of day and season. The CEC produces annual average GHG values of electricity generation. Staff uses these values to convert annual estimated electricity savings to avoided GHG emissions. While hourly values for the GHG content of electricity exist, the CEC lacks the same granular information about energy efficiency. For details on the calculation of annual and hourly GHG emissions from electricity, refer to the *2018 IEPR Update.*[82]

The conversion of natural gas efficiency to avoided GHG emissions is simpler. The CEC uses the U.S. Environmental Protection Agency (U.S. EPA) value for GHG content of natural gas combustion.[83] As mentioned in Goal 3, there are other GHG sources that could be included in calculating natural gas savings in buildings, but for the conversion shown here, staff has only multiplied by the accepted value.

The SB 350 targets are converted into avoided GHG emissions in Figure 25. This conversion forecasts that the state is short of a 2030 GHG goal, even in an aggressive

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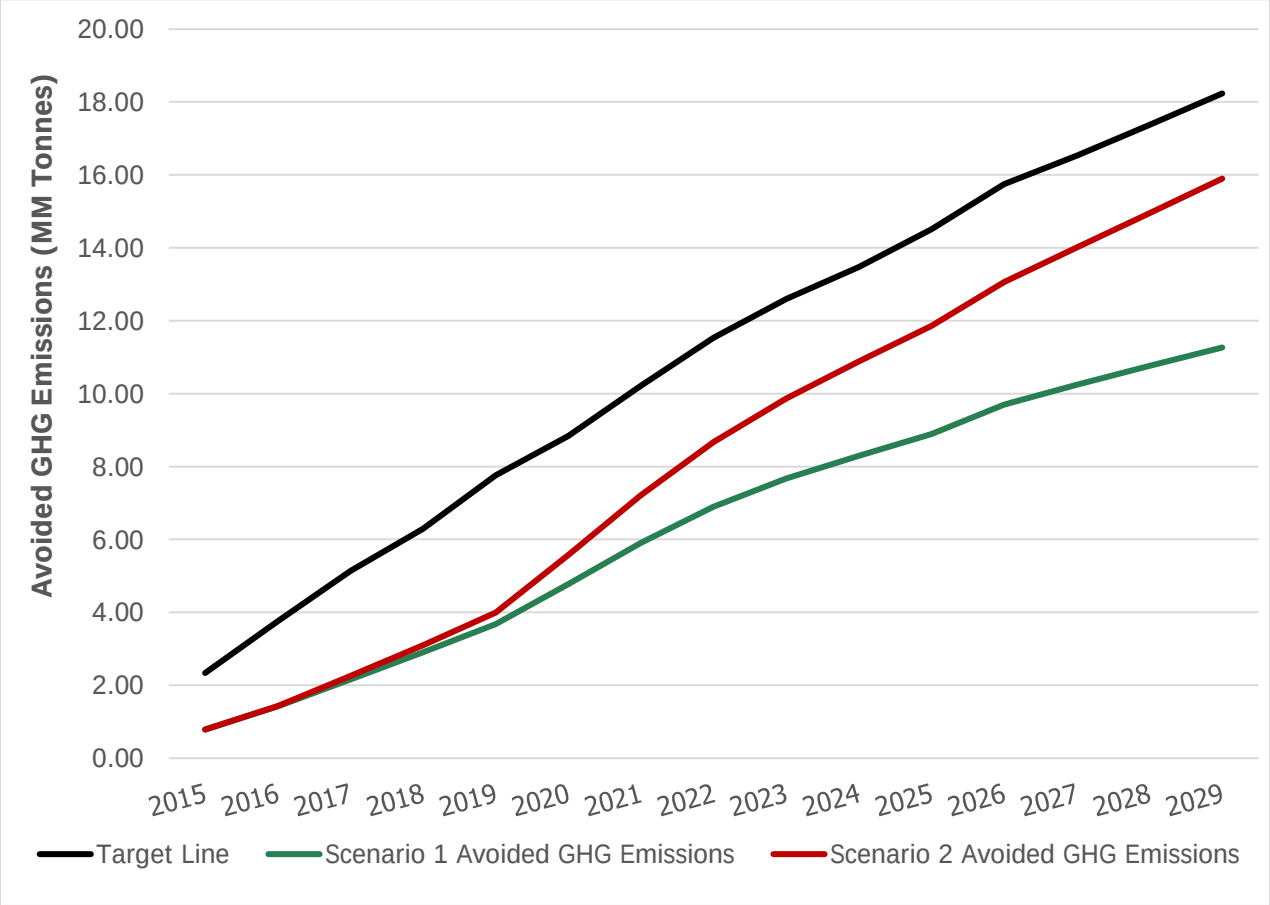
81 Navigant. *2019 Energy Efficiency Potential and Goals Study.* Prepared for the CPUC. July 2019. http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M309/K725/309725430.PDF.

82 *2018 Integrated Energy Policy Report Update,* Chapter 2, pp. 80-82, California Energy Commission, https://ww2.energy.ca.gov/2018publications/CEC-100-2018-001/CEC-100-2018-001-V2-CMF.pdf

83 0.0053 million metric ton CO2 per million therms. "Greenhouse Gases Equivalencies Calculator—Calculations and References." United States Environmental Protection Agency, Energy and the Environment, https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references.

scenario. The state's energy policy is increasingly looking toward GHG emission reductions, and the lack of progress from efficiency programs speaks to the way programs have historically been designed. A new paradigm is needed that targets energy savings and demand flexibility during specific hours of the day when GHG emissions are highest.

Figure 25: Avoided GHG Emissions From SB 350 Targets



Source: CEC

Goal 2: Low-Income and Disadvantaged Community Energy Equity

The second goal of the 2019 EE Action Plan is the equitable adoption of energy efficiency upgrades, especially by low-income customers and those who live in disadvantaged and rural communities. The complex and variable barriers preventing energy efficiency program availability to these communities are well understood, and actions are being taken to address them. This goal breaks down recent work performed, new reports, and next steps. Goal 2 is broken into three components to highlight the ongoing work and recommendations.

Component 1: Low Income and Disadvantaged Community Barriers

The first component of this goal addresses barriers faced by low-income and disadvantaged communities to energy efficiency and renewable energy. SB 350 directed the CEC to study the barriers to implementing energy efficiency upgrades and weatherization investments for low-income customers, including those in disadvantaged communities, and to make recommendations on how to increase access to these investments for low-income customers. This direction and others related to clean energy investments led to the Barriers Study.[84] There is agreement among stakeholders that multiple barriers prevent clean energy investments in low-income and disadvantaged communities.

Senate Bill 350 Low-Income Barriers Study

The Barriers Study highlights several structural challenges. Other barriers stem from policy and program decisions that can be overcome through new policy development or program refinements.

Structural barriers identified in the report include:

- Low home ownership rates
- Complex needs, ownership, and financial arrangements for low-income, multifamily housing
- Insufficient access to capital
- Building age
- Remote or underserved communities

The policy and program barriers identified include:

- Insufficient market delivery and outreach
- Lack of program integration or coordination

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84 Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, Bill Pennington, and Pamela Doughman. 2016. *Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income customers and Small Business Contracting Opportunities in Disadvantaged Communities*. California Energy Commission. Publication Number: CEC-300-2016-009-CMF.

- Data limitations
- Unrecognized cobenefits

The Barriers Study offers key recommendations (Table 4) to address barriers to clean energy access.

Table 4: CEC Low-Income Barriers Study Recommendations

#	Recommendation
1	Organizing a multiagency task force to promote coordination across state-administered programs.
2	Enabling community solar offerings for low-income customers.
3	Formulating a statewide clean energy labor and workforce development strategy.
4	Developing new financing pilot programs to encourage investment for low-income customers.
5	Establishing common metrics and encouraging data sharing across agencies and programs.
6	Expanding funding for photovoltaic and solar thermal offerings for low-income customers.
7	Enhancing housing tax credits for projects to include energy upgrades during rehabilitation.
8	Establishing regional outreach and technical assistance one-stop shop pilots.
9	Investigating consumer protection issues for low-income customers and small businesses in disadvantaged communities.
10	Encouraging collaboration with community-based organizations in new and existing programs.
11	Funding research and development to enable targeted benefits for low-income customers and disadvantaged communities.
12	Conducting a follow-up study for increasing contracting opportunities for small businesses in disadvantaged communities.

Source: CEC

The following are some of the key updates since the adoption of the Barriers Study. As this 2019 EE Action Plan does not replace the recommendations made within the Barriers Study, a full update on the recommendations, especially those outside energy efficiency, is outside the scope of this plan.

Disadvantaged Communities Advisory Group

Since publication of the Barriers Study in 2016, progress has been made on several recommendations. In 2018, the Disadvantaged Communities Advisory Group (advisory group) convened for the first time. Under Public Utilities Code Section 400 (g), the advisory group advises the CPUC and the CEC regarding the development,

implementation, and effects of proposed programs related to SB 350 in disadvantaged communities. In its first year of meetings, the advisory group took the following actions related to energy efficiency:

- Identified the Energy Equity Indicators (tool and report) as critical and set out further development of the indicators as a priority (See Goal 2, Component 3)
- Adopted an equity framework
- Provided recommendations for the CPUC proceeding R.15-03-010, examining affordable energy options in San Joaquin Valley communities

The equity framework seeks energy policies and programs that apply health and safety impacts; provides access and education; and provides financial benefits, economic development, and consumer protection.[85] More information on the recommendations from the equity framework can be found in the most recent advisory group annual report.[86]

Plug-Load Marketplaces

In 2017, the CPUC directed IOUs to create or expand online marketplaces for appliances and other plug loads, or do both, in response to Assembly Bill 793 (Quirk, Chapter 589, Statutes of 2015). The Barriers Study recommended that low-income households receive information and options for purchasing appliances or devices that draw electricity.[87] Now, all IOUs offer marketplaces that collect incentives and educate customers on the most efficient plug loads. These marketplaces can continue to expand and be a resource for more than IOU program activities. Collaboration between utilities and government agencies could add more incentives and information for products that benefit low-income households. The marketplaces could provide a direct-to-consumer channel for incentives, which would enhance consumer choice and flexibility, improve program effectiveness and lower costs. The CEC continuously approves new appliances for sale in the state, and these marketplaces are updated to reflect that.

Clean Energy in Low-Income Multifamily Buildings Action Plan

Another recommendation of the Barriers Study called for the development of a "comprehensive action plan to improve opportunities for energy efficiency, renewable energy, demand response, energy storage, and electric vehicle infrastructure for multifamily housing, with attention to pilot programs for multifamily rental properties in

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85 *Disadvantaged Communities Advisory Group 2018 Annual Report,* https://efiling.energy.ca.gov/getdocument.aspx?tn=227473.

86 "Disadvantaged Communities Advisory Group" Web page-https://www.energy.ca.gov/sb350/DCAG/.

87 Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, Bill Pennington, and Pamela Doughman. 2016. *Low-Income Barriers Study, Pa*rt A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities. California Energy Commission. Page 62. Publication Number: CEC-300-2016-009-CMF.

low-income and disadvantaged communities" (Barriers Study, p. 5). To address this recommendation, the CEC, with the direction of the Governor's Office and in coordination with other state agencies, developed the CLIMB Action Plan.[88] Adopted in November 2018, the CLIMB Action Plan identifies current programs and policies, remaining challenges, and concrete actions that the state can take to accelerate the launch of distributed energy resources within California's multifamily housing stock. With a significant portion of low-income Californians living in multifamily buildings, these buildings offer an opportunity, and a challenge, to accelerating the state's clean energy progress and ensuring energy equity.

Many of the CLIMB strategies support and align with goals and strategies in the *2016 EBEE Action Plan*.[89] For instance, CLIMB strategies to develop a cohesive understanding of the multifamily market support *2016 EBEE Action Plan* strategies to ensure data-driven decision making. In addition, CLIMB strategies to identify additional resources and deployment opportunities support *2016 EBEE Action Plan* goals for affordable and accessible energy efficiency solutions. Also included in the CLIMB Action Plan are strategies to ensure consumer protection, one of the energy efficiency mandates of SB 350.[90] Furthermore, strategies in the CLIMB Action Plan address recommendations in the Doubling Report, such as expanding funding for LIWP and ensuring adequate reporting of energy efficiency impacts in disadvantaged communities.

Energy Savings Assistance Program

The Energy Savings Assistance (ESA) program, overseen by the CPUC, provides no-cost home weatherization services, energy efficiency measures, and energy education to help eligible low-income households conserve energy; reduce monthly bills; and improve health, comfort, and safety. Since 2007, the CPUC's ESA Program has worked toward a 2020 goal to ensure that all eligible low-income electricity and gas customers can participate in low-income energy efficiency programs (Public Utilities Code 382.c). From 2007 to 2018, first-time ESA program participants numbered more than 3.1 million households.[91] By 2020, the IOUs' ESA goal is to increase the 3.1 million household first-time participant count to roughly 3.7 million households statewide. ESA's free services for California's lowest-income families improve daily life with efficiency measures like high-efficiency clothes washers and attic insulation.

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88 Haramati, Mikhail, Eugene Lee, Tiffany Mateo, Brian McCollough, Shaun Ransom, Robert Ridgley, and Joseph Sit. 2018. *Clean Energy in Low-Income Multifamily Buildings Action Plan.* California Energy Commission. Publication Number: CEC-300-2018-005-SF. https://efiling.energy.ca.gov/GetDocument.aspx?tn=224513.

89 California Energy Commission. 2016. *Existing Buildings Energy Efficiency Action Plan: 2016 Plan Update*. Publication Number: CEC-400-2016-023-CMF.

90 California Energy Commission. 2016. *Existing Buildings Energy Efficiency Action Plan: 2016 Plan Update*. Publication Number: CEC-400-2016-023CMF. Page 4.

91 CPUC. *ESA Annual Savings Report by Pacific Gas and Electric, Southern California Edison, Southern California Gas, and San Diego Gas & Electric,* https://www.cpuc.ca.gov/iqap/.

The four large IOUs administer the ESA Program— Pacific Gas and Electric, Southern California Edison, Southern California Gas, and San Diego Gas & Electric. Households with total annual incomes at or below 200 percent of the federal poverty guidelines qualify for the ESA program. Participants can be owners or renters in single-family homes, multifamily residences, mobile homes, or certain group homes. In multifamily properties, if 80 percent of tenant households are income-qualified, then the whole property is ESA-eligible. For deed-restricted multifamily properties, if 65 percent of tenant households are income-qualified, then common areas are ESA-eligible.

Environmental and Social Justice Action Plan

In early 2019, the CPUC published the Environmental and Social Justice Action Plan (ESJ Action Plan).[92] The CPUC is responsible for programs and policies that directly impact environmental and social justice communities via affordable clean energy, among other regulatory issues. The ESJ Action Plan is intended to provide a broad look at communities long underserved. The ESJ communities are designated as those that are:

- Predominantly communities of color or low-income.
- Underrepresented in setting policies or making decisions.
- Subject to a disproportionate impact from one or more environmental hazards.
- Likely to experience disparate implementation of environmental regulations and socioeconomic investments in their communities.[93]

ESJ communities also include those identified in the top 25 percent of California Environmental Protection Agency's CalEnviroScreen 3.0,[94] all tribal lands, low-income households,[95] and low-income census tracts.[96] The CPUC can use the ESJ Action Plan as a roadmap to ensure that it provides resources equitably across California. The goals of the ESJ Action Plan are to:

- Consistently integrate equity and access considerations throughout CPUC regulatory activities.
- Increase investment in clean energy resources to benefit ESJ communities, especially to improve local air quality and public health.
- Strive to improve access to high-quality water, communications, and transportation services for ESJ communities.
- Increase climate resiliency in ESJ communities.

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92 California Public Utilities Commission. February 2019. *Environmental and Social Justice Action Plan*, https://www.cpuc.ca.gov/CPUCNewsDetail.aspx?id=6442461331.
93 Government Code Section 65040.12.e.
94 CalEnviroScreen Tool, https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30.
95 Household incomes below 80 percent of the area median income.
96 Census tracts with household incomes less than 80 percent area or state median income.

- Enhance outreach and public participation opportunities for ESJ communities to participate meaningfully in the CPUC's decision-making process and benefit from CPUC programs.
- Enhance enforcement to ensure safety and consumer protection for all, especially for ESJ communities.
- Promote economic and workforce development opportunities in ESJ communities.
- Improve training and staff development related to environmental and social justice issues within the CPUC's jurisdiction
- Monitor the CPUC's environmental and social justice efforts to evaluate how they are achieving its objectives

Details for these goals can be found within the ESJ Action Plan.[97] The Disadvantaged Communities Advisory Group also provided input to this plan, and recommendations reflecting the related inputs are included in the final document.

San Joaquin Valley Proceeding

The CPUC is implementing pilot programs to increase access to affordable energy across several disadvantaged communities in the San Joaquin Valley. Assembly Bill 2672 (Perea, Chapter 616, Statutes of 2015) directed the CPUC to initiate proceeding R.15-03-010 to identify communities in need of support in the San Joaquin Valley. The CPUC selected 11 communities as pilot project sites with $56 million in funding. The approved pilots are the following:

- More than 900 homes in Alpaugh, Fairmead, Lanare, La Vina, and Le Grand will be eligible for an electrification project with community solar discount components by a to-be-selected third-party project administrator with a $25,754,613 investment.
- More than 300 homes in Allensworth, Cantua Creek, and Seville will be eligible for an electrification project with community solar discount components to be administered by Pacific Gas and Electric Company with a $9,655,835 investment.
- Nearly 450 homes in California City, Ducor, and West Goshen will be eligible for an electrification project with community solar discount components to be administered by Southern California Edison with a $15,411,008 investment.
- An additional 224 homes in California City will be eligible for a natural gas project including gas line extensions and appliance replacements, to be administered by Southern California Gas Company with a $5,591,100 investment.

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97 *CPUC Environmental and Social Justice Action Plan.* 2018, https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/CPUC%20Environmental%20and%20Social%20Justice%20Action%20Plan%20DRAFT.pdf.

Implementation and final planning of the pilots are underway with expected completion by 2021. During implementation, the CPUC will evaluate progress, collect data, and determine next steps. The final phase of the pilot will result in an economic feasibility study and a new scoping memo.[98]

Stakeholder Feedback

During the five workshops held to inform this 2019 EE Action Plan, and in response to questions in the workshop notice, stakeholders provided input regarding low-income and disadvantaged community issues. Several workshop panels focused on breaking down barriers in the multifamily energy efficiency market, which specifically affect low-income and disadvantaged communities. Panelists pointed to the need for more affordable housing efficiency upgrade funding, incentives to developers that can be relied upon throughout various retrofit stages, and improved alignment of funding requirements. Also, stakeholders praised technical assistance, like that offered by the LIWP program. Several panelists pointed to the success of the LIWP program and stated that the program framework allowed them to go after deeper retrofits than a traditional efficiency program. Southern California Edison pointed out that direct installation programs have shown the best success when targeting low-income or disadvantaged communities. Southern California Edison representatives point out that the San Joaquin Valley proceeding (discussed in Component 1, Goal 2) can inform the best pathways to improving conditions in low-income, disadvantaged communities.

Component 2: Rural Barriers

Rural and hard-to-reach communities face unique barriers compared to low-income or disadvantaged communities. The *CPUC Energy Efficiency Policy Manual*[99] defines hard-to-reach residential customers as "those customers who do not have easy access to program information or generally do not participate in energy efficiency programs due to a language, income, housing type, geographic, or home ownership (split incentives) barrier." This definition is joined by 15 other definitions the federal government used to define rural communities.[100] The CPUC uses its authority to direct resources to rural areas through the IOUs' abilities to claim a higher net-to-gross ratio for serving hard-to-reach customers. This policy helps utilities meet their efficiency goals. Another actor in this effort is California's Rural Hard-to-Reach Local Government Partnership, a working group that convenes quarterly to discuss practices for delivering efficiency to less densely populated regions.

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98 CPUC. San Joaquin Valley Affordable Energy Proceeding. https://www.cpuc.ca.gov/SanJoaquin/.
99 CPUC. 2013. *CPUC Energy Efficiency Policy Manual,* https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/EEPolicyManualV5forPDF.pdf.
100 Shoemaker, Mary, Annie Gilleo, and Jill Ferguson. ACEEE. 2018. *Reaching Rural Communities With Energy Efficiency Programs,* pg.2, https://aceee.org/sites/default/files/publications/researchreports/u1807.pdf.

CPUC Identified Rural and Hard-to-Reach Barriers

When people think of rural communities, they often only include geography. But California faces a diverse set of issues when reaching rural communities. The CPUC has outlined the primary barriers it sees to reaching rural and hard-to-reach communities.

- Geographic—Businesses or homes in areas other than the United States Office of Management and Budget Combined Statistical Areas of the San Francisco Bay Area, the Greater Los Angeles Area and the Greater Sacramento Area, or the Office of Management and Budget metropolitan statistical areas of San Diego County
- Language—Households where the primary language spoken is other than English
- Income—Customers who qualify for the California Alternative Rates for Energy or the Family Electric Rate Assistance Program
- Housing Type—Multifamily and mobile home tenants (rent and lease)

ACEEE Report—Reaching Rural Communities With Energy Efficiency Programs

In 2018, the American Council for an Energy-Efficient Economy (ACEEE) released a report documenting the barriers and highlighting successes to implementing energy efficiency in rural communities.[101] The report defines "rural communities" as those with fewer than 50,000 inhabitants. Infrastructure, fuel mix, and climate often vary in rural areas relative to metropolitan regions, making one-size-fits-all utility program offerings more challenging. The households also tend to have higher energy burdens than the median energy burden for their region. ACEEE identified the main challenges to implementing efficiency as:

- Low population density.
- Lack of broadband access.
- Customer reluctance.
- Shortage of qualified local energy efficiency workers.
- Financial constraints.
- High program delivery costs.
- Insufficient data collection.
- Efforts among state agencies.

Nationwide, rural housing is made up of older and geographically dispersed homes. Nearly one-third of rural households experience energy insecurity; that is, a challenge in paying energy bills or sustaining adequate heating and cooling in their homes.[102] Moreover, these homes tend to rely on heating fuels such as fuel oil, propane, and wood, which can come with higher costs and poor indoor air quality. In California, these areas may also be more prone to wildfires and electrical blackouts. Energy efficiency

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101 Ibid.

102 U.S. Energy Information Administration. "One in Three U.S. Households Faced Challenges in Paying Energy Bills in 2015," https://www.eia.gov/consumption/residential/reports/2015/energybills/.

and resiliency measures are crucial to keeping rural households safe and free of energy burden.

As an example, the Sierra Nevada Energy Watch, a local government partnership program implemented by Pacific Gas and Electric and the Sierra Business Council, was called out by ACEEE as an effective program in the state.[103] As the lead local partner, the Sierra Business Council oversaw direct-installation efficiency projects and reached out to local government agencies and small businesses. Pacific Gas and Electric provided technical assistance and identified energy efficiency measures for program participants. The program offered small businesses direct-install measures, building benchmarking, climate action plan development, funding of local government energy and climate meetings, and education.[104]

The Sierra Nevada Business Council faced many challenges running the program, such as staff availability and retention in local governments, travel to cover the large territory, and customer skepticism. These common issues resulted in a non-cost-effective result despite the good program design. As a result, the Sierra Nevada Business Council decided to no longer offer the direct installation part of the partnership.[105] These common issues associated with running energy efficiency programs in rural regions will continue unless action is taken to adjust the cost-effective calculation for projects in rural low-income and disadvantaged communities. Further collaboration with local governments or implementers in these regions is also essential.

The ACEEE report recommends states do the following to improve efficiency uptake in rural regions:

- Offer incentives to utilities to deliver energy efficiency in rural areas
    - Leverage public dollars to lower the costs for program implementers to work in these areas
    - Continue to fund entities designed to implement efficiency in rural and hard-to-reach areas
- Create programs that combine state with federal funding
    - For example, leverage Low-Income Home Energy Assistance Program (LIHEAP) and the U.S. Department of Agriculture's Rural Energy for America Program resources in conjunction with the CSD-led farm worker housing or CPUCs ESA programs
- Partner with local implementers who know the needs of the community
- Have programs work with local contracting firms and use local marketing strategies

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103 ACEEE. 2018. *Reaching Rural Communities With Energy Efficiency Programs*, pg.20-22, https://aceee.org/sites/default/files/publications/researchreports/u1807.pdf.
104 Ibid., pg.20.
105 2019 California Energy Efficiency Action Plan Workshop—Redding transcript. https://efiling.energy.ca.gov/getdocument.aspx?tn=228059j.

- Have programs keep communitywide economic development effects in mind
- Support local workforce through programs
- Combine programs and funding, such as water conservation and renewable energy resources
- When possible, try to bundle measures and install at households or businesses near one another to lower costs

Stakeholder Feedback on Rural Communities

The CEC received comments from rural community stakeholders at regional workshops and in the docket. The Sierra Business Council suggested that direct-installation programs are best suited for rural regions where customers have limited broadband access and may be less trusting of government programs. Education on energy options is a major barrier to success in rural regions, and local governments are best suited to deliver the outreach and education needed to be successful. Stakeholders stressed that rural regions cannot be cut off because the cost-effectiveness criteria do not meet a certain criterion. The cobenefits of working in these regions, which are largely not quantifiable, make efficiency programs worthwhile. Stakeholders also raised the importance of local communities taking control of energy efficiency funds in their region to ensure the programs work everywhere, including rural areas. The Sierra Business Council suggests making more data available to local governments, especially in rural communities, where strategic planning is even more important to achieve cost-effectiveness.

Component 3: Tracking Equity

In June 2018, the CEC published the *Energy Equity Indicators Tracking Progress* Report[106] (Equity Indicators Report) to advance implementation of the Barriers Study recommendations. The Equity Indicators Report outlines a set of energy equity metrics to better track progress toward achieving the Barriers Study recommendations. The report includes nine indicators relating to clean energy access, investment, and resilience in California's low-income and disadvantaged communities. The report is accompanied by an interactive map that highlights key opportunities to advance clean energy in low-income and disadvantaged communities (Figure 26).[107] The map allows stakeholders to focus on metrics and locations for their own analyses. The CARB is working closely with the CEC to identify metrics to ensure increased access to clean transportation programs. CEC staff will annually update the Equity Indicators Report.

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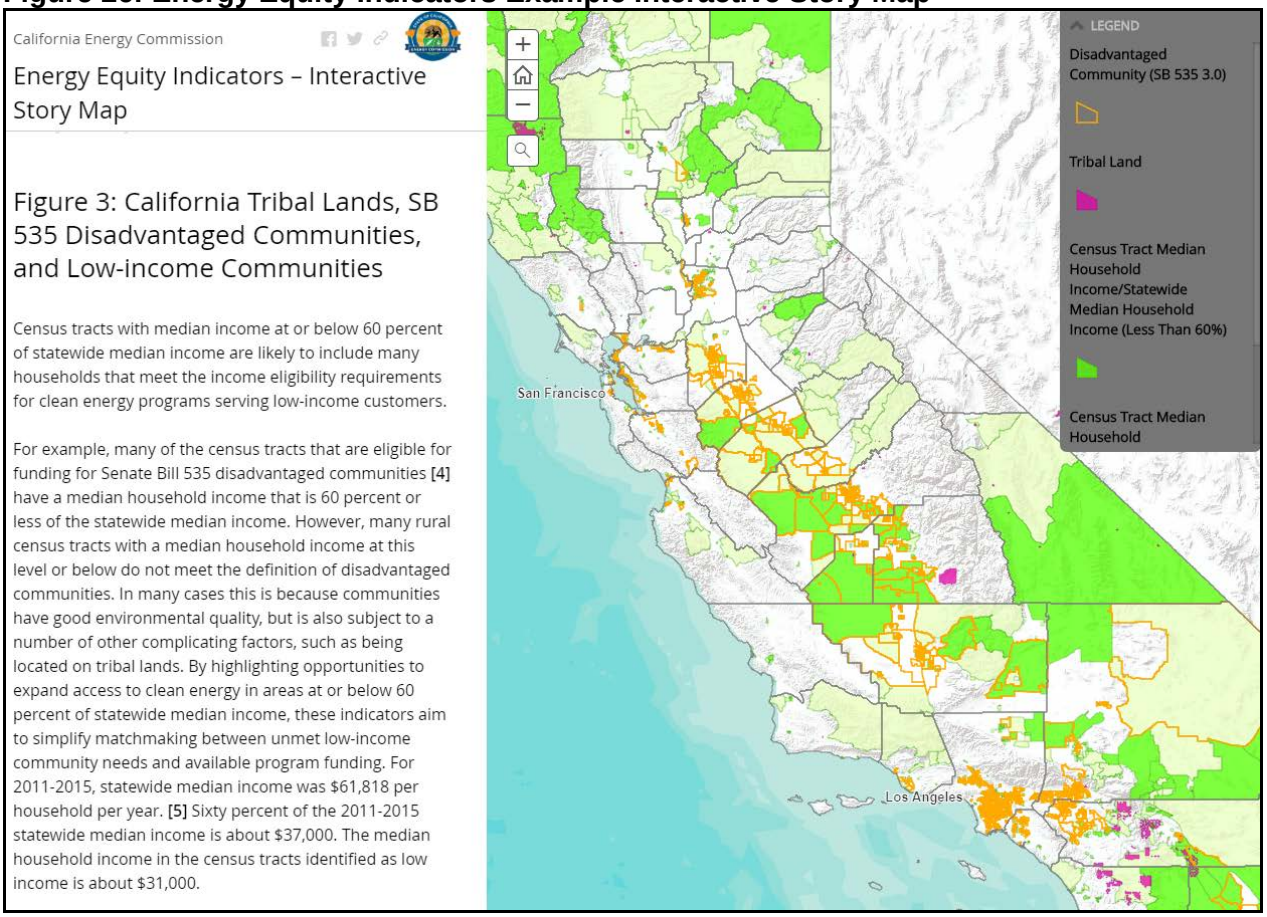
106 "Energy Equity Indicators Tracking Progress Report." California Energy Commission, June 2018, https://efiling.energy.ca.gov/GetDocument.aspx?tn=223922.
107 Ibid.

Figure 26: Energy Equity Indicators Example Interactive Story Map



Source: CEC

The energy equity indicators tool allows the user to overlay data sets to identify areas of need. For example, in the 2018 update, the map was used to show where low levels of energy efficiency participation overlap with low levels of energy efficiency investment near low-income areas, especially where older homes exist. These areas had on average eight households per 1,000 participating in energy efficiency programs.[108] The tool identified locations where opportunities for launching additional regional services exist to improve program delivery. This tool can also be used by local governments to understand where vulnerable populations exist and where to direct funding for clean energy initiatives.

Energy Savings in Low-Income and Disadvantaged Communities

The updated energy efficiency savings doubling targets allow for disaggregation, or breakdown, of savings attributed to disadvantaged communities and low-income households. Values are disaggregated based on the proportion of disadvantaged

108 Ibid., pg. 18.

communities reported in the CalEnviroScreen 3.0 tool and the percentage of low-income households from the median income data of the area (Table 5).

Table 5: Estimated Savings Attributed to Low-Income and Disadvantaged Communities

	Equity Group	*Percentage of SB 350 Savings in 2029*
Electricity	Disadvantaged Community	14.3
	Low-Income Household	8.90
Natural Gas	Disadvantaged Community	15.2
	Low-Income Household	12.2

Source: CEC

Next Steps for Energy Equity

The recommendations from the Barriers Study, CLIMB Action Plan, Equity Indicators Report, ESJ Action Plan, and ACEEE Rural Report should be pursued and tracked. This tracking requires a dedicated group, much like the advisory group, to account for progress, allocate resources to areas where progress is not being made, and suggest recommendations. There is a clear understanding among state agencies that disadvantaged communities, low-income household, and rural areas need more assistance than they are receiving. These agencies, including the CEC, need to continue collaborative efforts so that recommendations move on to implementation. This collaboration can also work to unlock any potential funds not being spent through existing program channels that can benefit the most vulnerable populations in the state.

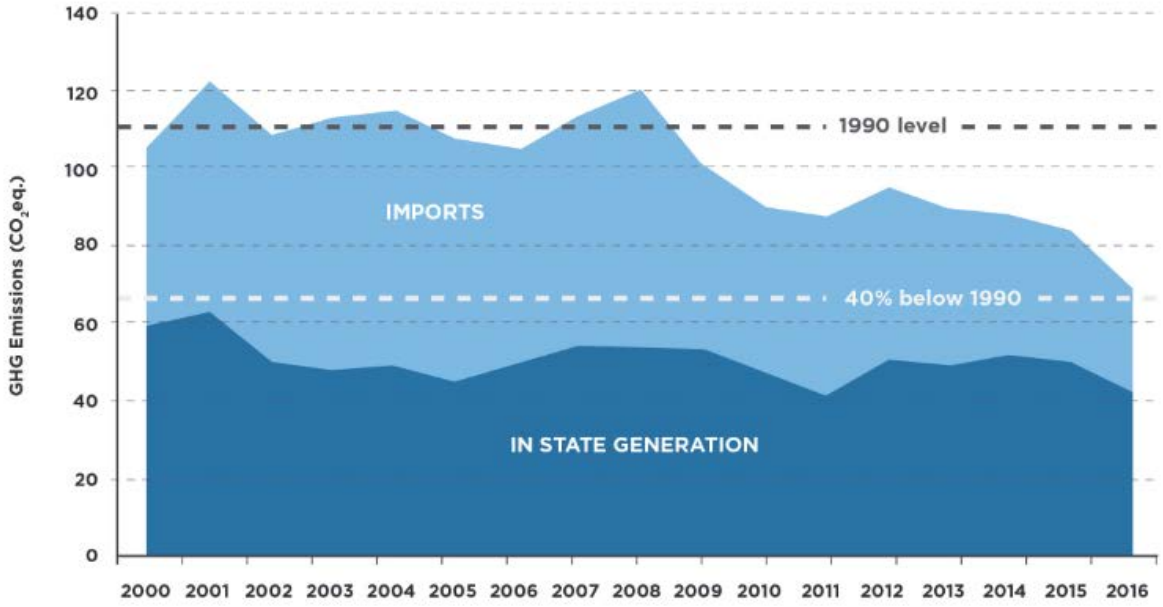
Goal 3: Reducing Greenhouse Gas Emissions From Buildings

Overview

To reduce the GHGs emitted from the buildings sectors, California must pursue a clean energy supply, deep energy efficiency, and demand flexibility. “Clean supply” refers to actions in the state’s IRPs, SB 100, and Low Carbon Fuel Standard. “Deep efficiency” activity is addressed in Goal 1. “Demand flexibility” refers to utility demand response programs, time-of-use rates, load management standards, and activity enabled by SB 49. These three components of building decarbonization will result in a clean, least-cost, reliable energy system. It also provides numerous cobenefits: better outdoor and indoor air quality, reduced health risks, new jobs, and addressing the impacts of climate change.

California’s electric grid can provide the backbone for building decarbonization through increased renewable energy, with the electricity generation sector leading the state in emissions reductions, achieving a 37 percent reduction over 1990 levels in 2016 (Figure 27).

Figure 27: GHG Emissions from California’s Electricity Sector Continue to Decline



Source: CEC using California ISO data

California’s GHG emission reduction strategies are driven by Assembly Bill 32 (Núñez, Chapter 488, Statues of 2006) and Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016). Building on the AB 32 requirement to reduce GHG emissions to 1990 levels by 2020, SB 32 set a statewide requirement to reduce California’s GHG emissions 40 percent below 1990 levels by 2030. The state is on track to exceed its 2020 GHG reduction goal next year. The state has subsequently updated its emissions goals, seeking to reduce GHG emissions 80 percent below 1990 levels by 2050 and achieve

economywide carbon neutrality by 2045. SB 100 sets a planning target of having renewable resources and zero-carbon electricity resources serve 100 percent of California's electricity use by 2045 and increases the 2030 Renewables Portfolio Standard target from 50 percent to 60 percent

There is evidence that electrification is the most viable and least-cost path to immediate zero-emission residential and commercial buildings.[109] In particular, electrification of space and water heating to high-efficiency, demand-flexible technologies is key to reducing emissions from homes and businesses. For example, time-of-use rates and demand-flexible appliances can shift the timing of energy consumption in buildings to coincide with peak solar production and when emissions are lowest (Figure 28). Replacing carbon-intensive power generation with renewable power will cut emissions for all end uses, including buildings. The expected shift in the GHG content of the electricity grid between 2020 and 2030 from added renewable generation is illustrated in Figures 29 and 30.[110] Strategies employed must also encourage the use of refrigerants with low-global warming potentials and otherwise reduce GHG emissions associated with refrigerants. Renewable gases will be part of the solution to reduce GHG emissions from buildings, but the role is likely to be constrained by limitations on its availability, cost, and leakage concerns. The renewable gas that is available will likely be needed for industry, transportation, and other processes not easily electrified. Effective statewide building decarbonization efforts will seek to increase the share of renewable generation on the electricity grid and increase energy efficiency, all while coordinating efforts to reduce electricity consumption when the GHG intensity of electricity is highest.

Tools for advancing building decarbonization efforts include, codes and standards, incentive programs, more effective financing models, and integration of building decarbonization into energy efficiency programs and independent local action. In July 2019, the CPUC voted to permit the use of ratepayer energy efficiency program funds for building decarbonization fuel substitution.[111] Additionally, local governments across California are adopting reach codes or using local police powers to further electrification efforts in their cities. In June 2019, Berkeley (Alameda County) became the first city in

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109 Energy and Environmental Economics (E3) produced the study *Deep Decarbonization in a High Renewables Future* https://www.ethree.com/wp-content/uploads/2018/06/Deep_Decarbonization_in_a_High_Renewables_Future_CEC-500-2018-012-1.pdf.

110 Emissions intensities are shaded from green to red; green is the lowest GHG content periods, and red is the greatest GHG content periods. Periods of lowest GHG-intensity electricity coincide with high solar PV generation.

111 CPUC Decision 19-08-009, "Modifying the Energy Efficiency Three-Prong Test Related to Fuel Substitution."

the United States to ban natural gas in new construction.[112] Envisioning zero-carbon buildings also requires better integration of enhanced building performance policies with local land use decision-making to promote walkable and transit-oriented development that will pave the way for higher-performing and healthier buildings and communities for all.

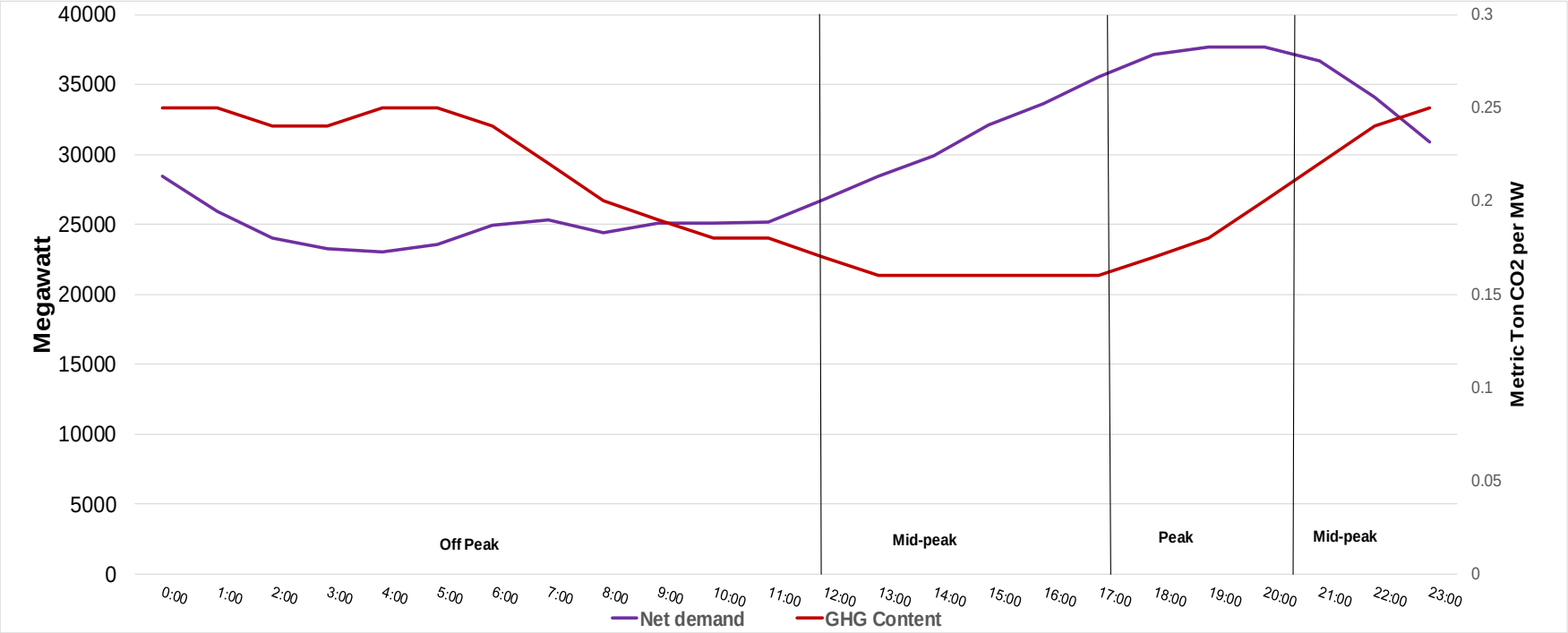
University of California and California State University Decarbonization Pilots

The University of California (UC) and California State University (CSU) systems have partnered with Southern California Edison to pilot a performance based, GHG reduction program, known as the Clean Energy Optimization Pilot.[113] The four-year, $20 million program provides financial incentives to university systems to identify and install clean energy technologies. Incentive levels are based on actual metered results. The program is not limited to a prescriptive approach but allows for energy and cogeneration efficiency measures, on-site renewable energy, clean transportation, and energy storage.

Seven sites across the two university systems have been selected to participate: UC Davis Veterinary Lab, UC Irvine Medical Center, UC Irvine, UCLA Medical Center, UC Santa Barbara, CSU- Pomona, and CSU-Dominguez Hills.

112 Ordinance NO. 7,672-N.S, City of Berkeley, City Council July 23, 2019 Meeting, https://www.cityofberkeley.info/Clerk/City_Council/2019/07_Jul/City_Council__07-23-2019_-_Regular_Meeting_Agenda.aspx.

Figure 28: Net Demand Versus GHG Content of Electricity During Time of Use



Source: CEC and SMUD

Figure 29: 2019 System Average Metric Ton CO_2 per MWh

2020	January	February	March	April	May	June	July	August	September	October	November	December
1	0.23	0.22	0.20	0.17	0.17	0.18	0.23	0.26	0.26	0.25	0.24	0.24
2	0.23	0.23	0.20	0.17	0.17	0.18	0.23	0.26	0.26	0.25	0.24	0.24
3	0.23	0.22	0.20	0.17	0.17	0.18	0.23	0.26	0.26	0.25	0.24	0.24
4	0.23	0.22	0.20	0.17	0.17	0.18	0.23	0.26	0.26	0.25	0.24	0.24
5	0.23	0.22	0.20	0.16	0.17	0.18	0.23	0.26	0.26	0.25	0.24	0.24
6	0.23	0.21	0.18	0.15	0.16	0.17	0.23	0.25	0.25	0.24	0.23	0.23
7	0.22	0.20	0.18	0.15	0.15	0.17	0.22	0.25	0.24	0.23	0.22	0.22
8	0.21	0.19	0.17	0.15	0.15	0.15	0.20	0.23	0.24	0.23	0.21	0.22
9	0.20	0.17	0.16	0.13	0.13	0.13	0.19	0.20	0.21	0.21	0.19	0.20
10	0.18	0.14	0.13	0.12	0.11	0.12	0.17	0.18	0.19	0.18	0.17	0.18
11	0.16	0.13	0.12	0.10	0.11	0.11	0.16	0.17	0.18	0.17	0.16	0.17
12	0.16	0.13	0.11	0.10	0.10	0.10	0.15	0.17	0.17	0.16	0.16	0.16
13	0.16	0.13	0.11	0.10	0.10	0.10	0.15	0.16	0.17	0.16	0.16	0.16
14	0.16	0.13	0.12	0.10	0.10	0.10	0.14	0.16	0.17	0.17	0.16	0.17
15	0.17	0.14	0.12	0.10	0.10	0.10	0.14	0.16	0.18	0.17	0.18	0.18
16	0.20	0.17	0.14	0.11	0.10	0.10	0.14	0.16	0.18	0.19	0.20	0.21
17	0.20	0.19	0.16	0.13	0.10	0.11	0.14	0.16	0.18	0.19	0.20	0.21
18	0.19	0.18	0.16	0.13	0.11	0.12	0.15	0.17	0.19	0.19	0.19	0.19
19	0.18	0.17	0.15	0.13	0.12	0.13	0.16	0.18	0.19	0.19	0.19	0.19
20	0.19	0.18	0.15	0.13	0.13	0.14	0.17	0.19	0.20	0.20	0.19	0.19
21	0.19	0.18	0.16	0.14	0.14	0.15	0.19	0.21	0.22	0.21	0.20	0.20
22	0.20	0.19	0.17	0.14	0.15	0.16	0.20	0.22	0.23	0.23	0.21	0.21
23	0.22	0.20	0.18	0.16	0.15	0.17	0.21	0.24	0.24	0.24	0.22	0.22
24	0.23	0.21	0.19	0.16	0.16	0.17	0.22	0.25	0.26	0.25	0.23	0.23

Source: CEC

Figure 30: 2030 System Average Metric Ton CO_2 per MWh

2030	January	February	March	April	May	June	July	August	September	October	November	December
1	0.20	0.18	0.16	0.13	0.12	0.13	0.20	0.24	0.24	0.23	0.21	0.23
2	0.21	0.19	0.16	0.14	0.12	0.13	0.20	0.24	0.25	0.23	0.21	0.23
3	0.21	0.19	0.17	0.14	0.12	0.13	0.20	0.25	0.25	0.23	0.22	0.23
4	0.21	0.19	0.16	0.13	0.12	0.13	0.20	0.24	0.24	0.23	0.22	0.23
5	0.21	0.19	0.16	0.13	0.12	0.13	0.20	0.24	0.24	0.22	0.21	0.23
6	0.20	0.18	0.15	0.12	0.11	0.13	0.20	0.23	0.23	0.21	0.21	0.22
7	0.19	0.17	0.14	0.11	0.11	0.12	0.19	0.22	0.22	0.20	0.20	0.21
8	0.18	0.16	0.14	0.10	0.08	0.08	0.15	0.19	0.22	0.20	0.17	0.20
9	0.13	0.09	0.08	0.05	0.04	0.05	0.10	0.12	0.13	0.13	0.10	0.14
10	0.08	0.05	0.05	0.04	0.04	0.04	0.08	0.10	0.09	0.07	0.07	0.09
11	0.07	0.05	0.04	0.04	0.04	0.04	0.08	0.09	0.08	0.06	0.06	0.08
12	0.06	0.04	0.04	0.04	0.04	0.04	0.08	0.09	0.08	0.06	0.06	0.07
13	0.06	0.04	0.04	0.04	0.04	0.04	0.08	0.09	0.08	0.06	0.06	0.07
14	0.07	0.05	0.04	0.04	0.04	0.04	0.08	0.10	0.09	0.06	0.07	0.08
15	0.08	0.05	0.04	0.04	0.04	0.04	0.09	0.11	0.10	0.07	0.08	0.10
16	0.14	0.07	0.04	0.04	0.04	0.05	0.11	0.12	0.12	0.10	0.15	0.17
17	0.18	0.16	0.09	0.05	0.05	0.06	0.12	0.14	0.15	0.15	0.18	0.20
18	0.16	0.15	0.13	0.09	0.06	0.07	0.12	0.14	0.16	0.15	0.16	0.18
19	0.16	0.14	0.12	0.08	0.06	0.07	0.13	0.15	0.16	0.16	0.16	0.18
20	0.16	0.14	0.12	0.09	0.09	0.10	0.14	0.16	0.17	0.17	0.17	0.18
21	0.17	0.15	0.13	0.10	0.09	0.11	0.15	0.17	0.19	0.18	0.18	0.19
22	0.18	0.16	0.14	0.11	0.09	0.11	0.16	0.18	0.21	0.20	0.19	0.20
23	0.19	0.17	0.15	0.12	0.10	0.11	0.17	0.21	0.22	0.21	0.20	0.21
24	0.20	0.18	0.16	0.13	0.11	0.12	0.19	0.22	0.24	0.22	0.21	0.22

Source: CEC

Role of the Traditional Energy Efficiency Portfolios

As decarbonization moves to a key goal of California's energy policy, the role and composition of the traditional gas and electric energy efficiency portfolios are changing. Going forward, traditional programs will need to focus more directly on two areas: first, ensuring low-income residents perceive the full range of benefits of the low-carbon energy economy; second, dramatically expanding utility investment in market transformation efforts around low-carbon technologies, whether within electric or gas end uses or in support of fuel substitution. Given recently reduced efficiency program savings from the IOU portfolio and challenging cost-effectiveness requirements, overall spending on the IOU energy efficiency portfolios may decline going forward. At the same time, opportunity exists to incorporate aggregated energy efficiency and load flexibility into utility energy procurement or resource adequacy markets or both. One area of effort going forward—whether by California's POUs, IOUs, or CCAs—is to continue to develop tools and programs that enable and facilitate aggregation, procurement, and forecasting of these demand-side resources.

SB 1477 and AB 3232 Implementation

Before 2018, decarbonization efforts were limited to fuel-switching to zero-emission options in the fossil fuel-dominated transportation sector. SB 1477 and AB 3232 widened the decarbonization scope to include reducing the carbon footprint of buildings, moving beyond advancing energy efficiency and zero-emission buildings. Altogether, buildings produce 12 percent of statewide GHG emissions.[114]

SB 1477 authorizes two incentive programs to spur market development for clean, near-zero-emission building equipment. To support that technical goal, the bill directs $200 million over four years to the Building Initiative for Low-Emissions Development (BUILD) and the Technology and Equipment for Clean Heating (TECH) programs. The programs promote retirement and replacement of conventional appliances, such as gas water heaters and gas space heaters, with low-, or zero-emissions electric equipment. The CEC and CPUC submitted a staff proposal to use the CEC as the program administrator for the BUILD program.[115]

The CPUC opened the proceeding for SB 1477 in January 2019. The rulemaking is named Building Decarbonization and is filed under proceeding R.19-01-011.[116] The proposed scope includes four issues:

- Implementing BUILD and TECH as defined in SB 1477
- Launching programs to address new construction in areas damaged by wildfires
- Coordinating CPUC policies with Energy Standards and Appliance Standards

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114 CARB, GHG inventory, 2016, https://ww3.arb.ca.gov/cc/inventory/data/data.htm.
115 CPUC and CEC. Staff Proposal for Building Decarbonization Pilots. July 2019. https://efiling.energy.ca.gov/GetDocument.aspx?tn=229015&DocumentContentId=60393
116 CPUC opened the order instituting rulemaking regarding building in November 2018, R.19-01-011.

- Establishing a building decarbonization policy framework

AB 3232 directs the CEC to assess the potential for reducing building GHG emissions 40 percent below 1990 levels by 2030. Assessment findings are due to the Legislature in January 2021. To start the assessment, the CEC is reviewing data on GHG emissions to inform an effective baseline that will clarify which emissions to include or exclude, from site to source, and will hold a scoping workshop in late 2019.

Building Decarbonization Technology and Research

Energy research, development, and demonstration that supports and advances technologies to improve reliability, affordability, and public health and safety is vital to achieving California's energy and climate goals. Deep energy efficiency is the primary carbon reduction strategy for California's buildings, minimizing long-term energy consumption from the start. Ongoing research on advanced building shells, for example, will help ensure that new structures across the state require only modest amounts of energy for mechanical heating and cooling.

The CEC is researching low- and no-carbon alternatives for space heating, water heating, and cooking in buildings, including those accompanied by low-global-warming potential or zero-hydrofluorocarbon refrigerants.[117] The following research projects focus on innovative approaches that reduce the carbon intensity of space-conditioning in buildings:

- Testing HVAC supporting technologies and analyzing integration into a single system. Technologies analyzed included a variable-capacity compressor, variable-speed blower, automated DR, intelligent dual-fuel heating, and zonal controls. The project includes testing a single-family residential heat pump conditioning system optimized for California climates.[118]
- Evaluating operational performance issues and market barriers of heat pump technology.[119] This work will assess barriers to further adoption of heat pumps across markets to support electrification goals.
- Reviewing cost-effective and integrated demand-side retrofits in multifamily buildings.[120] Example measures include smart thermostats, plug-load controls,

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117 Energy Commission research projects are available to review at http://innovation.energy.ca.gov/SearchHome.aspx?ti=636942212481590669.
118 Grant EPC-14-021, "Development and Testing of the Next Generation Residential Space Conditioning System for California," http://innovation.energy.ca.gov/SearchResultProject.aspx?p=30005&tks=636963103836691770.
119 Work Authorization NAV-15-007, "Heat Pump Technology Performance and Barriers and Recommendations for EPIC Research, Development, and Demonstration Activities."
120 Grant EPC-15-053, "Customer-Centric Approach to Scaling Integrated Demand Side Management Retrofits," http://innovation.energy.ca.gov/SearchResultProject.aspx?p=30924&tks=636963114547718447.

and central system heat pump water heating. The project will focus on solutions to maximize building decarbonization in retrofit markets.

The CEC is also researching fuel substitution and energy efficiency in commercial food service to identify opportunities to reduce the industry's energy intensity while maintaining the ability to meet customer desires:

- Test data show that plug-in commercial food service equipment has a wide range of energy intensity. Research is testing an electric cooktop that may be more efficient than induction cooktops. The conduction-cooking system has specialized double-walled, vacuum-sealed pots. Research includes determining energy savings, cooking times, and other parameters of interest to food service operators. Energy savings are claimed to be 250 percent versus comparable electric cooktops.[121]
- A commercial kitchen project is assessing the potential to reduce the electricity consumption of commercial plug loads from food service equipment. It also demonstrates the potential for reduced energy consumption using innovative precommercial appliance technologies and control technologies.[122]

Pathway for Building Decarbonization Within Energy Code

Building decarbonization is achievable with current building science and technology. Building decarbonization also has become an accessible path for local jurisdictions seeking to adopt reach building codes that support their climate plans. Space heating and water heating remain two of the largest energy loads in buildings, and natural gas is the dominant source for these end uses. The changes approved in the 2019 Energy Standards have included critical changes to ensure the energy standards does not prevent electrifying heating loads. Future energy standards updates will need to continue this work for newly constructed commercial buildings.

The 2019 Energy Standards update took two steps toward building decarbonization:

1. It removed language that required gas appliances in new homes, allowing all-electric buildings that can avoid gas-piping installation costs.
2. It established an all-electric prescriptive compliance path for homes.[123]

The 2019 Energy Standards take effect January 1, 2020. The benefits provided by decarbonization include many direct benefits to homeowners and tenants such as improved indoor air quality and reduced concentrations of criteria pollutants.

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121 Grant EPC-15-027, "Electric Plug Load Savings Potential of Commercial Foodservice Equipment," http://innovation.energy.ca.gov/SearchResultProject.aspx?p=30957&tks=636966615302804813

122 EPIC Grant EPC-15-027

123 The "prescriptive compliance path" in the Energy Code is the default baseline design defined in the code. The alternative is the optional "performance compliance path," which requires modeling the proposed project and showing it just as or more energy-efficient as the prescriptive path.

In the 2022 Energy Standards update, the CEC plans to focus on energy efficiency in multifamily buildings. This update will address additional barriers to building decarbonization, ensuring that all-electric pathways are available to all types of multifamily construction.

For commercial buildings, the CEC must first establish an all-electric baseline, starting with the most common building types. Commercial buildings have more varied designs than homes, and electric equivalents to commercial gas equipment are not available for some applications. There is also a need to integrate demand-responsive technologies to support a communicating energy grid that can cost-effectively integrate renewable generation.

Grid Interactivity and Renewable Energy Support

Heat pump water and space heating can support renewable energy integration and store energy. Making small adjustments in space-conditioning schedules and using heat pump hot water heaters as thermal storage are effective strategies for absorbing excess renewable generation from solar during the middle of the day and shifting it to meet late afternoon peak loads that occur after the sun sets. With the right automation, grid-level signals can allow devices to minimize the associated impact on the distribution grid while maintaining or improving the ability to meet customer needs.

The greater the penetration of these systems into the built environment, the greater the potential of these systems to absorb excess capacity and reduce grid stress from intermittent renewable generation, such as wind and solar. Improving demand flexibility will pave the way for development of additional renewable resources and the eventual transition to a zero-carbon grid while reducing the potential impacts of rapid electrification on California's electricity distribution infrastructure.

CHAPTER 4: Recommendations and Next Steps

Recommendations

The following recommendations will further the goals laid out in this 2019 EE Action Plan. These recommendations are meant to supplement the recommendations previously published in the EBEE Action Plan, Barriers Study, and CLIMB Action Plan. The following recommendations are also meant to complement those anticipated from assessment under AB 3232 and lessons learned from programs implemented under SB 1477. The recommendations are grouped together based on a common theme and assigned a time frame based on anticipated initial action. Short-term recommendations are expected to start in the next 12 months, medium-term recommendations in the next two to three years, and any long-term recommendations within the next five years. Each recommendation is assigned a lead whom the CEC has identified as having the authority or ability to implement the recommendation. Each recommendation also has one or multiple partners. They are additional stakeholders who can play a role in implementation.

All recommendations must be viewed and implemented through an equity and environmental justice lens. As leads and partners think through implementation, it is crucial to involve the communities that will be affected most. For example, individuals and communities must be enlisted to increase participation and engagement.

A. Funding Sources Beyond Ratepayer Portfolio

The need for simplified energy efficiency funding sources and requirements is apparent from the stakeholder comments received in the development of the 2019 EE Action Plan. In addition to the utility programs run by IOUs and POUs, there is a need for a comprehensive program that removes silos between clean energy solutions, supports grid-interactive buildings, and helps customers across sectors understand the numerous benefits to energy efficiency and clean energy. Funds and staff must be allocated to work directly with environmental justice communities across California. Such a program would:

1. Offer financing or grant funds for energy efficiency, renewable energy, electric vehicles, and storage projects.
2. Provide technical support to customers.
3. Be available to customers in the residential, commercial, local governments, industry, and agriculture sectors.
4. Offer consistent program requirements and funding levels.

5. Aggregate programs from state agencies, utilities, air districts, and local governments to maximize funding.
6. Fund early adoption of demand-flexible appliances.
7. Compile and publish program design best practices, including guidance for direct-installation programs, tariffed on-bill financing, and energy services performance contracting

Lead: Legislature

Partners: CEC, CPUC, CARB, local governments, Treasurer's Office, CAEATFA, utilities, air districts, CSD, CCAs, clean energy stakeholders

Time frame: Such a program, with an extensive list of responsibilities, should be developed in phases. In the short term, such a program should incorporate items one through four, and, in the medium term, expand to items five through seven.

B. Energy Efficiency Data

As savings become more difficult to achieve through traditional programs, state agencies, implementers, researchers, utilities, and the public will need better energy efficiency information. Leveraging the smart meter infrastructure and other big data systems, California can support efficiency programs, improve program targeting, and more accurately measure impacts. Pieces of this work are ongoing through efforts described in the market transformation portion of goal one. The following actions are needed:

1. Develop hourly energy efficiency savings profiles based on actual customer data across each climate zone (Lead: CEC and CPUC; Partners: CSD, CDPH, CARB, and utilities).
2. Create a common data visualization tool for use in state agencies, local governments, tribal governments, research institutes, and utility programs (Lead: CEC, CPUC, CARB; Partners: CSD, utilities, researchers, and local governments).
    - Pool data and modeling methods across state agencies
    - Develop guidelines for aggregating data in order to enable sharing with entities outside state government
    - Combine energy information with available building, health, and economic datasets, such as CalEnviroScreen 3.0 and CalBRACE
3. Use the CalTF to review published values of energy efficiency and building decarbonization cobenefits (Lead: CEC, CPUC, and CalTF; Partner: CARB, utilities, CDPH, and CSD).
    - Determine values that can be incorporated into cost-effectiveness tests across any program implementer

    - Leverage work done by CARB for the Greenhouse Gas Reduction Fund
4. Use meter-based energy efficiency program results to improve utility potential and goal studies (Lead: CPUC and POUs; Partners: CEC and IOUs).
5. Study the gaps among market, economic, and technical potential through the CalTF, including how the cost-effectiveness tests used by different program administrators affect the gaps (Lead: POUs, CPUC, and CalTF; Partner: CEC and CARB).
6. Use hourly energy efficiency savings estimates to verify and forecast SB 350 energy efficiency targets (Lead: CEC; Partners: CPUC, utilities, and CARB).

Time frame: Given that some of the work needed to complete this recommendation is underway, it is possible in the short term to complete items one and two, whereas items three through six can likely be done in the medium term.

C. Program Designs and Energy Efficiency as a Resource

California has unique tools at its disposal to implement new program designs and to procure resources that emit fewer GHG emissions. Through the IRP process, the state is increasing clean energy procurement. Energy efficiency and demand flexibility tools should be available for procurement, but are not currently pursued in this process.

1. Develop ways to incorporate aggregations of energy efficiency and demand flexibility into long-term planning (Lead: CPUC, IOUs; Partners: CEC, California ISO, program implementers).
2. Develop similar methods for POUs to integrate aggregations of energy efficiency and demand flexibility into each IRP (Lead: POUs and CEC; Partners: California ISO, program implementers).

California should not only look to expand the role of efficiency and demand flexibility in resource procurement, but also in program designs. Hourly data from smart meters and lessons learned from successes in other states and Europe reveal promising new programs for California.

3. Expand and foster the use of meter-based savings programs in both incentive-based programs and resource procurement (Lead: CPUC and utilities; Partners: CEC, California ISO, program implementers, energy service companies).
4. Encourage pay-for-performance approaches outside the ratepayer portfolio (Lead: Legislature; Partners: CPUC, CEC, California ISO, utilities, program implementers).
    - Leverage aggregated, normalized energy consumption data and open-source methods to enable new markets and unlock more private market capital

5. Implement California-wide, tariffed on-bill repayment programs to open new financing mechanisms for low-to-middle income households and multifamily units. Such a system is not based on credit score or income, leading to greater adoption. Successful examples include the Pay-As-You-Save model implemented in Kentucky, North Carolina, and Arkansas (Lead: Legislature; Partners: Utilities, CPUC, CEC, CCAs, investment banks, CAEATFA, energy service companies).

Time frame: In the medium term, agencies should work with utilities to set up energy efficiency and demand flexibility as resources in the IRP. New program designs should be addressed in the short term and medium term. Item three should be done in the short term and items four and five in the medium-term.

D. Workforce Development and Standards Compliance

Energy efficiency savings are maximized only if they are installed following manufacturer guidelines by a well-trained workforce. Long-lasting, impactful energy efficiency savings require local commitment, and local communities need to be the focal point for training and workforce development. For the state to achieve such successes, it will need to:

1. Support additional locally led outreach and education. The state needs to leverage local community groups and expertise. (Lead: Local governments; Partners: Building officials, CEC, CPUC, California State Licensing Board, trade unions, utilities, and energy service companies).
2. Use ongoing workforce development activities at the Employment Training Panel, Employment Development Department, and Governor's Office of Planning and Research. (Lead: Employment Development Department, Employment Training Panel, CEC, Governor's Office of Planning and Research; Partners: CPUC, California Workforce Development Board, utilities, and Energy Corps).
3. Work with workforce educators at community colleges, vocational schools, and workforce agencies to understand and remove barriers to a well-trained, energy efficiency workforce. (Lead: Community colleges, trade schools; Partners: CEC, CPUC, utilities, and California Workforce Development Board).

Time frame: Across the state, efforts are already underway to continue developing a well-trained workforce within each community. There is more work to be done though to ensure disadvantaged communities receive the same opportunities, to improve how well measures are installed, and to improve the pathways that exist for people to receive training. The three items in this recommendation should begin in the short term to strengthen relationships among leads and partners and continue into the long term to establish and maintain the workforce.

E. Demand Flexibility and Building Decarbonization

Recent legislation is guiding the state to demand flexible appliances, grid-interactive buildings, and reduced GHG emissions. The pathways for accomplishing these goals are

still taking shape, and careful planning and consideration are needed for success. Demand flexibility will be a key strategy to maximize renewable energy generation and limit grid demands.

To further demand flexibility, the state and others need to:

1. Initiate a rulemaking to explore demand flexibility approaches (Lead: CEC; Partners: CPUC, California ISO, utilities, contractors, building officials, western HVAC performance alliance).
2. Research and demonstrate the most effective demand flexibility appliances and plug loads (Lead: CEC; Partners: CPUC, contractors, appliance industry, and researchers).
3. Determine the best means of incorporating demand flexibility into the building and appliance standards (Lead: CEC; Partners: CPUC, California ISO, building officials, utilities, and program implementers).
4. Partner with the CPUC, utilities, California ISO, and others to develop effective, equitable demand flexibility tariffs that positively drive consumers to cheaper, cleaner energy usage (Lead: CPUC; Partner: utilities, CEC, California ISO, and ratepayer advocates).

To further building decarbonization efforts, the state needs to:

5. Establish a low-to-zero-emission building policy (Lead: Legislature; Partners: CEC, CARB, CPUC, and California ISO).
6. Implement the findings of the AB 3232 assessment and evaluate the effects of SB 1477's programs (Lead: CEC and CPUC; Partners: California ISO, CARB, Building Decarbonization Coalition, and clean energy stakeholders).
7. Continue to evaluate building decarbonization technologies and pathways (Lead: CEC; Partners: CPUC, CARB, utilities, and researchers).
8. Provide building decarbonization pathways in the building standards for new construction and retrofits (Lead: CEC; Partners: Local governments, CPUC, utilities, building officials, contractors, and California ISO).
9. Develop a statewide plan for the future of the natural gas system that protects workers, communities, and ratepayers (Lead: Legislature; Partners: CEC, CPUC, CARB, utilities, CCAs, local governments, and clean energy stakeholders).

Time frame: Demand flexibility work is beginning within the CEC; thus, items one through three are possible to accomplish in the short term. Item four should be accomplished in the medium term. Building decarbonization research is also underway at state agencies and utilities; thus, there is a pressing need to resolve item five in the short term. In the medium term, items six through nine should be taken up by state agencies and stakeholders.

Next Steps

The 2019 EE Action Plan is the first step in collecting the state's energy demand management and decarbonization efforts into a single document. Based on the wealth of information and the recommendations brought together, state agencies and other stakeholders have actionable tasks to help California achieve its ambitious energy and climate goals. The 2019 EE Action Plan and SB 350 targets will be updated every two years. The CEC anticipates pursuing all recommendations where it is identified as lead in the 2019 EE Action Plan and looks forward to partnering with other state agencies, local governments, utilities, and the larger stakeholder community to advance all the recommendations.

Glossary

Term	Definition
2019 EE Action plan	The 2019 California Energy Efficiency Action Plan covers issues, opportunities, and savings estimates pertaining to energy efficiency and building decarbonization in California's built environment.
AAEE	Additional achievable energy efficiency—Incremental savings from the future market potential identified in utility potential studies not included in the baseline demand forecast, but reasonably expected to occur, including future updates of building codes, appliance regulations, and new or expanded investor-owned utility or publicly owned utility efficiency programs.
AB 32	Assembly Bill 32 – Núñez, Chapter 488, Statutes of 2006
AB 758	Assembly Bill 758 - Skinner, Chapter 470, Statutes of 2009
AB 802	Assembly Bill 802 – Williams, Chapter 590, Statues of 2015
AB 3232	Assembly Bill 3232 – Friedman, Chapter 373, Statutes of 2018
ACEEE	American Council Energy Efficient Economy – A nonprofit organization that acts as a catalyst to advance energy efficiency policies, programs, technologies, investments, and behaviors.
Advisory Group	Disadvantaged Communities Advisory Group—State-supported group that reviews and provides advice on proposed clean energy and pollution reduction programs and determine whether those proposed programs will be effective and useful in disadvantaged communities.
AHSC	Affordable Housing and Sustainable Communities Program—California-funded program to support infill and compact development that reduce greenhouse gas emissions.
Air Districts	Air pollution control districts and air quality management districts. For definition, see APCD and AQMD.
AMF	Affordable Multifamily Program—Program run by CAEATFA to assist the new construction, rehabilitation, and preservation of permanent and transitional rental housing for lower-income households.
APCD	Air pollution control districts—Agencies responsible for regional air quality planning, monitoring, and stationary source and facility permitting.

Term	Definition
Appliance standards	Appliance Efficiency Regulations. California appliance regulations, combined with federal standards, set minimum efficiency levels for energy and water consumption in products, such as consumer electronics, household appliances, and plumbing equipment.
AQMD	Air quality management districts—Agencies that are county or regional governing authorities that have primary responsibility for controlling air pollution from stationary sources.
ARRA	American Recovery and Reinvestment Act of 2009—Federal act that promotes economic recovery and growth and includes measures to modernize U.S. infrastructure, enhance energy independence, expand educational opportunities, preserve and improve affordable health care, provide tax relief, and protect those in greatest need
ASHRAE	American Society of Heating, Refrigeration, and Air-conditioning Engineers—Professional association seeking to advance heating, ventilation, air-conditioning, and refrigeration systems design and construction.
BAAQMD	Bay Area Air Quality Management District—Air district that oversees policies and adopts regulations for the control of air pollution in the nine counties that surround the San Francisco Bay.
Barriers Study	2016 Low-Income Barriers Study—Study published by the CEC, mandated by SB 350 (2015), to explore the barriers to and opportunities for expanding low-income customers' access to energy efficiency, weatherization, and renewable energy investments. It also examines barriers and opportunities related to contracting with small businesses located in disadvantaged communities.
BayREN	Bay Area Regional Energy Network - Collaboration of the nine counties that make up the San Francisco Bay Area and provides regional-scale energy efficiency programs, services, and resources.
BSP	Bright Schools Program – California program that offers services to help schools identify the most cost-effective energy-saving opportunities.
Btus	British Thermal Units – A traditional unit of heat; it is defined as the amount of heat required to raise the temperature of 1 pound of water by 1 degree Fahrenheit.
BUILD	Building Initiative for Low-Emissions Development – State program mandated by SB 1477 (2018) to provide incentives for California's

Term	Definition
	builders to find innovative and low-cost ways to make clean heating technologies common practice in new construction.
CAEATFA	California Alternative Energy and Advanced Transportation Financing Authority – Authority under the California Treasurer's Office to provide innovative and effective financing solutions for California's industries, assisting in reducing the state's greenhouse gas emissions by increasing the development and deployment of renewable energy sources, energy efficiency, and advanced transportation and manufacturing technologies to reduce air pollution, conserve energy, and promote economic development and jobs.
CAEECC	California Energy Efficiency Coordinating Committee – CPUC-sponsored venue for stakeholders to discuss energy efficiency matters while ensuring transparent access to information and opportunities to get involve.
California ISO	California Independent System Operator – An independent organization that maintains reliability on the majority of California's electrical grid and operates a wholesale energy market.
CalBRACE	California Building Resilience Against Climate Effects - California Department of Public Health program that provides resources and technical assistance for the state and local public health departments to build climate adaptation capacity and enhance resilience at the local and regional levels.
CALGreen	California Green Building Standards Code – First-in-the-nation mandatory green building standards code that result in GHG emissions.
CalTF	California Technical Forum – Collaborative of experts who use independent professional judgment and a transparent, technically robust process to review and issue technical information related to California's integrated demand side management portfolio.
CalTRACK	CalTRACK – an open-forum of stakeholders working collectively to create a methodology for analyzing interval meter data.
Cap-and-Trade	California Air Resources Board regulates GHG emitting industries through the GHG emissions trading program, or Cap-and-Trade. It sets a statewide limit on the sources responsible for 85 percent of California's GHG emissions and establishes a price signal to drive investment in clean energy and energy efficiency.

Term	Definition
CARB	California Air Resources Board – Dedicated to protecting the public from the harmful effects of air pollution and developing programs and actions to fight climate change.
CCAs	Community Choice Aggregators - Lets local jurisdictions aggregate, or combine, their electricity load to purchase power on behalf of their residents. In California, CCAs are legally defined by state law as electric service providers and work together with the region's existing utility, which continues to provide customer services.
CCC	California Conservation Corps – Program administered by the California Department of Conservation that teaches young adults trade skills such as how to perform energy audits of buildings.
CEC	California Energy Commission - As the state's primary energy policy and planning agency, the CEC is committed to reducing energy costs, curtailing greenhouse gas emissions, and ensuring a safe, resilient, and reliable supply of energy.
CDFA	California Department of Food and Agriculture – State agency responsible for protecting and promoting agricultural industry.
CDPH	California Department of Public Health – State agency dedicated to optimizing the health and well-being of the people in California.
CHEEF	California Hub for Energy Efficiency Financing – Set of pilot programs overseen by CAEATFA as part of a public-private partnership among state agencies and investor owned utilities.
CLECA	California Large Energy Consumers Association – Ad hoc group of large industrial electric customers of PG&E and Edison, active on electric rate and service issues.
CLEEN	California Lending for Energy and Environmental Needs – A lending bank housed under the California Infrastructure and Economic Development Bank.
CLIMB	Clean Energy in Low-Income Multifamily Buildings – CEC report which sets forth early actions to implement energy and water efficiency, demand response, on-site renewable energy, electric vehicle infrastructure installation, and energy storage for multifamily housing in California.
CMUA	California Municipal Utility Association – Association that represents the interests of publicly-owned utilities in California.

Term	Definition
CPUC	California Public Utilities Commission – State agency responsible for regulating services and utilities, protecting consumers, safeguarding the environment, and assuring Californians' access to safe and reliable utility infrastructure and services.
CSD	California Department of Community Services and Development - Reduce poverty for Californians by leading the development and coordination of effective and innovative programs for low-income individuals, families, and their communities.
CSU	California State University
CVR	Conservation voltage reduction – Technologies which allow utilities to provide electricity to customers at lower voltages (~114 v) resulting in energy and demand reductions.
Demand flexibility	Demand flexibility refers to building technologies and policies that enable and provide incentives to reduce, shift, and shed energy consumption.
DERs	Distributed energy resources – electricity-producing or controllable loads that are directly connected to a local distribution system. They include DR, energy efficiency, and storage.
DGS	Department of General Services (DGS) – State agency that offers a diverse to state government, from managing construction projects to procuring vital equipment to overseeing a statewide vehicle fleet.
Direct installation	Direct installation is a type of energy efficiency program that involves an installer coming to the customer to provide the energy upgrade as opposed to a utility only providing a rebate.
DOE	United States Department of Energy
Doubling Report	Senate Bill 350 Doubling of Energy Efficiency by 2030 – Report mandated by SB 350 (2015) by the CEC. It established energy efficiency targets towards a statewide, cumulative doubling of energy efficiency savings in electricity and natural gas final end uses by 2030
DR	Demand response – Changes in electric usage by the end user in response to price signals or incentive payments.
DWR	Department of Water Resources – State agency that protects, conserves, develops, and manages much of California's water

Term	Definition
	supply. This includes the State Water Project, the nation's largest state-built water conveyance program.
EBEE Action Plan	Existing Buildings Energy Efficiency Action Plan – CEC report which acts as the state's roadmap energy efficiency in existing buildings mandated by AB 758 (2009).
ECAA	Energy Conservation Assistance Act – CEC clean energy financing program.
EEPs	Energy expenditure plans - The application used by local educational agencies to request Proposition 39 program award funds to implement proposed eligible energy projects.
EIA	Energy Information Administration – Federally administered entity that publishes independent statistics and analysis related to energy.
End use	An end use is the machine or product in a building that consumes energy to perform a function. Examples are refrigerators, HVAC, televisions, and so forth.
Energy Indicators Report	Energy Equity Indicators Report – a report published by the CEC that identifies metrics with which to track progress on reducing the energy inequality facing low-income and disadvantaged communities.
Energy Standards	Building Energy Efficiency Standards – California energy standards for new construction of, and additions and alterations to, residential and nonresidential buildings.
EPP	Energy Partnership Program – CEC program that offers services to help identify the most cost-effective, energy-saving opportunities for buildings and new construction.
ESA	Energy Savings Assistance - No-cost weatherization services to low-income households who meet the California Alternate Rates for Energy income guidelines.
ESJ	Environmental and Social Justice – phrase commonly used in association with communities that bear the brunt of societal and environmental damages and to focus on repairing the damages through outreach, training, investment, and assistance.
ESJ Action Plan	Environmental and social Justice Action Plan - Roadmap to expand public inclusion in California Public Utilities Commission decision-

Term	Definition
	making and improve services to targeted communities across California.
ETP	Employment Training Panel – State panel that provides funding to employers to assist in upgrading the skills of their workers through training that leads to good paying, long-term jobs.
EUC	Energy Upgrade California - Created to motivate and educate California residents and small businesses about energy management.
EVs	Electric Vehicles – Vehicles operated by electricity.
FARMER	Funding Agricultural Replacement Measures for Emission Reductions – CARB-run program that provides funding through local air districts for agricultural harvesting equipment, heavy-duty trucks, agricultural pump engines, tractors, and other equipment used in agricultural operations.
FPIP	Food Production Investment Program – CEC program that provides grants to help producers replace high-energy-consuming equipment and systems with market-ready and advanced technologies and equipment.
Fuel Substitution	Fuel substitution refers to the replacement of one fuel for another. In the context of this Action Plan, it is used when discussing the replacement of one utility provided fuel for another.
GGRF	Greenhouse Gas Reduction fund – State-run fund made up of California Cap-and-Trade auction proceeds.
GHG	Greenhouse gas - Gases in Earth's atmosphere that trap heat.
GWh	Gigawatt hour - Unit of energy representing one billion (1,000,000,000) watt hours and is equivalent to one million kilowatt hours.
HCD	California Department of Housing and Community Development – State department that promotes safe, affordable homes and strong vibrant communities throughout California.
HERS	Home Energy Rating System (HERS) – CEC program that tests and rates the energy performance of a home.
HP	Heat Pump – A device that transfers heat energy. Heat pumps in buildings use electricity to move heat from a cool space to a warm space.

Term	Definition
HUD	United States Department of Housing and Urban Development – Federal department that administers programs providing housing and community development assistance.
HVAC	Heating, ventilation, air-conditioning - Mechanical systems that provide thermal comfort and air quality to indoor spaces.
IACs	Industrial Assessment Centers – Federally-funded centers hosted at universities that conduct the energy audits to identify opportunities to improve productivity and competitiveness, reduce waste, and save energy
IEPR	Integrated Energy Policy Report – CEC biennial report on major energy trends and issues facing California's electricity, natural gas, and transportation fuel sectors. It contains policy recommendations to address issues.
IMD	Interval-meter-data - Record of energy consumption from a utility meter, with readings made at regular intervals throughout the day.
IOUs	Investor-owned utilities (IOUs) – Private electricity and natural gas providers.
IRP	Integrated Resource Planning - outlines an electric utility's resource needs in order to meet expected electricity demand over a long-term planning horizon.
kWh	Kilo-watt hour - Energy unit used in measuring electrical power, the work done by one kilowatt acting for one hour
LADWP	Los Angeles Department of Water and Power - Municipal utility covering the city of Los Angeles.
LEA	Local educational agency - A county office of education, school district, charter school, or state special school.
LED	Light-Emitting Diode - Light source which uses semiconductors and electroluminescence to create light.
LEED	Leadership in Energy and Environmental Design – Buildings may be rated for approval as LEED-certified. A LEED certification affirms that a building uses less energy, optimizes occupant health and productivity, generates less waste, and overall has fewer environmental impacts.
LGC	Local Government Challenge – CEC grant program for local governments.

Term	Definition
LIHEAP	Low Income Home energy Assistance Program - Federally funded program that assists eligible low-income households with their heating and cooling energy costs, bill payment assistance, energy crisis assistance, weatherization and energy-related home repairs.
LIWP	Low-Income Weatherization Program – State program run by CSD that helps low-income families to reduce their energy bills by making their homes more energy efficient. The program reduces greenhouse gas emissions and household energy costs by saving energy and generating clean renewable power.
MCE	Marin Clean Energy - Community choice aggregator for Marin County and adjacent participating local governments.
Microgrid	A microgrid involves a localized group of electricity sources and loads that normally operates connected to and synchronous with the traditional grid, but can also disconnect to function autonomously.
MIST	Moderate Income Sustainable Technology – ARRA-funded revolving loan fund run by Los Angeles County.
MM	Million
MW	Megawatt - A unit of power equal to one million watts, especially as a measure of the output of a power station.
MWh	Megawatt hour - Energy unit used in measuring electrical power, the work done by one megawatt acting for one hour
Natural Gas R&D	Natural Gas Research and Development Program – CEC-administered natural gas program that invests in scientific and technological research to accelerate the transformation of the natural gas sector to meet the state's energy and climate goals.
NMEC	Normalized metered energy consumption - Energy savings calculation based on energy usage data observed at the meter, and normalized to local weather.
NOx	Nitrous oxide- A greenhouse has and common air pollutant.
NRDC	Natural Resource Defense Council - Non-profit international environmental advocacy group.
OBF	On-bill financing – Alternative energy financing tool that allows a utility to recover the cost of an upgrade on the utility bill.

Term	Definition
PACE	Property Assessed Clean Energy – Private financing program for home and business owners, which is repaid through a special assessment on their property tax over a period of years.
PAs	Program administrators - Operate formal energy efficiency programs and play important roles in advancing new building codes and improving the savings from existing codes at the federal, state, and local levels.
PG Study	Potential and Goals Study – These studies are performed on behalf of IOUs and POUs to assess the energy savings potential of programs and to set energy savings goals for each utility to work towards.
Plug Load	Plug loads are any feature in a building which plugs into an outlet. Common plug loads are refrigerators, televisions, computers, and microwaves.
POUs	Publicly-owned utilities– non-profit public entity managed by locally elected officials or public employees. Subject to local public control and regulation. POUs are organized in various forms including municipal district, city department, irrigation districts, or rural cooperatives.
REEL	Residential Energy Efficiency Loan Assistance – Loan program run by CAEATFA to help homeowners and renters access lower cost financing for energy efficiency projects by reducing risk to participating lenders.
RENs	Regional energy networks -Provides regional-scale energy efficiency programs, services, and resources using ratepayer funds.
Retrocommissioning	Retrocommissioning is the practice of improving how building equipment and systems function together. It improves a building's operations and maintenance procedures to enhance overall building performance.
RLF	Revolving loan funds - Pools of capital from which loans can be made for clean energy projects, as loans are repaid, the capital is then re-loaned for another project.
RPS	Renewable Portfolio Standard – Regulation that requires increases procurement of electricity from renewable sources.
SB 32	Senate Bill 32 – Pavley, Chapter 249, Statutes of 2016

Term	Definition
SB 49	Senate Bill 49 – Skinner, Chapter 697, Statutes of 2019
SB 100	Senate Bill 100 – De León, Chapter 312, Statutes of 2018
SB 350	Senate Bill 350– Requires the California CEC to establish annual targets that will achieve a cumulative doubling of statewide energy efficiency savings and demand reductions in electricity and natural gas final end uses by 2030.
SB 1414	Senate Bill 1414 – Wolk, Chapter 678, Statutes of 2016
SB 1477	Senate Bill 1477 – Stern, Chapter 378, Statutes of 2018
SBF	Small Business Energy Efficiency Finance – CAEATFA-run finance program with the goal of helping small businesses access better financing terms for energy efficiency retrofits. Program features a credit enhancement to help financing companies mitigate risk.
SCAQMD	South Coast Air Quality Management District - Air district that oversees policies and adopts regulations for the control of air pollution in the Los Angeles basin region.
SCP	Sonoma Clean Power – CCA representing Sonoma and Mendocino counties.
SEM	Strategic Energy Management– A growing program design that targets industry and agriculture energy use. SEM programs focus on supporting customers to implement ongoing behavioral, retrocommissioning, energy efficiency, and operational savings measures
SEP	State Energy Program– Federal program that provides funding and technical assistance to states, territories or use in efficiency, renewable, and alternative energy demonstration activities.
SJAPCD	San Joaquin Valley Air Pollution Control District - Air district that oversees policies and adopts regulations for the control of air pollution in the San Joaquin Valley.
SMUD	Sacramento Municipal Utility District– Community-owned electric utility. SMUD provides reliable, affordable electricity to most of Sacramento County and a portion of Placer County.
SoCalREN	Southern California Regional Energy Network– Administered by the County of Los Angeles, SoCalREN provides regional-scale energy efficiency programs, services, and resources.

Term	Definition
Split Incentive	Split incentive is a term used to indicate the barrier between owners and tenants of buildings when deciding if an energy upgrade should be done.
SWEEP	State Water Efficiency and Enhancement Program – State program operated by CDFA that provides financial assistance in the form of grants to implement irrigation systems that reduce greenhouse gases and save water on California agricultural operations.
TCC	Transformative Climate Communities – Strategic Growth Council program that awards funds to community-led development and infrastructure projects to achieve environmental, health, and economic benefits for disadvantaged communities
TECH	Technology and Equipment for Clean Heating – Program mandated by SB 1477 to promote retirement and replacement of conventional appliances, such as gas water heaters and gas space heaters, with clean, low-, or zero-emissions electric equipment.
Therm	A therm is a unit of heat energy equal to 100000 Btus.
Trigger Event	A trigger event is any event that opens up an energy upgrade opportunity for a building owner.
UBIDs	Unique building identifiers – a series of digits tied to a building that identifies that structure amongst any other. The digits are determined in such a way that no other building can possess the same one.
UC	University of California
US EPA	United States Environmental Protection Agency
WE&T	Workforce Education and Training - Education and training activities aimed at supporting the achievement of energy savings targets.

Appendix A: Energy Efficiency Program Details

Publicly Owned Utilities Energy Efficiency Programs

California POUs are vertically integrated energy providers regulated by local governing boards and vary by size, customer base, and resource portfolios. There are over 40 POUs in 13 of the state's 16 climate zones. POU electricity savings programs provide subsidies and incentives for energy efficiency to end users. POU incentive programs range from cash rebates for the purchase of higher-efficiency products and home energy upgrades to customized financial incentives and awareness and education campaigns that improve customer energy use behavior. POUs also administer load management programs that provide technical assistance and customer incentives to install automated DR equipment,[124] undertake voluntarily scheduled load reduction, and manage peak-day and time-of-use consumption patterns.

Historical Energy Efficiency Savings

Each year POUs must report the following information to customers and to the CEC:

1. Investments in energy efficiency and demand reduction programs
2. Descriptions of each energy efficiency and demand reduction program, expenditures, cost-effectiveness of each program, and expected and actual energy efficiency savings and demand reduction results
3. Sources for funding of energy efficiency and demand reduction programs
4. Methods and input assumptions used to determine cost-effectiveness of programs
5. A comparison of the POUs' annual energy efficiency targets and the POUs' reported electricity efficiency savings and demand reductions

This collaborative report compiles the required data from the POUs into a comprehensive document in compliance with Public Utilities Code Section 9505. Recently, the POUs developed a new cost-effectiveness tool and reporting platform with the CEC. This platform improves the tracking and evaluation of energy efficiency programs. Using this new tool, POUs can analyze individual efficiency measures or full programs to determine the potential savings and cost-effectiveness before

124 Automated demand response measures will react automatically to utility price signals and reduce energy consumption.

implementation.[125] POUs are able to create unique programs and measures, and may choose to share them with other POUs collaboratively. The model also allows each POU to be able to specify many key inputs, including:

- Retail rates
- Hourly load shapes
- Hourly GHG emissions curves
- Hourly avoided cost
- Overhead allocations by measure, programs, portfolio, sector, or use, or a combination thereof

The new tool will allow POUs to manage reference libraries of measures, avoided costs, load shapes, and GHG emissions, allowing useful tracking and comparative scenario analyses for integrated planning.

POU Program Activity

The CEC established ambitious annual targets to achieve a statewide doubling of cumulative energy efficiency savings. Achieving these targets will require the collective efforts of many entities, including state and local governments, utilities, program administrators and implementers, private lenders, market participants, builders, equipment manufacturers, suppliers, and installers, as well as customers. As an example, the City of Palo Alto Utilities (CPAU) has been implementing a variety of energy efficiency programs since the 1970s. In 1998, CPAU created the Electric Public Benefits Program and increased the program budget to 2.85 percent of projected annual revenue to fund energy efficiency programs. CPAU's electric efficiency program budget can be supplemented with supply-side funds to meet state requirements that publicly owned electric utilities, in procuring energy, first acquire all available energy efficiency and demand reduction resources that are cost-effective, reliable, and feasible.[126]

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125 Northern California Power Agency. 2019 Energy Efficiency in California's Public Power Sector Report, *13th Edition*. https://www.ncpa.com/policy/reports/energy-efficiency/

126 Northern California Power Agency. *Energy Efficiency in California's Public Power Sector: 12th Edition — 2018,* https://www.ncpa.com/policy/reports/energy-efficiency/

POU Energy Efficiency Potential and Goals Studies

Every four years, POUs must identify all feasible and cost-effective energy efficiency savings and establish 10-year annual goals.[127] In addition, they must provide to their customers and the CEC the results of evaluation studies that measure and verify claimed demand reduction and energy savings. CMUA, in partnership with NCPA and the Southern California Public Power Agency, collaborated to develop 10-year electricity savings projections to establish electricity savings goals.[128]

The POUs' 2017 report on energy efficiency potential and goals (POU PG Study) was submitted in March 2017.[129] The next iteration is due in spring 2021. The POU PG Study presents a base set of projections of electricity savings and demand reduction as a function of projected electricity sales. Each POU then modified estimates using alternative assumptions, or other changes, for its own portion of the overall POU savings projection. The POU PG Study contains the results of the adjustments to the base analysis identified by each POU, so the study does not contain a uniform set of assumptions common to all POUs nor any alternative scenarios. The Doubling Report details how the CEC adjusted the goals for use in the initial target-setting process.[130]

California Public Utilities Commission

Energy Efficiency Rolling Portfolio

Before 2015, the CPUC approved energy efficiency portfolios on three-year program cycles. However, the timing and nature of regulatory oversight and portfolio approval often delayed CPUC approval of the next program cycle(s), which contributed to market uncertainty and a start-stop dynamic in energy efficiency funding. In 2014, the CPUC took the first step in eliminating these three-year funding "cliffs" and adopted annual energy efficiency program funding of nearly $1 billion for 2015-2025.

Marked as the first year of the "rolling portfolio," in 2015, the CPUC directed the energy efficiency program administrators to file high-level business plans that provided an overview of sector-level strategies as well as estimated budget forecasts and energy

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127 Assembly Bill 2021 (Levine, Chapter 734, Statutes of 2006) required 10-year efficiency targets to be set every three years. Assembly Bill 2227 (Bradford, Chapter 606, Statutes of 2012) changed the frequency of target setting to every four years.
128 Energy Efficiency in California's Public Power Sector: 12th Edition. 2018.
129 CMUA. March 2017. POU Potential and Goals Study, http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-06/TN217680_20170522T124015_Energy_Efficiency_in_California's_Public_Power_Sector_11th_Edit.pdf.
130 Jones, Melissa, Michael Jaske, Michael Kenney, Brian Samuelson, Cynthia Rogers, Elena Giyenko, and Manjit Ahuja. 2017. Senate Bill 350: Doubling Energy Efficiency Savings by 2030. pg. 33-39. California Energy Commission. Publication Number: CEC-400-2017-010-CMD.

savings. Program administrators file annual program-level specifics, including program-level budgets, energy savings forecasts, and new or closing programs, with the CPUC each September and request specific funding amounts for the next program year within the funding cap authorized by the CPUC.[131]

The energy efficiency portfolio faces challenges related to cost-effectiveness, as program administrators strive for deeper energy savings at lower cost. Consequently, the CPUC and stakeholders, via the CAEECC, are exploring ways to better realize the intent of the rolling portfolio, ensure proper oversight and cost-effectiveness, and streamline the budget request process.

Integrated Resource Planning

In 2018, CPUC Energy Division staff drafted a white paper outlining options for closer integration of energy efficiency into the IRP process. The white paper discusses the potential benefits from increased energy efficiency and IRP integration as well as some of the challenges and tasks that would come with integration. Stakeholders provided initial feedback on the white paper via an informal round of comments. As the Energy Division works toward future rounds of energy efficiency potentials analysis and goal setting, as well as integrated resource planning, CPUC will assess potential avenues for increased integration. Energy efficiency can be a resource that is contracted just like renewable energy, and natural gas; however, the value and reliability of efficiency must be clearly defined.

Normalized Metered Energy Consumption Approaches

SB 350 directed CPUC to measure progress toward energy efficiency goals, "taking into consideration the overall reduction in normalized metered electricity and natural gas consumption where these measurement techniques are feasible and cost effective."[132] The CPUC also approved high-opportunity projects and programs that leverage NMEC and have ranged from two rounds of a "pay-for-performance" residential procurement by Pacific Gas and Electric to site-level programs targeting large commercial and government buildings. The CPUC expects the first sets of NMEC savings reported by program administrators in Q4 2019 or Q1 2020.

Meanwhile, the CPUC has begun laying the foundation for expanded use of NMEC across the ratepayer-funded energy efficiency portfolio. In March 2018, Energy Division staff issued a draft rulebook for programs using "site-level NMEC," meant for large buildings that use a building-specific approach to determining savings. A January 31, 2019, ruling directed staff to update the site-level rules and develop rules for programs using population-level NMEC, which aggregates buildings. The CPUC launched an NMEC

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131 CPUC Decision (D.) 18-05-041 (2018) describes the current funding cap. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M215/K706/215706139.PDF.
132 Public Resources Code 25310(c)(1)

Working Group in May 2019 to solicit feedback from stakeholders on population-level NMEC rules.

Expanded use of NMEC has the potential to bring benefits to California's IOU energy efficiency portfolio:

- Program implementers and administrators can focus on achieving results measured at the meter
- Implementers can have more flexibility to innovate program design and delivery without shifting additional risk to ratepayers
- The use of metered savings can help make the CPUC program evaluation more efficient

Third-Party Energy Efficiency Implementation

In August 2016, the CPUC adopted D. 16-08-019, which defined a "third-party program" as a program designed, implemented, and delivered by nonutility personnel under contract to a utility program administrator. D.18-05-041 required the four California IOUs— Pacific Gas & Electric, Southern California Edison Company, Southern California Gas Company, and San Diego Gas & Electric Company—to contract at least 60 percent of its portfolio to third parties by the end of 2022 (Table A-1).

Table A-1: Program Administration Third-Party Requirements

Date	Third-Party Portfolio Percentage Minimum
December 19, 2019	25
December 31, 2020	40
December 31, 2022	60

Source: CPUC

This new policy reflects the CPUC's view that the IOUs should focus more on portfolio design and less on individual program design and implementation. With the new definition, third-party implementers will be able to offer more cost-effective and innovative programs, garner significantly higher portion of savings than in the past, and support the AB 802 concept for pay-for-performance and meter-based energy savings evaluation.

In January 2018, the CPUC addressed the process for third-party solicitations and the risks associated with such a process in D.18-01-004. The CPUC required the IOUs to develop a set of standard and modifiable contract terms and conditions for third-party programs, use procurement reviews groups to design and conduct solicitations, hire a pool of independent evaluators with energy efficiency expertise to monitor and review

utility solicitations, and implement a two-stage solicitation process, which begins with the request for abstracts followed by the request for proposals.

Market Transformation

The CPUC issued a market transformation staff proposal[133] in August 2018, outlining a new framework for setting longer-term program goals and recognizing accomplishments in terms of market metrics and transformation indicators. An important feature of the contemplated framework is the assessment of cost-effectiveness, which would occur over a longer time horizon (the projected life cycle of the Market Transformation Initiative) rather than year-over-year, as is required for the energy efficiency resource program portfolio. Two public workshops were held to discuss stakeholder comments and perspectives. The discussions led to the formation of a stakeholder working group and, ultimately, to a joint stakeholder market transformation report[134] that was released for public comment in March 2019.

It is important for the CPUC to study the pathways for market transformation through the ratepayer programs. New program designs, cost-effectiveness inputs or tests, or new technologies should play into the long-term plans of the program portfolio.

On-Bill Finance

D. 09-09-047 approved an on-bill financing (OBF) program as part of the energy efficiency funding for all four major energy utilities. The OBF program offers eligible nonresidential customers a way to pay for energy efficiency upgrades without incurring upfront costs. Under the program, a utility provides eligible customers with funded unsecured loans covering 100 percent of the energy efficiency equipment and installation costs (net of rebates and other incentives) with zero percent interest. Customers then repay the loans through charges added to their regular utility bills. Loan capital is raised through utility rates and the energy efficiency budget covers defaults and pays for program administration. The payment schedule for energy improvements allows the OBF amount to match cash savings on utility bills, to repay the cost of the improvements. The convenient access to capital and the cash flow profile is expected to boost the levels of efficiency adoption and increase energy savings.

Pacific Gas & Electric filed its petition for modification of D. 09-09-047 on September 7, 2018. Pacific Gas & Electric proposed to increase the OBF loan caps and terms. In the petition for modification, PG&E explains that it is motivated to help meet the state's increased energy efficiency goals to double energy efficiency savings by 2030 by increasing access to affordable capital for energy efficiency investments. Pacific Gas &

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133 CPUC. Market Transformation Proposal, 2018, http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=225059924
134 Joint Stakeholder Market Transformation Proposal, CPUC, http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=281395459

Electric believes that expansion of the OBF program can increase implementation of energy efficiency projects by raising maximum loan caps and terms.

On March 20, 2019, the CPUC issued D.19-03-001 approving the petition for modification and, among other things, increasing Pacific Gas & Electric's OBF loan limit to $250,000 per application, with a maximum 10-year loan term for all eligible nonresidential customers, as requested in the petition. The CPUC also increased the exception limit for standard OBF loans from $2 million to $4 million for all eligible nonresidential customers where unique energy savings opportunities are identified. Further, the decision allowed all four of the major IOUs to request future changes to their OBF loan tariffs by filing a Tier 2 advice letter. On August 6, 2019, Southern California Edison Company submitted for approval an advice letter to the CPUC to increase the loan caps for Southern California Edison's OBF Program similar to Pacific Gas & Electric.

Regional Energy Networks Energy Efficiency Programs

In D. 12-11-015 the CPUC approved the applications of the BayREN and the SoCalREN to receive ratepayer funds to offer energy efficiency offerings. The CPUC directed RENs to undertake:

1. Activities that utilities cannot or do not intend to undertake.
2. Pilot activities where there is no current utility program offering and where there is potential for scalability to a broader geographic reach, if successful.
3. Pilot activities in hard-to-reach markets, even if there is a current utility program that may overlap.

In D.18-05-041, the CPUC approved the 2018-2025 business plans of the two existing RENs and a new REN called the Tri-County REN made up of Santa Barbara, Ventura, and San Luis Obispo Counties. The decision approved SoCalREN's budget for this period at $173.6 million. SoCalREN's core programs were approved, including its public sector, residential, workforce education and training, and finance, though its request to add a codes and standards advocacy program was rejected. BayREN's approved budget for 2018-2025 is $193 million. The CPUC adopted BayREN's request to significantly ramp-up its commercial programs, but most of its approved budget is devoted to the residential sector. The Tri-County REN's approved budget is $48.3 million, and its approved programs include codes and standards advocacy, workforce training, and a residential middle-income direct-install program that focuses on multifamily tenants and Spanish-speaking occupants.

On March 27, 2019, the CPUC administrative law judge sought input on whether the policy currently in place for existing and new RENs is appropriate in light of current trends in energy efficiency policy and program administration.

Savings From Potential and Goals Study

Starting in 2006 with the passage of Senate Bill 1037 (Kehoe, Chapter 366, Statutes of 2005), the CPUC, in consultation with the CEC, has been required to identify all potentially achievable cost-effective energy efficiency savings and establish energy efficiency goals every other year for IOU electrical and gas corporations. These studies estimate all the potential energy savings available through different technologies, program measures, codes and standards, and, behavioral, retro commissioning, and operational measures and market transformation programs that the IOUs can use in their energy efficiency portfolios. Potential and goals studies typically identify energy efficiency savings based on technical, economic, and market potential. "Technical potential" is the amount of energy savings that would be possible if the highest level of efficiency for all technically applicable opportunities to improve energy efficiency were taken, including retrofit measures, replace-on-burnout measures, and new construction measures. "Economic potential" is the total energy efficiency potential available when limited to only cost-effective measures, as determined by the cost-effectiveness metrics. "Cumulative market potential" is a subset of economic potential that includes assumptions about stock turnover rates, participation, and incentives. The potential and goals study examines the savings from street lighting, mining, and additional savings from low-income households, beyond the traditional sectors: residential, commercial, agriculture, and industry.[135]

Community Choice Aggregators Energy Efficiency Programs

CCAs are local power purchasing entities created by local governments. These local governments could be any city, county, or combination thereof in California that is within an IOU territory. Community choice aggregators pool together a local government's electricity load to purchase or develop power projects on behalf of residents, businesses, and municipalities. As of May 2019, California has 19 active community choice aggregators, serving customer sizes ranging from just over 7,000 (Solana Energy Alliance) to 972,500 (Clean Power Alliance).[136]

The current operational model for CCAs involves the CCA purchasing the electricity and using the IOU for transmission and distribution of the energy, and for grid maintenance. IOUs still own and read the electric meter, send monthly bills, and provide the other repair services they always have. The CCAs can use the revenue generated by electricity sales to reinvest in the local community through programs and grants for EVs, energy efficiency retrofits, and rooftop solar.

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135 Added sectors are abbreviated Min (Mining); Stl (Street Lighting) by Navigant.
136 CalCCA, https://cal-cca.org/about/

In public workshops held to gather information for this Action Plan, stakeholders reported that a potential benefit of more CCA-run programs is their ability to fill gaps in areas that typical ratepayer programs cannot cover. Since the CCA can leverage modified cost tests, they are able to offer incentives for different retrofits.[137] However, stakeholders caution that the current EE market lacks clarity on who is responsible for the governance of and compliance with CCA programs. They stress that regulators need to make determinations on the program and contract requirements for CCAs, how CCAs should partner with IOUs to achieve the state's goals, and how CCAs will apply for energy efficiency funds with the CPUC.

CEC Energy Efficiency Programs

CEC operates a multitude of programs. The following provides concise descriptions of CEC programs.

Proposition 39 Clean Energy Jobs Act

The CEC administers three components of the California Clean Energy Jobs Act: a grant program (Proposition 39 K-12 Program), a revolving loan program (ECAA—Education Subaccount Financing Program), and a technical assistance program (Bright Schools Program).

The Proposition 39 Program provides grant funds for energy projects—energy efficiency measures and clean energy generation—at schools within a local educational agency (LEA), which include public school districts, charter schools, county offices of education, and state special schools. LEAs submit energy expenditure plans (EEPs) to the CEC. Once the EEPs are approved by the CEC, the California Department of Education distributes funding to the LEAs from the Clean Energy Jobs Creation Fund.

Each approved EEP can represent multiple eligible energy measures—energy efficiency or clean energy generation measures—at multiple school sites within an LEA. Completed EEPs have resulted in the installation of thousands of energy efficiency and clean energy generation measures throughout the state. More than 50 percent of the approved measures are lighting-related; more than 20 percent fall into the category of lighting and HVAC control measures; 10 percent are HVAC; 8 percent are other efficiency measures that include plug loads, pumps, motors, building envelope, domestic hot water, and so forth; and 3 percent are attributed to photovoltaic generation.

As of July 2018, more than 23,000 energy measures have been identified by LEAs. These energy measures are expected to reduce annual electricity usage by 520 GWh

137 CCAs do not need to follow the total resource cost tests mandated by the CPUC as long as they run programs with internal funds.

and annual natural gas usage by 2 MM therms. These reductions correspond to annual energy cost savings of $105 million.

Energy measures implemented through the Proposition 39 K-12 Grant Program may have a number of cobenefits, such as health, safety, enhanced comfort, better indoor air quality, and improvements to the learning environment. A cobenefit credit was included in the "savings to investment" determination of all identified measures, however, specific cobenefits of measures were not identified as part of the Proposition 39 K-12 Grant Program.

The Proposition 39 K-12 Grant Program provides benefits to California's workforce by providing funding for energy projects that create local jobs. The CEC has not directly quantified the number of jobs created; however, the California Workforce Development Board did provide a report estimating direct, indirect, and induced jobs created through the Proposition 39 K-12 Grant Program. Based on this report, the California Workforce Development Board estimates 18,571 total jobs created through 2017.

Senate Bill 110[138] created two additional grant programs from the Proposition 39 program for loans and technical assistance. The bill states that $75 million of the remaining Proposition 39 funds will be used to fund a clean school bus grant program, and up to $100 million in remaining Proposition 39 funds will be used to fund a competitive ECAA loan program. Anything left beyond those allocations would go to a revamped competitive Proposition 39 program. However, due to the higher participation in the Proposition 39 program than anticipated, only $117 million remained when the program closed. Therefore, the School Bus Replacement Program was fully funded, the ECAA-Ed Competitive Loan Program received roughly $42 million, and the Proposition 39 Competitive Grant Program was not funded.

SB 110 changed the prior ECAA-Ed Loan Program from first-come, first-served basis to a competitive basis. The interest rate will remain at zero percent, and the new program is structured to encourage greater participation by allocating funding based on region, size of school, and student eligibility for the free and reduced price meal program, further benefitting disadvantaged communities.

Energy Conservation Assistance Act

The ECAA Financing Program was established in 1979 and designed to reduce energy use and cost throughout California. All funded projects must demonstrate energy savings. The CEC provides ECAA loans to local governments and public education institutions to fund energy efficiency and renewable energy projects. Typical measures are upgraded lighting systems, pumps and motors, streetlights, energy management systems and equipment controls, building insulation, energy generation including

138 Budget and Fiscal Review, Chapter 55, Statutes of 2017.

renewable and combined heat and power projects, HVAC, water and wastewater treatment equipment, and load-shifting projects such as thermal energy storage.

Table A-2: Historical ECAA Data From 2000 to 2017

Total Number of Approved Loans:	332
Total Approved Loan Amount:	$349,497,866
Total Annual Energy Cost Savings:	$38,659,086
Total Annual Electric Savings (kWh):	362,311,130
Total Annual Demand Savings (kW):	44,249
Total Annual CO_2 reductions (tons):	126,466

Source: CEC, https://www.energy.ca.gov/efficiency/financing/calmap/county/counties/energy_savings_data.pdf.

The ECAA statute requires that the costs of the project be recovered through energy cost savings during the loan repayment period. The ECAA statute also requires that the repayment period not exceed the useful life of the equipment and that repayment not exceed 20 years. Loans are funded from ECAA appropriations or bond proceeds from tax-exempt revenue bonds. The loan interest rates are one percent for local governments and zero percent for public educational institutions.

The ECAA funding available for public education institutions is now competitive. CEC staff designed the program and published the program opportunity notice at the beginning of 2019.[139] Up to $36 million is available in the funding cycle for energy projects. ECAA funding for local governments will remain on a first-come, first-served basis.

Table A-3: Historical ECAA Loans From 1979 to 2017

Summary by Recipient Type	Total Number of Loans Awarded	Total Loan Amount Awarded
Local Government Loans	343	$234,683,139
K-12 School Loans	359	$99,580,928
College Loans	78	$38,798,900
Special District Loans	19	$15,706,078
Public Care & Hospital Loans	63	$25,341,483
Grand Total:	**862**	**$414,110,528**

Source: CEC, https://www.energy.ca.gov/efficiency/financing/calmap/county/

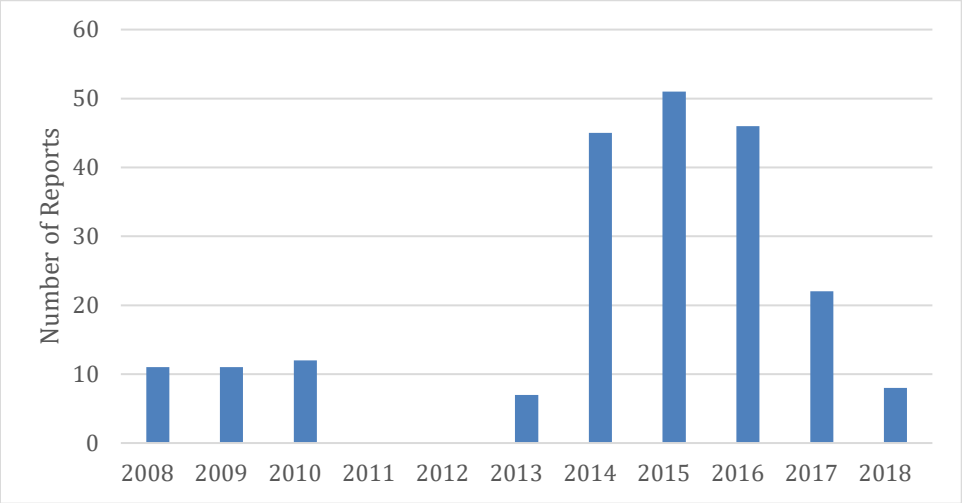
139 California Energy Commission. ECAA Loan, Program Opportunity Notice. February 2019, https://www.energy.ca.gov/solicitations/2019-02/pon-18-101-energy-conservation-assistance-act-education-subaccount-ecaa-ed.

Bright Schools and Energy Partnership Program

The Bright Schools Program (BSP), under the ECAA financing programs established in 1979, provides public K-12 schools assistance in identifying energy-saving opportunities in existing and planned facilities. The program started in 1988 and has historically provided a wide range of technical assistance services, including energy audits, third-party proposal reviews, and professional engineering support services. The Energy Partnership Program (EPP) provides the same type of assistance that the BSP provides, only to local governments (cities/counties), special districts, public colleges, and public hospitals/care centers.

The majority of effort is providing technical assistance in the form of American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) Level 2 energy audits, with the objective to identify all energy efficiency measures appropriate for buildings in concert with detailed financial analysis to justify project implementation, to lead to reduced energy use. Energy audit reports with recommendations of lighting and HVAC retrofits are expected to improve lighting quality, indoor air quality, and occupant comfort. Energy reductions will save customers energy operating costs. Figure A-1 below shows the number of final reports the BSP produced since 2008.

Figure A-1: Bright Schools Program Final Reports From 2008-2018



Source: CEC

The American Recovery and Reinvestment Act

The American Recovery and Reinvestment Act of 2009 (ARRA) awarded California nearly $5 billion to foster energy efficiency, modernize the electric transmission grid, and increase the use of alternative transportation fuels and vehicles. The CEC was awarded $226.1 million in stimulus funds to administer the State Energy Program (SEP). The CEC invested the funds in innovative market transformation pilot programs, including promoting the “whole-building” approach to energy efficiency upgrades for existing buildings. These funds were offered through competitive solicitations to local

jurisdictions and other organizations to preserve and create jobs, increase energy efficiency, and reduce reliance on imported energy. Although closed on April 30, 2012, the SEP benefits of the pilot programs will be realized for decades to come. The CEC continues to oversee four revolving loan funds (RLF): Energy Efficient State Property RLF Program (discussed in the DGS section, page A-18), Moderate Income Sustainable Technology (MIST) Program, Los Angeles County Public Building RLF, and SoCalREN Public Building RLF. The MIST program, sponsored by the California Homebuyers Fund, was designed to implement a comprehensive whole-house energy efficiency retrofits program for low- and moderate-income single-family homes.

The MIST program has exceeded expectations by providing financial assistance to more than 1,050 homeowners making energy-efficient home improvements. The average size of these loans was $25,531 with a program size totaling $25,585,350. The retrofits resulted with average cost savings per home of 34 percent, with the program savings totaling 100 MM Btus. All interest reflows to the CEC, per legislative authority, have been used to fund additional programs such as the Local Government Challenge.

The CEC awarded Los Angeles County $11 million to support existing energy efficiency retrofit financing programs and to create a new benchmarking program. Los Angeles County is using the ARRA funds to operate and support the following programs.

Los Angeles County Public Building RLF— The Public Building RLF uses $5.3 million to fund audits and energy efficiency retrofits for county municipal buildings. Since the creation of the fund, it has been used for 35 audits and 27 building retrofits. About $1.3 million dollars was shifted from this RLF to fund the new SoCalREN RLF.

SoCalREN Public Building RLF— The SoCalREN RLF is a new program for 2019 with anticipated loan sizes on the average of $350,000 to $400,000. The anticipated payback time frame will be 18-24 months. These bridge loans will be used by SoCalREN territory public agencies to fund energy efficiency retrofits in their building stock.

Santa Barbara County Benchmarking— Santa Barbara County is directing $828,000 dollars of ARRA funds to implement a voluntary auditing, benchmarking, and technical assistance program for commercial property owners in all sectors. Activities will include analyzing commercial building stock, conducting benchmarking and auditing, and providing technical assistance and support.

Los Angeles County Benchmarking— The Los Angeles County Benchmarking program will administer $1 million to develop tools and analyze buildings that are owned and operated by public agencies within Los Angeles County. By the end of 2020, county officials anticipate directly offering these services to 120 public agencies.

Local Government Challenge

The Local Government Challenge (LGC) program, funded by ARRA interest payments, aims to increase building efficiency and provide opportunities to small local

governments, as well as disadvantaged communities in California. The LGC is helping spawn innovative, practical solutions for these communities. In 2017, nearly $10.2 million in ARRA grant funds were awarded by the CEC to 13 local governments under the Energy Innovation Challenge, and the Small Government Leadership Challenge. The Energy Innovation Challenge committed $6.7 million to four local government agencies. These grants are providing opportunities to focus on innovative energy efficiency deployment that would not happen otherwise. The Small Government Leadership Challenge committed $3.5 million of grant funding to nine local governments with populations of fewer than 150,000 people. The focus of these small grants is on helping local governments develop climate action plans, conduct energy efficiency planning, and perform building retrofits.

Building Energy Efficiency Standards

The CEC's Energy Standards set energy and water design standards for residential and nonresidential buildings. The Energy Standards include cost-effective energy efficiency requirements for newly constructed buildings, additions and alterations to existing buildings. These standards are part of the California Building Codes, which are updated triennially.

2019 Building Energy Standards: Effective on January 1, 2020, the 2019 Energy Standards:

- Improve envelope efficiency, which refers to improving the insulation windows, exterior walls, floors, and roof of a building
- Create all-electric pathways for new homes
- Require appropriately sized solar photovoltaics on new homes
- Promote grid harmonization strategies that maximize self-utilization of photovoltaic output and limit exports to the grid

It is projected that these new standards will reduce 700,000 tons of CO_2 emissions over three years, which is equivalent to taking 115,000 gas cars off the road.

2022 Energy Standards and Beyond

Looking forward to 2022, in addition to addressing building efficiency, the Energy Standards will look to simplifying the code and adding flexibility for building decarbonization. Future Energy Standards aim to use an improved GHG-based metric to properly value the avoidance of GHG emissions in buildings. The CEC will also look to move away from equal hourly netting to support grid flexibility. This recognizes that not all hours of the day are equal on the electrical grid, and saving energy during certain peak times is more valuable than at other times when renewable generation sources are ample. Zero-net-energy homes or buildings may not interact with the grid in the most beneficial ways if the accounting ignores when energy is generated and consumed on site. The next Energy Standards cycle will also consider improving efficiency in

nonresidential and multifamily buildings, for example, by improving envelope, indoor air quality, mechanical systems, and lighting. These building types have not been the primary focus of previous iterations of the Energy Standards but contribute to a substantial portion of the energy used in buildings.

Numerous suggestions were made by stakeholders during staff workshops about changes to Energy Standards. The 2016 Energy Standards updated forms to be dynamic, easily accessible, and streamlined forms required. Another area of suggested improvement from stakeholders is a request for additional guidance on performance path compliance. This matter is especially important in regions with fewer resources or staff to assist builders or homeowners. The NRDC suggests the CEC investigate the role of mandatory standards in existing buildings as part of a full market transformation strategy to help achieve California's climate and clear air goals.

Standards Compliance

Acceptance Test Technician Certification Program

"Acceptance testing" is the process by which a field technician verifies the installation and operation of newly installed equipment or construction elements of a nonresidential building. Since 2005, the Energy Standards have required acceptance testing for nonresidential buildings. Acceptance testing ensures that installed equipment, controls, and systems in nonresidential buildings operate as required by the Energy Standards, and that the building owner and occupants receive the desired energy efficiency benefits. Acceptance testing is required for a wide range of installations, including envelope, lighting controls, mechanical systems, and covered processes (that is, escalators, elevators, refrigerated warehouses, and so forth).

Home Energy Rating System Program

The Home Energy Rating System (HERS) program verifies the installation and operation of certain appliances and construction elements in homes. HERS Raters ensure that installed appliances, controls, and systems in homes operate as required by the Energy Standards so that homeowners receive the intended energy efficiency benefits. HERS Raters are certified by HERS Providers, who are approved triennially by the CEC to train, certify, and oversee HERS Raters and document compliance with the Energy Standards.

Air-conditioner and Heat-pump Installation

The CEC is developing a plan to improve Energy Standards compliance for air-conditioner and heat-pump installations in homes. The plan will highlight the various compliance issues and effect on energy efficiency and make recommendations to resolve those compliance issues. The CEC hosted several stakeholder workshops to obtain input on potential recommendations for improving air-conditioner and heat-pump energy efficiency compliance. Parties suggest the CEC explore an HVAC tracking system to improve compliance. Another party suggested that prior to sale, major unpermitted

building retrofits be brought up to code or be required to obtain a permit. Providing forms online and in multiple languages would also lead to better compliance rates.

Ongoing Compliance Concerns

BayREN has found within its territory that only 16 percent of permits are error-free, and more than half of reviewed projects had errors that would result in worse energy performance than expected. BayREN found that installed measures were often less efficient than the documented measures, and designs were often changed during construction without updating the energy efficiency portion of the design to match. To make matters worse, building departments have noted that soon most of their officials will retire, and departments lack knowledgeable staff to replace them or acquire their institutional knowledge. Several parties noted that the frequency of changes to the residential and nonresidential code, and the lack of enforcement capabilities, leads to lower compliance.

Title 20: Appliance Efficiency Regulations

Another major responsibility of the CEC is to adopt and enforce appliance efficiency standards to reduce the wasteful, uneconomic, inefficient, or unnecessary consumption of energy or water.[140] The appliance standards set minimum efficiency levels for energy and water consumption in many types of products, including consumer electronics, such as computers, televisions, and monitors; household appliances, such as refrigerators and clothes washers; and plumbing equipment, such as showerheads, toilets, and kitchen and lavatory faucets. 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 usefulness or functionality of the products. Many standards have been adopted by the DOE for national standards and by other states looking to follow California's path.

Recent regulations apply to computers, monitors, signage displays, small-diameter directional lamps, general purpose LEDs, portable electric spas, portable air conditioners, and compressors. The changes to computers and monitors and to LEDs are expected to save 2,332 GWh per year and 3,794 GWh per year, respectively. These small changes to residential and commercial loads collectively result in massive bill savings, lower GHG emissions, and less strain on the electricity grid.

Many appliances are now covered under federal efficiency standards that apply nationwide. One of the most significant regulations applies to general purpose light bulbs, requiring these light bulbs to be LEDs beginning in 2020. However, the U.S. Department of Energy is considering repealing the types of light bulbs subject to the

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140 Public Resources Code Section 25402

efficiency standards, which could cost Californians between $736 million and $2.4 billion.[141] As a result, the CEC is taking action to backstop the standards to ensure that these savings still accrue to California.

Meanwhile, the CEC continues to evaluate improvements in the energy and water efficiency of nonfederally regulated appliances, such as sprinklers, commercial-size fans, gas fireplaces, and certain types of linear tube lights.

Food Production Investment Program

The Food Production Investment Program (FPIP) was established by Assembly Bill 109 (Ting, Chapter 249, Statutes of 2017). FPIP provides grants to food processing plants installing energy technologies that reduce GHG emissions. Funding is provided through California's Cap-and-Trade Program and administered through California Climate Investments.[142] Current program funding is about $124 million.

The program goals are to accelerate adoption of advanced energy efficiency and renewable energy technologies at food processing plants. The technologies are required to show promise to demonstrate reliability and effectiveness and help food processors work toward a low-carbon future. The funded technologies will support energy cost reductions. All FPIP projects must also reduce GHG emissions.

Renewable Energy for Agriculture Program

The CEC administers the Renewable Energy for Agriculture Program that incentives the installation of renewable energy technologies serving agricultural operations to reduce GHG emissions.[143] The program was authorized with the passage of Assembly Bill 109 (Ting, Budget Act of 2017, Chapter 249, Statutes of 2017) and Senate Bill 856 (Budget and Fiscal Review Committee, Chapter 30, Statutes of 2018). The goal of the program, in addition to reducing GHG emissions, is to increase energy reliability, and reduce demand on the electrical grid. The program aims to keep agricultural operations producing the same high quality and abundant resources while California tackles GHG emissions from the sector. Priority access to funds is given to operations in disadvantaged and low-income communities. Combining this effort along with traditional energy efficiency programs, will make California's agricultural operations resilient to climate change and benefit the communities most at risk to climate change impacts.

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141 Saxton, Patrick. 2018. Analysis of General Service Lamps (Expanded Scope). California Energy Commission. Publication Number: CEC-400-2018-015-SD.
142 California Climate Investments is a statewide initiative that administers cap-and-trade funding though programs administered by various state agencies. For more information, visit http://www.caclimateinvestments.ca.gov/.
143 California Energy Commission. Renewable Energy for Agriculture Program. https://www.energy.ca.gov/programs-and-topics/programs/renewable-energy-agriculture-program

Whole-Building Energy Use Data Access, Benchmarking, and Public Disclosure

In October 2017, the CEC approved regulations implementing the whole-building energy use data access, benchmarking, and public disclosure provisions of Public Resources Code Section 25402.10. The regulations require the owners of commercial buildings larger than 50,000 square feet to report building characteristics, energy use data, and building usage information to the CEC by June 1, annually, beginning in 2018. The regulations require the owners of residential buildings larger than 50,000 square feet to do the same beginning in 2019. The regulations state that the CEC will make building-level information publicly available beginning in 2019 for commercial buildings and in 2020 for residential buildings.

In 2018, the CEC received reports for roughly 10,800 commercial buildings, including about 3,300 buildings in jurisdictions with their own benchmarking and public disclosure programs. In 2019, as of August 2, 2019, the CEC received about 8,400 commercial and 3,045 multifamily building reports. The submissions for 2019 are not final, CEC will continue to evaluate submissions.

In late 2019, the CEC's public disclosure website will launch. The website will include energy performance information for reported buildings and provide resources for owners to learn more about potential building improvements, as well as options for financing those improvements.

Property-Level Data Access: AB 802 was limited in that it did not provide energy use data to the owner of a property containing multiple buildings with fewer than five utility accounts each, regardless of the number of such buildings on the property. (A notable example of this is a complex of residential four-unit buildings.) In September 2018, the Legislature passed Senate Bill 782 (Skinner, Chapter 684, Statutes of 2018) to address this. Effective January 1, 2019, utilities were required to begin providing combined data for multiple buildings containing, collectively, five or more utility accounts upon the request of the property owner. Senate Bill 782 also gives the CEC the authority to amend its regulations accordingly.

Other California State Agency Programs

This section discusses programs operated by other California state agencies.

Department of General Services

DGS operates the Energy Efficient State Property Revolving Fund. The fund provides loans to state agencies to fund energy efficiency projects at their buildings. Original funding for the program came from ARRA in 2009 through the CEC. The revolving fund was created by and operates under the terms of Public Resources Code Chapter 5.7 Section 25472. Under the terms of program, projects that receive funding must use them for projects that "will improve long-term energy efficiency and increase energy

use savings." In addition, loan-funded projects must generate enough energy cost savings to repay the loan amount within the life of the energy-saving equipment.

From 2014 to 2018, DGS loaned more than $88 million to upgrade state agency buildings. There are several more applications awaiting loans. Altogether, these completed and proposed projects will result in electricity reductions of more than 70 GWh per year and 370,000 therms per year. These reductions will save the state nearly $10 million dollars on energy costs annually.

California Air Resources Board

CARB operates an enforceable California Cap-and-Trade Program that meets the requirements of AB 32. Proceeds from the Cap-and-Trade Program support a wide range of programs called California Climate Investments. The programs aim to reduce GHG emissions and deliver major economic, environmental, and public health benefits for Californians, including meaningful benefits to the most disadvantaged communities and low-income households.

Funds received from the Cap-and-Trade Program are deposited into the Greenhouse Gas Reduction Fund (GGRF) and appropriated by the California Legislature. The GGRF funds many important programs that are split into three categories: transportation and sustainable communities, natural resources and waste diversion, and clean energy and energy efficiency. For the clean energy and energy efficiency initiatives, the programs are administered by several state agencies, including the CEC. The programs that directly support the goals laid out in the 2019 EE Action Plan include the Woodsmoke Reduction Program and the Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program, both administered by CARB; the LIWP administered by CSD; the Water-Energy Grant administered by the Department of Water Resources (DWR); the State Water Efficiency Enhancement Program administered by the California Department of Food and Agriculture; The Energy Corps program administered by the California Conservation Corps; and the FPIP and REAP, administered by the CEC. These programs help fill the gap in meeting SB 350 doubling targets, improving conditions in low-income or disadvantaged communities, and decarbonizing the built environment and related processes. Through the FARMER program, funding is available to the agricultural community for upgrading agricultural pump engines. The FARMER program may reduce total energy consumption but it results in fewer GHG and air pollutant emissions. Funding eligibility is detailed in the Carl Moyer Program Guidelines, 2017 Revisions, Chapter 5, Off-Road Equipment.[144] Similarly, the Woodsmoke Reduction Program does not reduce electricity and natural gas use; it reduces total energy consumption and helps with the State's objective of increasing energy efficiency and improving air quality. Senate Bill 563 (Lara, Chapter 671, Statutes of 2017) established

144 CARB, The Carl Moyer Program Guidelines; 2017 Revisions; Chapter 5, Off-Road Equipment https://www.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017_gl_chapter_5.pdf.

the Woodsmoke Reduction Program to promote the voluntary replacement of old wood-burning stoves with cleaner and more efficient alternatives. The Woodsmoke Reduction Program is being implemented by the California Air Pollution Control Officers Association in coordination with local APCDs or AQMDs. The California Air Pollution Control Officers Association determines how much funding is available to each district participating in the Woodsmoke Reduction Program.

Department of Water Resources

The Department of Water Resources receives funding from the GGRF to run the Water-Energy Grant Program. It is open to applicants from the residential and nonresidential sectors. Grants are used to finance upgrades that improve water efficiency, reduce GHG emissions, and reduce energy use. Energy savings are captured primarily by installing fixtures that reduce hot water use, resulting in water and energy use reduction.[145] Examples include replacing high-water use fixtures with WaterSense-approved fixtures,[146] installing low-flow irrigation units, directly installing efficient clothes washers and dryers in disadvantaged communities, and providing additional rebates for energy-efficient dishwashers.

California Department of Food and Agriculture

The State Water Efficiency and Enhancement Program[147] is administered by California Department of Food and Agriculture and provides financial assistance in the form of grants to implement irrigation systems that reduce GHGs and save water on California agricultural operations. Eligible system components include soil moisture monitoring, drip systems, switching to low-pressure irrigation systems, pump retrofits, variable-frequency drives, and installation of renewable energy to reduce on-farm water use and energy.

California Department of Community Services and Development

CSD administers the LIWP that is a statewide California Climate Investments program funded through the GGRF. The LIWP funds energy efficiency upgrades and renewable energy systems for low-income single-family households and multifamily properties. The LIWP goals are to reduce GHG emissions and lower the energy costs of low-income households. The LIWP creates a number of co-benefits including improved living conditions, health and safety of occupants, air quality, a better equipped workforce, and economic benefits.

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145 California Climate Investments Using Cap-and-Trade Auction Proceeds, Annual Report 2017. pp. 82.
146 WaterSense fixtures are water efficiency products that meet the U.S. EPAs criteria for efficiency and performance, https://www.epa.gov/watersense/about-watersense
147 "State Water Efficiency an Enhancement Program." California Department of Food and Agriculture, https://www.cdfa.ca.gov/oefi/sweep/.

Single-Family Energy Efficiency and Solar Photovoltaics Programs

CSD installs no-cost energy efficiency measures, solar water heating, and rooftop solar PV for low-income single-family dwellings. The program reduces GHG emissions through lower energy demand and increased renewable energy generation, and reduces energy costs for low-income residents. Solar PV installations are limited to owner-occupied households. This program ceased operating at a statewide level in April 2019 due to reduced LIWP funding levels, and is currently limited to serving farmworker households across 12 counties.[148]

Multifamily Energy Efficiency and Renewables Program

CSD provides technical assistance and financial incentives for the installation of energy efficiency measures and solar photovoltaic for low-income multi-family dwellings. These projects reduce residential energy demand and GHG emissions. The low-income residents that participate in this program benefit from lower energy costs and improved living conditions. The program also helps preserve affordable housing by reducing owner operating costs.

Another program component, the LIWP Community Solar Pilot, currently funds two projects designed to expand access to renewable energy for low-income households, including those that do not have the ability to participate in existing low-income solar photovoltaic programs – either due to a lack of home ownership, inadequate roofing for solar photovoltaic, or other factors.

California Department of Housing and Community Development

The California Department of Housing and Community Development (HCD) plays a role in building standards. HCD protects the health and safety of Californians by enforcing standards for housing construction, maintenance of farmworker housing, and manufactured homes. HCD also proposes amendments to California's residential building standards for new construction to the California Building Standards Commission and creates specialized standards for CALGreen, the nation's first mandated green-building code. HCD also adopts amendments to the CALGreen code to improve building water efficiency.

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148 Community Services and Development. Low Income Weatherization Program Year End Reports, 2017, 2018, https://www.csd.ca.gov/Shared%20Documents/LIWP-Supplemental-Report-November-2018.pdf

California Department of Public Health

The CDPH protects and improves the health of all Californians and helps shape positive health outcomes for individuals, families, and communities.[149] As an example, CDPH supported a pilot project in Contra Costa County to document the collaborative partnership between the county's home visitation nurse/health program and disseminating information about and providing referrals to LIWP and LIHEAP services for eligible households. From this pilot, a weatherization and energy efficiency pilot project guidance document was developed, *Energy Efficiency and Health: A Guide for Public Health and Health Care Professionals on Connecting Vulnerable Residents with Energy Efficiency Services.*[150]

Housing conditions play a significant role in health. Health care professionals can help residents and communities have healthier housing by connecting them with free weatherization and energy efficiency programs. The guidance document addresses why health professional should connect residents with energy efficiency programs and how to make that connection. This strategy is included in the CLIMB Action Plan. CDPH was a partner agency to the CEC and other state agencies on developing the CLIMB Action Plan. There is great value in its continued involvement as a partner in the implementation of the plan.

California Building Resilience Against Climate Effects: The California Building Resilience Against Climate Effects[151] (CalBRACE) project aims to enhance CDPH's capability to plan for and reduce health risks associated with climate change. The program provides resources and technical assistance for the state and local public health departments to build climate adaptation capacity and enhance resilience at the local and regional levels. The CalBRACE project focuses on preparing for three of the major climate impacts facing California: increasing temperature/extreme heat, wildfires, and sea-level rise, including flooding. As temperatures rise and more communities experience extreme heat, building insulation and energy efficiency will become increasingly important in saving energy and reducing GHG emissions. Additional climate action strategies include reducing building energy use through weatherization, cool roofs/green roofs, and water conservation. Reducing building energy use will reduce energy costs, promote healthy living environments, promote cooler communities, create local green jobs, and improve climate resilience.

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149 California Department of Public Health, https://www.cdph.ca.gov/
150 Energy Efficiency and Health: A Guide for Public Health and Health Care Professionals on Connecting Vulnerable Residents with Energy Efficiency Services. 2018 http://www.rampasthma.org/D:Web%20Siteswww.rampasthma.orgwp-contentuploads/2018/12/Energy-Efficiency-and-Health-Guide-for-Public-Health-and-Health-Care-Professionals.pdf.
151 "CalBRACE." California Department of Public Health, https://www.cdph.ca.gov/Programs/OHE/Pages/CalBRACE.aspx#.

California Strategic Growth Council

The Affordable Housing and Sustainable Communities Program (AHSC) is administered by the Strategic Growth Council in partnership with HCD. AHSC works to increase the supply of affordable places to live near jobs, stores, transit, and other daily needs. AHSC funds the building of affordable housing and transportation options that encourage residents to walk, bike, and use public transportation. Through the AHSC program, $440 million has been invested across the state that will provide more than 6,050 affordable homes and covering 60 sustainable projects that will reduce 1.58 million tons of GHGs over the operating lives. Historically, most AHSC applicants have been developers of affordable and mixed-income housing, local governments, regional transportation agencies, and public transit providers. Other eligible applicants include K-12 school, college, and university districts and federally recognized indigenous tribes. In addition to reducing GHGs from transportation, AHSC also incentivizes constructing housing that are compliant with green building standards and generate renewable energy on-site.

In addition to administering the Affordable Housing and Sustainable Communities Program, the Strategic Growth Council funds the Transformative Climate Communities (TCC) program.[152] Strategic Growth Council awards funds to community-led development and infrastructure projects that achieve environmental, health, and economic benefits for disadvantaged communities. The TCC program used GGRF funds for two different solicitations. The first round resulted in $132 million awarded to three locations: City of Fresno, Watts (within the City of Los Angeles), and City of Ontario.[153] The second round of funding awarded $46 million between the City of Sacramento and the Pacoima neighborhood in Los Angeles.[154] Examples of projects are affordable and sustainable housing developments, bicycle and car share programs, urban greening, and residential weatherization.

California Alternative Energy and Advanced Transportation Financing Authority

CAEATFA is a five-member board housed under the California State Treasurer's Office. It is designed to advance the state's goals of reducing GHG emissions, increasing sustainable and renewable energy sources, implementing energy efficiency measures, creating green sector jobs, and reducing California's dependence on fossil fuels.

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152 "Transformative Climate Communities." Strategic Growth Council, http://www.sgc.ca.gov/programs/tcc/
153 "Transformative Climate Communities, Previous Awardees." Strategic Growth Council, http://www.sgc.ca.gov/programs/tcc/resources/previous-awardees.html.
154 "Transformative Climate Communities, 2018 Awardees." Strategic Growth Council, http://www.sgc.ca.gov/programs/tcc/resources/2018-awardees.html.

CAEATFA accomplishes these goals by bringing together public funds and private capital investments to spur increased market transformation.

California Hub for Energy Efficiency Financing

CAEATFA serves as the administrator of the California Hub for Energy Efficiency Financing, in collaboration with the CPUC and supported by the IOUs. The program develops and implements financing pilots that bring together private funds and investments with IOU ratepayer dollars. These pilots promote energy efficiency installations through credit enhancement in the form of a loan loss reserve, on-bill financing, and other methods. It gives customers access to lower-cost financing products while offering financing companies mitigated risk through the loss reserve. The CPUC evaluates the proposed pilots to determine whether they are scalable, have leveraged private capital to install energy efficiency upgrades, improved conditions for underserved Californians, and resulted in measurable energy savings. The current budget for the various pilots totals $65.9 million. This budget is shared among approved pilot programs: Residential Energy Efficiency Loan Assistance (REEL), Small Business Energy Efficiency Financing (SBF), Affordable Multifamily Energy Efficiency Financing (AMF), and on-bill repayment functionality. GoGreen Financing is the public-facing website for these pilot programs.[155]

REEL offers loans to owners and renters of existing single family properties who select from a large list of energy efficiency measures to implement on their property. The property owner or renter must receive electricity and/or gas service from an IOU. The lenders receive a credit-enhancement of 11 percent of the claimed eligible amount, or 20 percent if the applicant is considered underserved. The credit enhancement leads to better financing terms for the loan recipient resulting in increased maximum loan amounts and longer repayment terms, which means deeper retrofits are possible. At the September 2019, REEL had seven participating lenders and more than 350 contractors.[156] Since program launch, REEL has supported more than $8 million in loans, primarily for air conditioning, duct work, windows, and insulation. More than half of the home improvements occurred in low- to moderate-income census tracts.

The SBF program is designed to help small businesses install energy-saving retrofits through access to affordable private capital. By removing the barrier of up-front cost and offering financing terms better than would be available without the loss reserve, customers can install deeper retrofits and achieve greater energy savings. In 2020, the SBF program will also support financing repayment through the customer's utility bill. CAEATFA enrolled the first finance companies and retrofit contractors into the program in Q1 2019 and enrolled the first financing agreement in Q3 2019. Concurrently,

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155 GoGreen, www.gogreenfinancing.com.
156 California Alternative Energy and Advanced Transportation Financing Authority. 2018 Annual Report. March 2019, https://www.treasurer.ca.gov/CAEATFA/annual/2018.pdf.

CAEATFA staff worked with its vendors to develop a user interface to expedite the exchange of program information between the program and participants. The user interface launched and was available for use in September 2019.

The AMF is designed to match the SBF program in many ways. A key efficiency of the AMF program design is integration with existing AMF programs across the state, specifically the LIWP administered by CSD and the Solar On Multifamily Affordable Housing program, administered by the CPUC, via a competitively selected team of nonprofit organizations. Similarly, the AMF program will fund any energy efficiency or demand response measure approved for rebate and incentive by any IOU, REN, or community choice aggregator, as well as any measure from a broad, pre-approved, energy savings measures list. There is no minimum or maximum financing amount, although only the first $1 million claim eligible financed amount is credit-enhanced. To be eligible, the multifamily property must have five or more units with at least 50 percent of the units being income-restricted up to 120 percent of the area median income.

As of September 2019, OBF as a functionality of both the SMF and AMF programs is in the design and testing phase. CAEATFA staff are working collaboratively with its master servicer and all four IOUs to create a process by which a financing customer can repay its financing obligation through its utility bill. OBF functionality is anticipated to be available to customers in 2020.

PACE Reserve Program

The PACE Reserve Program was authorized in 2013 to address the concerns raised by the mortgage industry over residential single-family PACE financings.[157] Senate Bill 96 (Committee on Budget and Fiscal Review, Chapter 356, Statutes of 2013) allocated $10 million to CAEATFA to set up a loss reserve. This reserve would cover the first mortgage holder on a property should PACE payments be required while the lender is in possession of a property. The reserve would also cover any losses to the lender up to the amount of the outstanding PACE assessment in a forced sale for unpaid taxes or special assessments. PACE administrators may participate in the reserve program by applying to CAEATFA and demonstrating that they meet the minimum underwriting criteria of the program as established in statute and regulation.

To date, the reserve covers 156,415 PACE financings, with a total principal value of more than $3.6 billion. Semiannual activity reports indicate a dramatic reduction in enrollment since mid-2016. To date, no claim has been made on the reserve. CAEATFA is analyzing the potential long-term liability and longevity of the reserve based on financing activity. CAEATFA staff initially estimated that the $10 million reserve would

157 Broader description of PACE financing is on page 59.

last 8 to 12 years. In 2018, CAEATFA staff elected a firm and began performing a risk analysis of the $10 million loss reserve to help inform future efforts.

Clean Energy Bond Financing

CAEATFA acts as California's primary alternative energy bond issuer and has issued more than $212 million in bond financing since the 1980s. The program has slowed in recent history, with only two outstanding bonds on the books for 2018.

California Conservation Corps

The California Conservation Corps (CCC) administers the Energy Corps program. The Energy Corps program trains young adults to implement energy efficiency projects. It is a full-time, one year program for anyone between 18 to 25 years of age, and military veterans up to age 29. The program is funded by the Cap-and –Trade program. Since 2013, the program has put people to work in over 1,600 project sites. Members in the program are taught to conduct energy audits and perform lighting and controls retrofits.[158]

Local Government Energy Efficiency Programs

This section describes energy efficiency programs operated by local governments and other special districts.

Air Quality Management and Air Pollution Control Districts

BAAQMD

In June 2018, BAAQMD approved spending $4.5 million to fund projects at 15 regional public agencies to reduce GHG emissions from existing buildings or develop strategies for the long-term reduction of GHG emissions or a combination. All projects conform to BAAQMD's clean air plan and accelerate the reduction of criteria air pollutants, like nitrous oxide (NO_x), as well as GHG emissions. The funded projects that will reduce GHG emissions include implementation of effective energy saving programs on a regional level that will develop a program to use electric hot water heat pumps instead of traditional natural gas water heating tanks; refrigeration upgrades in corner markets; market transformation for electric heat pump water heaters; a commercial building ordinance to reduce energy use; solar photovoltaic generation for critical facilities, like hospitals; replacement of diesel generators with battery storage in data centers; and replacement of wall furnaces with electric heat pumps.

BAAQMD typically offers $250,000 in grants each fiscal year to Bay Area nonprofit organizations and school communities. There are two grant opportunities under this grant program: the School Community Grants and the James Cary Smith Community

158 Energy Corps Program, California Conservation Corps, https://ccc.ca.gov/what-we-do/conservation-programs/energy-corps/

Grants. The BAAQMD offers $50,000 to school communities for projects that increase knowledge about the science of air quality, the relationship between air quality and public health, and the impact of air pollution on the global climate. Grants of up to $2,500 will be awarded for K-12 schools, teachers, student leaders, or parent leaders to implement air quality-related projects. In addition, under the James Cary Smith Community Grants funding program, the air district will offer $225,000 for air quality-related education and engagement projects, local air pollution mitigation projects, and community-based participatory research projects. Grants of up to $25,000 per project are awarded.

BAAQMD is collaborating with Pacific Gas & Electric and SCP on the Advanced Energy Rebuild Program that offers incentives to fire victims in Sonoma and Mendocino Counties.[159] This program was launched in May 2018. For customers who choose to rebuild their homes as all-electric, combined incentives can amount to $12,500. PG&E is providing building design assistance to build beyond the building standards, while SCP and BAAQMD are providing incentives for electric appliances, solar panels, and EV charging stations. PG&E is using its existing California Advanced Home Program funds to support the above code design assistance offered to Sonoma and Mendocino Counties for fire rebuild efforts.

SCAQMD

SCAQMD funded the Coachella Valley Project, which was highlighted in the 2016 EBEE Action Plan. In 2015 and 2016, SCAQMD funded a basic energy efficiency retrofit for 2,100 homes in the Coachella Valley area of eastern Riverside County. This was not a low-income program but was focused on those homeowners and renters in disadvantaged communities. The retrofits focused on the building envelope. The SCAQMD Coachella Valley project was completed by the end of 2016. The average cost per home was $1,950, and the average time to complete each home was under three hours in a day.

SCAQMD is developing a net emissions analysis tool and working group to assess the cost-effectiveness of technologies and life-cycle emissions. The tool includes several control measures that seek emission reductions with zero and near-zero NO_x appliances in commercial and residential applications and integrate energy efficiency enhancements with criteria pollutant (such as NO_x) cobenefits. To this end, the emissions tool estimates changes in criteria and GHG emissions and costs associated with upgrades in commercial and residential appliances in conjunction with installation of zero- and near-zero emission technologies.

159 See program blurb on page 55 in the CCA section.

In January 2019, the SCAQMD Board approved funding of more than $20 million for 10 projects to reduce energy consumption and GHG emissions in residential and commercial buildings. These projects are:

- Multifamily Affordable Housing Electrification Project
- Zero-NO_x Water Heating; Space Heating, Cooking and Laundry Systems
- Residential Energy Efficiency Retrofit Project (San Fernando Valley)
- Midstream Commercial Water Heating Incentive Program
- Residential Fuel Cell Demonstration With PV and Storage
- Residential Energy Efficiency Retrofit Project (Coachella Valley)
- Rialto Bioenergy Facility RNG Upgrading and Interconnection Project
- Aquarium of the Pacific 1,320 kW Fuel Cell Power Generation System
- Riverside Flare Reduction Project: Producing Renewable Hydrogen and Power and Avoiding NO_x and Volatile Organic Compounds
- Fuel Cells Integrated With Energy Storage on College of the Canyons Campus
- Microgrid System at University of Redlands

SJVAPCD

The SJVAPCD consists of eight counties, all primarily driven by the agricultural industry. As a result, most of the program activity supported by the SJVAPCD focuses on reducing emissions from the agricultural sector. While the emission reduction programs typically focus on farm equipment like tractors, the SJVAPCD also offers incentives for agricultural pump changes.[160] The pumps are switched from either diesel to more efficient diesel, or diesel to electric. The latter switch is important for decarbonizing the agricultural sector. In 2010, the SJVAPCD adopted regional energy efficiency strategies to advance energy conservation and efficiency activity that would also reduce emissions and improve air quality. SJVAPCD does not offer an energy efficiency programs or grants like those described in the BAAQMD or SCAQMD. It has historically offered such programs but more recently has leveraged education campaigns. For example, in late 2018 the SJVAPCD approved continued funding for the “Green Team” programs.[161]

Next Steps

Going forward, the CEC can leverage the activities of these and other local districts to reach the industrial and agricultural sectors and obtain additional energy efficiency savings critical to meeting the objectives of the SB 350. Though the industrial sector consumes more than 20 percent of the overall energy consumption in California, the established SB 350 targets projected minimal energy savings for the industrial and agricultural sector. The CEC can work with California Air Pollution Control Officers

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160 "SJVAPCD Grants, Ag Pump Program," http://valleyair.org/grants/agpump.htm.
161 "SJVAPCD Governing Board Meeting Minutes," December 2018, http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2018/December/final/11.pdf.

Association, which represents the state's 35 local air districts, to reach various small and medium industries. These efforts can initiate energy savings that may reduce costs, lead to increased business profitability, benefit local districts by reducing criteria pollutants, increase efficiency savings, and reduce GHG emissions.

Local Benchmarking Programs

Beyond the commercial and multifamily building benchmarking program run by the state, several local jurisdictions have passed compliant benchmarking programs that cover a smaller or a broader range of buildings. Cities with their own local benchmarking program are San Francisco, Los Angeles, San Diego, San Jose, and Berkeley.[162] Building owners in these jurisdictions report their energy use directly to their local program, which then reports data from qualifying buildings to the CEC. Some local benchmarking programs have broader reporting requirements than the state program, such as requiring buildings under the state's 50,000 sq. ft. threshold to report, or requiring energy audits and retrocommissioning.

Building Energy Efficiency Reach Codes, CALGreen

Jurisdictions can develop their own local code ordinance or can conduct an analysis to adopt CALGreen standards.[163] Local jurisdictions wishing to enforce locally adopted energy standards must submit an application with the following materials to the CEC: (1) the proposed energy standards, (2) the local jurisdiction's findings and supporting analyses on the energy savings and cost-effectiveness of the proposed energy standards, (3) a statement or finding by the local jurisdiction that the local energy standards will require buildings to be designed to consume no more energy than permitted by Energy Standards, and (4) any findings, determinations, declarations or reports, including any negative declaration or environmental impact report, required under the California Environmental Quality Act.[164]

Throughout the 2016 Energy Standards cycle, several local governments adopted aggressive energy efficiency and solar requirements. Some of the local jurisdictions include Santa Monica, San Mateo, Palo Alto, Los Angeles County, Marin County, Arcata, and Davis.[165] Common code adoptions featured cool roofs, solar PV, solar thermal, or a requirement to meet a certain efficiency percentage above code baseline.

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162 Local Benchmarking and Public Disclosure Ordinances, https://www.energy.ca.gov/benchmarking/
163 California Building Standards Commission. "California Green Building Standards Code (Part 11 of Title 24, California Code of Regulations)." Access in May 2019. Available online at: http://www.bsc.ca.gov/Home/CALGreen.aspx.
164 Public Resources Code section 25402.1(h)2 and section 10-106, outline the local ordinance procedure
165 "Local Ordinances Exceeding the 2016 Building Energy Efficiency Standards." Accessed,in May 2019, https://www.energy.ca.gov/title24/2016standards/ordinances/

Energy Upgrade California

Energy Upgrade California® (EUC) is a statewide marketing, education, and outreach initiative. The multilingual campaign educates Californians on issues from energy efficiency to time-of-use rates. The EUC focus on marketing, education, and outreach was initiated in 2013 by CPUC Decision 12-05-015, which directed the program to serve as the primary statewide campaign to help residential and small business customers initiate energy management concepts and programs. EUC is supported by an alliance of the CPUC, the CEC, utilities, RENs, local governments, CCAs, businesses, and nonprofit organizations to assist communities in meeting state and local energy and climate action goals. Funding comes from surcharges to IOU energy utility customers.

Federal Energy Efficiency Programs

Below are descriptions of programs funded by the federal government. The verification of savings from these programs is challenging due to the lack of available public data. Nevertheless, these programs result in energy savings and positive socioeconomic impacts.

U.S. Department of Energy

Appliance Standards

The U.S. DOE sets standards for common household, commercial, and industrial appliances. These are designed to save consumers money and protect them from inferior products. DOE is required to review standards and test procedures periodically for more than 60 products, representing about 90 percent of home energy use, 60 percent of commercial building energy use, and 30 percent of industrial energy use.[166] Common appliances covered by these standards include refrigerators, air conditioners, dishwashers, clothes washers, and furnaces.

Better Buildings Initiative

Through the Better Buildings Initiative, DOE partners with leaders in the public and private sectors to make the nation's homes, commercial buildings, and industrial plants more energy-efficient by accelerating investment and sharing successful best practices. There are several efforts that DOE leads under this umbrella, some including:

- Better Buildings Challenge
- Better Buildings Accelerators
- Better Communities Alliance
- Better Plants Program
- Better Buildings Alliance

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166 "Appliance Efficiency Standards." U.S. Department of Energy, https://www.energy.gov/sites/prod/files/2017/01/f34/Appliance%20and%20Equipment%20Standards%20Fact%20Sheet-011917_0.pdf.

- Better Buildings Workforce

As of 2018, nationwide, the Better Buildings Initiative has resulted in 1.38 quad Btus of energy savings, $8.4 billion saved, and 82 million tons of CO_2 emissions avoided. The initiative has partnered with more than 900 entities.[167] The CEC partners with DOE on several better buildings initiatives and supports the continuation of these efforts.

Weatherization Assistance Program

The Weatherization Assistance Program founded more than 40 years ago, offers incentives for mechanical, building envelope, electric, water, and health and safety weatherization measures. These measures help reduce the costs associated with fixing, replacing, and installing upgrades for low-income families. The mechanical weatherization measures include cleaning, repairing, or replacing HVAC units, and repairing, replacing, or installing water heaters and pipe insulation. Building shell weatherization measures include repairing roof or wall leaks, improving attic and wall insulation, repairing or replacing windows and doors, and installing awnings and solar screens. Electric and water weatherization measures include installing energy-efficient lights and low-flow shower heads and replacing old refrigerators with new energy-efficient models. Health and safety weatherization measures include installing ventilation to ensure good indoor air quality, installing smoke and carbon monoxide alarms, and evaluating mold and moisture hazards. The non-energy benefits associated with weatherization measures are reduced energy bills for the recipient, reduced GHG emissions, improved indoor comfort, greater health and safety, and improved energy equity for the homeowner. The intent with this program is to increase energy efficiency of homes while improving the recipient's health, safety, and energy equity. This program supports 8,500 jobs and improves about 35,000 homes nationwide annually.

National Labs

The DOE supports several national research labs across the country.[168] A select few of these labs focus on energy efficiency matters: National Renewable Energy Lab, Lawrence Berkeley Lab, and Pacific Northwest National Lab. At these facilities, researchers study new technologies, software tools, barriers, reliability, energy generation, program designs, and more. Covering each activity is beyond the scope the Action Plan but more information is available here:

- Lawrence Berkeley Lab: https://www.lbl.gov/
- Pacific Northwest National Lab: https://www.pnnl.gov/
- National Renewable Energy Lab: https://www.nrel.gov/

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167 Better Buildings Program, 2019 Progress Report. U.S. Department of Energy, https://betterbuildingssolutioncenter.energy.gov/sites/default/files/program/DOE_BBI_2019_Progress_Report.pdf.
168 U.S. DOE. National Labs, https://www.energy.gov/national-laboratories

U.S. Department of Health and Human Services

Low-Income Home Energy Assistance Program

LIHEAP provides financial assistance and weatherization to households. The funds are allocated to each state for implementation. In California, CSD administers the funds. In 2018, more than $200 million were allocated to California to run the Home Energy Assistance Program, Energy Crisis Intervention Program, and LIHEAP Weatherization.[169] The first two programs provide direct financial assistance with paying utility bills, while the third program provides free energy efficiency upgrades to reduce monthly utility bills and improve the health and safety of the occupants.[170]

U. S. Department of Housing and Urban Development

The United States Department of Housing and Urban Development (HUD) funds energy efficiency through various programs. It recognizes that utility costs can burden households, especially low-income ones. HUD also sees the benefit of reducing its own energy costs through efficiency. HUD spends funds on heating, cooling, and lighting efficiency improvements for its portfolio of public and assisted housing, and Section 8 vouchers. Furthermore, reducing the energy burden strengthens local economies; thus, these programs act as investments in a community's future.

HUD offers energy efficiency funds and support through numerous programs, including:

- Community Development Block Grants.[171]
- Choice Neighborhoods Planning Grants Program.[172]
- HOME Investment Partnership.[173]
- Public Housing Environmental and Conservation Clearinghouse.[174]
- Veterans Housing Rehabilitation and Modification Pilot Program.[175]

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169 "2019 Funding Release of LIHEAP Block Grant Funds." https://liheapch.acf.hhs.gov/Funding/funding.htm.
170 California Department of Community Services and Development, LIHEAP, https://www.csd.ca.gov/Services/HelpPayingUtilityBills.aspx
171 "Community Development Block Grants" U.S. Department of Housing and Urban Development, https://www.hudexchange.info/programs/cdbg./
172 "2019 Grant Programs." U.S. Department of Housing and Urban Development, https://www.hud.gov/program_offices/spm/gmomgmt/grantsinfo/fundingopps/fy19cnpg.
173 U.S. Department of Housing and Urban Development https://www.hudexchange.info/programs/home/
174 "Public Housing Environmental and Conservation Clearinghouse." U.S. Department of Housing and Urban Development, https://www.hud.gov/program_offices/public_indian_housing/programs/ph/phecc.
175 "Veterans Housing Rehabilitation and Modification Pilot Program." U.S. Department of Housing and Urban Development. https://www.hudexchange.info/programs/rural/veterans-housing-rehabilitation-and-modification-pilot-program/.

These programs benefit low-income, disabled, disadvantaged, rural, and urban communities. Often, they leverage private funds with public money to expand the scope of a project. These funds play an essential role in financing affordable housing, improving low-income communities, and redeveloping neighborhoods that have suffered economic downturns.

United States Environmental Protection Agency

Energy Star

Energy Star is a federal program administered by the United States Environmental Protection Agency. The Energy Star program helps to align the energy efficiency programs offered across the country. It provides energy efficiency information and tools for consumers, homeowners, and businesses. Through their rating of appliances and other plug-loads, an Energy Star score guides consumers purchase energy efficiency products.[176] The Energy Star Portfolio Manager assists building owners with managing the energy use of their property and identifies ways they can save energy.[177] This tool is also used as the backbone for the CEC's benchmarking program. Homeowners can also use tools and resources from Energy Star to learn ways energy use can be reduced.

Private Market Energy Efficiency Program

Residential and Commercial PACE

PACE financings rely on the existing framework of residential property taxes by allowing property owners to repay the entire financing for a project through a special tax assessment made on the property. This arrangement limits PACE providers' field of operation only to those jurisdictions that passed laws permitting the special tax assessment. The funds are used to pay for property-affixed energy efficiency measures such as building insulation, HVAC, envelope improvements, windows, lighting controls, and other equipment controls. It may also pay for rooftop PV and seismic retrofits. The initiation of these programs did not substantially gain momentum until the opening of the PACE reserve (addressed on page XXIII of this report). The commercial market has seen slow but continued growth.

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176 U.S. Environmental Protection Agency, Energy Star Rating, https://www.energystar.gov/products?s=mega

177 U.S. Environmental Protection Agency, Energy Star Portfolio Manager, https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

Conservation Voltage Reduction

Conservation voltage reduction (CVR) is a proven technology for reducing energy use and peak demand. CVR improves the efficiency of the distribution system by optimizing voltage. The key principle of CVR operation is that the standard voltage band between 114 and 126 volts can be compressed using regulation to the lower half (114–120 volts) instead of the upper half (120–126 volts),[178] producing considerable energy savings at low cost without harm to consumer appliances.[179] Sensors detect distribution voltages, and when voltages exceed preset limits, voltage regulation equipment is triggered.

To date, pilots on implementing CVR have been run by smaller POUs such as Glendale and Palo Alto. Larger-scale adoption has not occurred in California. The benefits from reduced energy consumption (metered end-user usage and distribution losses) and avoided equipment damage through time must exceed the investment and operating costs for CVR to make sense economically. While CVR is a proven technology, it is difficult to calculate cost-effectiveness unless the utility is vertically integrated, meaning the utility owns the electricity supply, transmission, and distribution system. More work is needed to determine a societally cost-effective method so that the energy savings from this technology can be properly captured.

Energy Efficiency Research and Development

This section highlights the areas where the state is investing funding dollars into energy research and technology development and deployment.

Electric Program Investment Charge

The CPUC established the Electric Program Investment Charge (EPIC) through Decision 12-05-037 under Rulemaking 11-10-003, on May 24, 2012. Senate Bill 96 guides the administration of EPIC. The program funds roughly $162 million annually in clean energy research, demonstration, and deployment projects that support California's energy policy goals and promote greater electricity reliability, lower costs, and increased safety.

EPIC's proposed 2018-2020[180] Triennial Investment Plan[181] focuses on improving existing building energy efficiency and reducing GHG emissions in the following areas of opportunity:

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178 In the United States, regulations require that voltage be made available to consumers at 120 volts (V) plus or minus 5 percent, yielding a range of 126V to 114V.

179 Electrical equipment including air conditioning, refrigeration, appliances, and lighting is designed to operate most efficiently at 114V. Power delivered at higher voltage wastes energy as heat.

180 The EPIC investment plan can be found here: https://www.energy.ca.gov/research/epic/17-EPIC-01/

181 E*PIC Proposed 2018-2020 Triennial Investment Plan*. California Energy Commission. April 2017. CEC-500-2017-023-CMF Chapters 2 and 3.

- Accelerating product development and market acceptance of solid-state lighting technologies and designs
- Developing and launching next-generation windows and envelope technologies
- Satisfying existing buildings demand for energy-efficient HVAC and refrigeration systems that have low GHG emissions and use refrigerants with low global warming potential
- Enabling integration of building and equipment controls and automation
- Increasing plug loads and consumer electronics efficiency
- Transitioning to direct current-powered buildings
- Developing and using cost-effective decarbonization strategies in California's industrial sector
- Scaling up cost-effective and sustainable retrofits to highly energy-efficient buildings, including zero-net-energy retrofits, where technically and economically feasible

The current authorization for EPIC will expire at the end of 2020. The CPUC has indicated, in an October 2018 Decision (D.18-10-052), that it intends to open a new rulemaking proceeding in 2019 to examine the future of the program.

Natural Gas Research and Development Program

In 2000, California enacted legislation to enable the Natural Gas Research and Development (R&D) Program under Assembly Bill 1002.[182] AB 1002 directed the CPUC to impose a surcharge on all natural gas consumed in California to fund research and development specific to natural gas. The CPUC created the Natural Gas R&D Program in August 2004. That same year, the CPUC designated the CEC as the administrator of program research funds under Decision 04-08-010. The CPUC allocates $24 million per year to the Natural Gas R&D Program; program funding has not increased since 2009.

The Natural Gas R&D program also prioritizes research focused on strengthening the integrity and safety of natural gas infrastructure. In recent years, the program has funded research and development aimed at GHG reduction, production of renewable gas, climate adaptation, and resiliency for the natural gas system. One example of this is the Demonstrating Innovative Solutions to Convert California's Forest Biomass Resources Into Renewable Gas (GFO-18-501) solicitation. This solicitation will fund research and development aimed at achieving GHG reduction, reducing the increasing risk of wildfires, and developing renewable sources of gas.

182 Wright, Chapter 932, Statutes of 2000.

Market Transformation Data Efforts

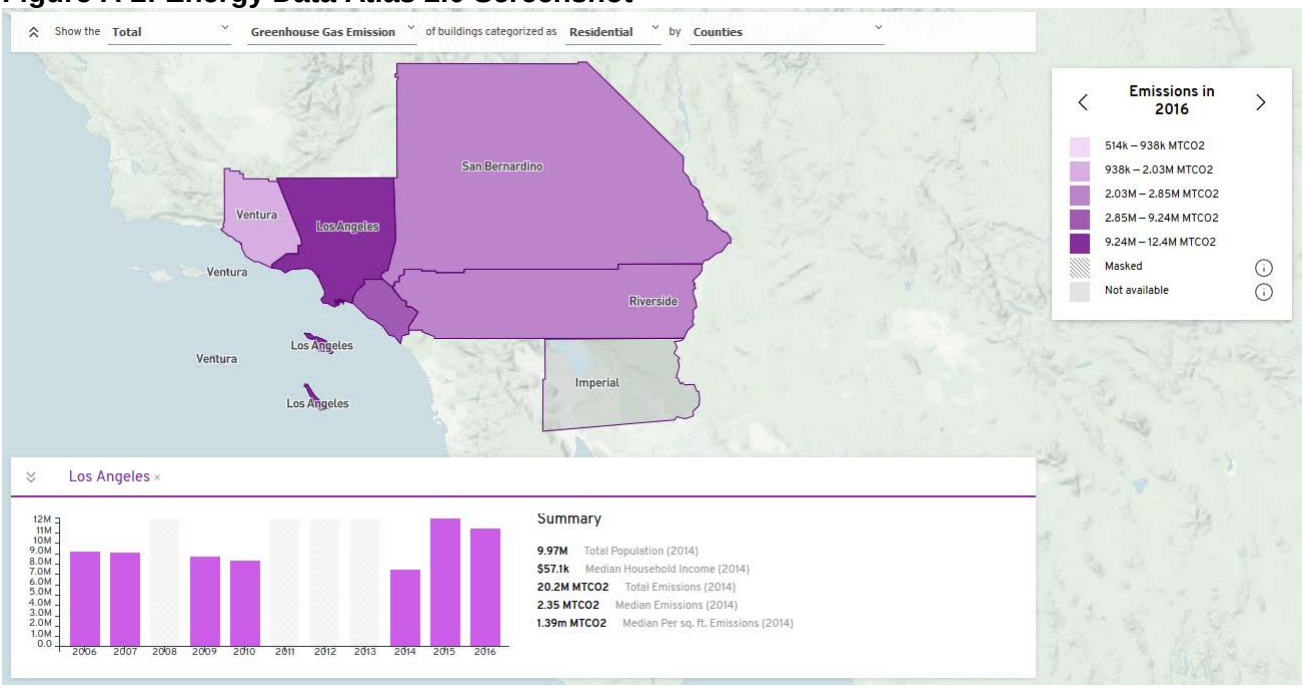
While ongoing energy efficiency work is crucial to meeting the 2030 doubling goal, there is additional data, market, and workforce development to be done. This section goes into the big data needed for proper efficiency valuation, the tools in development or newly available to analyze efficiency, and workforce development and training improvements that are necessary for the success of all programs.

Energy Data Atlas and Beyond

Energy Atlas is a proprietary tool developed by the California Center for Sustainable Communities at UCLA through funding by Strategic Growth Council, CEC EPIC grant and ratepayer funds. The purpose is to analyze actual (not modeled or estimated) energy consumption by building type, age, type of energy, and GHG emissions in Los Angeles County and most of Southern California (example of atlas in Figure 22). Before public disclosure, data are aggregated to protect individual customer privacy in accordance with CPUC guidelines. In D 18-05-041, the CPUC ordered the IOUs to expand access to actuarial energy use data statewide (akin to Energy Atlas in Southern California). Leveraging the CEC enterprise systems described above, the statewide tool would map and analyze customer actuarial energy consumption data aggregated to meet privacy and confidentiality protections required under current laws and regulations. Local governments, governmental agencies, and energy efficiency PAs would be the targeted users of the tool. The statewide tool is expected to be launched by end of 2020.

Analytics and mapping of aggregated actuarial energy use come with several benefits, such as providing an energy consumption baseline from which program implementers can track progress; helping policy makers understand how well a particular policy is working; assisting local governments with developing, implementing, and tracking climate action plans; and helping stakeholders understand how the built environment contributes to GHG emissions. The CEC expects to leverage big data efforts like these with the respective enterprise platform and energy consumption datasets. Coordination with the CPUC is essential to developing a statewide tool that can result in the benefits described above.

Figure A-2: Energy Data Atlas 2.0 Screenshot



Source: UCLA Energy Data Atlas 2.0

Behavioral Program Expansion

As utilities increasingly look for cost-effective energy efficiency measures, AB 802 opened the door to offer more behavior improvement-based programs. These new program opportunities are occurring as more granular data about energy consumption are becoming available, which make verifying behavioral savings possible. Utilities have had success recently with offering home energy reports. They compare a customer's energy use to that of their neighbors, with the expectation of motivating changes by high-usage consumers. This purely behavioral approach produces savings ranging, on average, from less than 1 percent up to 3 percent per household.[183] In the most recent PG Study, behavioral programs like these will soon represent a large portion of savings.[184]

The initial SB 350 efficiency savings estimates for behavioral and market transformation programs accounted for about 2 percent of the total projected electricity savings and 7 percent of natural gas savings in 2030. In establishing the SB 350 targets, the CEC used

183 CPUC. *Energy Efficiency Portfolio Report*, pg. .28. May 2018. Retrieved from http://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/About_Us/Organization/Divisions/Office_of_Governmental_Affairs/Legislation/2018/13-15%20Energy%20Efficiency%20Report_Final.pdf.
184 20*19 Potential and Goals Study*. Prepared by Navigant on behalf of the CPUC, pg. 5.

the best available data and methods to project savings from behavior and market transformation while recognizing that these programs and measures are still being designed and developed for widespread implementation. Because many of these are nascent programs, uncertainty remains about whether the CEC's projections capture all possible behavioral-based strategies and what is the amount of confidence to place in current methods to count potential savings.[185]

Building Asset Scores

The EBEE Action Plan calls for standardized energy asset ratings for residential and nonresidential buildings. An "asset rating" is a method of quantifying the efficiency potential of a building, independent of the number of occupants and their behavioral choices. By including an asset rating as part of real estate listings or information for a building owner, one can factor the behavior-independent energy costs of a building into his or her decisions and amend behavior to achieve the full potential energy efficiency. The factors affecting underlying efficiency potential include the envelope, heating, cooling, ventilation, and hot water systems of the building, along with the installed lighting and major appliances and any offsetting electrical power produced by on-site renewable systems. Energy savings that can be directly attributed to an energy asset rating are behavioral, whereas any measures implemented due to knowing and acting on the rating is attributable to that specific program.[186]

Home Energy Rating System

The 2009 update to the HERS Regulations instituted Phase II of the HERS program.[187] This update involves rating the energy efficiency of a building on a scale from 0 to 250, relative to a reference home that just meets the prescriptive requirements of the Energy Standards. A 0 rating home is best and 250 rating the worst. This whole-house HERS rating applies to new and existing single-family homes and multifamily buildings up to three stories. This program is intended to provide reliable asset ratings that the real estate industry can use to compare the built-in energy features of buildings and, by extension, inform Realtors®, lenders, and buyers of potential operating costs. This is an important step toward market valuation of building energy efficiency.

For example, homes with lower (better) ratings could qualify for an energy-efficient mortgage, in which expected utility savings translate to a higher loan amount. It would also create value propositions for homeowners to ensure compliance with codes. The

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185 "Behavioral and Market Transformation," *2018 IEPR Update,* pg. 72, https://ww2.energy.ca.gov/2018publications/CEC-100-2018-001/CEC-100-2018-001-V2-CMF.pdf.
186 Jones, Melissa, Michael Jaske, Michael Kenney, Brian Samuelson, Cynthia Rogers, Elena Giyenko, and Manjit Ahuja. 2017. *Senate Bill 350: Doubling Energy Efficiency Savings by 2030*. California Energy Commission. Publication Number: CEC-400-2017-010-CMF.
187 Public Resources Code Section 25942.

CEC has approved one California HERS provider to deliver HERS ratings, and collectively, completes about 100 ratings per year.

Nonresidential Building Energy Asset Ratings

The EBEE Action Plan recommended the CEC study the applicability of nonresidential asset scores to California. The CEC studied and identified the possible specifications for such a tool to work in California but did not proceed with implementation. In 2018, the CEC and a contractor reviewed the DOE commercial energy asset rating tool and compared it to draft specifications developed by the CEC. The assessment found that the DOE tool is applicable to California nonresidential buildings but would require modification.

Workforce Alignment and Development

The Workforce Education and Training (WE&T) Program represents a portfolio of education and training activities aimed at supporting the achievement of IOU energy savings targets, as well as the workforce objectives set forth in the California Long-Term Energy Efficiency Strategic Plan.[188]

The WE&T program has a similar overall structure across the IOUs and is organized into three subprograms:

> The **Centergies** subprogram receives most of the WE&T program funding and organizes training around technology categories and building type and focuses on promoting education and training in energy efficiency, and integrated demand-side management.
>
> The **Connections** subprogram focuses on forging collaborations with external education institutions to promote coordinated energy-related careers and training.
>
> The **Planning** subprogram develops the statewide framework for planning, coordinating, and implementing WE&T activities, stakeholder engagement meetings, and partnerships.

In D. 18-10-008, the CPUC ordered specific workforce standards be applied by all energy efficiency PA business plan portfolios for HVAC and lighting programs that meet certain criteria. These workforce requirements are intended as a starting point for requirements in the future, in coordination with the evaluation and the CEC adoption of a "responsible contractor policy" as set forth by SB 350.

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188 *California Long-Term Energy Efficiency Strategic Plan,* CPUC, https://www.cpuc.ca.gov/uploadedfiles/cpucwebsite/content/about_us/organization/divisions/office_of_governmental_affairs/legislation/2018/13-15%20energy%20efficiency%20report_final.pdf.

Specifically, the workforce standards are required to be included in the first round of third-party solicitations. All downstream or midstream HVAC energy efficiency measures with incentives of $3,000 or more installed, subsidized, or paid for out of ratepayer energy efficiency program portfolios are to be installed by Journeymen 2 with five or more years of experience or apprentices enrolled in or having completed a federal or California state apprenticeship program. All downstream and midstream advanced lighting control installation, modification, or maintenance measures with incentives of $2,000 or more installed, subsidized, or paid for under a program administrator's energy efficiency portfolio are to be installed by workers that have been certified by an acceptance test technician.

Other California Programs

The Employment Training Panel (ETP) was created in 1982 by the California Legislature and is funded by California employers through a special payroll tax. The ETP provides funding to employers to assist in upgrading the skills of their workers through training that leads to good-paying, long-term jobs. ETP concentrates its outreach to industries identified during the panel's strategic planning; one of those priorities is for ETP-funded training for job creation and economic revitalization throughout Green/Clean Technology. The benefits of the ETP warrant continued coordination with state agencies to further align workforce goals.

The Employment Development Department offers a variety of comprehensive services and programs, at no cost, designed to benefit all job seekers, including laid-off workers, youth, workers looking for better opportunities, veterans, and individuals with disabilities. The Employment Development Department provides individuals with job search and resume workshops, training, referrals, and more. It offers guidance on green/clean technology job requirements and available training and education programs.

Financing Opportunities

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 for alternative financing mechanisms that avoid the typical financing barriers that systematically disqualify prospective participants by applying criteria directly dependent on income, credit score, and owner/renter status.

Green Banks

Green banks are set up to secure low-cost capital for large clean energy projects. They can be set up by state or local governments. Active examples of green banks nationwide are Connecticut Green Bank, New York Green Bank, California Lending for Energy and Environmental Needs, Rhode Island Infrastructure Bank, Montgomery

County Green Bank, and Hawaii Green Energy Market Securitization. California Lending for Energy and Environmental Needs (CLEEN) is part of the California Infrastructure and Economic Development Bank.[189] CLEEN offers direct public financing to municipalities, universities, schools, and hospitals to reduce GHG emissions, conserve water, and save energy. It rolls money out through two programs: the Statewide Energy Efficiency Program and the LED Street Lighting Program. Financing is available as a direct loan or through publicly offered tax-exempt bonds. An applicant can apply for financing between $500,000 and $30 million. According to information published on the CLEEN web page, in the last few years, only a single jurisdiction has leveraged funding.[190] It is unclear what barriers are preventing more entities from using this financing tool.

Green Leases

A "green lease" is a tool available to tenants and landlords for capturing additional energy efficiency. It creates an agreement in which the tenants are receive incentives to participate in water and energy efficiency programs. Example terms for green leases are available online and can be implemented in several building sectors. They are more complicated to negotiate than a traditional lease but offer benefits such as higher occupant productivity and health, reduced energy bills, higher future rent and occupancy rates, and improved marketability.[191]

Increase Energy Efficiency Appraisals

Leading up to the 2015 EBEE Action Plan, 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 the 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.[192] The CEC recognizes the value of integrating energy efficiency into property appraisals and supports including energy efficiency attributes in real estate appraisals.

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189 California Lending for Energy and Environmental Needs, http://www.ibank.ca.gov/cleen-center/.
190 California Lending for Energy and Environmental Needs. Project History. http://www.ibank.ca.gov/wp-content/Documents/CLEEN/CLEENCenter2016-18ProjectProfiles1.23.18.pdf.
191 Green Leasing, Green Building Alliance, https://www.go-gba.org/resources/green-building-methods/green-leasing/.
192 Build It Green, 2016. "Statewide Realtor Survey." Discussion at Green Real Estate Working Group. Meeting Summary via email. September 15, 2016. Facilitator: StopWaste.org.

Additional Achievable Energy Efficiency and Senate Bill 350 Targets

Adjustments made to the demand forecast by efficiency efforts are termed AAEE. The beyond-ratepayer and ratepayer energy efficiency savings in this report are used to adjust the state's demand forecast. AAEE in the forecast has historically included new savings from utility programs and updated codes and standards. However, SB 350 identified a number of other sources of savings that reduce statewide demand, so beginning with the initial target setting process in 2017, the CEC has worked to improve estimations of the savings outside utility efforts and standards, so that they may also receive recognition in AAEE. These "beyond-ratepayer and standards" savings from sources discussed throughout this report are now included in the AAEE adjustments to the state's demand forecast. The estimates are adjusted due to the conservative nature of the demand forecast. Each program has a multiplier between zero and one applied based on the confidence the program can or has achieved its stated energy efficiency. Scenarios of savings are developed in the updated forecasting workbooks, which are also incorporated into the different iterations of the demand forecast and AAEE.

Attachments

1. Navigant Report- SB 350 Energy Efficiency Savings Methodology Update
2. SB 350 Master Savings Workbooks
3. SB 350 Program Workbooks

RESOLUTION NO: 19-1211-6

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION – RE ADOPTION OF THE 2019 CALIFORNIA ENERGY EFFICIENCY ACTION PLAN

WHEREAS, the State Energy Resources Conservation and Development Commission (Energy Commission) has been directed to develop a comprehensive program to achieve greater energy savings in California's existing buildings, in collaboration with the California Public Utilities Commission and stakeholders, under Assembly Bill No. 758 (Skinner, Statutes of 2009, Chapter 470) ("AB 758"); and

WHEREAS, AB 758, as codified in Public Resources Code sections 25943(a) and 25943(b), directs the program developed by the Energy Commission to "comprise a complementary portfolio of techniques, applications, and practices that will achieve greater energy efficiency in existing [buildings] that fall significantly below the [Commission's] current [building] standards," and "may include . . . a broad range of energy assessments, building benchmarking, energy rating, cost-effective energy efficiency improvements, public and private sector energy efficiency financing options, public outreach and education efforts, and green workforce training;" and

WHEREAS, the Energy Commission has been directed in Public Resources Code 25310(c) to further its efforts to scale energy efficiency by setting statewide energy savings targets to achieve a doubling of current energy efficiency efforts by 2030 in Senate Bill No. 350 (De León, Chapter 547, Statutes of 2015) ("SB 350"), and update them every two years thereafter; and

WHEREAS, SB 350, as codified in Public Resources Code, section 25943(f)(2), directs the Energy Commission to update the *Existing Buildings Energy Efficiency Action Plan* by January 1, 2017, and at least once every three years thereafter; and

WHEREAS, Energy Commission staff has developed the *2019 California Energy Efficiency Action Plan* to serve as the new *Existing Buildings Energy Efficiency Action Plan* and SB 350 energy efficiency savings targets tracking document; and

WHEREAS, the Energy Commission held 5 public workshops to develop the *2019 California Energy Efficiency Action Plan Staff Draft*, which took place on April 9, 2019; April 15, 2019; April 25, 2019; April 30, 2019; and May 1, 2019; and

WHEREAS, on August 20, 2019, the Energy Commission publicly noticed the *2019 California Energy Efficiency Action Plan Staff Draft* and provided the CPUC, local

publicly owned electric utilities, other stakeholders, and interested members of the public an opportunity to comment on the report; and

WHEREAS, on November 27, 2019, the Energy Commission publicly noticed the *2019 California Energy Efficiency Action Plan*, which fulfills the mandates in Public Resources Code Sections 25310(c) and 25943(f); and

WHEREAS*,* the Energy Commission has considered the application of the California Environmental Quality Act (CEQA) to the *2019 California Energy Efficiency Action Plan* and finds that this report is not subject to CEQA under CEQA Guidelines, Sections 15061, 15308, and 15378. The report is not a "project" subject to CEQA pursuant to CEQA Guidelines, Section 15378 (b)(2) and (5), in that it deals with general policy and procedural activities or organizational and administrative activities and does not involve any commitment to any specific project that may result in a potentially significant physical impact on the environment. The report also falls within the so-called "common sense" exemption pursuant to CEQA Guidelines, Section 15061(b)(3), which indicates that CEQA only applies to projects that have a "significant effect on the environment" as defined in Public Resources Code section 21068 and in CEQA Guidelines, Section 15382, as being a substantial, or potentially substantial, adverse change in the environment. Furthermore, the report is categorically exempt from CEQA as an action taken to protect the environment pursuant to CEQA Guidelines, Section 15308; and

WHEREAS, the Energy Commission has considered the *2019 California Energy Efficiency Action Plan*, all written comments submitted in this proceeding, and all oral comments made at the business meeting and the public workshops in this proceeding; and

THEREFORE BE IT RESOLVED, the Energy Commission hereby adopts the *2019 California Energy Efficiency Action Plan*.

CERTIFICATION

The undersigned Secretariat to the Commission does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the CEC held on December 11, 2019.

AYE:
NAY:
ABSENT:
ABSTAIN:

_____
Cody Goldthrite
Secretariat