Energy Efficiency Business Plan

October 18, 2016

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Introduction & Executive Summary

Document Organization

San Diego Gas & Electric's (SDG&E) business plan is organized into chapters, with each chapter corresponding to one of the sectors. Specifically, each sector chapter will:

- summarize SDG&E's mission and vision for the sector's energy efficiency efforts
- provide a market characterization of the specific sector, including size and types of customers, as well as highest consuming segments, end-uses, and measures
- identify key challenges, problem statements and barriers that sector customers face in planning, executing, and managing energy efficiency efforts
- define the overarching energy efficiency goals, strategies, tactics, and metrics for the sector

Key Business Plan Elements

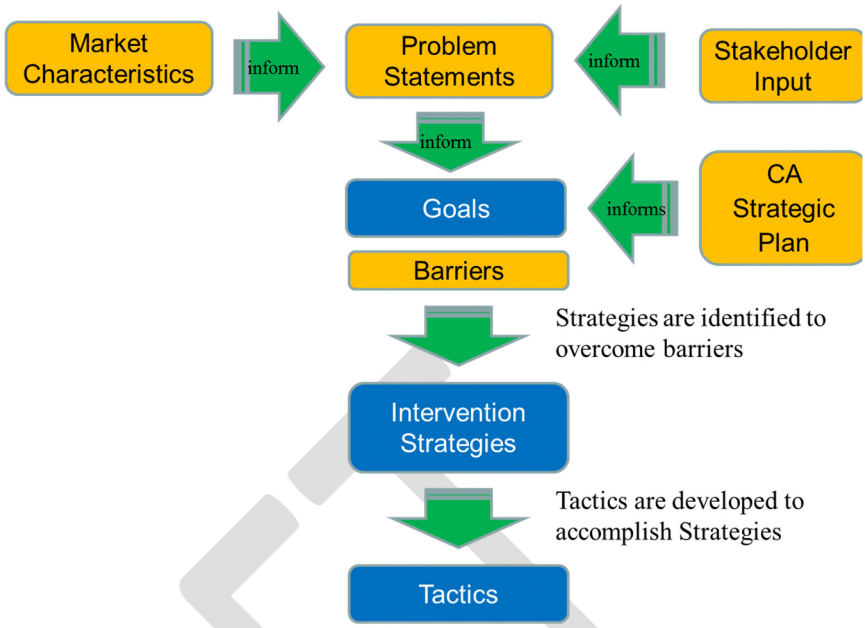
Goals – Sector level objectives based on the market analysis and stakeholder input

Strategies – Approaches to overcome the barriers that are currently preventing the attainment of goals

Tactics – Specific activities to accomplish strategies

Based on the guidance provided in the Decision (D.15-10-028), as well as the consensus reached amongst the PAs, each chapter will describe the degree of statewide coordination to be performed. In the case of areas that are not to be administered by SDG&E, the plan will provide the consensus language provided by the statewide administrator. In all cases, program administration details will be deferred to the individual implementation plans. Finally, each chapter will conclude with a discussion of the Evaluation, Measurement, and Verification (EM&V) considerations for the specific sector energy efficiency efforts. Upon final delivery of the plan, SDG&E will include a document that describes the incorporation of stakeholder input through the California Energy Efficiency Coordinating Committee (CAEECC) process.

SDG&E's Business Plan Framework



SDG&E's business plan uses market and utility data, as well as qualitative input from stakeholders, provided through the CAEECC process, to identify problems. Based on these problems and key elements of the California EE Strategic Plan (CEESP), SDG&E has developed a set of overarching goals for each sector. Next, SDG&E identified specific barriers to reaching the goals. For each barrier, SDG&E has developed intervention strategies (also referred to simply as strategies) to overcome the barriers and reach the goal. In some cases, strategies may address more than one barrier and impact more than one goal. To further elaborate on the strategies, SDG&E has provided a description of specific implementation methods or tactics. The structure of the business plan is summarized in Figure Exec-1 above.

Fig Exe-1: SDG&E Business Plan Framework

This business plan focuses on strategies s
sustained for the long-term but may also be modified as their effectiveness is determined. This business plan will also include a description of metrics, which will be used to measure the longer term advance towards meeting the business plan goals.

Figure Exec-2 depicts the relationships between the goals, strategies, and tactics:

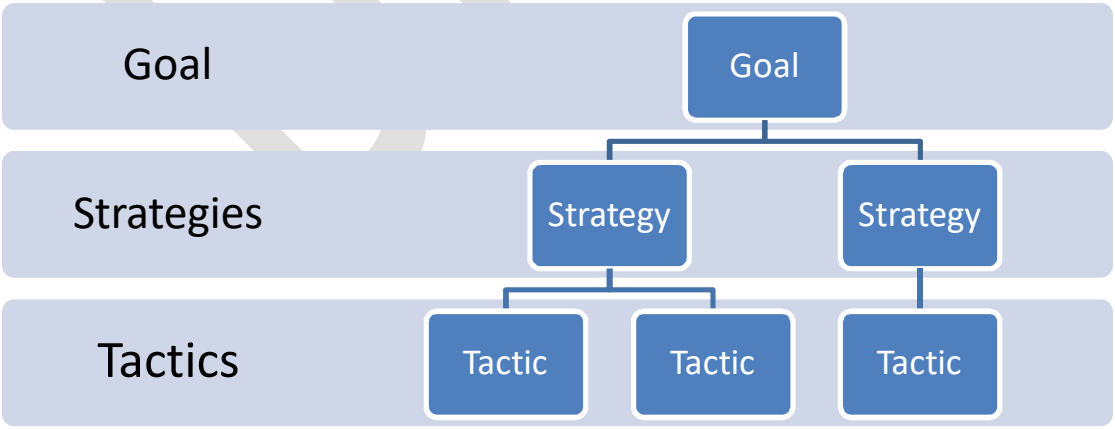


Figure Exec-2: Goal, Strategy, Tactic Structure

Executive Summary

This executive summary will provide an overview of SDG&E's service territory and its EE portfolio results and potential. Additionally, this section will describe what approaches have been successful in the past and what intervention strategies SDG&E will be exploring in the future. Finally, this business plan will summarize the market, regulatory and legislative analysis that informed the design of SDG&E's business plan.

SDG&E provides energy service to 3.6 million people through 1.4 million electric meters and 873,000 natural gas meters in San Diego and southern Orange counties. SDG&E's service area spans 4,100 square miles

State of California

Energy Action Plan II

2005

"… cost effective energy efficiency is the resource of first choice for meeting California's energy needs. Energy efficiency is the least cost, most reliable, and most environmentally-sensitive resource, and minimizes our contribution to climate change. California's energy efficiency programs are the most successful in the nation and we want to continue to build upon those successes."

State of California

Energy Action Plan

2008 Update

"Meeting our AB 32 goals will require, under any scenario, unprecedented levels of energy efficiency investment. This necessitates a more rigorous examination of our energy efficiency options and the setting of more aggressive energy efficiency goals."

The California Long-Term Energy Efficiency Strategic Plan's Vision

"The goal is for California's energy to be adequate, affordable, technologically advanced, and environmentally-sound. Cost

San Diego is a city of homes and small businesses spread over mostly three climate zones (7, 10, and 14). Over 80% of the consumption in SDG&E territory comes from the Residential and Commercial sectors.

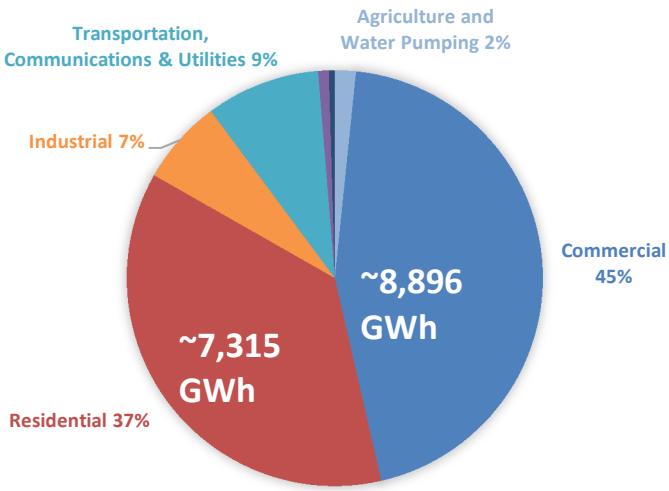
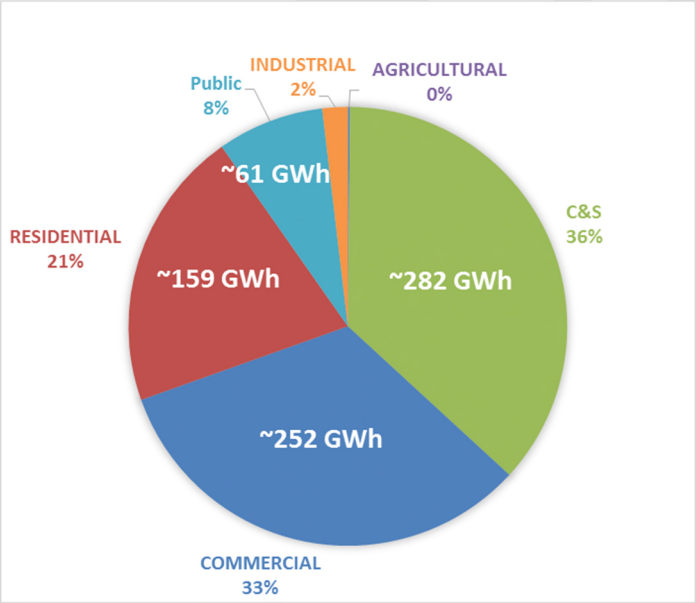


Figure Exec-3: 2013-2015 Average Annual SDG&E Consumption by Sector (GWh) [1]



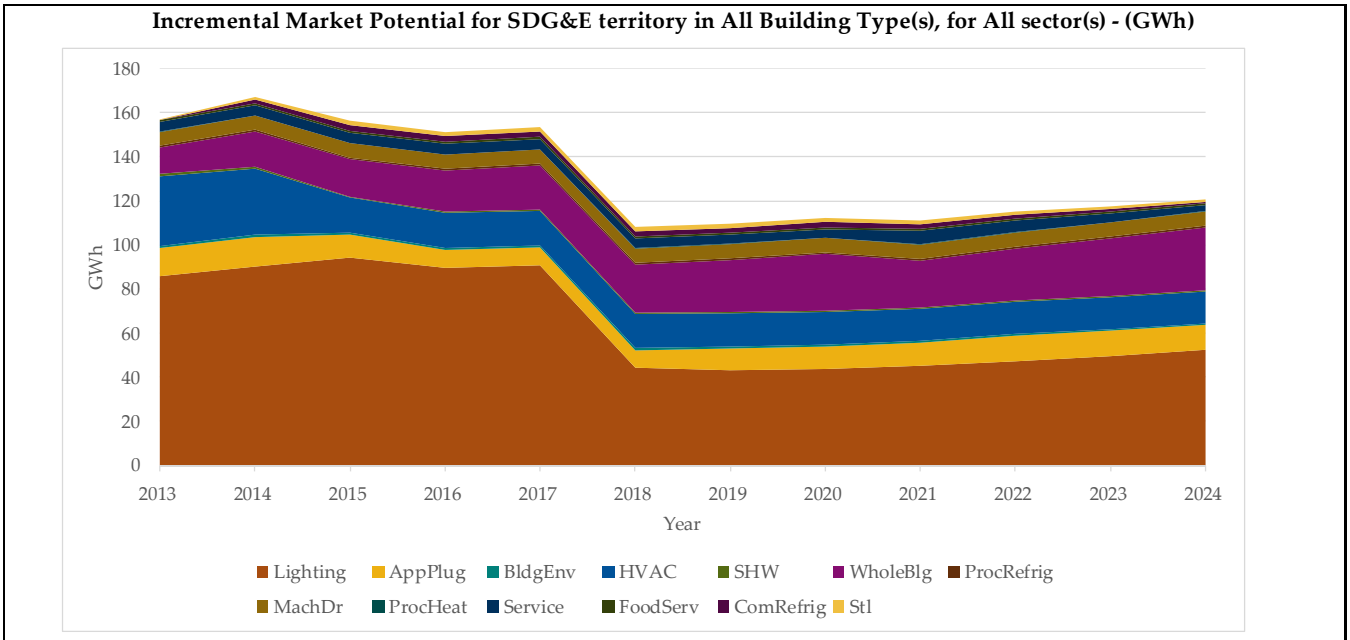
FFigure Exec-4: 2013-2015 SDG&E Portfolio kWh Savings by Sector[2]

As seen in Figure Exec -4, most of SDG&E electric energy saving came from three areas: the commercial and residential sectors, and codes & standards.

[1] Energy Consumption Data Management System, California Energy Commission, http://ecdms.energy.ca.gov/gasbyplan.aspx
[2] SDG&E 2013-2015 Monthly Energy Efficiency Program Report, December 2015 - Table 1.6

Because of the large residential and commercial sectors most of San Diego's natural gas consumption is from domestic water heating and space heating. As such, natural gas energy savings opportunities are limited as opposed to other areas across the state with a more diverse mix of sectors.

Going forward most of SDG&E's energy savings potential will come from lighting, whole building, HVAC and plug load as shown in Navigant's GWh saving potential chart, Figure Exec-5.



Note: Graphs exclude behavior programs, impacts of financing, and IOU C&S advocacy programs.

Figure Exec-5: Market Savings Potential by End-Use

SDG&E prior approach has been successful with:

- Achieving portfolio savings goals
- Installing single end-use projects
- Leveraging trade professionals to bring in HVAC & Lighting
- Developing new potential through behavioral programs
- Financing for small businesses

In the future SDG&E will explore the following:

- Leverage Third Party expertise to find untapped savings
- Leverage data to empower customers and provide customized solutions and assistance
- Expand behavioral programs
- Expand from focus on single end use to more comprehensive and integrated projects and solutions
- Make it easier for customers to get started by creating a simple and streamlined process
- Provide a clear and easy path for customers to continue EE adoption to become ZNE ready
- Expand offerings that make saving energy easier for customers (automation, controls, energy management systems)

- Expand Financing programs to meet all sector needs by helping customers shift funds from capital expenses to O&M expenses
- Educate customer on the value proposition for energy efficiency and ensuring it is properly installed and maintained
- Test new strategies and approaches to generate savings (e.g. RFO, pay for performance, new stakeholders)

In addition to the market analysis summarized above, there are important regulatory, legislative and stakeholder considerations that SDG&E factored into this plan. The table shown in Figure Exec-6 provides an overview of key legislative bills that impact energy efficiency and outlines which sectors incorporate them.

Legislation	Sector								
	Res	Com	Ind	Ag	Pub	ET	WET	Fin	C&S
SB 350 • Requires doubling EE by 2030 • CEC adopt responsible contractor policy • Workforce development and job training in disadvantaged communities	✓	✓	✓	✓	✓	✓	✓	✓	✓
AB 628 • Authorizes ports to create energy management plans with utilities			✓		✓				
AB 758 • Existing Buildings Energy Efficiency Action Plan	✓	✓	✓		✓		✓	✓	✓
AB 793 • Utilities provide incentives/educate residential and small commercial customers re: energy management technology	✓	✓				✓	✓		
AB 802 • Sets requirements for building benchmarking • Authorizes utilities to provide incentives for savings based on current energy usage	✓	✓	✓	✓	✓	✓	✓		✓

Figure Exec-6: Sectors Addressing Legislative Action

It is worth noting that SDG&E also reviewed and incorporated findings and recommendations from various CPUC documents including the CALTEESP, various Action Plans, Process Evaluations and guidance documents.

Finally, SDG&E received additional guidance from stakeholders via the CAEECC process. A detailed summary of their feedback and how we addressed it is included in the appendices of this plan.

Sourcing Strategy

One consistent theme presented by stakeholders is for the Program Administrators to look to third parties to bring innovation, expertise and cost efficiencies to the portfolio. As a result SDG&E has created an outsourcing strategy that both responds to this stakeholder input as well as the latest CPUC direction. SDG&E will begin actively seeking new energy efficiency programs in 2017 with a ramp up of solicitations over years 2018 and 2019 to achieve at least the 60% threshold of Third Party Programs by 2020, as required in D.16-08-019. Figure Exec-7 shows this plan and is based on assumptions of a Q3 start upon approval of business plans. Solicitations by sector and percentages are to be determined, but are outlined here to illustrate the proposed cadence and timeline.

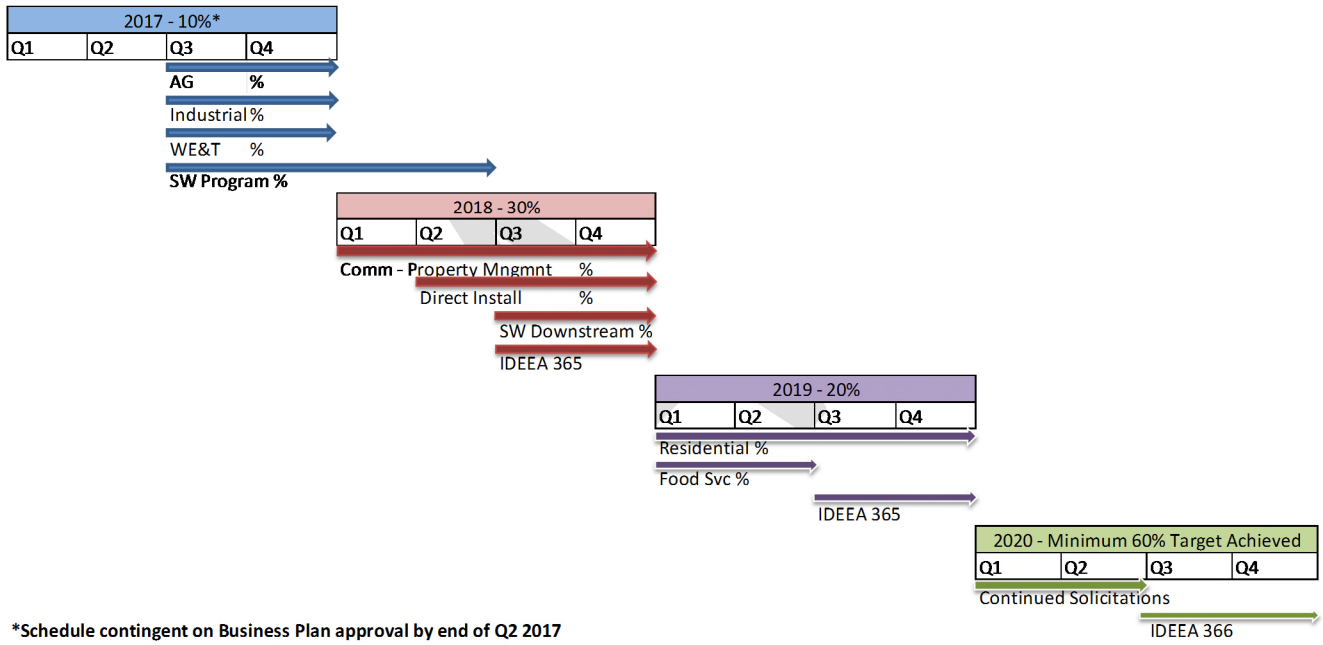


Figure Exec-7: Third-Party Sourcing Timeline

In addition to meeting the 60% threshold, the objective of the solicitations will be to seek new programs in the Commercial, Industrial, Agricultural, Residential and Public sectors which are proposed, designed, implemented and delivered by non-utility personnel under contract to SDG&E. These sourcing opportunities for programs will add qualified implementers and service providers to streamline program delivery services and reduce program delivery costs. SDG&E will also continue to look for innovation and new technologies through the IDEEA 365 selection process.

SDG&E will continue to utilize "best value" practices to ensure competitive pricing through contract negotiations that require the delivery of cost efficient programs which meet energy savings targets and the aggressive goals set for the PA's and the state in the coming years.

Residential Sector

Chapter Summary

As one of the most recognized brands in San Diego and with a reputation for reliability and service, SDG&E serves its single family and multifamily residential customers as a trusted energy advisor to continue to achieve California's significant energy reduction goals. The residential sector is SDG&E's second largest customer group after the commercial sector. Residential customers consume over a third of all electricity in San Diego County and thus are a critical component in SDG&E's plans to meet Senate Bill 350's objective of doubling energy efficiency savings.

The California Energy Efficiency Strategic Plan's Vision for the Residential Sector
"Residential energy use will be transformed to ultra-high levels of energy efficiency resulting in Zero Net Energy new buildings by 2020. All cost-effective potential for energy efficiency, demand response and clean energy production will be routinely realized for all dwellings on a fully integrated, site-specific basis."

Traditionally, financial constraints are the largest reasons customers cite for not being able to take action.3 While SDG&E offered a large number of rebates and services to its customers, there was not a clear path for the customers to advance towards zero net energy (ZNE). Analysis and stakeholder feedback supports simplifying participation, creating awareness and encouraging engagement. As a result, SDG&E intends for program offerings to be more widely adopted by customers while elevating and simplifying the customer experience. This business plan describes SDG&E's further plans to encourage customers to continue on the path towards ZNE, as well as provide dynamic solutions as customers transition to time-of-use (TOU) rates. This chapter will discuss residential energy trends and describe how SDG&E will expand behavior programs and provide customers with enhanced online self-service capability.

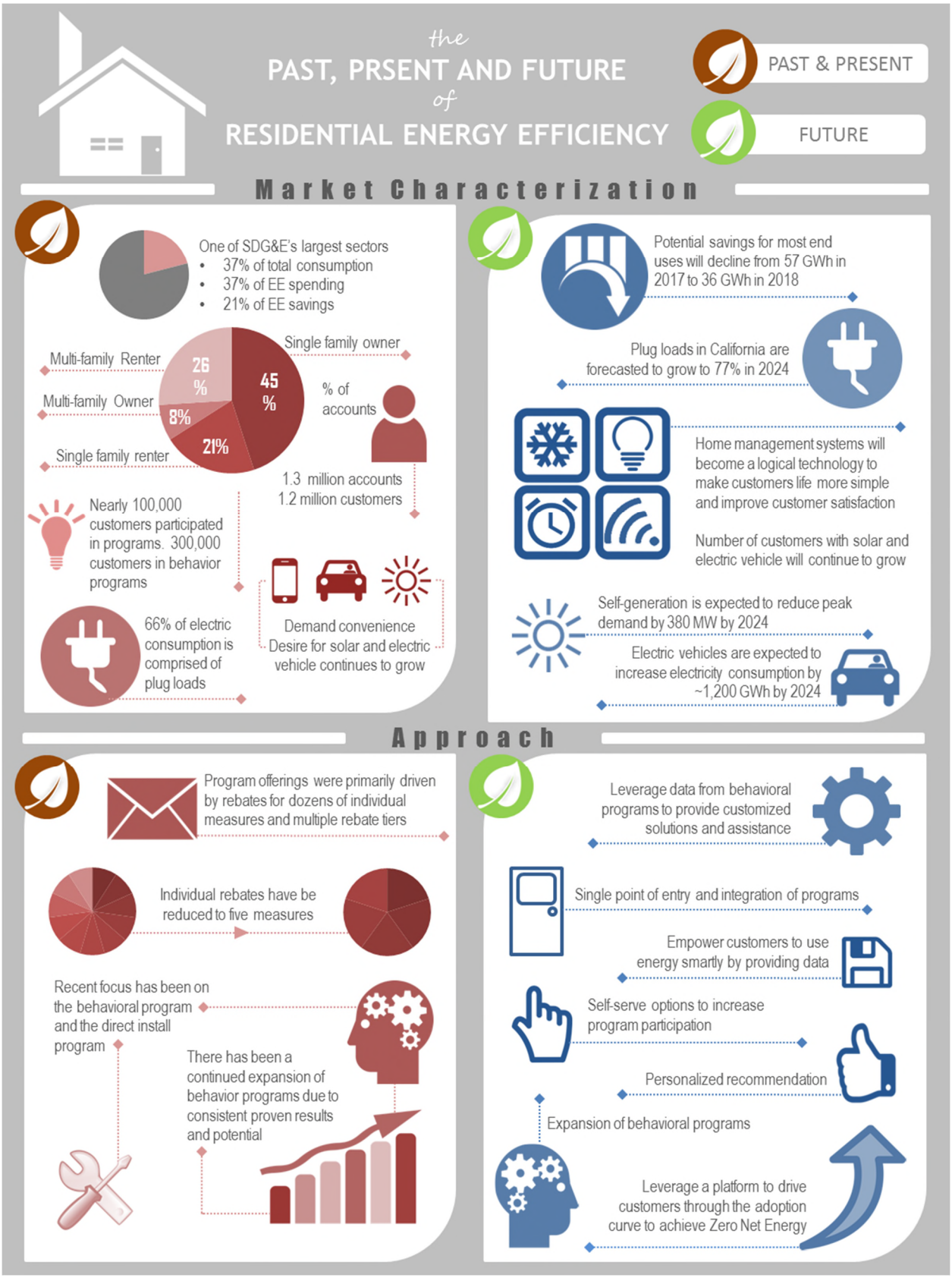
Consistent with the CEESP, SDG&E's vision for the residential sector is to create the foundation for an innovative, integrated, and sustainable energy future for our customers. SDG&E's mission for the residential sector is to empower customers by providing the tools, program offerings, and access to assistance needed on their path to ZNE. To accomplish this mission, SDG&E has established the following residential sector goals:

- Residential Goal 1: Increase energy efficiency savings in the residential sector by X% through improved customer experience by providing engaging self-service tools and data driven insights.
- Residential Goal 2: Increase energy efficiency participation in the multifamily sector by X% through an approach targeting both tenants and property owners.
- Residential Goal 3: Continue to innovate by executing X new approaches to the market.

In addition to the goals above, this plan identifies strategies that will help customers move to the next level of energy efficiency implementation. SDG&E has developed these strategies and tactics to

[3] Whole House Retrofit Impact Evaluation - Evaluation of Energy Upgrade California Programs (CPU0093.01) Published September 9, 2014

complement the existing offerings and move customers towards a more comprehensive and sustained approach to energy efficiency implementation.


the
PAST, PRSENT AND FUTURE
of
RESIDENTIAL ENERGY EFFICIENCY
PAST & PRESENT
FUTURE
Market Characterization
One of SDG&E's largest sectors
• 37% of total consumption
• 37% of EE spending
• 21% of EE savings
Single family owner
Multi-family Renter
Multi-family Owner
Single family renter
26 %
45 %
8%
21%
% of accounts
1.3 million accounts
1.2 million customers
Nearly 100,000 customers participated in programs. 300,000 customers in behavior programs
66% of electric consumption is comprised of plug loads
Demand convenience
Desire for solar and electric vehicle continues to grow
Potential savings for most end uses will decline from 57 GWh in 2017 to 36 GWh in 2018
Plug loads in California are forecasted to grow to 77% in 2024
Home management systems will become a logical technology to make customers life more simple and improve customer satisfaction
Number of customers with solar and electric vehicle will continue to grow
Self-generation is expected to reduce peak demand by 380 MW by 2024
Electric vehicles are expected to increase electricity consumption by ~1,200 GWh by 2024
Approach
Program offerings were primarily driven by rebates for dozens of individual measures and multiple rebate tiers
Individual rebates have be reduced to five measures
Recent focus has been on the behavioral program and the direct install program
There has been a continued expansion of behavior programs due to consistent proven results and potential
Leverage data from behavioral programs to provide customized solutions and assistance
Single point of entry and integration of programs
Empower customers to use energy smartly by providing data
Self-serve options to increase program participation
Personalized recommendation
Expansion of behavioral programs
Leverage a platform to drive customers through the adoption curve to achieve Zero Net Energy

Approach to Achieve Residential Sector Goals

Our customers increasingly value energy cost savings, conservation, and home improvements that are simple and easy to understand[4]. Much of the approach that will be discussed in greater detail is geared towards reaching the objectives of the Residential Zero Net Energy Action Plan. [5] The primary focus for SDG&E's residential sector is to develop a common pathway that meets customers where they are on their journey to achieving their energy goals and encourages them towards ZNE – providing a more seamless customer experience. The customer journey will include participation in behavioral programs that will leverage data to provide customized solutions and assistance.

With this Business Plan, SDG&E seeks to:

- Facilitate, sustain, and transform the long-term delivery and adoption of energy-efficient products and services for single and multi-family dwellings;
- Cultivate, promote and sustain lasting energy efficient behavioral changes by residential customers; and
- Meet customers' energy efficiency adoption preferences through offerings that range from single-measure incentives to more comprehensive approaches.

SDG&E's market analysis and stakeholders have identified a number of consistent barriers for this sector. SDG&E has analyzed these barriers and considered the direction set by the California Energy Efficiency Long-Term Strategic Plan to determine the goals needed in order to establish a unified, achievable framework that will yield concrete results in support of the mission and vision of the residential sector. These barriers are discussed in the tables below and explored further in the market characterization and segmentation section.

In summary, the barriers for this sector can be characterized by these statements:

- Efficient products are more expensive and offer a low return on investment (ROI), which leads to a low adoption rate of high efficiency products. Customer feedback shows that cost savings is the largest driver for customers to invest in new products. [6] Educating customers on the economic value associated with investing in energy efficient products will be a key component to increased customer participation.
- Customers are confused by the number of programs and entry points, which may be a cause of low overall customer participation[7]. Moving forward, creating a common pathway and integration of programs will become a key component for SDG&E.
- The ever increasing efficiency levels required by codes and standards lead to a smaller pool of cost effective measures. It is important to explore other opportunities through the ideation process and behavior program.
- Solar and electric vehicle (EV) adoption is increasing which leads to less predictable energy usage characteristics. There will be a need for better segmentation to leverage and personalize the recommendations for this diverse customer base.

Each of these has influenced the goals and strategies selected for this business plan and may impact tactics used in the future.

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[4] Source: Residential Direct Install Focus Groups, June 2015
[5] New Residential Zero Net Energy Action Plan 2015-2020, June 2015
[6] SDG&E Residential Direct Install Focus Groups, June 2015
[7] Process Evaluation of the SDG&E 2006- 08 Residential Customer Programs, ECONorthwest, Feb 15, 2008

Figure Res–2: Residential Market Characteristics and Problems Overcome by Goals

Problem	Goal	Targeted by Strategies supporting Goals		
		Customer Size	Market Segments	End-Uses
Energy efficiency typically competes with other priorities	Increase energy efficiency savings in the residential sector by X% through improved customer experience by providing engaging self-service tools and data driven insights.	All	All	Lighting, Plug Loads, Building Envelope, HVAC, Hot Water, Whole Building
EE is not a top focus for many customers				
Many energy efficient products have a high cost and low ROI				
Facility operators understand and can identify the energy efficiency upgrades needed, but do not have the authority to make the decisions	Increase energy efficiency participation in the multifamily sector by X% through an approach targeting both tenants and property owners.	All	Multifamily owners and renters	Lighting, Plug Loads, Building Envelope, HVAC, Hot Water, Whole Building
Multiple decision makers (property owner, property manager, tenant) make it difficult for a comprehensive uptake in program participation in multifamily properties				
Split-incentive continues to be challenging (tenants pay for utilities, property owners receive less benefits from energy-efficiency improvements)				
Energy efficiency is often not a priority for property owners/managers				
Lending laws and current program requirements related				

Problem	Goal	Targeted by Strategies supporting Goals		
		Customer Size	Market Segments	End-Uses
to On Bill Financing may not be ideal for multifamily retrofit opportunities				
The energy efficiency industry has the potential to see significant change in the next decade	Continue to innovate by executing X new approaches to the market	All	All	Lighting, Plug Loads, Building Envelope, HVAC, Hot Water, Whole Building

In order to establish a unified, achievable framework that will yield concrete results in support of the mission and vision of the residential sector, it is critical to define specific steps that SDG&E and its customers must take to best position themselves to achieve their goals. This section outlines the four overarching goals that set the direction for SDG&E's residential sector, as well as the key strategies and tactics that support those goals. SDG&E's residential sector goals are:

- Residential Goal 1: Increase energy efficiency savings in the residential sector by X% through improved customer experience by providing engaging self-service tools and data driven insights.
- Residential Goal 2: Increase energy efficiency participation in the multifamily sector by X% through an approach targeting both tenants and property owners.
- Residential Goal 3: Continue to innovate by executing X new approaches to the market.

These goals and the existing core program components will be used to reach savings goals based upon approved budgets. The following tables outline the proposed energy efficiency goals and budget for SDG&E's residential sector.

Figure Res - 3: Residential Sector Annualized Savings Goals

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
GWh	TBD	TBD	TBD
MW	TBD	TBD	TBD
MMTherms	TBD	TBD	TBD

Figure Res - 4: Residential Sector Annualized Budget

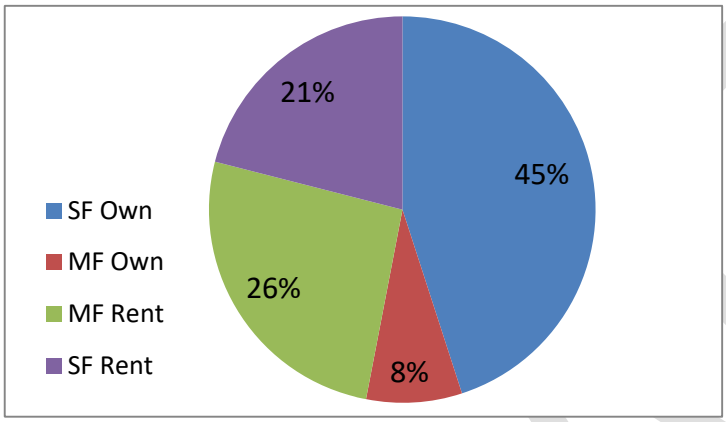
	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
Annual Budget	TBD	TBD	TBD

It is important to recognize that SDG&E developed the goals, strategies, and tactics described in this business plan to complement, and not replace, the current offerings.

Residential Market Characterization and Segmentation

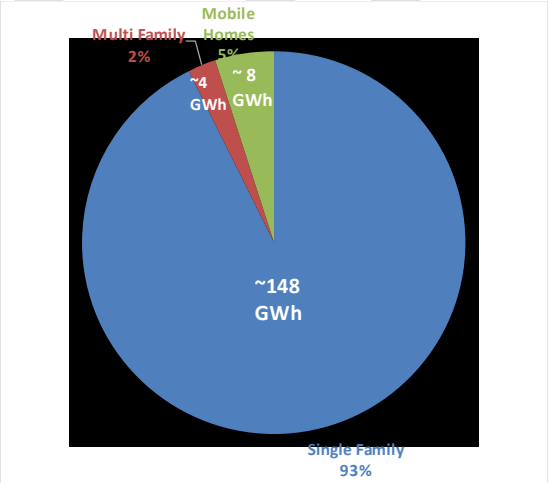
Utilizing customer data, SDG&E has categorized its residential accounts by number of units and ownership status, which yields four customer segments: single family owners, single family renters, multifamily owners, and multifamily renters. Figure Res-5 shows that the majority of SDG&E's residential customers are single family owners (45%), and the next largest group consists of multifamily renters (26%).

Figure Res-5: SDG&E Residential Customer Home Ownership[8]



From Figure 6 below, it is clear that single family owner segment consumes the most energy, has the most accounts and has the highest per capita consumption. This figure also shows that single family renters use disproportionately more gas and electricity than multifamily renters.

Figure Res - 6: 2013-2015 Usage by Customer Segment[9]



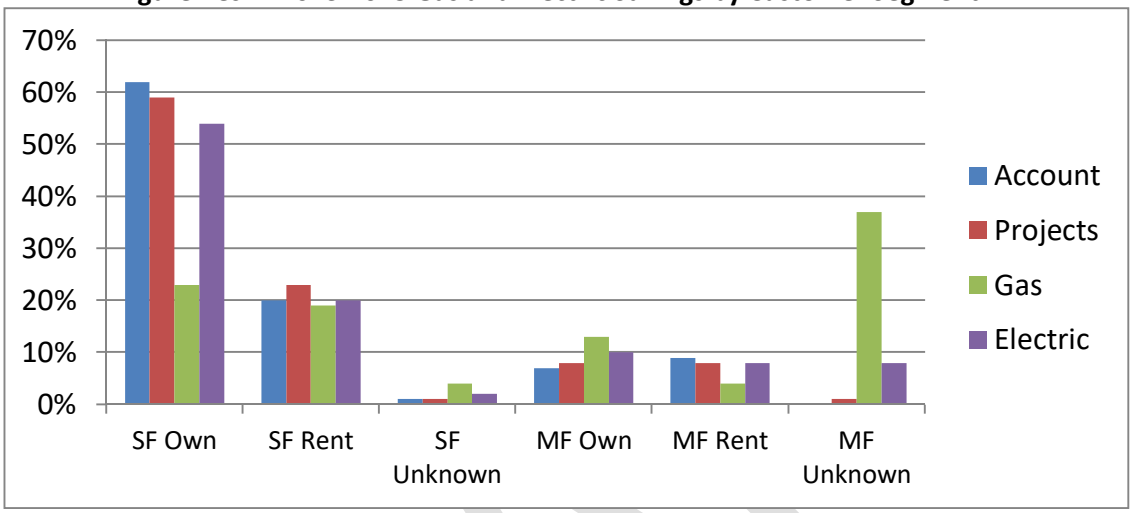
Residential Sector Quick Facts

- SDG&E's residential sector consists of 1.3M accounts and 1.2M customers.
- SDG&E customers (accounts) have been with SDG&E for an average of nine years.
- From 2013-2015, over 395,000 (~30%) participated in our energy efficiency programs. This includes customers who were auto-enrolled in our Behavior program by the end of 2015.
- Over 96,000 (7%) of SDG&E residential customers are on rates which are net energy metered, and over 8,000 (0.5%) are on an electric vehicle rate.

[8] Source: SDG&E data
[9] Source: SDG&E Data

Figure Res-7 shows that single family owners have completed the most projects followed by single family renters. The multifamily sector (owners and renters) accounts for a combined 17% of completed EE projects, note this does not include participation through our Energy Savings Assistance program. Ownership classification for the California Advanced Home Program projects are unknown due to a lag between the project completion and occupancy and is therefore represented as "unknown".

Figure Res-7: 2013-2015 Gas and Electric Savings by Customer Segment[10][11]



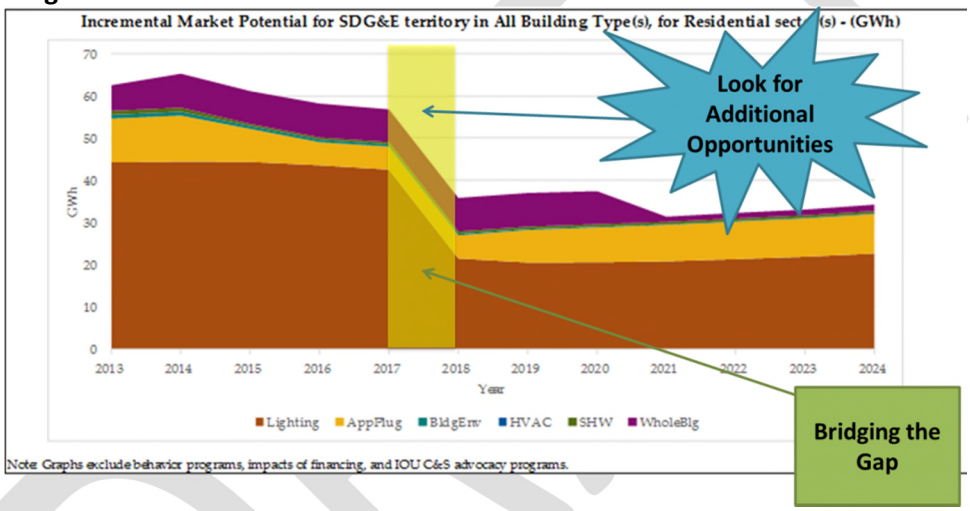
[10] Source: SDG&E program data for 2013-2015

[11] Note: SF and MF Unknown are customers that we do not have record if they own or rent. Much of the MF unknown came from the California Advanced Home Program (New Construction).

Energy Efficiency Potential

The 2015 Navigant potential study predicts that the new building codes for residential buildings taking effect in 2017 will reduce end-use from approximately 57 GWh in 2017 to less than 36 GWh by 2018[12], which does not include any potential from behavioral programs. Changes to code that will take effect for new construction will have significant impacts; in fact, studies suggest that "single family homes built to the 2016 standards will use about 28 percent less energy for lighting, heating, cooling, ventilation, and water heating than those built to the 2013 standards." [13] Although significant potential will be lost to these code changes, new opportunities such as behavioral programs can augment future savings up of 35 GWh annually[14].

Figure Res - 9: SDG&E Residential Sector Incremental Market Potential 2013-2024[15]



Future Trends

There are both upward and downward pressures expected to impact energy usage in the residential sector in the future. Overall, the sector will experience an increase in consumption and a decrease in savings potential due to the market transformational effects of code changes and appliance standards. Certain areas, such as plug loads and electric vehicles, will continue to show growth. [16] Therefore, it will be increasingly important to expand upon the behavioral program and promote innovative technologies in order to help customers become aware of this growing trend and manage it effectively. Currently California's residential electric energy consumption from plug loads is 66% and is forecasted to grow to 77% by 2024. [17]

[12] Source: 2015 Navigant Market Potential Study
[13] Source: 2016_Building_Energy_Efficiency_standards_FAQ.pdf
[14] Source: 2015 Navigant Market Potential Study
[15] Source: 2015 Navigant Market Potential Study
[16] : Plug-In Equipment Efficiency: A Key Strategy to Help Achieve California's Carbon Reduction and Clean Energy Goals; NRDC Issue Brief and 2015 IEPR Electric and Natural Gas Demand Forecast, mid demand case.
[17] Source: Plug-In Equipment Efficiency: A Key Strategy to Help Achieve California's Carbon Reduction and Clean Energy Goals; NRDC Issue Brief

Legislative Impacts on Strategy

SDG&E is committed to the strategic implementation of legislative mandates. The following table summarizes SDG&E residential sector efforts to comply with legislative mandates.

Figure Res – 10: Legislative Impacts on Strategy

RESIDENTIAL		
Policy Driver	**Specific Requirement / Guidance**	**Business Plan Response**
SB 350 - Clean Energy and Pollution Reduction Act of 2015	* Achieve a cumulative doubling of savings in electricity and gas retail customers final end uses by 1/1/30.	* Dramatically increase savings through an improved customer experience by providing engaging self-service tools and data driven insights. * Develop a single sign-on self-service portal to support customers on their path to ZNE. * Improve customer real-time access to energy use and utilize behavioral interventions to stimulate energy efficiency activities.
AB 793 - Energy Management Technology Incentive Offering	Must develop programs that provide incentives to help residential and small/medium business customers acquire energy management technology and educate them about these programs.	* Online platform will provide customers improved opportunities to access program offerings and control their energy use by utilizing AMI data.
AB758 - Existing Buildings Energy Efficiency Action Plan	Strategy 4.1.2 - Develop and compile information on building life-cycle and/or building occupant tenure cost reductions for energy and water efficiency measures. Strategy 3.4.2 - Identify building/business types well-suited for ZNE retrofits but where current ZNE guidance is scarce.	* Increase engagement in the real estate market. * Promote increased value of buildings generated by energy efficiency and ZNE to property owners and tenants
AB 802 - Benchmarking and Changes to Energy Efficiency Baselines	**Benchmarking** - By 1/1/17, for multi-unit buildings, utilities must provide aggregated energy usage data to its owner, its agent or the building operator. Commission will set requirements for public disclosure of information for benchmarking purposes. **Baselines** - Authorizes utilities to provide incentives to customers for energy efficiency projects based on normalized metered energy	* Develop pilots and trials to explore alternative incentive structure based on benchmarking of portfolios of properties - create energy use index. * Will introduce opportunities to enable contractors and third parties to achieve deeper savings through pay for performance models.

RESIDENTIAL		
Policy Driver	**Specific Requirement / Guidance**	**Business Plan Response**
	consumption as a measure of energy savings.	

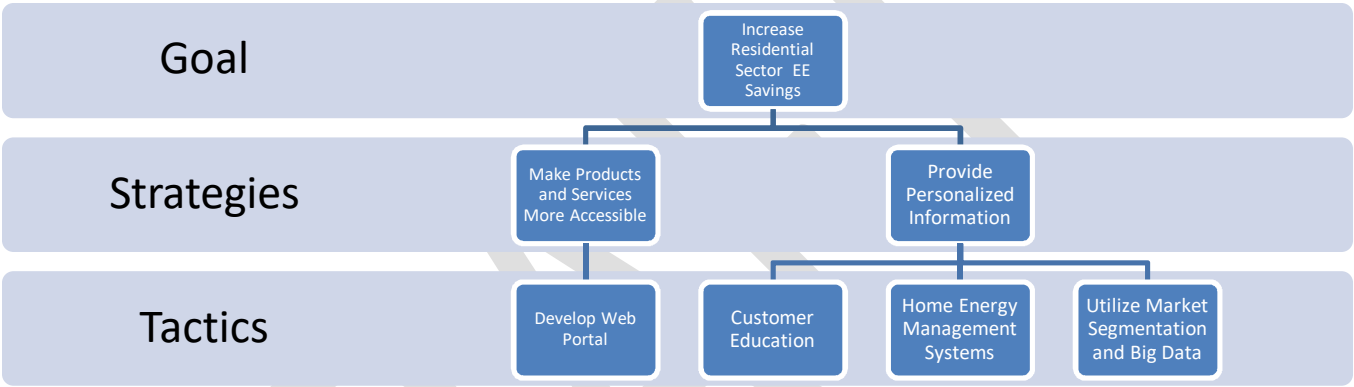
Overview of Current Offerings

To date, the California IOUs have employed a number of different residential energy efficiency programs that are in various stages of maturity and availability across the state. The IOUs are working to integrate all of these programs to coordinate efforts and increase comprehensiveness of measure delivery when feasible. The table below details SDG&E's residential offerings and highlights how existing, modified and new offerings support the goals.

Figure Res-11: Overview of Current and New Offerings

Goal	Strategy	Tactic	New, Existing, Modified	Short, Mid, Long-Term
Increase energy efficiency savings in the residential sector by X% through improved customer experience by providing engaging self-service tools and data driven insights.	Make Energy Efficiency Products and Services More Accessible	Develop a web portal		
	Provide personalized information.	Customer Education		
		Home Energy Management Systems		
		Utilize market segmentation and big data		
Increase MF participation in EE	Promote Asset Value	Alternative incentives		
		Educate owners		
	Benchmark Properties	Promote in ads		
Execute New Approaches	Identify and Utilize Stakeholders	Educate and incentivize contractors		

Goal	Strategy	Tactic	New, Existing, Modified	Short, Mid, Long-Term
		Offer Direct Install services		
		Connect customers with Financing		
		Engage realtors to promote EE		



Goal 1: Increase energy efficiency savings in the residential sector by X% through improved customer experience by providing engaging self-service tools and data driven insights.

As mentioned in the market characterization section, the residential sector makes up:

- 1.3M accounts in the SDG&E service territory,
- 37% of the portfolio's consumption, and
- 21% of the savings[18].

Therefore it is important to address some of the trends that affect this sector's growing consumption, and also address why there may be a low uptake in some of the programs developed to help customers save energy. Energy efficiency typically competes with other priorities and is not a top focus for many customers. Many energy efficient products have a high cost and low ROI; therefore, it is incumbent upon SDG&E to elevate awareness, engagement and participation through an enhanced customer experience.

Strategy: Make Energy Efficiency Products and Services More Accessible

Sample Tactics:
In support of the Residential Zero Net Energy Action Plan, SDG&E intends to develop a common pathway to support customers on their journey to ZNE. This web portal may include a variety of features such as:

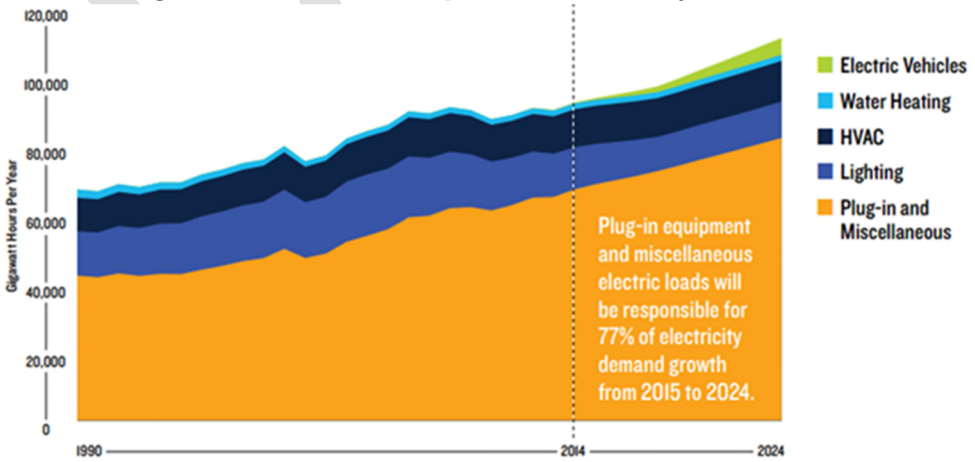
[18] EESTATs December 2015 monthly report, includes residential

- Online chat function to engage customers and respond to inquiries
- Ability to track energy efficiency progress towards ZNE by logging all measures installed or projects completed
- Customized and targeted offers that span
    - Audits (including demand response, water conservation and renewables)
    - Behavioral actions
    - Education and training
    - Rates
    - Marketplace products and services
    - Financing
- Integration with SDG&E's MY Account, behavioral programs and Marketplace.
- Prequalification for financing.
- Integration with SDG&E's MY Account, behavioral programs and Marketplace.

SDG&E also may include the following features:

- **Online resources to further adoption of electric vehicles.** SDG&E will continue "Power Your Drive", a program by which SDG&E is committed to installing electric charging stations throughout the service territory in order to encourage green transportation. Part of SDG&E's efforts to encourage customer adoption of EVs may be to partner and provide listings on the online solution that is discussed above.
- **Resources to select qualified trade professionals.** Resources will be provided to customers so that they can make informed decisions before selecting qualified trade professionals to assist with installation.
- **Connection to online solution where customers can purchase energy efficient products.** Providing customers with an online solution to purchase energy efficient appliances and home improvements is another method to help simplify the decision-making process for customers. The first step in the process will require enhancing the current online solution in order to integrate it with rebate offerings. Currently 66% of residential electric energy consumption in California is comprised of plug loads and plug load consumption is forecasted to grow to 77% by 2024.

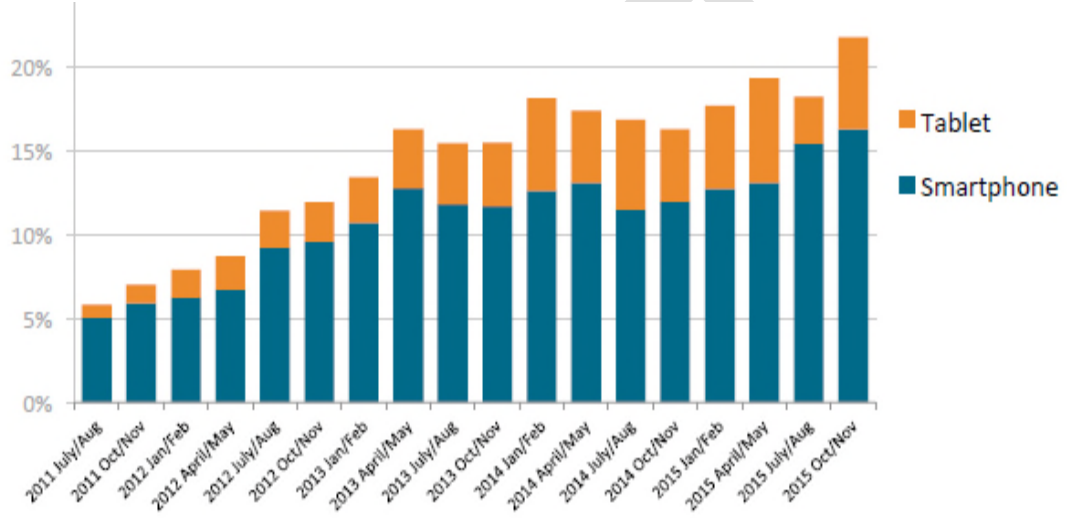
Figure Res-X: California Residential Electricity Growth Forecast[19]



[19] Source: Plug-In Equipment Efficiency: A Key Strategy to Help Achieve California's Carbon Reduction and Clean Energy Goals; NRDC Issue Brief

- **Integration of online solutions with rebates to simplify the purchase of energy efficient products and services.**
- **Access platform through mobile channels.** Data shows that customers' attention is quite high for messages delivered on a mobile platform. Therefore it is important to think about ways to utilize that engagement by optimizing programs and offerings for mobile browsing or through the SDG&E app. With the market moving towards mobile applications, it will be important to integrate our offerings with mobile platforms so that customers can be connected to SDG&E at any time through their mobile device.[20]

Figure Res - 11: Type of Device Used to Access Utility Website[21]



In order to increase participation, SDG&E will deliver a variety of marketing campaigns that use different types of messaging such as loss aversion, which has been shown to be successful in grabbing customers' attention and increasing participation in the rebate program.[22] Rebates will be processed through the integrated online channel to allow for a quick turn-around time and more streamlined solution for customers. This approach will continuously evolve to keep customers engaged and returning to Marketplace by working through the ideation process to identify new technologies and add new products. Specifically, SDG&E will include energy management technologies in its review of new technologies to assist with the pending time of use rates and battery storage. Marketplace will provide customers with a way to compare different models, prices, rebate information from multiple sources, and purchase the product all in one location.

Strategy: Empower customers to better manage their energy usage

In order to fully engage customers and maximize savings, SDG&E will need to bring customers along the customer engagement curve. Due to the many benefits of smart meters, AMI/interval data is available to customers to better manage energy use through Green Button and SDG&E behavioral programs.

[20] Source: Efficiency Beyond Widgets: Residential Behavioral Program Options
[21] Utility Customer Engagement" , JD Power March 3, 2016
[22] Source: SDG&E internal data analysis on messaging campaign

The first step involves making customers more aware of their energy usage. The next step along the engagement curve process is to get customers more educated on the energy they are using and identify tools available to improve energy management. One example of how this can be done is through a behavioral program that provides customers with an "attention grabbing" normative comparison report. The report informs customers of ways that they can save energy and encourages customers to go to the web platform to learn more about their energy usage.

Sample Tactics:
SDG&E will use data analytics and customer segmentation to identify key customer attributes (customer profile), including: [23]

- Customer preferences (contact preferences);
- Customer values and drivers (environment, energy rates);
- Customer economic status (household size, income level); and
- Customer property (sq. footage, vintage, consumption, peak use & times, climate zones, etc.).

For this strategy, SDG&E will employ the following tactics:

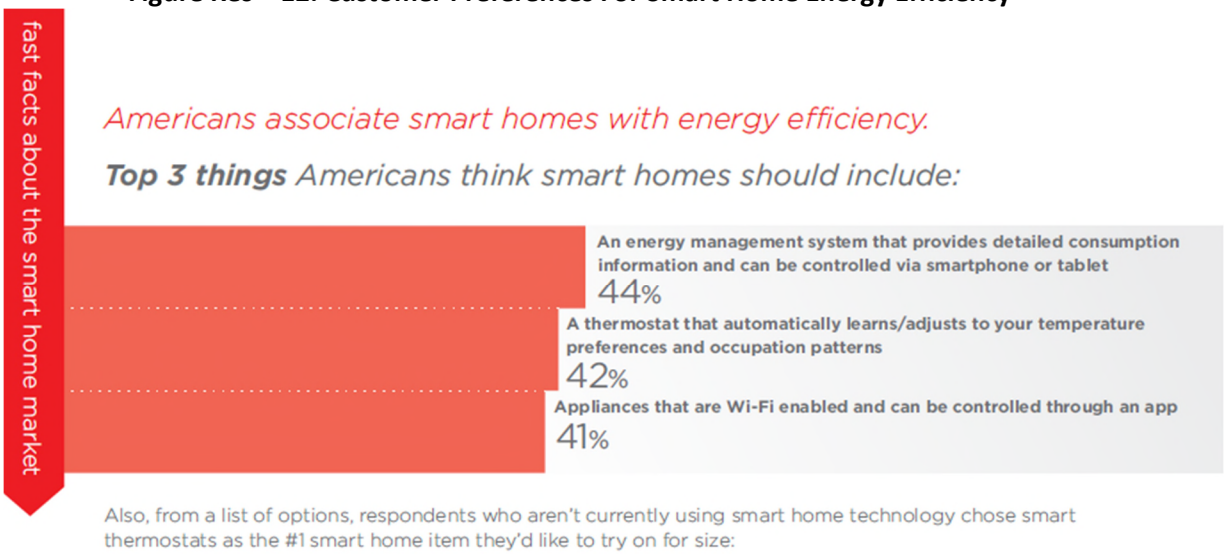
- **Utilize behavioral interventions to increase engagement.** SDG&E will continue to provide targeted messaging through the behavioral program and encourage customers to visit the online platform as that has been shown to increase engagement and savings.
- **Provide education through the audit tool capabilities.** Customers will be directed to complete an audit/energy efficiency survey that will not only provide energy efficiency recommendations but also provide information on other resources available for a whole home approach. By making customers aware of utility rebates and efficient appliances, customers will have the knowledge and tools to adopt energy efficiency into their lifestyle, make smarter purchases, and ideally continue to make smart energy choices in their home in the future.
- **Provide customers with near real-time information on their energy-usage**. This will become especially important when residential customers are defaulted onto a time of use rate (if a rate has not already been selected).
- **Provide customers with energy alerts to better manage their energy usage.**
- **Investigate home management system as part of home upgrade package.** Customers are increasingly demanding tools that simplify their lives, making home management systems a logical technology to incorporate in order to improve customer satisfaction. Home management systems "quickly gain customer's mind share, wallet share, and trust by providing new connected products and services".[24] Even though there are energy efficiency benefits associated with home energy management systems, research has indicated that it is important to inform customers of other benefits besides energy efficiency to improve uptake.[25] The Home Energy Management offering would:
    - Describe the comfort, convenience, and efficiency benefits of home management systems, and follow with environmental messages.
    - Leverage pending time of use rates to increase awareness of energy management technology attributes.

[23] Source: 2010-2012 PG&E and SCE Whole House Retrofit Program Process Evaluation Study (PGE302.01) Published December 12, 2012

24 Top Utility Industry Trends to Keep an Eye on in 2015, Alanya Schofield, June 10, 2015

[25] Smart Home Strategies for Utilities: Five Reasons You Should Get in the Game, Shelton Communications Group

Figure Res – 12: Customer Preferences For Smart Home Energy Efficiency[26]



- Hold workshops to teach homeowners steps they can take to be more energy efficient, including how to manage home energy use.
- Explore the use of incentives for customers who install home management systems. This will involve first working through the ideation process to determine which home management systems are effective at managing technology within a customer's home.[27] A good approach to first introducing/incentivizing a home management system is through Demand Response (DR) and/or EE (if available) programs.

Goal 2: Increase energy efficiency participation in the multifamily sector by X% through an approach targeting both tenants and property owners.

"The diversity of multifamily building types makes it highly challenging to develop program delivery models, incentive programs and consistent packages of building upgrade measures that meet the needs of every situation." [28]

- Improving California's Multifamily Buildings: Opportunities and Recommendations for Green Retrofit & Rehab Programs

Multifamily accounts make up 34% of the 1.3 million accounts within SDG&E's service territories and account for 24% of residential electric consumption, and account for 25% of electric savings generated through our energy savings programs. Multifamily accounts for 23% of residential gas consumption and 54% of gas savings generated through energy savings programs. [29] Despite representing a large

[26] Source: Smart Home Strategies for Utilities: Five Reasons You Should Get in the Game, Shelton Communications Group

[27] Reconsidering What We Measure: A White Paper Residential Decision-Making and Proposed Standard Questionnaire Items (aka AKAB Whitepaper) (SCE0305); Published August 1, 2011

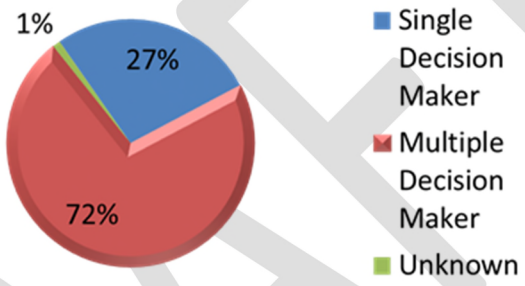
[28] Source: Improving California's Multifamily Buildings: Opportunities and Recommendations for Green Retrofit & Rehab Programs; April 11, 2011; http://chpc.net/wp-content/uploads/2015/11/26-MF-HERCC_Multifamily-Program-Design_Final_04112022.pdf

[29] Note: The numbers referenced here represent consumption and savings for residential only.

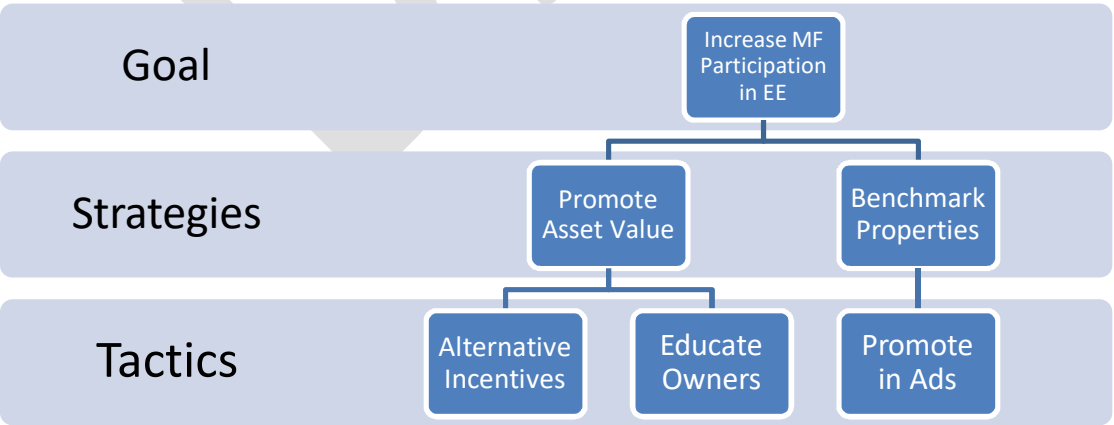
proportion of the sector's energy consumption, multifamily properties continue to lag in their uptake of energy efficiency measures. There are several reasons for this, including:

- Facility operators understand and can identify the energy efficiency upgrades needed, but do not have the authority to make the decisions;[30]
- Multiple decision makers (property owner, property manager, tenant) make it difficult for a comprehensive uptake in program participation in multifamily properties;
- Split-incentive continues to be challenging (tenants pay for utilities, property owners receive less benefits from energy-efficiency improvements);[31]
- Energy efficiency is often not a priority for property owners/managers;
- Lending laws and current program requirements related to On Bill Financing may not be ideal for multifamily retrofit opportunities;

Figure Res – 13: Number of Decision Makers at Multifamily Properties[32]



For multifamily properties, 72% stated that there are multiple decision makers. This presents challenges when promoting energy efficiency programs and encouraging participation. In addition, through anecdotal feedback from SDG&E program staff suggests that a majority of property owners and managers think that while energy efficiency is important to their tenants, factors such as property amenities, floor types, counter types, appliance design, etc. are frequently viewed as more important to tenants. Through the implementation of its existing and new innovative approaches, SDG&E plans to drive its multifamily sector closer to ZNE.



[30] Note: SDG&E program staff anecdotal data
[31] Source: 2010-2012 Multifamily Property Owner and Operator Study, April 15, 2013
[31] Source: CADMUS, ESA Program Multifamily Segment Study Volume 1 Report, December 4th, 2013
[32] Source: 2010-2012 Multifamily Property Owner and Operator Study, April 15, 2013

Strategy: Promote Increased Value of Asset, Generated by Energy Efficiency and ZNE to Property Owners

"A growing body of research has shown that energy efficient buildings rent for an average premium of 2-6%, can sell for a premium of as much as 16%, attract high quality tenants, and have lower default rates for commercial mortgages."

- Energy Efficiency in Separate Tenant Spaces-A Feasibility Study by the US DOE

In order to increase multifamily building participation in energy efficiency programs, it is necessary to engage building owners. One way to accomplish this is to sell building owners on the value proposition that energy efficiency increases the value of the asset. The market poses several barriers to engaging building owners, including:

- The landlord / tenant split incentive: Energy efficiency in the multifamily segment is complicated by the split incentive issue where tenants pay for utilities and experience most of the benefits of energy efficiency, while the landlords who own the building realize little benefit yet are supposed to pay for upgrades;[33]
- the practice of evaluating cost effectiveness for whole home programs by building and not the owner's portfolio;
- assessing tenant qualifications for low income energy upgrades vs. the building; and
- confusion as to which offers are right for them.

In light of these barriers, SDG&E proposes the following incremental "out of the box" tactics to support our strategy in addition to existing programs.

Strategy: Promote the benefits of renting in an energy efficient building to tenants

In order to address a lack of uptake in the multifamily sector it is important to create demand for energy efficient units. The first step in this process is to benchmark a portfolio of properties to identify properties with the highest energy use index. The next step would be for a percentage of buildings to perform a comprehensive audit to identify Integrated Demand Side Management (IDSM) opportunities that could be included as part of a whole building package. As outlined in the previous section, SDG&E's efforts towards a multifamily single point of contact would assist property owners in the completion of the benchmarking process and audit completion. SDG&E would also help with tracking of improvements through a portal available to property owners, property managers and other designees.

In the spirit of creating demand, after developing benchmark scores it will be necessary to ensure they are promoted in unconventional areas such as "For Rent" ads, lobbies, elevators, and stairwells. Ensuring that customers know the value of energy efficient units is key to creating demand. The environmental and monetary benefits should be included. This is a strategy effectively used by casinos when promoting events or their restaurants to patrons/visitors.

Sample Tactics

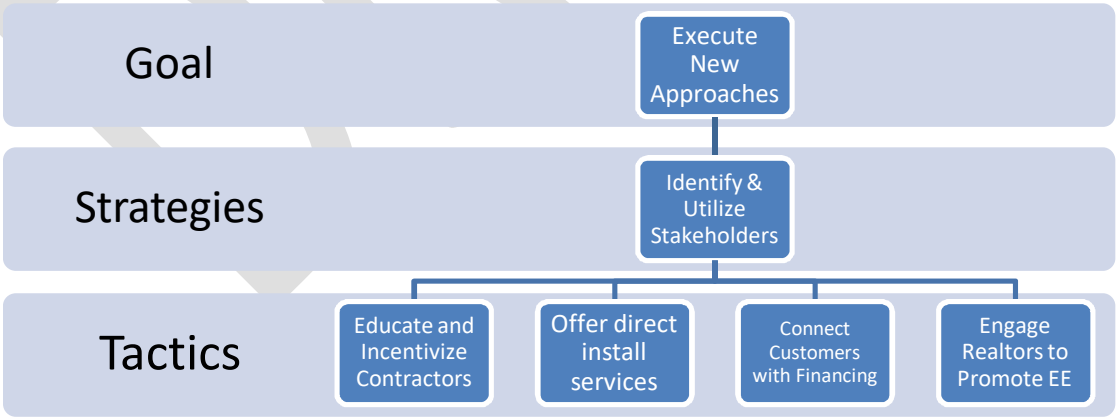
- **Develop pilots and trials to explore property owner incentive structure.** Address split incentive barrier that currently prohibits property owners/managers from making comprehensive energy efficiency improvements.

[33] Source: CADMUS, ESA Program Multifamily Segment Study Volume 1 Report, December 4th, 2013

- **Coordinate EE and low-income proceedings.**
    - SDG&E will link to Energy Savings Assistance program. This tactic is included in the Proposed Low Income Decisions for PRIZM code zones that are % above the poverty line. It is designed to ensure that all units are upgraded to use less energy and in the case of master metered areas that efficiency upgrades benefit all tenants. SDG&E will coordinate between both EE and Low Income proceedings in order to maximize efficiencies. Also work with Low Income and Energy Efficiency team to qualify the building and not just the individual tenant and vice versa
    - SDG&E will work to qualify multifamily properties at the building level, as opposed to only qualifying an individual tenant as Energy Savings Assistance qualified. This "80-20 Rule" depends upon reaching an 80% threshold of qualified tenants to qualify an entire multifamily building for service. The reverse would be applicable for the tenants when looking at the whole building. [34]
- **Provide owners and property managers with the ability to aggregate single buildings into a portfolio of assets.** Work with third-party to bundle offerings.
- **Hold seminars to educate building owners** about the value of energy efficiency to sell to potential renters.
- **Promote inclusion of benchmark scores and tenant cost benefit of energy efficient units** through channels such as "For Rent" ads, lobbies, elevators, stairwells

Goal 3: Continue to innovate by executing X new approaches to the market.

Existing programs alone do not address the universe of customer needs nor recent changes prompted by legislation. The energy efficiency industry has the potential to see significant change in the next decade providing an opportunity for innovation. This influx of innovation should not be limited solely to technologies, but also different approaches to programs and procurement which may include outsourcing opportunities. SDG&E will use a test and learn approach to maximize both savings and efficiency.



Strategy: Identify influential stakeholders that will allow the expansion of market opportunities / efficiencies

[34] Source: Statewide P&P Manual in Sec. 2.2.6, Qualifying Multifamily Complexes on pages 14-15

SDG&E will engage various stakeholders that have a greater influence and direct touchpoint with customers in order to convey the benefits of incorporating energy efficiency into their lifestyle. SDG&E will also explore new approaches that will allow for a greater reach, deeper savings, and ultimately help customers on their pathway to ZNE.

Sample Tactics

SDG&E proposes the following tactics to engage stakeholders and increase energy efficiency savings from the residential sector:

- **Utilize new approaches for contractors to achieve deeper savings**, such as pay for performance.
- **Offer a training roadmap** so contractors are aware and to provide guidance for contractors in selecting appropriate trainings to attend, we recommend creating a "training roadmap" document that displays all of the home-performance-related courses offered.
- **Provide direct install** at little cost for customers of moderate to higher income. Potential integration of DR in the midterm to ensure the solutions are holistic
- **Connect customers to financing opportunities.** One of the barriers for customers to adopt a whole home approach as identified in a Whole House Retrofit Impact evaluation can be cost: *"Financial constraints are the largest reason for not being able to take action"*.[35] In order to assist with that barrier, SDG&E will provide or connect customers to financial assistance.
- **Work with real estate professionals and services to drive increased penetration of EE.** A March 2015 National Association of Homebuilders survey found that 9 out of 10 Americans want permanent energy-saving features and will pay 2-3% more for a home that has them.[36] Prospective buyers often overlook efficiency characteristics that can waste environmental resources and money for decades to come. Leveraging real estate professionals and services is a natural 'next step' to promote the value of energy efficiency to home buyers. In an effort to promote the value and benefits of energy efficiency, SDG&E intends to offer training through Workforce Education and Training to real estate professionals, including appraisers. This would include not only a comprehensive program for home efficiency characteristics, but also various financing opportunities available. Engage home appraisers to include energy efficiency characteristics as part of a home's value.
- Partner with previously untapped manufacturers and retailers to promote new efficiency channels

[35] Whole House Retrofit Impact Evaluation - Evaluation of Energy Upgrade California Programs (CPU0093.01) Published September 9, 2014

[36] http://energyefficientcodes.com/facts/the-economic-case/

Residential Sector Metrics

Energy Efficiency Business Plans: Sector Metric Table - Residential Sector

Problem Statement	Market Barriers	Desired Sector Outcome	Intervention Strategy	Sector Metric	Baseline	Metric Source	Short Term Target (1-3 years)	Mid-Term Target (4-7 years)	Long Term Target (8-10 years)
Current program can be complicated and impede EE participation	*High cost and low ROI leads to low adoption of high efficiency products *Multiple programs and entries leads to low program participation	Increase Energy Efficiency Savings in residential Sector by X% through an Improved Customer Experience	Make Energy Efficiency Products and Services More Accessible Through Methods Such as Mobile Apps & a Self Service Web Portal	Track individual unique program app downloads and unique website visits	N/A	Program tracking data	x% increase month over month	x% increase month over month	x% increase month over month
Current program design is transactional in nature and thus short-term focused and results in missed opportunities	*As plug loads grow and continue to grow this leads to increase energy usage *The growth of solar and EV leads to increased diversity of customer base	Increase Energy Efficiency Savings in residential Sector by X% through an Improved Customer Experience	Empower customers to better manage their energy usage by providing them with granular level information on end-use and personalized recommendations on how to save	Number of customers enrolled in program tracking program and how many of those ultimately enroll in additional programs and services.	N/A	Program tracking data	x% increase month over month	x% increase month over month	x% increase month over month
The split incentive betweeen property owners and tenants dramatically reduces energy efficiency upgrades	*Multiple decision makers *Split-incentive	Increase EE participation in Multifamily sector by X% through improved customer experience	Promote Increased Value of Asset, Generated by Energy Efficiency and ZNE to Property Owners	% increase in non occupant participants across sector offerings	Current level of non-occupant particpants	Program tracking data	x% increase month over month	x% increase month over month	x% increase month over month
The diversity of multifamily building types makes it highly challenging to develop program delivery models, incentive programs and consistent packages of building upgrade measures that meet the needs of every situation	*Multiple decision makers *Split-incentive	Increase EE participation in Multifamily sector by X% through improved customer experience	Promote Increased Value of Buildings Generated by Energy Efficiency and ZNE to Property Owners and Tenants	% increase in non occupant participants across sector offerings	Current level of non-occupant particpants	Program tracking data	x% increase month over month	x% increase month over month	x% increase month over month

PA/Program Coordination

Cross-Cutting Coordination

Description of how cross cutting activities are addressed in customer sector strategies.

WE&T

As a cross-cutting program, Workforce, Education and Training (WE&T) is critical to building customer demand by highlighting the value of EE, promoting market acceptance by educating trade professionals on how to maximize sales through the value proposition, and ensuring that a skilled and trained workforce properly installs and maintains equipment leading to greater EE savings. SDG&E's WE&T program has and will continue to focus on the following areas to engage with both residential customers and the trade professionals who support them. Looking ahead, the WE&T program will continue to support the following areas and will expand or contract based on market and potential data forecasts:

- Building Design & Construction
- Building Performance
- Codes & Standards
- Home Performance / Whole House
- HVAC
- Lighting
- Marketing / Finance / Sales / Real Estate
- Renewable Energy
- Sustainability
- SDG&E's Rebate & Incentive Programs

More details on these efforts are provided in the WE&T chapter of this Business Plan.

Financing

Financing options will be included across all of our residential sector goals.

Statewide Crosscutting Programs

Since Emerging Technologies, Codes &Standards, and aspects of financing will be transitioning to statewide programs that may be administrated outside of SDG&E, this section will be updated with more details after the lead PAs are selected in the upcoming weeks.

Residential EM&V Considerations

SDG&E EM&V is preparing for the evaluation of the residential sector and its various interventions. With the introduction of AB802, we will be required to expand our EM&V responsibilities to include using normalized meter data to determine impacts associated with sector interventions. This presents an opportunity to implement early M&V (sometimes referred to as M&V 2.0), along with process evaluations to analyze program success, while tracking sector metrics. In analyzing this sector, SDG&E's team will implement a holistic evaluation methodology attempting to determine the effect of residential sector activity, as well as establish causal effects of various tactics to increase EE savings. The result of this methodology will be regular feedback to the residential team to necessitate changes if necessary. The EM&V activities for the residential sector will include:

- Normalized net-metered energy usage based on AMI data
- Regular strategy and implementation metric tracking and providing
- Casual analysis between metrics and strategies, and "success" i.e. are these the correct metrics to drive program success?

These three evaluation approaches will be used in concert to gain a complete picture of the sector across time, and at various intervention points.

While various residential programs will be assigned to one statewide administrator, the residential sector EM&V effort will begin with the implementation of the business plan and occur at regular and ongoing intervals. Metrics and savings will be tracked quarterly, biannually, or annually dependent on evaluation and programmatic need and constraints, including EM&V resources. Ultimately, SDG&E would like to be able to measure normalized net metered savings in real time with the appropriate granularity required for the metrics. Until that system goes online we will measure normalized metered savings biannually in concert with the statewide administrator. This will require determining a methodology to forecast what usage would have been absent of the program intervention, and comparing that to actual usage. For an example methodology please see the Statewide HVAC evaluation titled AMI Billing Regression Study[37]. Net-metered savings provides critical feedback to program staff and the success of their work, without having to wait years for a large scale Impact Evaluation.

On a more regular basis, EM&V will be engaged in measuring sector and implementation level metrics. SDG&E EM&V suggests two types of analysis related to metrics. The first capitalizes on the objective of the metric as a quick indicator of programmatic success or direction, without the necessity of a full scale, resource impact evaluation. This first type of analysis will use summary statistics to understand how the sector, program, and individual interventions are changing, operating, or succeeding over time. EM&V will provide program staff a regular report that tracks individual metrics to determine if any course correction needs to occur.

Additional analysis will become necessary over time. Eventually metrics themselves will need to be tested, specifically whether or not a metric is appropriate. This analysis requires significant savings and metrics data, thus the timeline will need to be determined at a future point. This analysis will likely be a simple OLS regression to test correlations between metrics and savings. Where evaluators identify metrics that are significant and positive, we can further engage our programs to address these metrics. Where we find individual metrics that lack significance or are negatively correlated, programs can stop that activity and reallocate resources to other positive and significant metrics.

This plan is presented independent of the statewide EM&V efforts included in the CA EM&V Research Roadmap. Additional evaluation will occur within that forum and provide significant programmatic feedback to the residential staff.

A preliminary list of 2017 residential EM&V studies includes:

[37] Evergreen Economics, "AMI Billing Regression Study," Calmac ID SCE0383.01 (March 16,2016)

2016 Study Area/Title	Study Manager (ED/IOU)	2017 Budget	Completion Date
Process			
Process Evaluation of AB793 Programs	IOUs	$100,000	Q1/2018
Statewide Single Family Pool Pump Workpaper Update and Process Evaluation	IOUs	$150,000	Q1/2018
Upstream Lighting Attribution Study	IOUs	$50,000	2017
Statewide Residential Baselines for Business Plan Metrics	IOUs	$300,000	2017
Market Assessment			
Statewide Retail Products Platform (RPP) National Market Share Characterization	IOUs	$100,000	Q4/2017
Other Studies Under Consideration			
• PG&E Step-Up-and-Power-Down Process Evaluation, • PG&E Early M&V for PG&E Home Energy Reports, • SCE Energy Pledge Behavior Program Early M&V Assessment, • Statewide RPP Market Transformation Baseline Study, • CALTRACK Energy Savings Tool Support for EUC-HU program, • PG&E Single-Family and Multi-Family Population Characterization and Analysis.	IOUs	$500,000	2017
Total	IOUs	**$1,200,000**	

In addition to EM&V Roadmap studies, SDG&E regularly conducts research for the residential sector. Examples include the monthly Customer Connections Survey, and the Quarterly Res Customer Opinion Survey. External research is utilized as well, such as results from JD Powers and E Source.

Online tools are of particular interest going forward and will be a topic of interest in research efforts. The tools developed today by SDG&E focus on the motivation of the customers to participate in Residential programs. SDG&E plans to collect data from users to incorporated and improve our online offering as necessary. As more information becomes available to SDG&E, additional customization can be made based on the customers' long term energy plans and the best ways for the IOUs to engage with that customer. Additional studies will be considered in future research.

SDG&E will continue to work with the CPUC on evaluation needs. These may include:

- **Expanding the Behavior program definition.** Currently the definition is very restrictive and does not allow all customers in the SDG&E service territory to benefit by participating in the program. More flexibility is required in order to expand the reach of Behavior type programs. Some recommendations would be to allow other types of behavior intervention strategies besides comparative energy usage, allow multiple types of evaluations besides experimental design, and allow savings to be claimed ex-ante besides ex-post.

- **Refreshing the Residential Appliance Saturation Study (RASS) and updating California Lighting Saturation Study (CLASS).** These would be helpful in knowing what the potential is to continue to promote certain measures and gain adoption.

SDG&E will continue to address recommendations from several EM&V studies. These studies resulted in findings and recommendations that have either already been accepted, adopted, rejected, or are still under discussion. As the future offerings/programs are designed or continued it is important to take into account the recommendations that came out of these studies so best practices can continue to be enhanced. Some of the recommendations/findings that will continue to be offered as part of the future offerings can be found in XX:

Commercial Sector

Chapter Summary

As it is SDG&E's largest sector, the company's approach to the Commercial sector is critical to achieving its share of California's ambitious energy efficiency and greenhouse gas reduction goals. Over 160,000 mostly smaller commercial accounts in San Diego and southern Orange County consume 45% of total electricity and 32% of total gas, the sector is the company's largest. In turn, the sector's vibrancy is marked by the area's appeal to new businesses with Forbes magazine in 2014 labeling San Diego as the best city in which to launch a business.[38]

The California Energy Efficiency Strategic Plan's Vision for the Commercial Sector

"Commercial buildings will be put on a path to zero net energy by 2030 for all new and a substantial proportion of existing buildings. Innovative technologies and enhanced building design and operation practices will dramatically grow in use in the coming years through a combination of comprehensive whole building programs, technology development, market pull, professional education, targeted financing and incentives, and codes and standards."

SDG&E's energy efficiency offerings provide the keys for customers to unlock their savings potential through financial incentives, expert assistance, and personalized tools. For several decades, this approach has proven successful but the higher expectations envisioned for energy efficiency as a primary component to combating climate change demand ever more innovative approaches. There is already a solid foundation of energy efficiency in this sector and SDG&E will build on successful strategies and tactics by creating evolutionary changes through targeted strategies that expand opportunities, streamline participation, and stimulate customer pursuit of zero net energy (ZNE) buildings.

In support of the EE Strategic Plan, SDG&E's mission for the commercial sector is to help customers achieve ZNE by providing them greatly enhanced self-help tools, program options, and expert assistance. To accomplish this mission, SDG&E has established the following commercial sector goals:

- Commercial Goal 1: Improve the penetration of energy efficiency in the property management market by X%.
- Commercial Goal 2: Increase penetration by XX% through an improved customer experience, facilitated by an intuitive platform designed to make energy efficiency offerings much more accessible.
- Commercial Goal 3: Maximize savings and efficiency by executing new approaches, among them variations on All-Source RFOs, expanding efforts to optimize the grid through targeted distributed energy resources, and leveraging energy management product innovations to better inform small commercial customers.

These goals are designed to directly address the needs of the large majority of SDG&E's commercial customers who are small businesses that lease their facilities. This customer composition poses unique challenges for SDG&E as both characteristics are defined by the CPUC as hard-to-reach.[39]

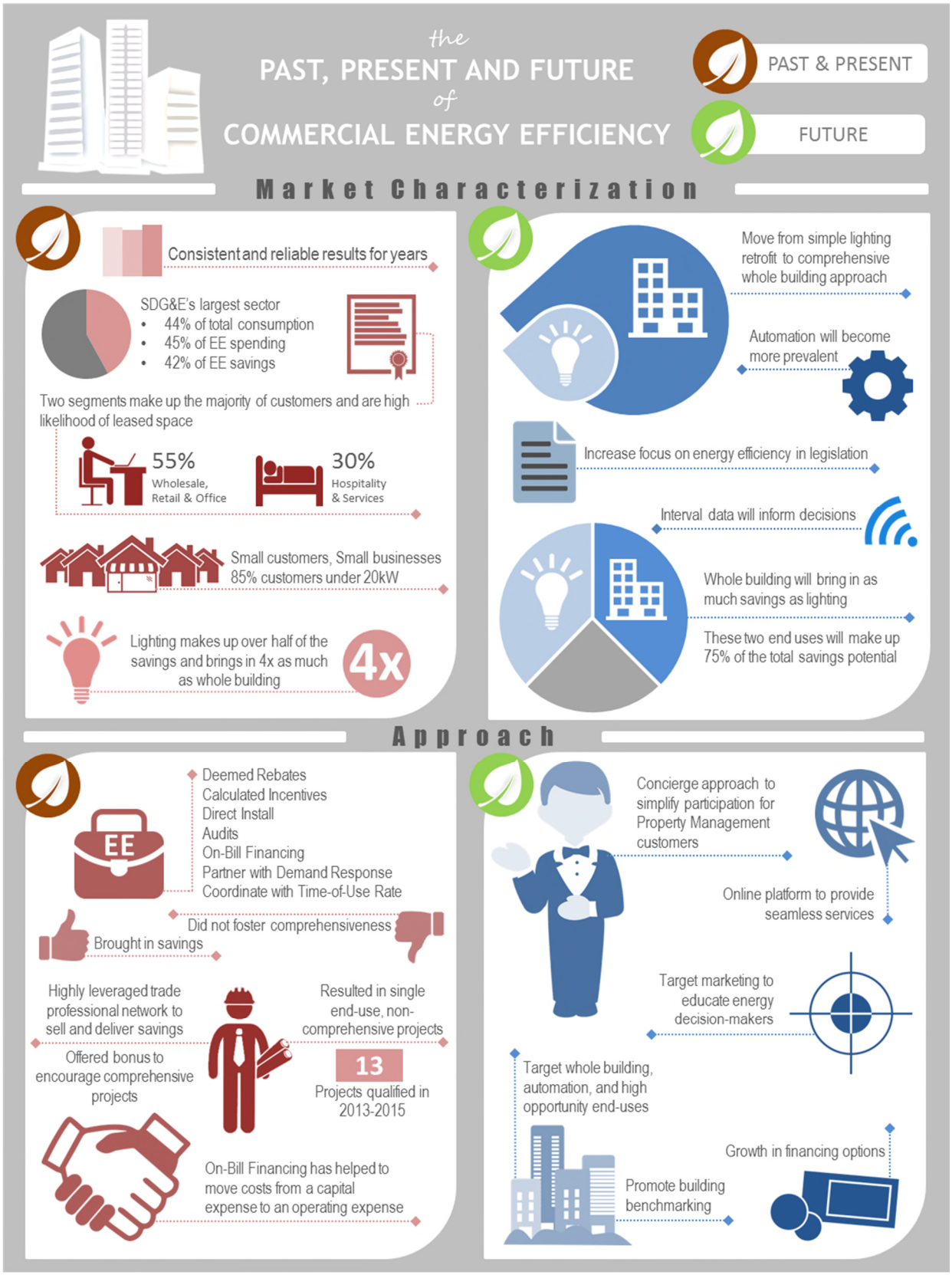
[38] Forbes 2014, http://www.forbes.com/sites/tompost/2014/03/13/the-best-places-to-launch-a-startup-in-2014/#4fb48e10359c

[39] "Hard to Reach – Non-Residential: Those customers who do not have easy access to program information or generally do not participate in energy efficiency programs due to a language, business size, geographic, or lease (split incentive) barrier." California Energy Efficiency Policy Manual, Version 4.0 (August 2008), Appendix B, p. 7.

Commercial customers have indicated that they view SDG&E as their trusted energy advisor[40] because we possess a deep understanding of our electricity and gas networks, our customers' needs, and our customers' energy consumption patterns. This expertise uniquely positions SDG&E to design an energy efficiency portfolio that will maximize commercial customer program participation. Leveraging smart meter data and the myriad of potential energy saving opportunities that flow from this information, SDG&E can design offerings that channel this information back to customers through benchmarking, advanced analytics, and performance-based incentives.

This business plan identifies goals that will help customers move to the next level of energy efficiency adoption. SDG&E has developed the strategies and sample tactics described in this plan to complement the existing offerings and move customers towards a more comprehensive and sustained approach to energy efficiency implementation.

[40] Source: SDG&E Customer Insight Panel, 2012.


the
PAST, PRESENT AND FUTURE
of
COMMERCIAL ENERGY EFFICIENCY
PAST & PRESENT
FUTURE
Market Characterization
Consistent and reliable results for years
SDG&E's largest sector
• 44% of total consumption
• 45% of EE spending
• 42% of EE savings
Two segments make up the majority of customers and are high likelihood of leased space
55%
Wholesale, Retail & Office
30%
Hospitality & Services
Small customers, Small businesses
85% customers under 20kW
Lighting makes up over half of the savings and brings in 4x as much as whole building
4x
Move from simple lighting retrofit to comprehensive whole building approach
Automation will become more prevalent
Increase focus on energy efficiency in legislation
Interval data will inform decisions
Whole building will bring in as much savings as lighting
These two end uses will make up 75% of the total savings potential
Approach
EE
Deemed Rebates
Calculated Incentives
Direct Install
Audits
On-Bill Financing
Partner with Demand Response
Coordinate with Time-of-Use Rate
Did not foster comprehensiveness
Brought in savings
Highly leveraged trade professional network to sell and deliver savings
Offered bonus to encourage comprehensive projects
Resulted in single end-use, non-comprehensive projects
13
Projects qualified in 2013-2015
On-Bill Financing has helped to move costs from a capital expense to an operating expense
Concierge approach to simplify participation for Property Management customers
Online platform to provide seamless services
Target marketing to educate energy decision-makers
Target whole building, automation, and high opportunity end-uses
Growth in financing options
Promote building benchmarking

Approach to Achieve Commercial Sector Goals

SDG&E's market analysis and stakeholders have identified a number of consistent barriers to address in this plan. SDG&E has analyzed these barriers and considered the direction set by the California EE Long-Term Strategic Plan to determine the goals needed in order to establish a unified, achievable framework that will yield concrete results in support of the mission and vision of the commercial sector.

SDG&E found that when assessing barriers for the broader commercial market, there are two categories that can be created, namely barriers affect a customer's attitude towards energy efficiency and those that negatively impact the customer's aptitude to participate in energy efficiency.

Barriers that impact attitude – Attitudinal barriers are those that shape a customer's attitude and perception about energy efficiency and determine the likelihood of their participation in programs. The more complex and difficult it is for a customer to participate reduces the likelihood of participation. Sometimes these complexities are not with the program but within the customer's own corporate or business structure. Tenant and landlord situations are an example of this. Additional complexities can arise when there are multiple layers of management and decision makers within an organization.

Barriers that impact aptitude – Aptitude barriers explain reasons that customers who recognize the benefits of energy efficiency still may not participate in programs. These reasons deal with whether or not the customer or company has the *technical capacity* to act. In some cases, even for customers that recognize the benefits of energy efficiency *and* have the technical capacity to act still may not have the financial ability to take action. Lack of awareness of financing options is a barrier in this category.

Figure Com-1: Attitudinal and Aptitudinal Market Barriers

Attitudinal Barriers	Aptitudinal Barriers
Split Incentives • Tenant / Landlord Leasing	**Customer Sophistication** • Gap in technical expertise. • Lack of in-house expertise. • Not familiar with program rules.
Multiple levels of decision making • Corporate vs. local decision making. • Facility manager vs. business manager.	Financial Considerations • Lack of capital. • Unaware of financing options.
Misperception of EE Value • Uncertainty of project savings. • Unaware of the benefits beyond utility energy cost savings.	
Program complexities diminish value • Multiple program options can create confusion. • Multiple step program processes can add to uncertainty of project savings and create a "hassle factor" that may deter customers.	
Contractors are often single end use focused • Customers that have comprehensive needs must seek multiple contractors to complete projects.	

- Contractors do not tend to cross-promote other programs or end-uses.

In order to overcome these barriers, SDG&E seeks to combine successful, traditional offerings with new, targeted approaches to more efficiently penetrate segments that have the most potential. Creating an online platform that can simplify the participation in programs will create an improved customer experience. Identifying new approaches to the market by leveraging third parties and best practices will keep the commercial portfolio of offerings fresh, innovative and striving for deeper, more comprehensive savings.

The two tables below summarize the linkage between the problems (or barriers) that have been identified through the stakeholder process and through market analysis and the goals that have been created.

Figure Com - 2: Market Characteristics and Problems Overcome by Goals

		Targeted by Strategies supporting Goals		
Problem	**Goal**	**Customer Size**	**Market Segments**	**End-Uses**
Most customers are small	1. Engage Property Managers and Tenants	Small, Medium	Wholesale/Retail/Offices Hospitality/Services	Lighting, HVAC, Refrig, Water Heating, Cooking
Split Incentive				
Transactional nature of programs	2. Improve Customer Experience	Small, Medium, Large	Wholesale/Retail/Offices Hospitality/Services	Lighting, HVAC, Refrig, Water Heating, Cooking
Difficult to understand / participate in programs				
Need to Innovate	3. Execute New Approaches	Small, Medium, Large	Wholesale/Retail/Offices Hospitality/Services	Whole Building

The assessment of the market and identification of barriers leads to the creation of goals for the sector. In addition to savings and cost effectiveness targets, SDG&E has set the follow commercial sector goals:

- Commercial Goal 1: Improve the energy efficiency penetration in the property management market by X%
- Commercial Goal 2: Increase penetration by XX% through an improved customer experience, facilitated by an intuitive platform designed to make energy efficiency offerings much more accessible.
- Commercial Goal 3: Maximize savings and efficiency by executing new approaches, among them variations on All-Source RFOs, expanding efforts to optimize the grid through targeted distributed energy resources, and leveraging energy management product innovations to better inform small commercial customers.

These goals, along with the strategies and tactics that effectuate the goals, will be combined with the existing core programs to reach savings goals based upon approved budgets. The following tables outline the proposed energy efficiency goals and budget for SDG&E's commercial sector.

Figure Com - 3: Commercial Sector Annualized Savings Goals

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
GWh	TBD	TBD	TBD
MW	TBD	TBD	TBD
MMTherms	TBD	TBD	TBD

Figure Com - 4: Commercial Sector Annualized Budget

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
Annual Budget	TBD	TBD	TBD

It is important to recognize that SDG&E developed the goals, strategies, and tactics described in this business plan to complement, and not replace, current financial incentives, financing, outreach and education, technical assistance, and other program level interventions that have been proven successful in assisting customers with their facility upgrades and energy savings ventures.

Overview of Current Offerings

Included within the savings and budget estimates in Tables 3 and 4, above, are SDG&E's current commercial sector offerings as demonstrated in the table below.

The strategies and tactics proposed in this business plan will expand the existing programs, supplement them, and drive participation in them.

Figure Com-6 - Overview of Current and New Offerings

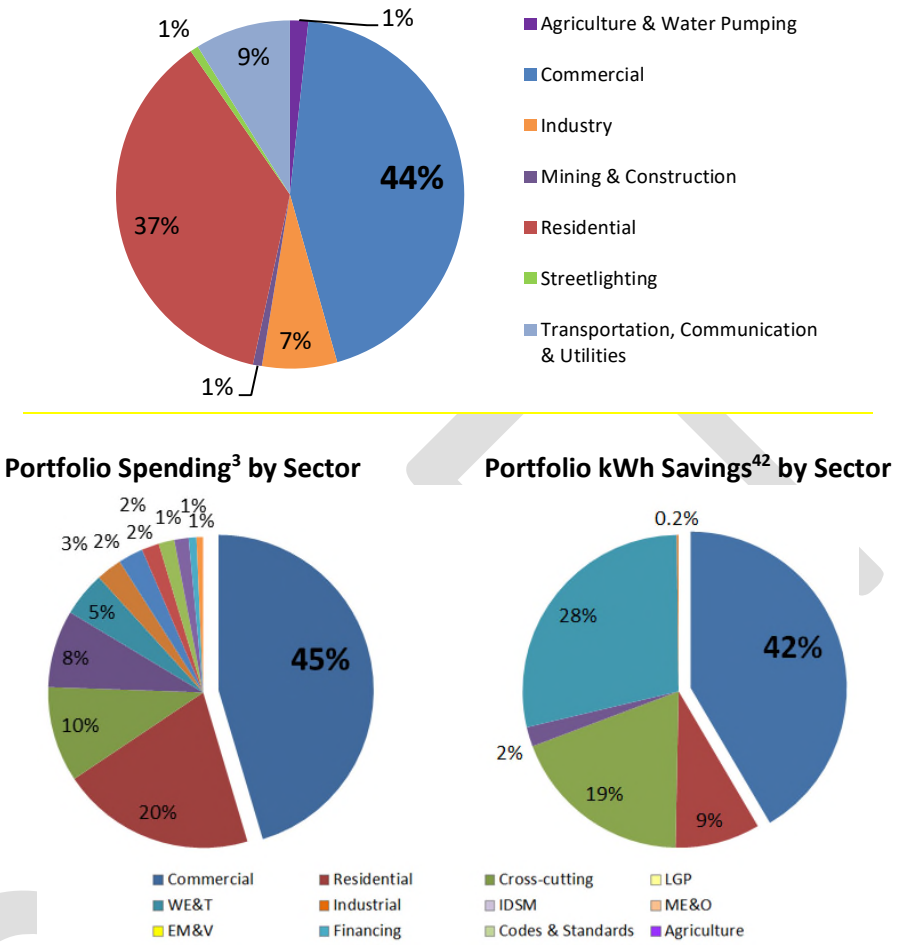
Goal	Strategy	Tactic	New, Existing, Modified	Short, Mid, Long-Term
Improve the Energy Efficiency Penetration in the Property Management Market by X%	• Transform tenant energy savings into asset value for property owners. • Provide a simple, yet comprehensive, customized energy management solution for this hard to reach segment.	Benchmarking	Existing	Mid
		Concierge Approach will bundle all the relevant energy components, including: benchmarking, rates and usage, IDSM, behavioral, rebates / incentives, financing and implementation	New	Long
		Property Manager Education • Higher rent / sq ft • Importance of knowledgeable building operators Tenant Education • Forecasted energy costs	Modified	Mid
		Comprehensive Audit Program	Existing	Short
		Deemed Rebates and Calculated Incentives	Existing	Short
		Business Energy Solutions (Direct Install)	Modified	Mid
		Premium Efficiency Cooling	Modified	Short
		Retrocommissioning	Existing	Short
		Savings By Design	Modified	Short
		Locational Energy Efficiency	Modified	Short
		On Bill Financing	Existing	Short
		Financing Pilots	Existing	Short

Commercial Sector Market Characterization

The commercial sector is perhaps the most important component SDG&E's energy efficiency portfolio in terms of market size and energy savings opportunities. SDG&E provides electricity and gas service to over 160,000 commercial accounts in San Diego and southern Orange County, including customers in all varieties of non-residential, non-manufacturing business establishments, such as hotels, restaurants, wholesale businesses, retail stores, warehouses, storage facilities, and health, and social institutions. From 2013-2015, this sector has represented 45% of SDG&E customers' total electric energy consumption, 45% of portfolio electric energy efficiency spending, and 42% of SDG&E's portfolio electric savings (Figure 2). For the same period, the commercial sector represented 32% of total gas consumption and 57% of portfolio gas savings (Figure 3).

As SDG&E's largest, the commercial sector must be successful in reducing energy consumption in order to achieve the goals established by the California Energy Efficiency Strategic Plan.

Figure Com - 7: 2013-2015 SDG&E Consumption (kWh), Spending, and Savings (kWh) by Sector[41]



Although the commercial sector is SDG&E's largest, it primarily consists of very small customers. SDG&E defines customers by electric demand: small (<20kW), medium (20-199kW), and large (>200kW). These ranges and the distribution of customers within them differ significantly by California utility. Specifically, the proportion of SDG&E's commercial customers that are classified as small is much larger than that of PG&E or SCE, as shown in the following chart. PG&E considers "small" any commercial customer with demand less than 40kW.

Using electric demand for classification purposes, it becomes clear, as illustrated in Figure 3 below, that small commercial customers, who make up 85% of all SDG&E commercial customers, dominate the sector.

[41] Source: SDG&E 2013-2015 EE Programs

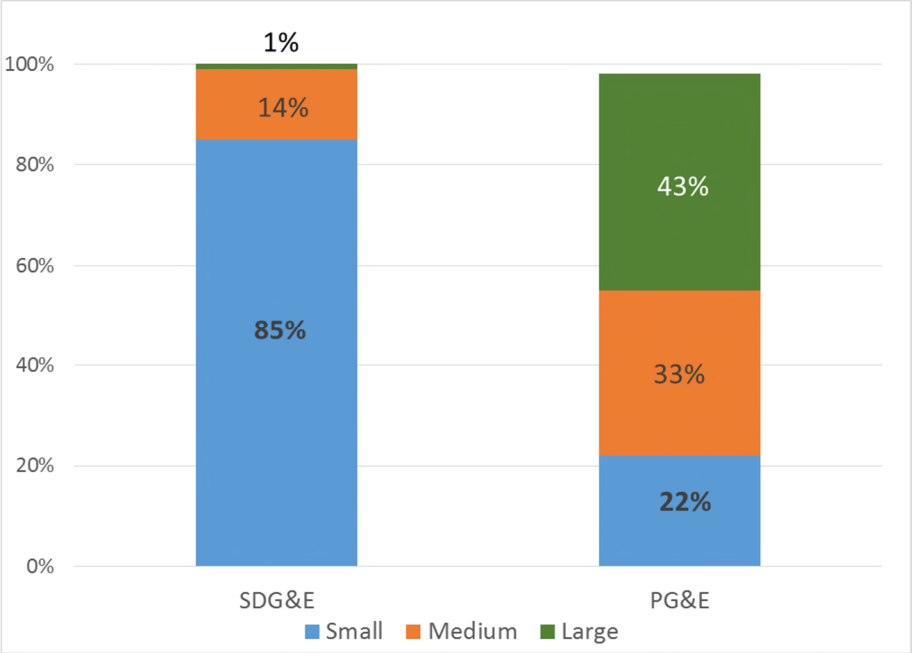
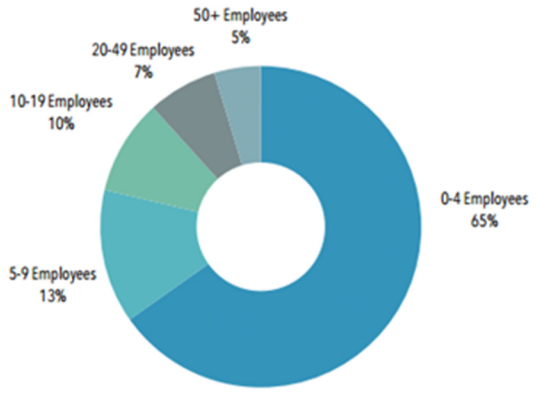


Figure Com-8: Commercial Customer Size by IOU Specific Definition (Based on Demand)

SDG&E recognizes that customers and others outside of the energy industry do not categorize themselves according to their electric demand. Therefore, it is also important to consider external categorizations as well. The California Employment Development Department categorizes business size by the number of employees. Figure Com-9 represents an employee distribution for San Diego County. Almost two-thirds of the businesses have fewer than five employees and over 75% have fewer than ten employees.



[8] In 2014, SDICCCA and SDWP jointly identified five "Priority Sectors" to focus workforce development efforts and resources: Advanced Manufacturing, ICT, Health Care, Life Sciences and Clean Energy (which includes Advanced Transportation).
[9] Some employers that participated in the study were larger than 50 employees but smaller than 75 due to recent growth. Their responses were not excluded from the study to provide a richer sample.
[10] Source: California Employment Development Department.

Fig Com-9: Commercial Customer Size by Number of Employees[43]

[43] Source: California Employment Development Department

Using these methods of categorization together, a picture of the SDG&E service territory begins to take shape. Looking at SDG&E's commercial sector, one can make the following observations:

- 85% of commercial accounts are under 20 kW (small); and
- 78% of the businesses in San Diego have fewer than 10 employees (small).

The preponderance of small commercial customers within the sector poses unique challenges but also creates opportunities for SDG&E to pursue innovative approaches to achieving energy efficiency goals.

Market Segments

Market segmentation provides additional insights that can inform targeting, strategy, and program design. Utilizing North American Industry Classification System (NAICS) designations, SDG&E has categorized its commercial accounts by industry type, grouped them by similar energy usage patterns, and found that the majority fall into two main segments:[44]

- Wholesale/Retail/Offices – includes the majority of commercial customers;
- Hospitality/Services – e.g. hotels and motels;

As discussed below, these segments have identifiable consumption patterns and program participation trends. By understanding these participation patterns and trends, SDG&E is able to design offerings that suit each of these segments. The pie charts below describe the commercial sector by segment in terms of percent of commercial accounts, percent of projects completed, and percent of electric (kWh) and gas (therm) savings.

As shown in Figure Com-10, the Wholesale/Retail/Offices segment is the commercial sector's largest segment in terms of number of accounts, making up 55% of commercial customer accounts. It also has the highest program participation rate (61% of projects in Figure 5) in terms of project count and electric energy savings. However, because the majority of projects are lighting improvements, this segment contributes to an increase in therm consumption (because of interactive effects). The Hospitality/Services segment includes 30% of commercial customer accounts and 28% of the projects.

[44] The groupings of Wholesale/Retail/Offices and Hospitality/Services were made based on the observation that these segments exhibit similar load shapes and usage patterns.

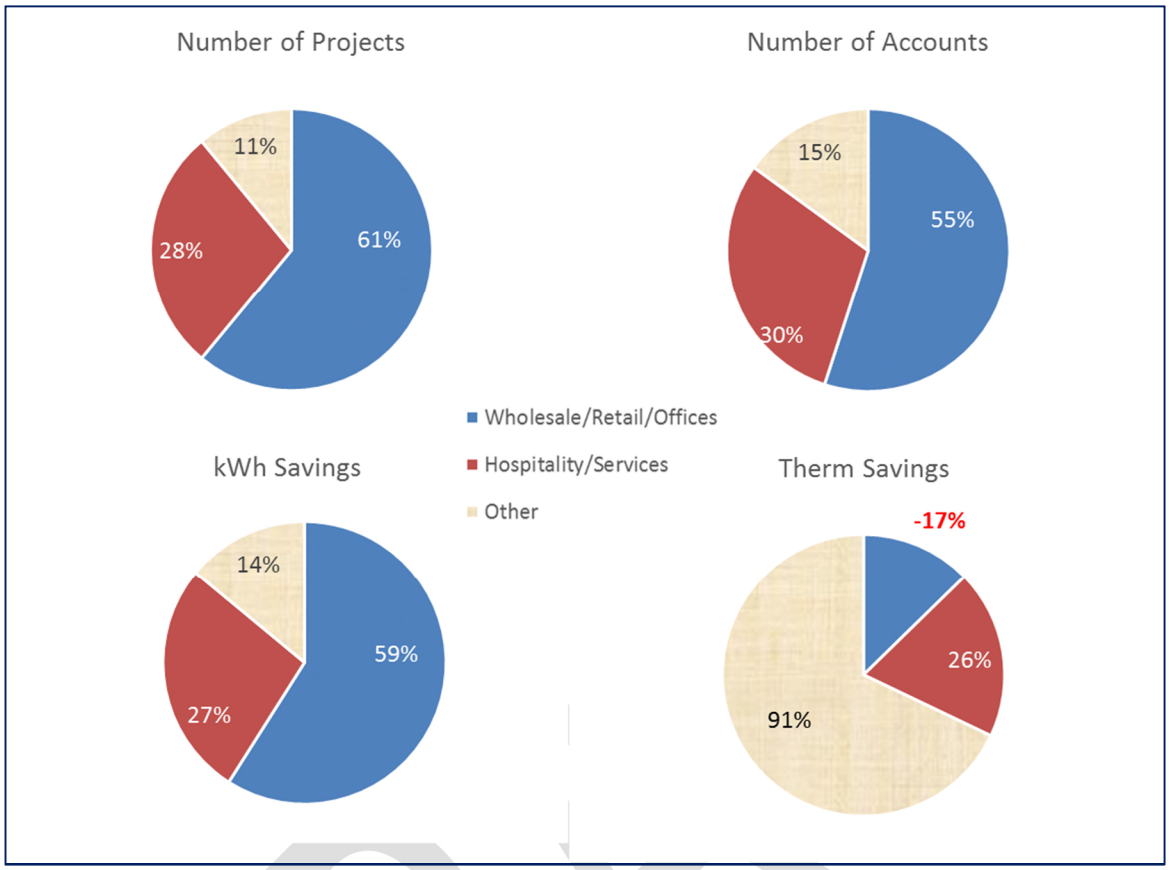


Figure Com - 10: 2013-15 Commercial Sector EE Participation

The Wholesale/Retail/Office segment is comprised of businesses such as:

- Groceries;
- Non-Food Retail;
- Property Management and Offices;
- Restaurants, and
- Wholesale/Warehousing.

The Hospitality and Service segment includes businesses such as:

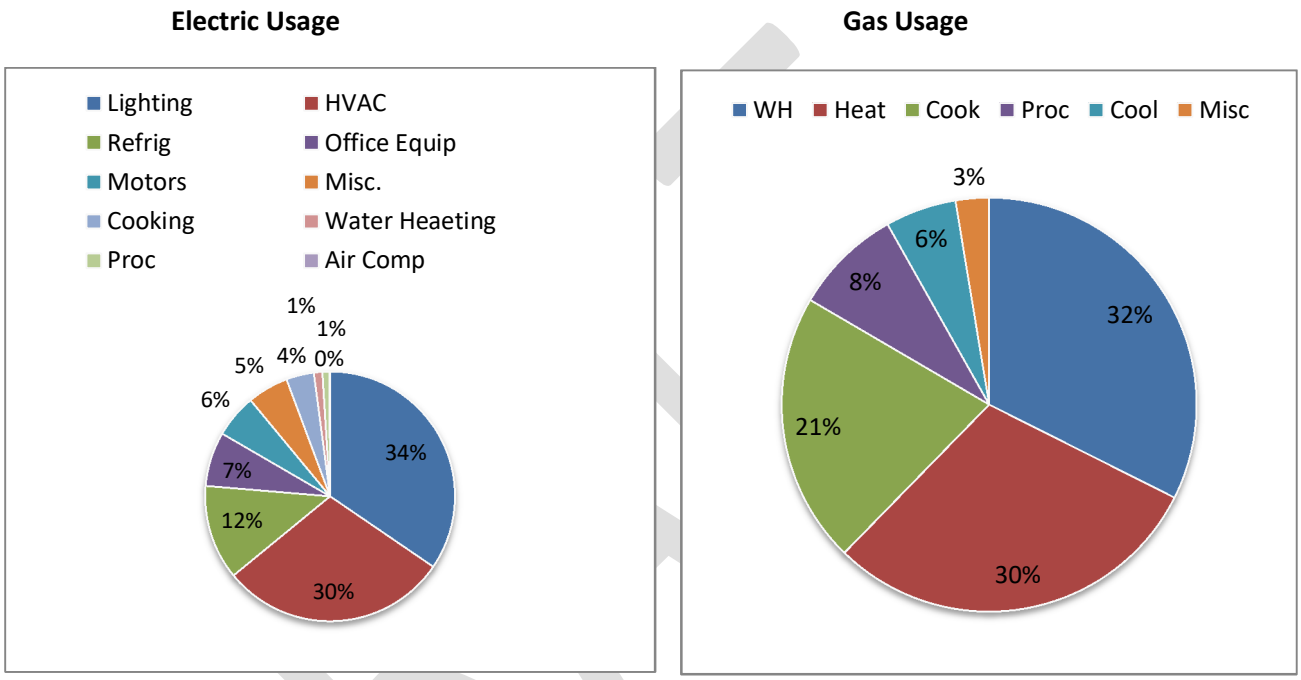
- Lodging (hotels and motels);
- Recreation and Entertainment (e.g., amusement parks), and
- Miscellaneous Services (e.g., nail or hair salons, banks, dry cleaners).

The technology and end-uses for these two segments tend to be less complex than segments within other sectors and align well with a deemed approach to program delivery. Typical end-uses tend to be interior lighting, HVAC, commercial refrigeration and food service technologies. Atypical end-uses may include water pumping and significant outdoor lighting. End-uses are discussed further in the next section.

Commercial Sector End-Uses

According to the California Commercial End-Use Survey, SDG&E's largest electric end-uses (based on consumption) in the commercial sector are lighting, HVAC, and refrigeration equipment, while the biggest gas end-uses are water-heating, heating, and cooking equipment (Figure Com-11). These findings are in consistent with the market characterization described earlier in this chapter.

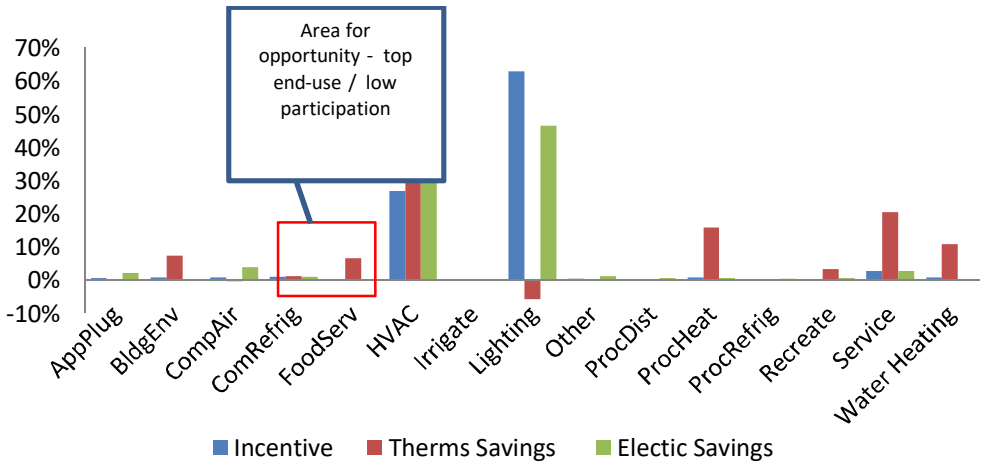
Figure Com - 11: Commercial Sector Electric and Gas Consumption by End-Use[45]



Comparing commercial end-use data with historical program participation by end-use provides a high-level perspective on end-uses underserved by current energy efficiency opportunities. Figure Com-12 outlines historical savings by end-use. Commercial refrigeration represents 12% of overall commercial consumption yet SDG&E has experienced very low participation rates (1-2% of total commercial savings). Similarly, with gas, food service represents 21% of commercial gas consumption, but has produced only 7% of sector savings. These discrepancies indicate areas on which SDG&E programmatic efforts can focus.

[45] Source: California Commercial End-Use Survey, 2006

Figure Com - 5: Historical Incentives, Electric & Gas Savings by End-Use[46]

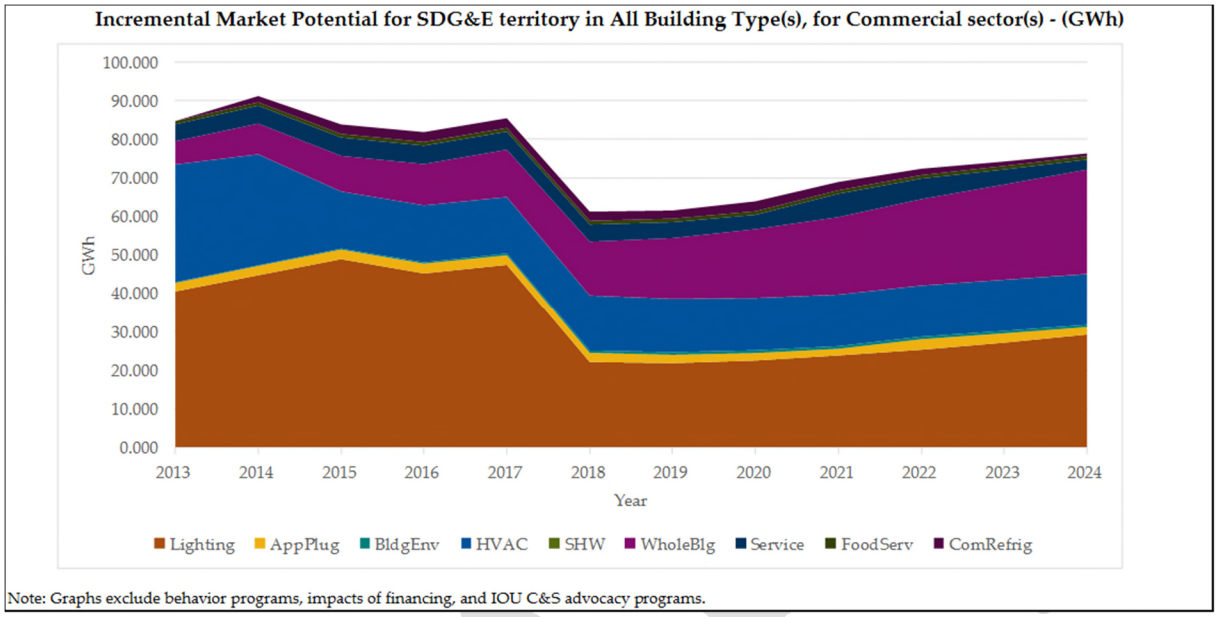


Energy Efficiency Market Potential

The 2013 Navigant California Market Potential Study provided data on energy efficiency market potential by utility, sector, and end-use. Figure 8 shows incremental market potential (in GWh) by end-use over time. While the total market potential fluctuates between approximately seven and nine GWh from 2013 to 2024, the individual end-uses also show significant variation. For instance, while HVAC was a large percentage of the commercial sector market potential in 2013, due to code changes, it diminishes to a very small percentage by 2024. On the other hand, there will be a significant increase in whole building potential. 2024, lighting will remain the largest potential in the commercial sector in SDG&E's service territory.

[46] Source: SDG&E 2013-2015 EE Programs

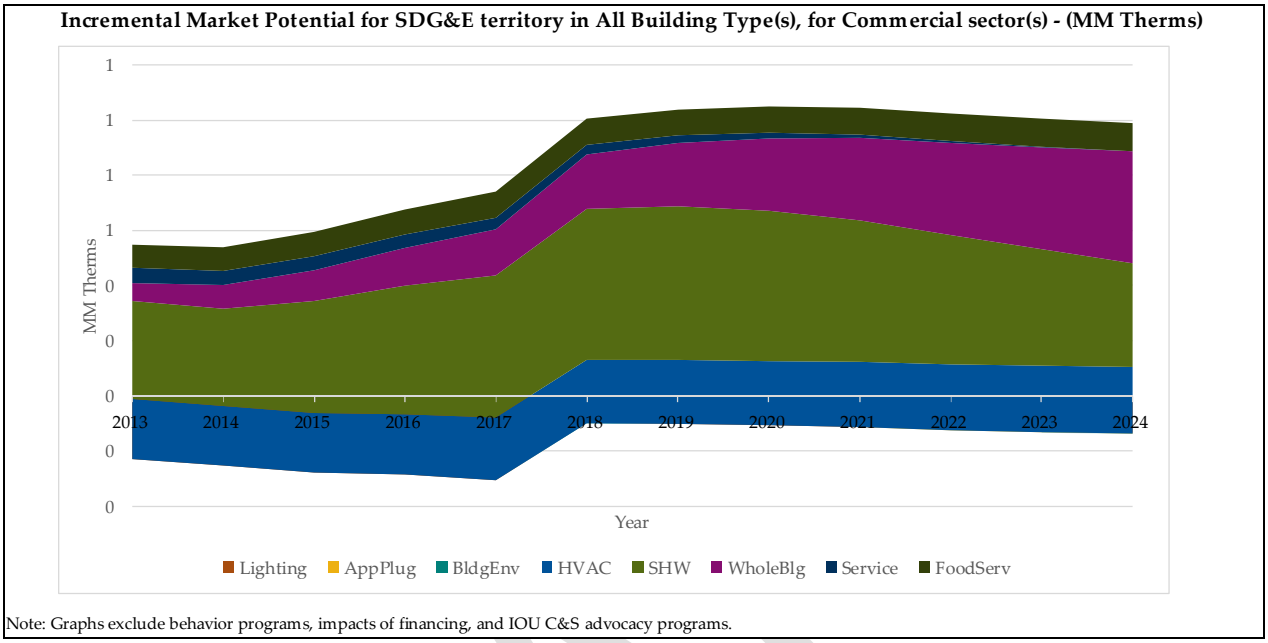
Figure Com - 13: SDG&E Commercial Incremental GWh Market Potential[47]



From the gas potential perspective, the potential is very small for this sector. As the lighting potential decreases on the electric side of the potential, it decreases the impacts on the therm savings potential. Hot water heating is the largest contributor, followed by whole building. Since the potential for savings is so small, this sector will focus more on the electric side of the potential bundling as appropriate with whole building approaches and comprehensive programs.

[47] Source: 2013 California Statewide Market Potential Study, performed by Navigant.

Figure Com - 14: SDG&E Commercial Incremental GWh Market Potential[48]



Future Trends

The following trends have influenced the goals and strategies selected for this business plan and may impact tactics used in the future. Trends within the commercial sector include:

- A focus on premium, urban office space – with an emphasis on green and LEED-certified building and retrofits. San Diego real estate market case studies show "vacancy rate for green buildings 4 percent lower than non-green properties…and that LEED-certified buildings routinely commanded the higher rents." [49]
- data-driven decisions in the retail segment. "While supermarket retailers have primarily focused on low-hanging fruit, such as reducing energy use through LED lighting retrofits and advanced refrigeration rack control algorithms, the next wave of energy efficiency initiatives will focus on combining data to better invest their maintenance budgets." [50]

One trend that will impact all commercial customers is the structure of rates, with particular emphasis on time-of-use rates. Changing rates and differing energy usage profiles will make customized solutions more important in the coming years. In addition, broader trends including the continued installation of solar, as well as electric vehicles and their impact on the grid and energy efficiency policies, will also impact energy usage in the commercial sector in years to come.

[48] Source: 2013 California Statewide Market Potential Study, performed by Navigant.
[49] The Business Case for Green Building, USGB
[50] Chain Store Age,12/22/2014

Legislative Impacts on Strategy

No discussion of planning for energy efficiency's future would be complete without addressing recent state legislative actions. Specifically, Senate Bill (SB) 350 and Assembly Bills (AB) 793, 758 and 802 provide directives that will impact energy efficiency strategy and implementation. SB 350, in particular, calls for a doubling of energy efficiency savings during the term of this Business Plan. The CPUC has provided initial guidance implementing these directives and SDG&E and the other PAs will continue to work with the CPUC to determine the most efficient means of complying with the new legislative mandates. SDG&E believes that the strategies outlined below will complement the recently adopted legislation. While compliant energy savings goals and budgets are not specifically addressed in this business plan, the goals and strategies described have been developed with this over-arching objective in mind. Going forward, specific tactics and their processes will be adjusted as needed to meet the legislative directives and any further direction from the CPUC.

These legislative mandates have been incorporated into this business plan both implicitly and explicitly. Generally, the commercial goals and strategies were developed to capture additional savings beyond those that existing program designs have been able to capture. Such strategies are aimed at doubling energy savings as required by SB 350. The benchmarking aspects of AB 802 are specifically addressed under Goal 2. Per AB 802, SDG&E will work with customers to unlock saving from inactive projects in existing commercial buildings. AB 758 is specifically addressed by Goal 1 as it describes strategies leveraging tenant and owner data.

The table on the following page summarizes these policy drivers and how this business plan address each one.

COMMERCIAL		
Policy Driver	**Specific Requirement / Guidance**	**Business Plan Response**
SB 350 - Clean Energy and Pollution Reduction Act of 2015	* Achieve a cumulative doubling of savings in electricity and gas retail customers' final end uses by 1/1/30. * The CEC shall adopt a responsible contractor policy to ensure that ratepayer-funded EE retrofits meet high-quality performance standards and reduce energy savings lost or foregone due to poor-quality workmanship.	* Interventions targeted to the Commercial sector are fundamental to SDG&E's ability to achieve SB 350's objectives. * Will continue successful approaches while substantially increasing efforts to engage the commercial properties segment, establishing an intuitive energy management platform to provide actionable solutions, and experiment with innovative procurement vehicles and intervention strategies.
AB 793 - Energy Management Technology Incentive Offering	Must develop programs by 1/1/17 that provide incentives to help residential and small/medium business customers acquire energy management technology and educate them about these programs.	* Online platform will provide customers improved opportunities to access program offerings and control their energy use.
AB758 - Existing Buildings Energy Efficiency Action Plan	Strategy 5.2.3 - to surmount "split incentive" dilemma.	* Increasing the value of the building as an asset * Work with third-parties to design offerings that maximizes landlord and tenant value while minimizing the impact to both the landlord and tenant businesses
AB 802 - Benchmarking and Changes to Energy Efficiency Baselines	**Benchmarking** - By 1/1/17, for multi-unit buildings, utilities must provide aggregated energy usage data to its owner, its agent or the building operator. Commission will set requirements for public disclosure of information for benchmarking purposes. **Baselines** - Authorizes utilities to provide incentives to customers for energy efficiency projects based on normalized metered energy consumption as a measure of energy savings.	* Establishing benchmarking scores as a best practices to sell energy efficiency projects. • Using benchmarking results to support third-party implementers in their efforts to sell energy efficiency

Goals, Strategies, and Tactics for the Commercial Sector

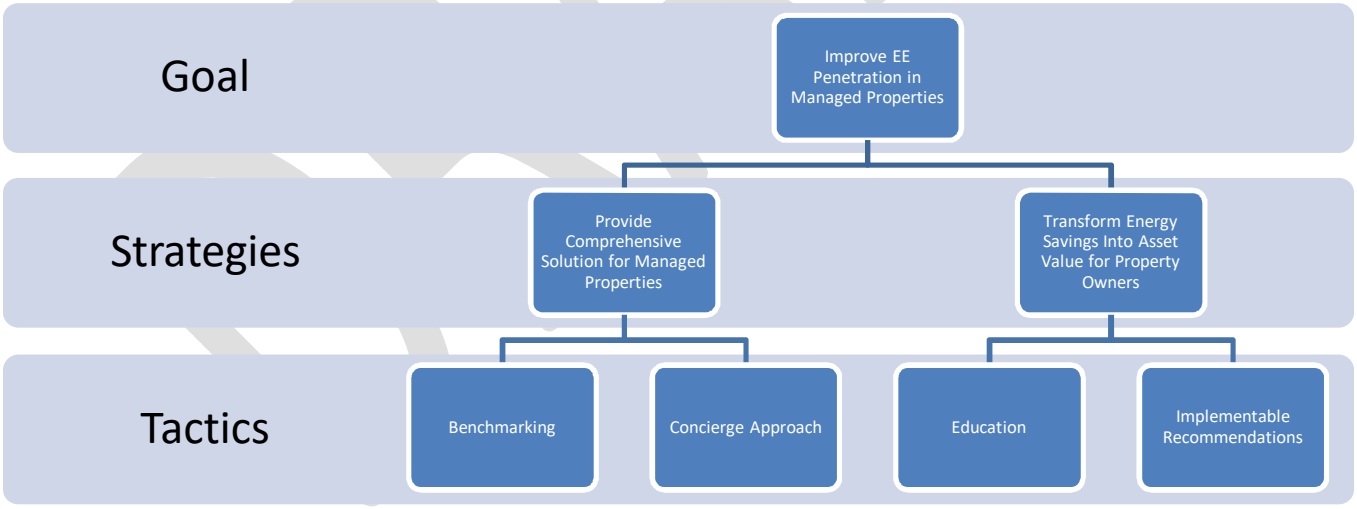
SDG&E's market analysis and input from stakeholders highlights consistent themes with respect to barriers customers face in adopting more energy efficient behaviors. SDG&E has analyzed these barriers in detail and considered the direction set by the California EE Long-Term Strategic Plan to determine the goals required to establish a unified, achievable framework that will yield concrete results in support of the mission and vision of the commercial sector. The two tables below summarize this process. To see a detailed description of the commercial sector problems included in the CA CEESP and provided through the CAEECC feedback process, please see Appendix B.

These goals and the existing core program components will be used to achieve savings goals based upon approved budgets. These activities have proven successful in assisting customers with facility upgrades and energy savings efforts.

Commercial Goal 1: Improve the Energy Efficiency Penetration in the Property Management Market by X%

> *Roughly one-third to one-half of the energy consumption in commercial, multi-tenanted buildings is driven by the behavior, equipment, and operating decisions of the tenants. Landlords (owners and managers) seeking to improve the energy performance of their buildings need to encourage and work with tenants to adopt best practices for energy management.*[51].

As discussed in the Market Characterization section, SDG&E's commercial sector is dominated by very small businesses. Because San Diego is a city of small businesses who lease, rather than own, their facilities, property management companies hold the key to reaching the majority of our commercial customers. This creates a "three-legged stool" from a targeting perspective. SDG&E will need to target the property owners of small commercial spaces, the tenants of those leased spaces and the contractors and vendors that service them. The CPUC has identified leased space as hard-to-reach because split incentives make it difficult to align the interests of lessors and lessees with respect to energy efficiency.[52] AB 758 identifies property owners and occupants as targets for data driven approaches[53], and SDG&E recognizes that achieving ongoing energy savings in this important market requires a new approach. SDG&E proposes to increase customer uptake in this hard-to-reach segment by accessing small commercial properties through their property managers.



Strategy: Transform tenant energy savings into asset value for property owners.

Traditionally, energy efficiency marketing and outreach strategies have focused on highlighting energy savings and return on investment (ROI) for potential participants. However, the managed property segment is driven more by a desire to increase revenues, and in turn increase asset values, as opposed

[51] Better Building Alliance, U.S. Department of Energy
[52] CPUC Policy Manual
[53] AB758, Existing Building Energy Efficiency Action Plan, Pg. 9

to an interest in avoiding costs.[54] This results in an opportunity. Due to the nature of most commercial leases, neither tenants nor landlords are motivated to make energy efficiency improvements at their facilities. As emphasized by CAEECC stakeholders, this key barrier and market research is the split incentive issue. Tenants, especially small businesses, are apprehensive to invest in energy efficiency projects for several reasons:

- Uncertainty about the longevity and/or profitability of their business, and/or
- Lack of authority to make facility upgrades.

Property owners have not been motivated to invest in energy efficiency improvements because they are not responsible for the utility bill and thus are not financially motivated to become more energy efficient.

SDG&E will transform the traditional approach to this market by shifting away from focusing on energy savings to focusing on maximizing the asset value of the building for landlords and demonstrating the benefits realized by tenants.

Strategy: Provide a simple, yet comprehensive, customized energy management solution for this hard-to-reach segment.

When working with small commercial markets, addressing leased spaces is imperative since most small businesses lease their space rather than own.[55] Utilities such as Connecticut Light and Power, Public Service of New Hampshire, Ontario Power Authority, and SMUD are all targeting this leasing market with a direct install approach.[56]

In addition to the split incentive barrier, two other related barriers impede tenant-occupied EE projects. These barriers facing both tenants and landlords are:

- A lack the time or skills to invest in EE projects, and/or
- Not understanding the benefits of EE.

Many utilities address these barriers by using a direct install approach; however, there are a broad range of direct install variations, each with pros and cons. To transform the way this segment values and implements energy efficiency, SDG&E will introduce a "concierge approach" that bundles all the relevant energy components, including:

- benchmarking
- rates and usage
- IDSM
- behavioral
- rebates/incentives
- financing
- implementation

[54] Upgrading Tenant Spaces, EPA 430-B-94-001B
[55] Small Business Direct Install Benchmark Study, ESource 2013, https://www.esource.com/members/EDRP-F-48/Focus-Report/Small-Business-Direct-Install
[56] Ibid.

Sample Tactics

Two primary tactics are needed to implement the strategies to achieve the tenant/landlord goal. The first tactic is to deploy a redesigned educational effort that is consistent with using energy efficiency to increase the value of the building as an asset. The primary objectives of this effort will be to provide elements for each leg of the "three-legged stool" of targets for this market. Holistically, these elements will need to address the various barriers as viewed from each target market (Property managers, tenants and contractors). The objectives will be to:

- Educate property management companies about how efficient rental properties can expand revenue generating opportunities and potentially lower vacancy rates, making them more competitive.[57]
- Educate tenants to include concepts such as forecasted/benchmarked energy costs when evaluating rental properties as well as how to choose contractors and access financing.
- Provide benchmarking data and scores that can be used by property owners and managers to justify rents levels and building values, consistent with AB 802 direction.
- Provide specific, implementable recommendations such as green lease contract clauses which specifically address the split incentive issue[58].
- Educate landlords/property managers about the need to use building operators & facility managers who are knowledgeable about energy measures to ensure proper maintenance and operation.
- Facilitate market acceptance through workforce, education and training for trade professionals:
    - Understanding and selling the value proposition of high efficiency equipment
    - Providing access to tools that showcase the value to customers (sales tools as well as measurement tools from WE&T lending libraries)
    - Educational offerings and certifications that promote quality installation and maintenance

The second tactic for this goal will be to work with third-party implementers to design and deliver a comprehensive offering that maximizes landlord and tenant value while minimizing the impact to both the landlord and tenant businesses. Key components of this program will be:

- Establishing benchmarking scores as a best practice to sell energy efficiency projects.
- Using benchmarking results from AB 802 compliance to support third-party implementers in their efforts to sell energy efficiency.
- Creating a program specifically targeting property managers that takes an integrated, concierge approach to implementation that includes financing and rebate/incentives.
- Facilitating market acceptance through workforce, education and training for trade professionals:

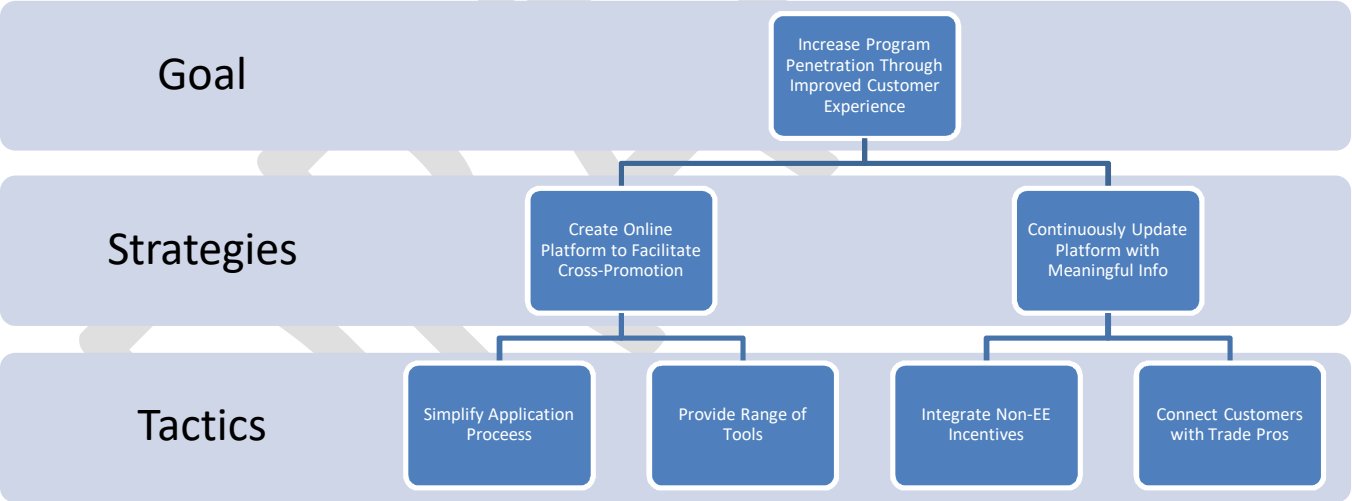
[57] San Diego real estate market case studies show the "vacancy rate for green buildings 4 percent lower than non-green properties…and that LEED-certified buildings routinely commanded the higher rents." *The Business Case for Green Building,* USGB

[58] Office Building Sector Snapshot, ESource, 2011 pg.10

- Expand workforce, education and training offerings to ensure that Trade Pros have a deep understanding and are fully engaged in promoting benchmarking scores as a sales tool.
- Encourage advanced education and higher workforce standards by highlighting these credentials in the concierge approach.

Commercial Goal 2: Increase penetration by XX% through an improved customer experience, facilitated by an intuitive platform designed to make energy efficiency offerings much more accessible.

SDG&E will design an intuitive platform that bundles rates, usage, products and financing into a holistic, customized energy management solution. The platform will provide the experience that customers have come to expect in a connected world by transforming data into actionable recommendations. The current transactional nature to these encounters will evolve to an interactive, relational experience that provides customers with a starting point and milestones which will encourage ongoing participation through behavioral strategies. The end result will be an improved customer experience[59] and an increase in penetration.



Strategy: Create an online platform to facilitate cross-promotion

The 2010-2011 Non-Residential Program Process Evaluation Study identified a "lack of cross promotion of SDG&E EE Programs by Contractors, and little (if any) follow up on other programs" as an area of improvement.[60] This lack of cross-promotion of energy efficiency programs acts as a barrier to reaching the goal of an ongoing partnership and results in leftover opportunities. A review of past energy efficiency projects found efforts were often single-end-use, non-comprehensive projects. For example, more than half of the deemed projects were lighting only. This leaves many untapped opportunities to encourage IDSM and encourage implementation of more comprehensive projects. Further,

[59] Using Online Rebate Processing to Improve DSM Program Performance, ESource 2014, pg. 2

[60] SDG&E 2010-2011 Non-Residential Program Process Evaluation Study: Main Volume (SDG0256.01-.05 or WO1025); Published March 19, 2012

transactional nature of current energy efficiency programs and multiple sources of energy related data create an informational barrier preventing customers from fully understanding their energy usage and possible savings paths. The following strategy will leverage program policy and system improvements made over the last few years including:

- Workflow management tools with holistic view of planned and implemented projects across programs
- Improved auditing approach that provides automated referrals to core offerings to increase likelihood of implementation of audit recommendations
- Comprehensive, multi-technology trade professional directory to facilitate deeper energy savings
- A simplified, more streamlined application process

SDG&E believes that building a tool that bundles rates, usage, products and financing into a holistic, customized energy management solution can be used by customers to overcome both these barriers and better understand how they are using energy, develop an energy plan on their own, and connect them to the Trade Professionals who can assist with execution.

Strategy: Ensure that the platform continuously provides meaningful information to encourage customers to return and guide their advancement up the energy adoption curve.

SDG&E has identified the lack of customized data as an additional barrier preventing attainment of reaching the goal of an improved customer experience and ongoing partnership. The platform will use customer data and intelligent, intuitive technologies to ensure that a customer's experience is customized to their needs each time they visit the platform. This approach will simplify the transactional process while empowering the customer to take action on an ongoing basis.

Sample Tactics

Both of these strategies will be implemented by creating a new customer energy hub or platform. This system will include the following characteristics:

- Simplify the application process by enhancing the online experience.
  - Evolve this process to create an online portal that will "process" rebates with a simple "click" and leverage data to present customized participation options.
- Provide a range of tools that align with the customer's desired level of sophistication and advances as the customer's knowledge grows.
  - Tools can include alerts, goals and subscriptions
- Integrate incentives for other energy related and/or sustainability offerings. These other incentives and offerings may include:
  - Zero-Emission Vehicles
  - Demand Response
  - Renewables
  - Water-Energy Nexus
  - Emerging Technologies
  - Workforce Education and Training Opportunities
  - Financing Opportunities

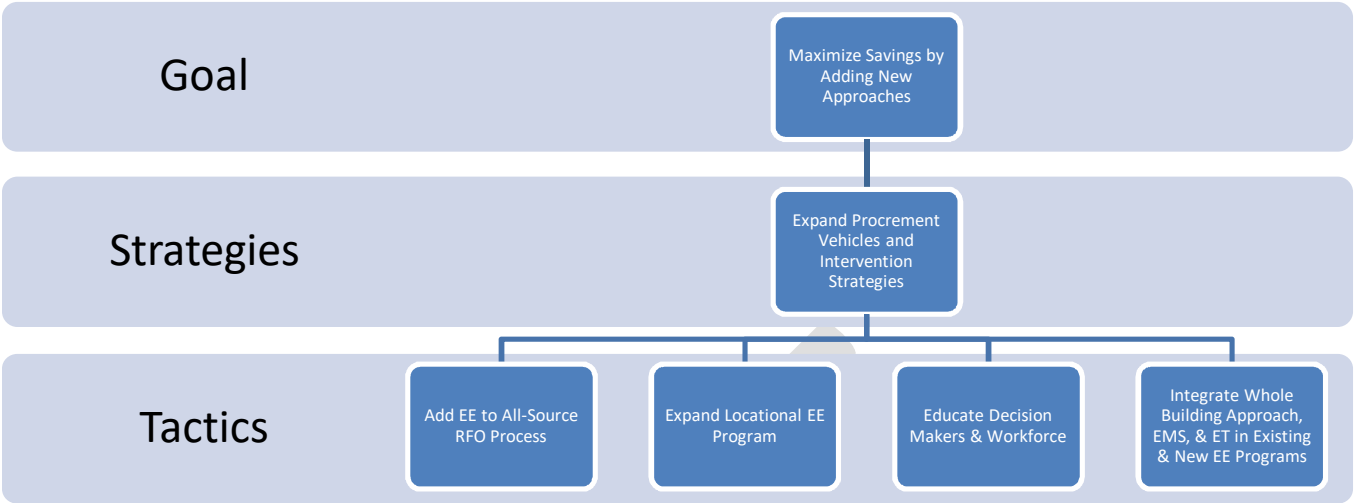
- Connect customers with qualified, skilled trade professionals who can provide installation, maintenance and other related services.
    - Allow customers to request quotes online
    - Enable customers to make informed decisions about trade professional selection
        - Educate customers on what to look for when hiring a trade pro (e.g., work experience, history of successful EE projects, workforce education and standards, customer satisfaction, violations, etc.)
        - Highlight trade pro "stats" from public EE data sources (e.g., EE savings contributions, rate of successful project completion, WE&T participation and certifications, etc.) to provide customers more complete and transparent information for decision making
- Integrate the customer's energy experience including usage history and patterns, rate information, as well as energy efficiency opportunities.
- Provide an easy to understand and customized energy plan with a graphical depiction of progress.

In addition to creating this new customer-centric tool, SDG&E will leverage existing offering to enhance the customization and scope of the data provided to customers by the tool. These offering include:

- Data and recommendations from the Comprehensive Audit Program
- Workforce, Education and Training courses applicable to the customer
- Eligibility for enhanced incentives based on targeted locational efforts
- Information provided by statewide implementers
- Facilitate market acceptance through workforce, education and training for trade professionals
    - Offer workforce, education and training courses and certifications that promote a skilled and trained workforce that can be demonstrated via platform at both the company and the worker level.
    - Raise standards required to participate in SDG&E's Trade Professional Alliance Directory that allows trade professionals to submit applications on behalf of commercial customers.

Commercial Goal 3: Maximize savings and efficiency by executing new approaches, among them variations on All-Source RFOs, expanding efforts to optimize the grid through targeted distributed energy resources, and leveraging energy management product innovations to better inform small commercial customers.

Existing programs alone do not address the universe of customer needs or recent changes prompted by legislation. The energy efficiency industry has the potential to see significant change in the next decade, providing opportunities for innovation and market transformation. This influx of innovation should not be limited solely to technologies but rather should require us to consider fresh approaches to programs and procurements. SDG&E will use a test and learn approach to maximize both savings and efficiency.



Strategy: Explore the expansion of various procurement vehicles and intervention strategies to find targeted, deeper, or incremental savings.

SDG&E developed this strategy to address two unique, yet general, challenges. The first challenge is successfully identifying and capturing additional energy savings. The second challenge is to realize these savings in as cost effective a manner as possible. SDG&E believes that the strategies already discussed assist in overcoming these barriers and believe that additional opportunities exist. Stakeholder input and recent direction from the CPUC reaffirms these beliefs. Thus, SDG&E plans to expand the methods by which it achieves energy savings by leveraging market opportunities.

Sample Tactics

Various tactics will be tested and refined as needed to achieve reliable, meaningful, and cost effective savings for ratepayers. Specific tactics will include:

- Building on SDG&E's initial All-Source RFO to achieve additional EE savings.
- Expanding the Locational EE program to focus on grid stability and/or other needs.
- Incorporate pay for performance payment terms to maximize contract value and minimize ratepayer risk.
- Focusing workforce, education and training on the energy efficiency value proposition for all segments.
- Including whole building approaches within both traditional EE programs as well as those that may be part of this strategy's implementation.
- In support of AB 793, finding, testing and learning about energy management products for small customers.
- Providing the emerging technology program with specific high need areas for SDG&E commercial customers so that appropriate technologies are explored and evaluated with available ET tactics. Emerging technology evaluations will identify the technologies that are suitable for new pilots or program offerings in SDG&E's commercial programs.
- Exploring mutually beneficial opportunities with other agencies.
- Targeting underperforming/high-potential end-uses such as refrigeration and food service.

Commercial Sector Metrics

Energy Efficiency Business Plans: Sector Metric Table - Commercial Sector									
Problem Statement	**Market Barriers**	**Desired Sector Outcome**	**Intervention Strategies**	**Sector Metric**	**Baseline**	**Metric Source**	**Short Term Target (1-3 years)**	**Mid Term Target (4-7 years)**	**Long Term Targets (8-10+ years)**
1. Extremely high proportion of customers are small and lease their facilities.	-Multiple decision makers -Split Incentives	1. Improve the Energy Efficiency Penetration in the Untapped Property Management Market by X%	1. Provide a simple, yet comprehensive, customized energy management solution for this hard to reach segment	% of commercial customers that are small and lease their facility	Current % of commercial customers that are small and	Program database			
2. The split incentive between property owners and tenants dramatically reduces energy efficiency upgrades.	-Multiple decision makers -Split Incentives	1. Improve the Energy Efficiency Penetration in the Untapped Property Management Market by X%	1. Provide a simple, yet comprehensive, customized energy management solution for this hard to reach segment 2. Transform tenant energy savings into asset value for property owners.	% of property owners and tenants that participate in programs		Program database			
3. Current program design is transactional in nature and thus short-term focused and results in missed opportunities	Lack of cross-promotion leads to single end-use transactions Trade Pros and Customers are confused by rules and processes	2. Increase penetration by XX% through an improved customer experience.	3. Create an online platform to facilitate cross-promotion 4. Ensure that the platform continuously provides meaningful information to encourage customers to return and guide their advancement up the energy adoption curve	Number of return customers to the online platform and number who participate across multiple end-uses	N/A	Program database			
4. Current program processes can be complicated and impede EE participation.	Lack of cross-promotion leads to single end-use transactions Trade Pros and Customers are confused by rules and processes	2. Increase penetration by XX% through an improved customer experience.	3. Create an online platform to facilitate cross-promotion	Absolute number of visitors to the online platform that click through and inquire to receive more information. Additionally how many ultimatley enroll.	N/A	Program database			
5. Innovation of implementation methodolgies and procurement processes are needed to meet the SB 350 goals.	Need for identifying and capturing additional energy savings. Maintain Cost Effectiveness	3: Maximize savings and efficiency by executing XX# new approaches.	5. Explore the expansion of various procurement vehicles and intervention strategies to find targeted, deeper, or incremental savings	Number of new approaches initiated and customers enrolled.	N/A	Program database			

*All metrics will track AMI data when possible.

Key Partners

Coordinating and collaborating with partners will be important to helping SDG&E engage customers in program activities. Following are list of key partners and the roles they will play in implementing SDG&E's vision.

Program Administrators

SDG&E will coordinate with other PAs to:

- Leverage lessons-learned and implement best practices, particularly as they relate to the commercial segments identified herein as playing crucial roles in achieving the Company's energy efficiency goals;
- Refine, especially for the benefit of market actors who work across service territories, efforts to create statewide consistency in the types of programs offered to customers, and
- Conduct market research to help identify, better understand and address customer barriers to energy efficiency investments.

Trade Organizations and Trade Professionals

Trade organizations and trade professionals play an especially important part in delivering energy efficiency benefits to commercial customers. SDG&E will continue to work with trade organizations and trade professionals to:

- Enable them to, where feasible and practical, play active roles in helping design programs that serve the commercial sector;
- Create opportunities for groups, companies and individuals who demonstrate their commitments to energy efficiency to be leaders in communicating to the market SDG&E's offerings;
- Coordinate with trade organizations and trade professionals from other service territories as a means of elevating the importance of energy efficiency to their businesses.

Third-Party Program Implementers

The CPUC has established that third-party program implementers will be the primary delivery mechanism for energy efficiency programs by 2020. With this in mind, SDG&E commits to working with potential third-party program implementers by:

- Establishing a clear schedule for anticipated solicitations;
- Creating a structured dialogue to enable third-party program implementers opportunities to provide input on program design;
- Publishing, within the confines of protecting customer privacy, information about customer energy use and other trends, to better enable implementers who respond to open solicitations to propose programs that meet SDG&E's energy efficiency program needs;
- Coordinating with other PA's to establish consistent solicitation schedules and, where appropriate, common language and methods of having a structured dialogue with implementers; and
- Dramatically increasing the number of potential third-party program implementers by conducting trainings, creating self-help tools for bidders, and establishing platforms that enable greater levels of participation.

Local and State Government

Local and State governmental entities will continue to be actively involved with SDG&E's efforts to increase customer levels of energy efficiency. SDG&E's commercial sector programmatic offerings will be closely tied with the Company's Partnership offerings.,

California Public Utilities Commission and other Key Regulatory Bodies

Although there is not anything necessarily unique to the Commercial sector that would apply to the CPUC and other regulators such as the California Energy Commission, CalEPA, and others, it will remain important for SDG&E to engage regulators:

- to ensure that the CPUC is kept apprised of developments in SDG&E's commercial sector as they relate to the Business Plan and any mid-course corrections that SDG&E may propose;
- to keep the CEC (and the CPUC) informed about ways that implementation of AB802's baseline changes is impacting energy forecasting;
- check the progress of programmatic initiatives as they relate to metrics and other key performance indicators, and
- to understand how to best implement the directive to shift program implementation to third parties and to candidly convey how well the process is working.

Cross-Cutting Coordination

Description of how cross cutting activities are addressed in customer sector strategies.

WE&T

As a cross-cutting program, WE&T is critical to building customer demand by highlighting the value of EE, promoting market acceptance by educating trade professionals on how to maximize sales through the value proposition, and ensuring that a skilled and trained workforce properly installs and maintains equipment leading to greater EE savings. SDG&E's WE&T program has and will continue to focus on the following areas to engage with both commercial customers and the trade professionals who support them. Looking ahead, the WE&T program will continue to support the following areas and will expand or contract based on market and potential data forecasts:

- Building Design & Construction
- Building Performance
- Codes & Standards
- Food Service
- HVAC
- Lighting
- Marketing / Finance / Sales / Real Estate
- Renewable Energy
- Sustainability
- SDG&E's Rebate & Incentive Programs

More details on these efforts are provided in the WE&T chapter of this Business Plan.

Financing

Improve Financing Opportunities
SDG&E will provide more financing opportunities and make financing programs easier to use. Traditional financing programs, such as SDG&E's On-Bill Financing, are helpful tools to encourage participation in IDER programs. Although most customers qualify, trade professionals often must front the project costs for their customers until a project is completed, at the risk of the customer being disqualified from financing if the project scope changes.

Financing options will be included across all of our commercial sector goals.

Statewide Crosscutting Programs

Since Emerging Technologies, Codes &Standards, and aspects of financing will be transitioning to statewide programs that may be administrated outside of SDG&E, this section will be updated with more details after the lead PAs are selected in the upcoming weeks. Please note that although the WE&T Connections program will also be administered statewide, it focuses on K-12 education and isn't relevant to this sector.

Commercial EM&V Considerations

SDG&E EM&V is preparing for the evaluation of the commercial sector and the interventions proposed here. With the introduction of AB802, we will be required to expand our EM&V responsibilities to include measuring normalized meter data to determine impacts associated with sector interventions. This presents an opportunity to implement early M&V (sometimes referred to as M&V 2.0), along with process evaluations to analyze program success, while tracking sector metrics. In analyzing this sector, SDG&Es team will implement an holistic evaluation methodology attempting to determine not only the effect of commercial sector activity, but also establish causal effects of various tactics to increase EE savings, while providing regular feedback to the commercial team to necessitate changes if necessary.

The EM&V activities for the commercial sector will include:

- Normalized net-metered energy usage based on AMI data
- Regular strategy and implementation metric tracking and providing
- Casual analysis between metrics and strategies, and "success" i.e. are these the correct metrics to drive program success?

These three evaluation approaches will be used in concert to gain a complete picture of the sector across time, and at various intervention points.

The commercial sector EM&V effort will begin with the implementation of the business plan and occur at regular and ongoing intervals. Metrics and savings will be tracked quarterly, biannually, or annually dependent on evaluation and programmatic need and constraints, including EM&V resources. Ultimately we would like to be able to measure normalized net metered savings in real time. Until that system goes online we will measure normalized metered savings biannually. This will require determining a methodology to forecast what usage would have been absent of the program intervention, and comparing that to actual usage. For an example methodology please see the

Statewide HVAC evaluation titled AMI Billing Regression Study.[61.] Net-metered savings provide critical feedback to program staff and the success of their work, without having to wait years for a large scale Impact Evaluation.

On a more regular basis, EM&V will be engaged in measuring sector and implementation level metrics. SDG&E EM&V suggests two types of analysis related to metrics. The first capitalizes on the objective of the metric as a quick indicator of programmatic success or direction, without the necessity of a full scale, resource intensive impact evaluation. This first type of analysis will use summary statistics to understand how the sector, program, and individual interventions are changing, operating, or succeeding over time. EM&V will provide program staff a regular report that tracks individual metrics overtime.

Additional analysis will become necessary over time. Eventually metrics themselves will need to be tested, specifically whether or not a metric is appropriate. This analysis requires significant savings and metrics data; thus, the timeline will need to be determined at a future point. This analysis will likely be a simple OLS regression to test correlations between metrics and savings. Where evaluators identify metrics that are significant and positive, we can further engage our programs to address these metrics. Where we find individual metrics that lack significance or are negatively correlated, programs can stop that activity and reallocated resources to addressing other positive and significant metrics.

This plan is presented independent of the statewide EM&V efforts included in the CA EM&V Research Roadmap. Additional evaluation will occur within that forum that will provide significant programmatic feedback to the commercial staff.

[61] Evergreen Economics, "AMI Billing Regression Study," Calmac ID SCE0383.01 (March 16,2016)

Public Sector

Chapter Summary

Ten percent of SDG&E's electric consumption is attributable to the public sector. While this statistic is meaningful in itself, it might be argued that the public sector has an even greater importance because of the high visibility and influence of the customer base.

The California Energy Efficiency Strategic Plan's Vision for Local Governments
"By 2020, California's local governments will be leaders in using energy efficiency to reduce energy use and global warming emissions both in their own facilities and throughout their communities."

Traditionally, customers within the public sector have been grouped within the commercial sector. This legacy creates certain data challenges; however, SDG&E has been working closely with the public sector for many years through formal EE Partnerships in addition to collaborating on projects and special initiatives with many public entities. This approach to the public sector has proved successful. In fact, while representing 10% of electric load, public entities accounted for 15% of SDG&E's energy savings in 2013-15. This business plan describes how SDG&E, with this experience and input from many partners, will create offerings focused specifically to public sector customers.

Consistent with the EE Strategic Plan for local governments, SDG&E's mission for the larger public sector is to support public customers with the knowledge and resources required to champion energy efficiency within their own facilities and communities.

SDG&E developed this business plan's goals to directly address the needs of the large majority of our public customers, consisting of federal, state, local government and educational entities. This customer composition poses unique challenges for SDG&E as these entities are expected to lead by example in their own facilities as well as create and enforce mandates, many of which are unfunded.

To accomplish this mission, SDG&E has established the following public sector goals:

- Public Goal 1: Empower Leaders by equipping them with knowledge and tools to make informed EE decisions
- Public Goal 2: Eliminate Barriers to Public Sector Participation by developing tailored solutions and financing options
- Public Goal 3: Influence Private Sector EE Activities through reach codes and engagement.

The public sector presents both unique barriers and tremendous opportunities. This business plan summarizes the strategies SDG&E has developed based on its long-term relationship with its public partners. These strategies support the goals listed above and will help governments and other public entities meet or exceed their environmental and sustainability objectives through interventions such as financing and climate action plan support.


the
PAST, PRSENT AND FUTURE
of
PUBLIC ENERGY EFFICIENCY
PAST & PRESENT
FUTURE
Market Characterization
Relatively small sector
• 10% of total kWh consumption
• 13% of EE spending
• 15% of EE kWh savings
Majority of customers are small
77% accounts under 20kW
Unique sector attributes
Taxpayer funded
Public decision-making and budgeting process
Political mandates
Climate Action Plans create focus on energy efficiency
ZNE
ZNE goals suggest flat, or possibly lower future consumption
Responsible for complying with increased political mandates, often unfunded
Non-EE benefits like comfort and productivity will drive deeper EE penetration
Approach
No focus on the public sector as a unique customer segment
Part of commercial sector. Participated in bundled non-residential programs
Lacked customization to unique needs and challenges - minimal focus on leveraging influence over private sector
Savings from traditional non-residential, single end-uses such as lighting and HVAC
Limited comprehensive projects
Misaligned program deadlines and public project implementation timelines restrict participation
Missed opportunity for engaging public leaders as EE champions
Missed opportunity to drive additional private sector savings
New public sector represents an opportunity to modify existing and develop new innovative offerings. Address the sector's unique needs and challenges
Facilitate best practice sharing and equip leaders with knowledge and tools to make informed energy efficiency decisions
Garner public leader support of energy efficiency
Eliminate barriers to participate
• Tailor offerings to address unique needs
• Develop public sector action plan
• Drive success in climate action planning
• Enable projects through financial solutions
• Modify finance products
Enhanced marketing, education and outreach and Reach Code development will encourage participation and progress beyond existing codes and standards in private sector

Approach to Achieve Public Sector Goals

As a trusted energy advisor to our public sector customers, SDG&E offers extensive local knowledge of our grid and our customers' energy consumption patterns. SDG&E can provide its various stakeholders[62] valuable support to continue to achieve California's significant energy reduction goals.

The public sector is a critical component of the overall SDG&E business plan. This section serves to define the optimal strategy to meet this sector's unique needs and to promote progress toward the overall mission of energy efficiency and greenhouse gas emissions reduction in California. However, from SDG&E's assessment of the Public sector, it's clear that there are distinct barriers and needs that are applicable to each of these groups:

- Public leaders and elected officials
- The Public buildings and customers
- The constituency that the Public sector influences.

"Most public sector energy efficiency projects stall due to one or more of the following perceived barriers: lack of money to fund them, lack of time or personnel to design and plan them, or lack of internal expertise to implement them."[63]

In order to identify the optimal strategy to achieve the energy efficiency vision, it is important to understand the gaps that must close as we partner with key public sector players to meet or exceed energy efficiency goals in the SDG&E territory. The following are key considerations for the public sector.

Staff Bandwidth

"Insufficient local staff capacity and resources is a barrier to doing more municipal retrofits".[64]

While there is no formally gathered data across the public sector, public entities have communicated anecdotally and through EM&V studies that the number of EE staff is not at sufficient levels to support lasting energy efficiency efforts. Lack of dedicated EE staff is repeatedly called out as a barrier to progress toward aggressive EE goals and mandates.

"These additional services are extremely important to the [City] because the City has a small staff and is not able to conduct the appropriate research or plan preparation without the help of outside consultants. Utilizing outside consultants is very costly to the City. Therefore, having the training opportunities and funded consultants to help local cities to achieve strategic plans that are encouraged by the State is beneficial. Without these services to the City, many plans would not be properly researched, created or implemented."[65]

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[62] Stakeholders include, but are not limited to: state agencies, specifically the California Public Utilities Commission and California Energy Commission (CEC), Investor Owned Utilities, Program Administrators, energy efficiency program implementers, capital providers and customers.

[63] Financing Energy Efficiency Projects, Government Finance Review, Energy Star, February 2003, https://www.energystar.gov/ia/business/government/Financial_Energy_Efficiency_Projects.pdf.

[64] Program Assessment Study: Local Government Partnership Programs, Evergreen Economics and Navigant Consulting, July 2013, p. 98

[65] PY 2013-2014 Local Government Partnerships Value and Effectiveness Study Final Report, Opinion Dynamics, p. 34.

Technical Expertise

"The largest barriers to Strategic Plan Project completion are 1) a lack of subject-matter expertise, and 2) technical support for projects. While the IOUs generally provide this service directly to LGs, there remains an unmet need for greater access to technical staff and resources".[66]

If available, internal energy efficiency technical experts are in high demand across their organizations, and their availability to support ongoing EE programs and initiatives is very limited. As is most often the case, technical expertise is generally lacking. As a result, outside technical and project management experts must be brought on board on a short-term basis at higher costs, burdening public agency budgets that are already packed to capacity.

No Universal Acceptance of Value Proposition

"The absence of a systematic quantification of the value of energy and efficiency upgrades for nonresidential and residential building properties is a major barrier to energy efficiency investments. Research and customer surveys indicate that there is quantifiable value in energy efficiency, including operational cost reductions, healthier buildings, better employee and tenant retention, and higher resale and lease opportunities".[67]

Energy efficiency projects are often evaluated only by their Return on Investment (ROI) or Simple Payback. Particularly for taxpayer-funded projects in the public sector, it is important to not only highlight the direct financial benefits of a project, but also the financial benefits of wise business decision regarding EE—which result in ongoing, long-term savings for the organization[68]. Additionally, public entities must be thoroughly informed of the significant value that qualitative benefits offer to the public—such as reduced environmental impacts, improved occupant productivity and comfort, and spillover of public sector retrofits into private sector projects. The disconnect between EE and the value it offers to public customers has resulted in significant investments in the form of EE audits that have yielded a low rate of successfully implemented EE measures. In fact, SDG&E performed 875 audits for public customers during the 2013-2015 program cycle, and saw a very low conversion rate. This barrier is addressed later in the document throughout the strategies discussion, and especially under Goal 1: Empower Leaders by equipping them with knowledge and tools to make informed EE decisions.

Funding and Procurement Challenges

"The cyclical nature of capital renewal requires consistent investment to keep pace with decline. While the State may have competing priorities for limited capital funding, lack of routine improvements only postpone long term need. Immediate and sustained investment reduces CSU's financial exposure by avoiding costly emergency repairs to poorly maintained facilities."[69]

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[66] PY 2013-2014 Local Government Partnerships Value and Effectiveness Study Final Report, Opinion Dynamics, p. 67

[67] California Existing Buildings Energy Efficiency Action Plan, California Energy Commission, Sept 2015, http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN206015_20150904T153548_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf

[68] Reduced maintenance costs is an example of the additional savings realized through EE projects.

[69] California State University System, 2014 Capital Renewal Annual Report, Sightlines, 2014, p. 12.

When it comes to funding EE projects, public entities face challenges on various fronts.

Public entities typically fund energy efficiency projects through their general maintenance or capital budgets. Incentives and energy savings from these projects are thus credited to the general fund, and are rarely earmarked for future energy efficiency improvements.

"Government and institutional organizations do not typically prioritize energy improvements as part of their overall capital improvement budgets, especially when utility bill savings accrue to their operating budget".[70]

Energy efficiency project funding is often cited as the largest hurdle for customers to overcome. In discussions with various customers in this space, it has been shared that capital improvement and maintenance budgets are rarely made available to energy efficiency retrofit projects, so utility financing, school bonds, CEC loans and other funding sources must be leveraged for EE projects to move forward. These funding sources each have their challenges and limitations.

The public sector's procurement process and rules are unlike other sectors'. The Davis Bacon Act requires payment of prevailing wage to any contractor or subcontractor, which several public entities have cited as increasing overall EE project costs[71]. Competitive bid requirements slow down the project procurement process, as does the council/board/regents approval process. This lengthy process—along with the expectation that project financials would not change once approved—presents significant hurdles for moving energy efficiency projects forward.

Current Processes and Tools Are Not Intuitive

Program evaluations and customer feedback indicate the current mix of EE portfolio offerings can be confusing, due to multiple program entry points, complex program requirements, and program rule changes. Anecdotal feedback from customers and account executives support this finding. While the variety of program options provides flexibility, customers often have difficulties finding the right program to pursue; this can cause frustration and discourage participation. Similarly, mid-stream program rule changes can negatively impact project financials and cause frustration and delays if the project must be re-approved by the board/council/regents.

A result of the increasing level of EE program complexity is the reduction in energy savings upon which incentives may be paid. Other conflicting policies, such as how to address customers with significant self-generation, further limit the amount of incentives that can be paid. This reduction can exclude public sector customers from full program participation. Increasing project costs and lower incentives limit the comprehensiveness of energy efficiency projects, running counter to California's Long-Term Energy Efficiency Strategic Plan.

Public Sector Project Implementation and EE Program Timelines Are Not Aligned

The timeline expectations and complexity of current programs dis-incentivizes the public sector from participating in energy efficiency programs and increases the challenge of doubling the state's energy

[70] Energy Efficiency Financing in California Needs and Gaps: Preliminary Assessment and Recommendations, Harcourt, Brown, and Carey, San Francisco: CPUC, 2011, p.34. http://www.harcourtbrown.com/wp-content/uploads/CPUC_FinancingReport_HBC_Jul8v2.pdf

[71] Several partners have shared this sentiment anecdotally. Specifically, the University of California and California State University Pre-Stage 2 Input, Submitted 12 April 2016, states, "Energy efficiency projects in the public sector are more expensive due to statutory requirements like prevailing wages, bidding requirements and reporting requirements." Decreasing Incentive Levels section, p. 2. http://media.wix.com/ugd/0c9650_c6c73755ceca43a1af197c26325c5f04.pdf

efficiency.[72] The public sector's planning horizon is markedly longer than other sectors', which is both a boon and challenge for energy efficiency projects. This long-term view offers the potential for more comprehensive, longer-payback projects to be implemented, yet the dynamic nature of California's EE programs limits the certainty that is often required by entities with long-term planning horizons.

Specifically, this portion of the business plan will first provide an overview of the public sector and SDG&E's energy efficiency program offerings. Next, this plan will discuss SDG&E's mission and vision for its public sector energy efficiency programs, as well as the key challenges that public sector entities face in planning, executing, and managing energy efficiency efforts. Once the business plan establishes this current-state environment, the plan will highlight the overarching strategic goals for SDG&E's public sector energy efficiency efforts:

- Public Goal 1: Empower Leaders by equipping them with knowledge and tools to make informed EE decisions
- Public Goal 2: Eliminate Barriers to Public Sector Participation by developing tailored solutions and financing options
- Public Goal 3: Influence Private Sector EE Activities through reach codes and engagement

The strategic goals in this plan will serve as the foundation for SDG&E's public sector energy efficiency strategy, and the discussion will focus on the best-fit intervention strategies that SDG&E will implement in collaboration with its public sector partners. Once these intervention strategies have been defined, the plan will identify metrics that reflect progress against the strategies—and serve as key indicators of program performance for SDG&E's public sector energy efficiency efforts. This plan will go on to include a discussion of the Evaluation, Measurement, and Verification considerations for public sector energy efficiency efforts.

Lastly, this business plan will address its coordination approach across a variety of areas. First, the plan will describe SDG&E's key partners in the public sector, as well as how SDG&E will collaborate with them to meet energy efficiency goals and objectives together. Next, the plan will lay out how statewide coordination across programs ensures alignment across Program Administrators, while simultaneously meeting strategic goals and maximizing efficiencies. The final portion of the coordination discussion will cover the intersection between the energy efficiency strategies for the public and cross-cutting sectors, and how the two programs will coordinate to achieve the most impactful results.

This approach has been designed to provide the public sector with the support and collaboration necessary to reach savings goals based upon approved budgets. The following tables outline the proposed energy efficiency goals and budget for SDG&E's public sector.

[72] SB 350 https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350.

Figure Pub-1: Public Sector Annualized Savings Goals

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
GWh	TBD	TBD	TBD
MW	TBD	TBD	TBD
MMTherms	TBD	TBD	TBD

Figure Pub-2: Public Sector Annualized Budget

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
Annual Budget	TBD	TBD	TBD

Public Sector Market Characterization

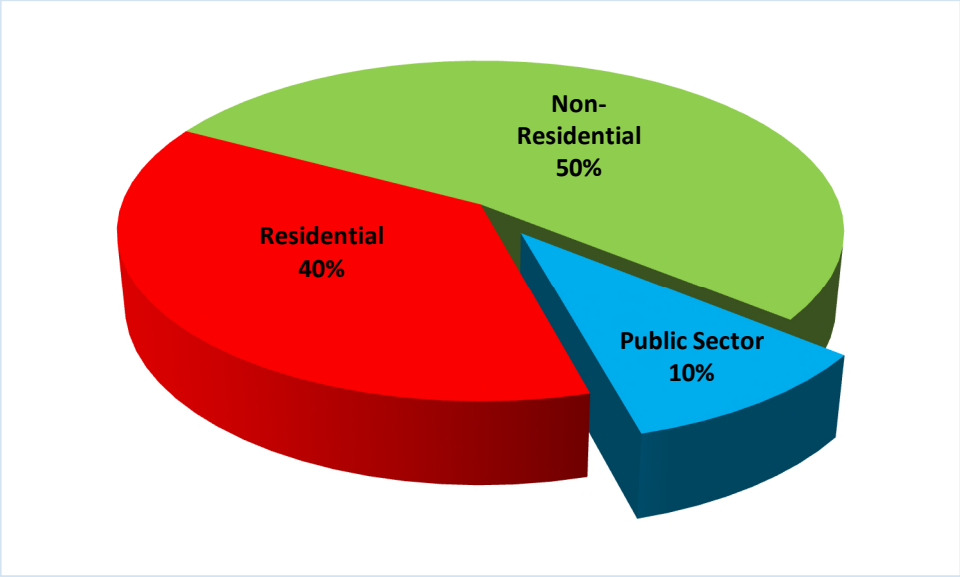
"SDG&E is unique in that it has several LGPs within a single county, two cities that have a legacy of energy efficiency, and association of governments that works with the remaining cities, and a Port District that focuses on a subset of businesses located in the district and County."[73]

It is important to consider the key characteristics of the public sector market. Historically, public sector customers have been classified as commercial, which has presented challenges in meeting the needs of public customers. The CPUC's Decision 15-10-028 provided the opportunity to create a strategy and offerings specifically for public customers. Through collaboration with California's Program Administrators and other stakeholders, the public sector came to be defined as the group of customers that are tax-payer funded, have political mandates, and that must go through a public budgeting and decision-making process.

SDG&E provides electricity and gas service to over 14,000 public sector accounts in San Diego and southern Orange Counties, including customers in the federal, state, local government, and public education segments. As illustrated in the Figure below, the public sector accounted for 10% of SDG&E's system electric consumption and 14% of gas consumption from 2013-2015, and contributed 15% of SDG&E's portfolio energy savings during the same time period. Despite this relatively low percentage of direct consumption and savings, the public sector influences and informs—and therefore contributes to—both residential and non-residential markets, making it an important factor across all sectors. Due to the influence the public sector has across various customer types, the public sector plays a pivotal role in reaching the Governor's, and the California Long-Term Energy Efficiency Strategic Plan's goals.

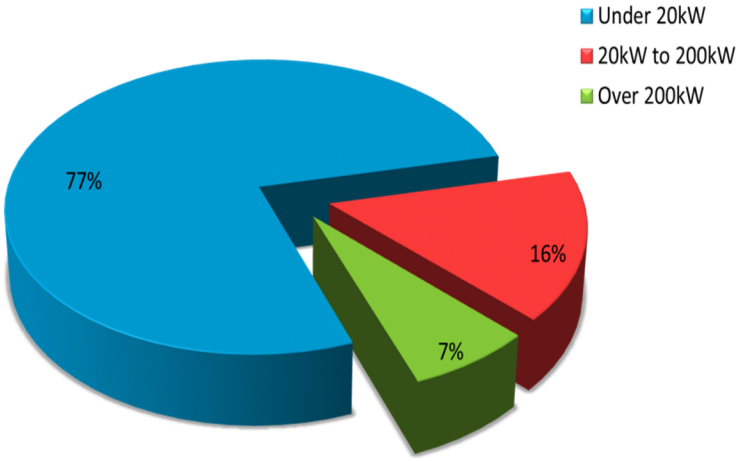
[73] Program Assessment Study: Local Government Partnership Programs, Evergreen Economics and Navigant Consulting, July 2013, p. 87, http://www.energydataweb.com/cpucFiles/pdaDocs/971/Local%20Government%20Partnership%20Programs-%202010-2012.pdf

Figure Pub-3: SDG&E Electric Consumption[74]



SDG&E's public sector is made up of many small accounts, which SDG&E defines as an annual peak demand of less than 20 kW. As shown in the Figure below, 77% of public sector accounts have a peak demand of less than 20kW, which helps to inform the approach and design of public sector energy efficiency offerings moving forward.

Figure Pub-4: Public Sector Customer Size[75]



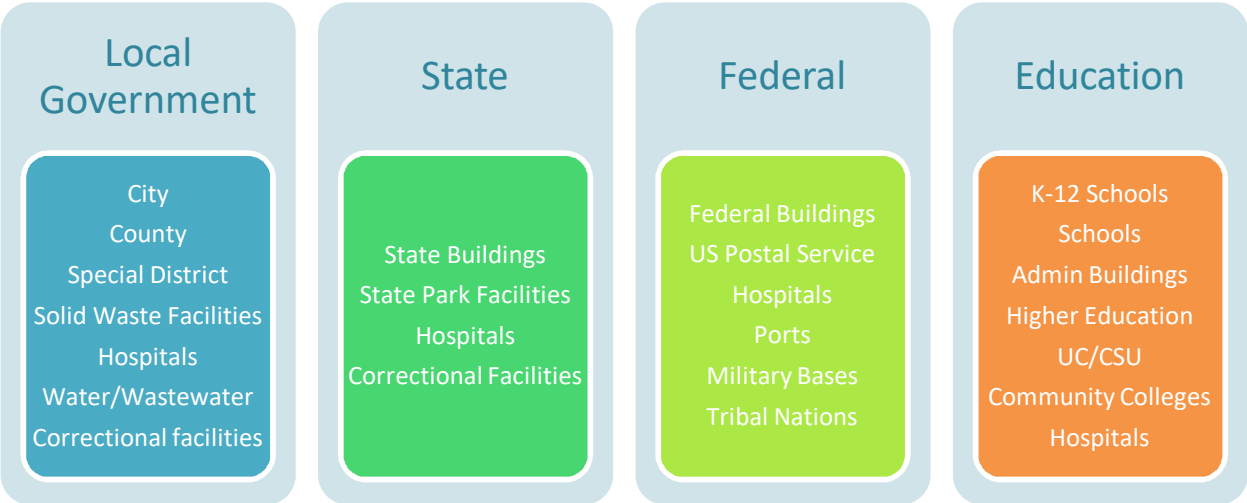
Market Segments

In addition to the unique characteristics of the public sector market as a whole, it is important to define and understand the makeup of the public sector in order to best meet their needs and to collaborate to achieve statewide goals. Market segmentation provides additional insights that can inform targeting, strategy, and program design. Utilizing the North American Industry Classification System (NAICS)

[74] SDG&E 2013-2015, CEC - Kavalec et al., 2013. California Energy Demand 2014-2024, http://www.energy.ca.gov/2013publications/CEC-200-2013-004/CEC-200-2013-004-SF-V1.pdf
[75] SDG&E 2013-2015 data

designations, SDG&E has identified its public sector customers and has categorized them into four segments in the table below:

Figure Pub-5: SDG&E's Public Sector Segments



SDG&E's public sector customers include entities across local government, state, federal, and education realms. Because this sector has never been broken out separately before, it is important to understand how it is unique from other sectors. The following table highlights some of the key characteristics of the public sector, and how they compare to commercial sector customers.

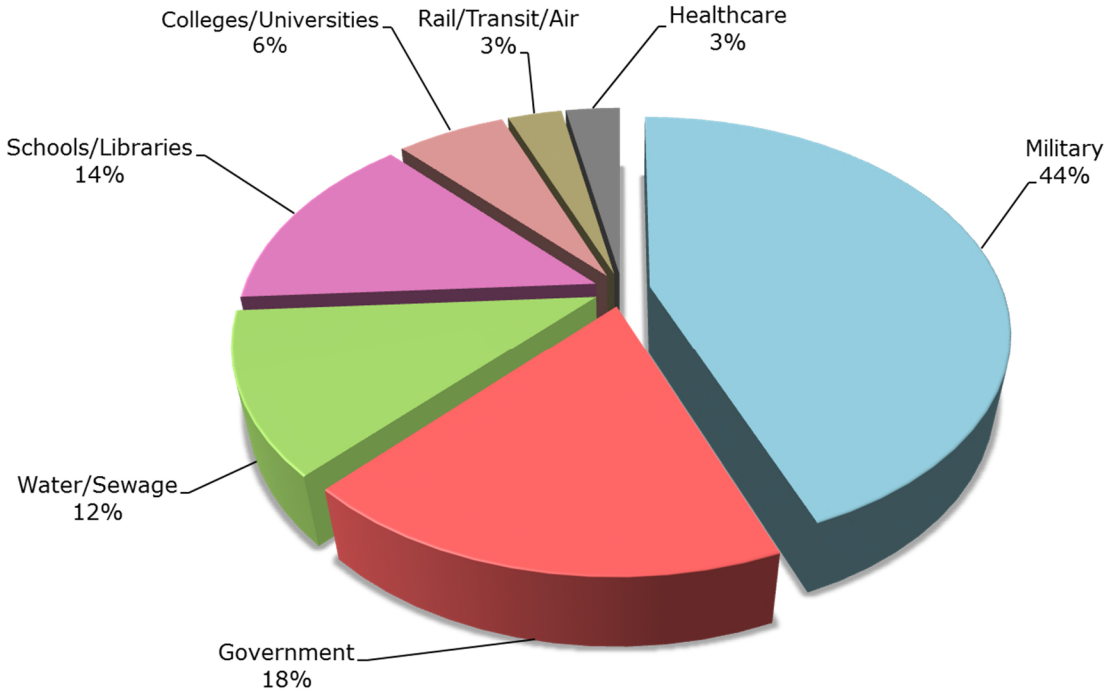
Figure Pub-6: Typical Public Sector vs. Commercial Sector Comparisons

Public Sector Customer	Commercial Sector Customer
For public good	For profit
Risk averse	Calculated risk
Investments based on benefits to the public and available funds	Investment based on ROI and growth opportunities
Long approval process, often requiring council and/or board approvals	Approval typically granted when business case is proven
Complex funding mechanisms	Financial tools are easier to access
Reactive maintenance	Replace on business case
Tax-payer funded	Sales-based revenue generation
Subject to political support	Insulated from political changes
Influence customer behavior across sectors	Influence is typically limited to behavior within the customer's industry
Responsible for developing and enforcing code, policies and mandates	Responsible for complying with code

Figure Pub-7 below illustrates the distribution of SDG&E's public sector electric consumption. Military, government, and water/sewage entities represent approximately three quarters of the public sector's electricity consumption.[76]

[76] SDG&E 2013-2015 data

Figure Pub-7: Public Sector kWh Consumption Distribution[77]



Government agencies tend to have a high number of accounts when compared to usage, in contrast to the military's low number of accounts given their high usage. This may indicate, as suggested for the overall public sector, that government facilities are typically small (<20 kW) and are likely individually metered. The military's low number of accounts suggests facilities and campuses are master-metered.

Past Participation

The figures below provide an overview of the public sector's participation in energy efficiency programs, including detail on which program types are most frequently utilized by various public sector customer types.

Figures Pub-8 and Pub-9 below highlight the high electric and gas savings delivered by colleges/universities, healthcare, and schools/libraries when compared to usage. Electric and gas usage figures for colleges and universities are skewed due to cogeneration's large contribution at these facilities; electric usage in the figures below does not reflect the electricity generated on site, and the gas usage figures represent traditional end-uses as well as cogeneration consumption.[78]

[77] SDG&E 2013-2015 data

[78] Cogen gas usage in the Colleges/Universities segment represents 80% of total gas usage.

Figure Pub-8: kWh Usage and Savings by Customer Segments[79]

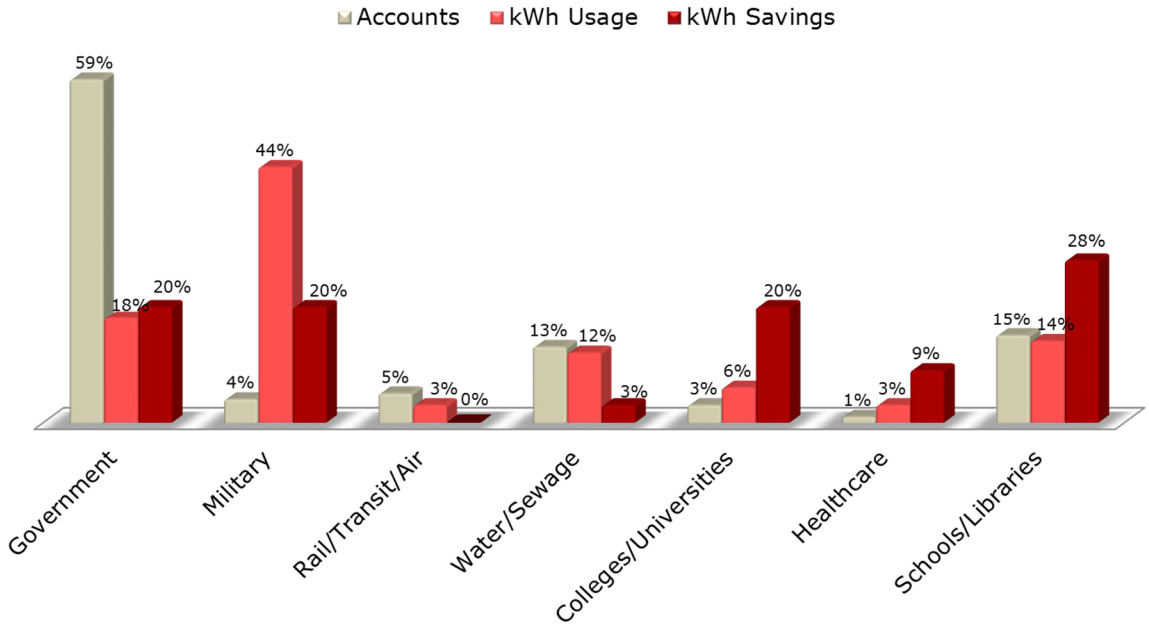
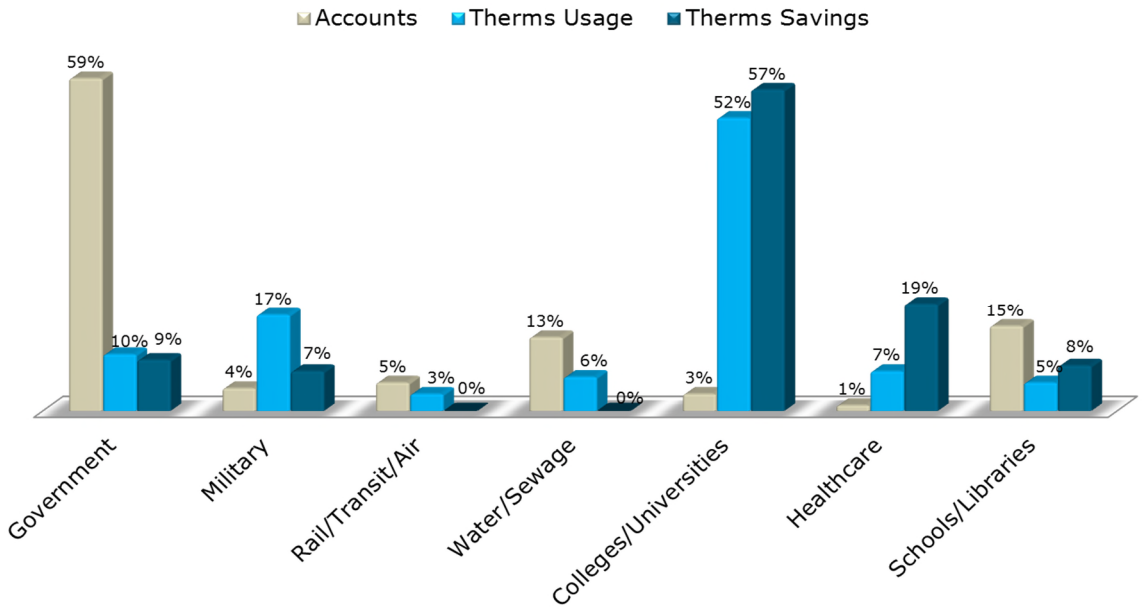


Figure Pub-9: Therm Usage and Savings by Customer Segments[80]



The following figures illustrate the EE program types leveraged by public sector customer types for electric and gas measures. Government and School/Library customers rely primarily on deemed measures, while College/University and Healthcare customers rely most heavily on custom measures. This is indicative of the complexity of typical systems in each customer's buildings, and informs program design moving forward in that there is no "one size fits all" delivery mechanism for public sector customers.

[79] SDG&E 2013-2015 data
[80] SDG&E 2013-2015 data

Figure Pub-10: EE program types by public sector customer types (electric)[81]

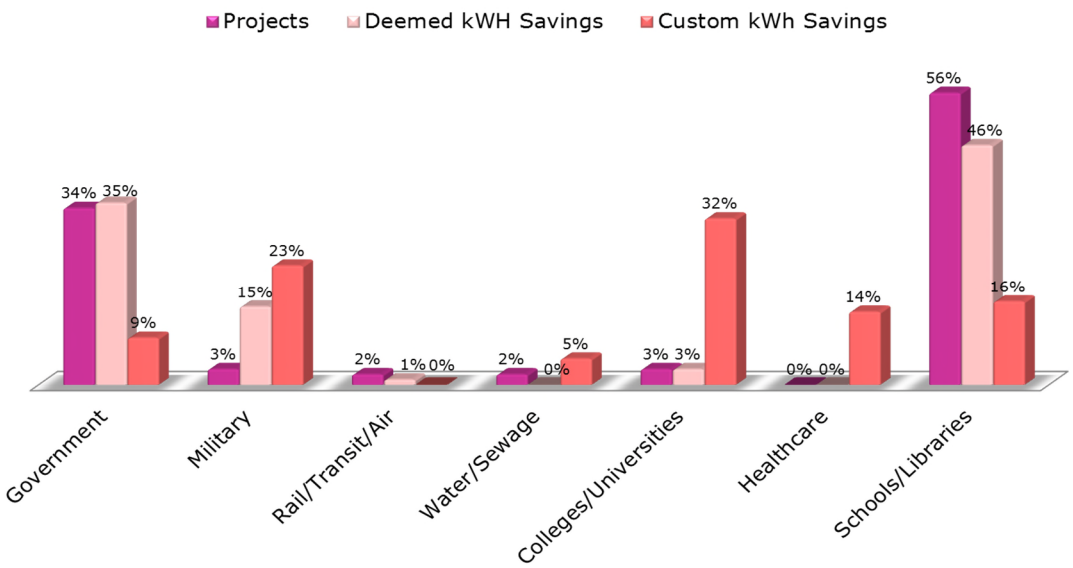
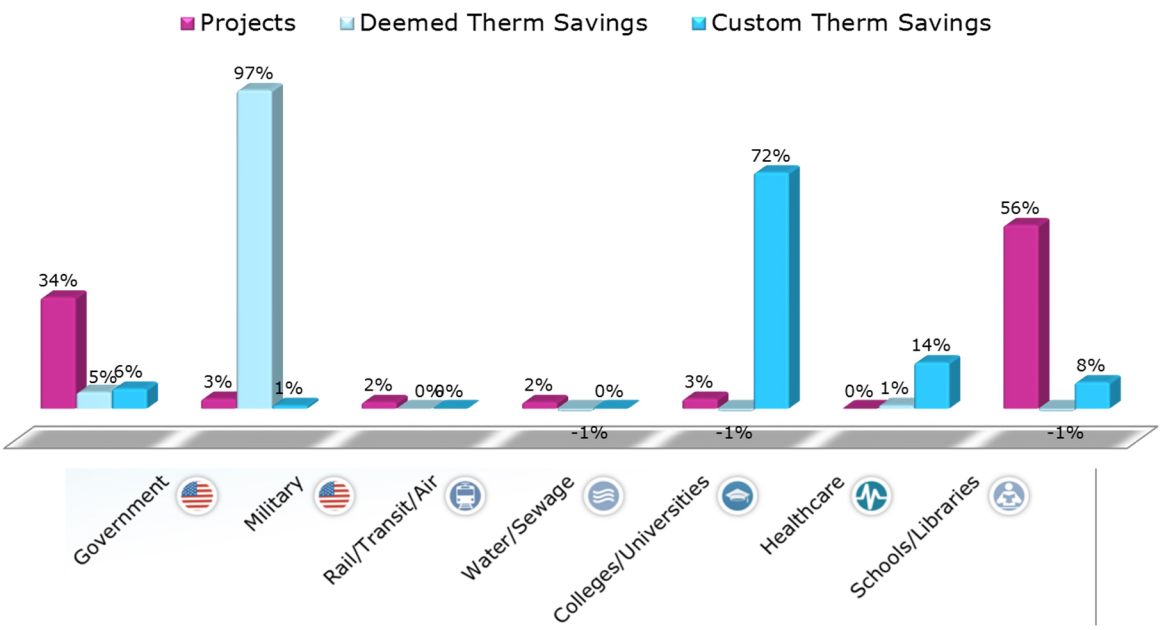


Figure Pub-11: EE program types by public sector customer types (gas)[82]

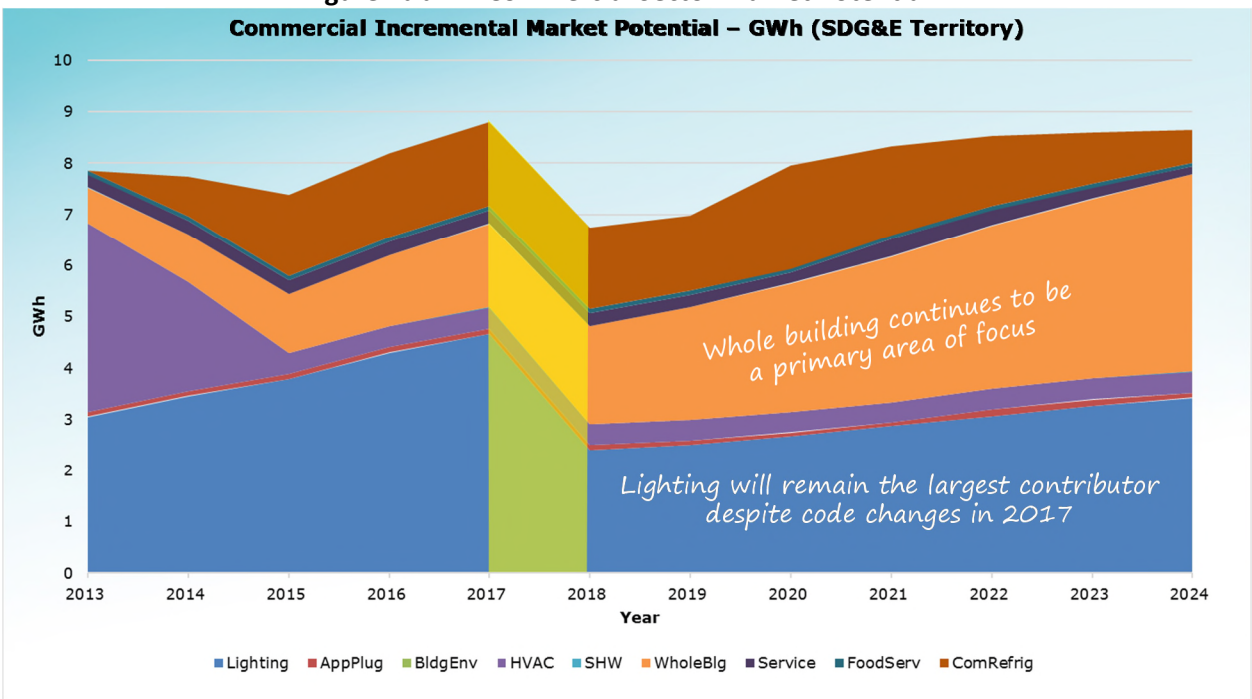


[81] SDG&E 2013-2015 Data
[82] SDG&E 2013-2015 Data

Energy Efficiency Market Potential

The 2013 California Market Potential Study by Navigant provided data on energy efficiency market potential by utility, sector, and end-use. Because a comparable study has never been conducted for the public sector, the commercial sector's potential study serves as the best available representation of public sector market potential at this time.

Figure Pub-12: Commercial Sector Market Potential[83]



Based on the information presented for the commercial sector, of which public customers are a component, whole building and lighting measures will continue to be major areas of focus for energy efficiency program administrators in California. Once a potential study becomes available specifically for the public sector, a more detailed analysis will be possible.

Public Sector End Uses

As mentioned above for the potential study, public sector-specific studies on end use are not currently available. As such, the California Commercial End-Use Survey (CEUS) was used as the best available approximation for public end use.[84] According to the CEUS, SDG&E's largest electric end-uses (based on consumption) in the commercial sector are lighting, HVAC, and refrigeration equipment, while the biggest gas end-uses are water-heating, heating, and cooking equipment.

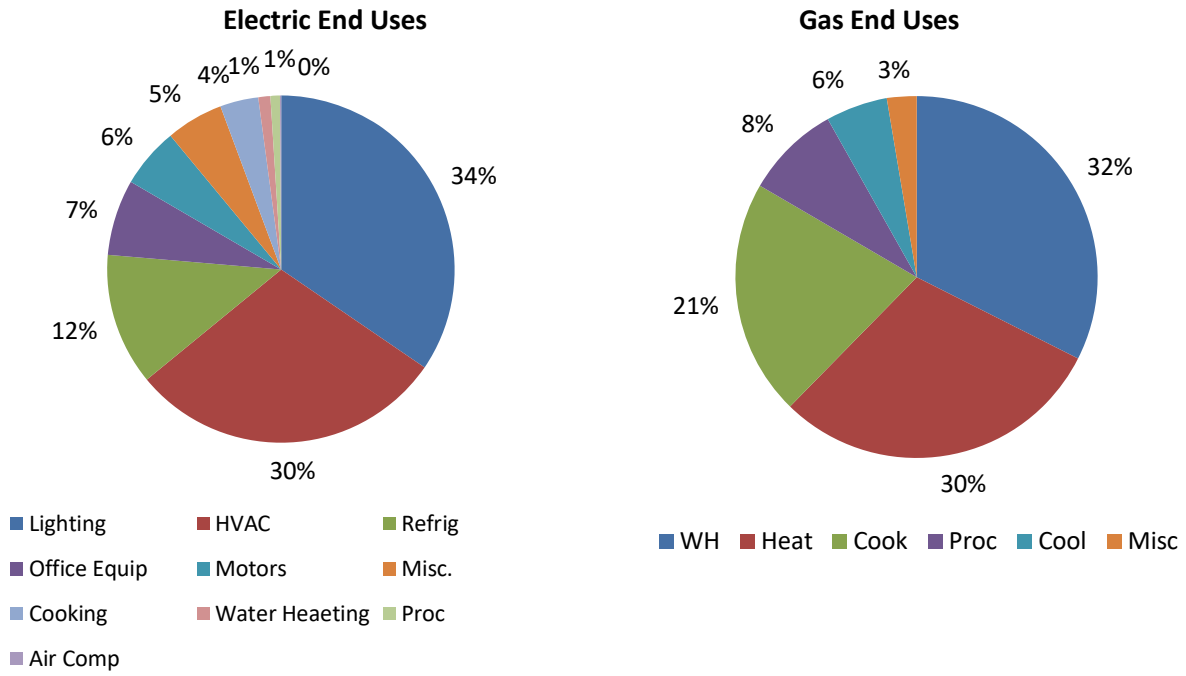
[83] 2015 California Statewide Market Potential Study, performed by Navigant.

[84] California Commercial End-Use Survey, 2006, http://www.energy.ca.gov/2006publications/CEC-400-2006-005/CEC-400-2006-005.PDF

Top 3 End Uses of Energy

Electric	*Gas*
1. Lighting	1. Water Heating
2. HVAC	2. Heating
3. Refrigeration	3. Cooking Equipment

Figure Pub-13: Electric and Gas Usage by End Uses



The pie charts above illustrate the end uses for electricity and gas and serve as a more detailed breakout of the summary table for the top three end uses by energy type.

Future Trends

In examining the public sector environment, some key trends have emerged to guide our strategic planning efforts over the next several years.

Program offerings will continue to evolve. Code changes that take effect in 2017 will increase efficiency standards, which may impact incentive levels across all sectors. Equipped with the knowledge that code changes are imminent, PAs can seize this opportunity to adapt and customize program offerings in order to better fit public sector needs. Such program changes should result in faster implementation timelines that enable public sector partners to maximize their incentives.

Collaborative relationships will be critical to EE effectiveness. In an environment where resource constraints will remain and savings expectations will continue to climb, collaborative relationships are crucial to maximizing EE program performance. Through such strategies as the

creation of revolving funds and collaborative marketing and outreach efforts, public entities can leverage their partnerships with SDG&E and each other to combine resources and implement more projects. By working together to develop the optimal level of collaboration for each partnership, SDG&E and its partners can mitigate many of the risks that public entities face over time.

The whole building approach will be the best way to maximize energy savings.[85] In considering how to maximize EE savings, it is just as important to identify the best-fit approach for implementing EE measures as it is to pursue the optimal EE program. Currently, the best practice to maximize return on investment for an EE initiative is to take a whole building approach. As identified in the market potential above, this trend is expected to continue over time, and individual metering will be a key area of implementation in pursuing this approach.

Lighting will continue to be the largest contributor to energy savings. Despite the code changes that will take place in 2017, lighting will continue to serve as the most significant portion of energy savings. This high-savings status means that there are considerable opportunities that public entities may realize if they incorporate lighting measures into their EE projects.[86]

California Climate Action Plans (CAPs) and Energy Action Plans (EAPs) will continue to play a greater role in public sector decision making. Based on guidance at both the state and local levels, public entities are placing a larger emphasis on the importance of EE efforts. Because EE and sustainability practices are making their way into the core missions for these organizations, this shift in thinking presents an opportunity to advocate for increased progress in the EE realm. As CAPs and EAPs continue to provide guidance on EE policy and encourage the public sector to demonstrate leadership in EE and sustainability, the case for change will continue to grow stronger and opportunities to implement EE projects should increase. The adoption rate of alternative energy solutions is already increasing in the public sector, and this trend is expected to continue over time.

Legislative Impacts on Strategy

No discussion of planning for energy efficiency's future would be complete without addressing recent state legislative actions. Specifically, Senate Bill (SB) 350 and Assembly Bills (AB) 628, 793, 758 and 802 provide directives that will impact future energy efficiency strategy and implementation. SB 350, in particular, calls for a doubling of energy efficiency savings during the term of this Business Plan. The CPUC has provided initial guidance implementing these directives and SDG&E and the other PAs will continue to work with the CPUC and stakeholders to determine the most efficient means of complying with the new legislative mandates. SDG&E believes that the strategies outlined below will complement these recent legislative bills. While compliant energy savings goals and budgets are not specifically address in this business plan, the goals and strategies described have been developed with this over-arching objective in mind. Going forward, specific tactics and their processes will be adjusted as needed to meet the legislative directives and any future direction from the CPUC. These legislative mandates have been incorporated in this business plan both implicitly and explicitly. Generally, the public sector goals and strategies have been developed to capture additional savings beyond those that existing program design has been able to capture. Such strategies are aimed at doubling energy savings as required by SB 350. Per AB 802, SDG&E will work with customers to unlock saving from inactive projects

[85] The "University of California Whole Building Efficiency Pilot: Summary Proposal" features the whole building approach as the optimal way to achieve carbon neutrality and maximize energy savings.
[86] This statement is based on the Navigant Energy Efficiency Potential Study, http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=11189.

in existing commercial buildings. Lastly, per AB 628, SDG&E will work actively with the Port of San Diego to help the Port assess opportunities for and implement energy efficiency projects.

PUBLIC		
Policy Driver	**Specific Requirement / Guidance**	**Business Plan Response**
SB 350 - Clean Energy and Pollution Reduction Act of 2015	* Achieve a cumulative doubling of savings in electricity and gas retail customers final end uses by 1/1/30.	* SDG&E will develop and manage a collaboration platform that covers all public sector customers. * Partner to provide the EE support that best matches the self-sufficiency level of each public entity. * Create one-stop shop for Public customers. * Increased incentives for high-performing customers. * Assist municipalities with code compliance and provide tools to enable reach codes.
AB 793 - Energy Management Technology Incentive Offering	Must develop programs by 1/1/17 that provide incentives to help residential and small/medium business customers acquire energy management technology and educate them about these programs.	* Not applicable to this sector.
AB758 - Existing Buildings Energy Efficiency Action Plan	Strategy 3.4.1 - Look for opportunities in specific building sectors … where there is evidence of ZNE technical potential, current ZNE guidance, and available financing. Strategy 3.4.3 - Make financing widely available for ZNE retrofits.	* SDG&E will work with public customers to encourage participation in EE service offerings and programs—and to facilitate progress towards ZNE in their facilities, consistent with Executive Order B-18-12. * SDG&E will provide more financing opportunities and make financing programs easier to use. This will complement efforts to provide tools that facilitate pursuit of reach codes that assist with ZNE.

PUBLIC		
Policy Driver	**Specific Requirement / Guidance**	**Business Plan Response**
AB 802 - Benchmarking and Changes to Energy Efficiency Baselines	**Benchmarking** - By 1/1/17, for multi-unit buildings, utilities must provide aggregated energy usage data to its owner, its agent or the building operator. Commission will set requirements for public disclosure of information for benchmarking purposes. **Baselines** - Authorizes utilities to provide incentives to customers for energy efficiency projects based on normalized metered energy consumption as a measure of energy savings.	* Will develop Public Sector customer action plans, tailored to the needs of individual customers - to include a concierge approach that bundles, among other services, benchmarking, financing, and GHG inventories and related services. * Leveraging opportunities afforded by AB 802, SDG&E will work with customers to unlock savings from inactive projects in existing buildings.
AB 628 - Energy Management Plans for Harbor and Port Districts	PUC shall encourage utilities to work with ports to develop, implement and administer energy management plans.	* Will work actively with the Port of San Diego to help the Port assess opportunities for and implement energy efficiency projects

Goals, Strategies, Tactics

As the focus of this business plan, Energy Efficiency is defined as "[a]ctivities or programs that stimulate customers to reduce customer energy use by making investments in more efficient equipment or controls that reduce energy use while maintaining a comparable level of service as perceived by the customer."[87] In its role to encourage progress within the EE realm, SDG&E aims to provide effective and actionable EE support to its customers—and specifically to its public customers, in the context of this plan. Ultimately, SDG&E has been tasked with "maximizing cost-effective long-term savings."[88] The goals, strategies and tactics below lay out a roadmap for achieving these cost-effective savings and the goals established by the Long Term Energy Efficiency Strategic Plan.

Public Goal 1: Empower Leaders by equipping them with knowledge and tools to make informed EE decisions

A critical component of building an innovative, connected, and sustainable energy future is the ability to identify the best way forward, implement initiatives that demonstrate success, share knowledge to empower key players, and collaborate with stakeholders to pursue effective EE solutions. The key driver for this goal is the need to demonstrate the value that EE offers to public entities and their stakeholders. Because there is a lack of universal understanding of EE benefits, it is challenging to garner widespread

[87] http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/EEPolicyManualV5forPDF.pdf
[88] Ibid

support for progress in the EE realm; this barrier hinders the enablement of EE projects and makes it challenging for public entities to demonstrate leadership in EE. Without universal acceptance of EE's value, public organizations will struggle to maintain and/or develop EE staff bandwidth and expertise necessary to achieve the EE goals that have been mandated across California. By establishing a clear and consistent flow of information with key decision makers across the public sector, SDG&E aims to boost overall EE program participation, and shift the culture across the public sector to support progress toward key EE goals.

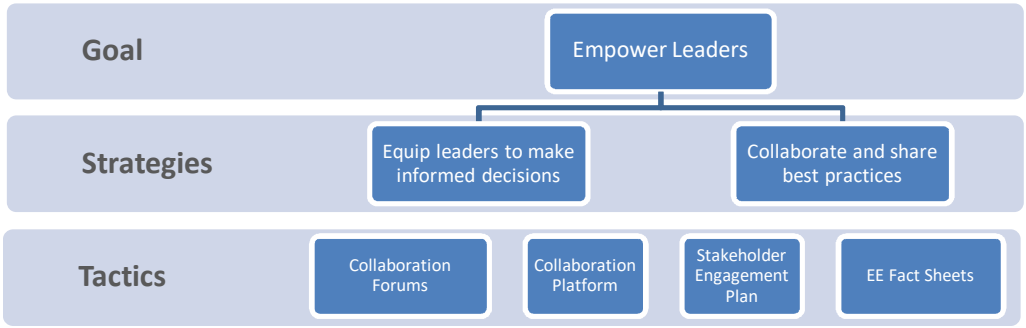


Figure Pub-24: Goal 1 Strategies and Tactics

Goal	Strategy	Tactics	New, Existing, Modified	Short, Mid, Long-Term
Empower Leaders	• Equip leaders with knowledge and tools to make informed decisions • Collaborate and share best practices with key players	Facilitate best practice sharing	M	Ongoing
		Develop and manage a **collaboration platform**	N	Mid, Long-Term
		Develop and manage **stakeholder engagement plans**	N	Mid, Ongoing
		Provide **energy efficiency fact sheets** to highlight the energy efficiency progress made within a leader's jurisdiction	E	Short

Equip leaders with knowledge and tools to make informed decisions

As discussed in the Market Characterization section of this plan, public entities are in a unique position to influence constituent behavior across all sectors. Public organizations can serve as trail blazers that demonstrate how to make substantive progress in the EE realm, and some can establish regulatory requirements and policies that call constituents to action and incentivize behaviors that contribute to EE goals. Such attributes place public customers in the position to both lead and influence the EE environment across multiple sectors. SDG&E will leverage this rich set of communication channels and

the experience of its public sector staff to demonstrate the value of EE to key decision makers at public organizations.

By helping public sector leaders to understand which EE options are available to them and how to go about implementing those options, SDG&E can empower these leaders to make informed decisions that maximize EE savings and facilitate progress toward EE goals. To this end, SDG&E will pursue a variety of avenues to establish itself as a thought leader in the EE realm.

For instance, a tailored approach to informing decision makers on the benefits of proactive maintenance and equipment replacement will help to transform the current culture and challenges associated with reactive maintenance. This approach of informing key decision makers would yield improvements in quality and reliability across all upgraded facilities.

This knowledge sharing strategy ties SDG&E audits performed to implementation decisions made by public sector leaders. Because audits serve to identify the best-fit approach for an organization to realize EE savings, the outputs from audits translate into strategic actions that offer the most value to that organization. By tracking and managing public sector stakeholders' responses to SDG&E-funded audits, this strategy directly ties EE knowledge sharing to results.

Additionally, benchmarking services equip SDG&E and public sector leaders with the information necessary to prioritize facilities in need of energy efficiency retrofits, and allows for ongoing management of building performance.

Collaborate and share best practices with key players

The Market Characterization section in this document discusses the barriers public entities face throughout the EE project life cycle. These challenges can be mitigated by collaborating with players across the EE and public communities in order to leverage best practices that will ease the process to shepherding EE projects through their life cycles. Best practices are actions that stakeholders can take to maximize their EE savings and/or incentives; such best practices are usually tied to available technology and those actions that are widely accepted as most effective by industry standards. Sharing best practices not only increases awareness, but also informs partners and stakeholders about how to leverage those practices to achieve EE goals.

By putting forward recommendations that are aligned to accepted best practices (such as whole building approach and progress toward ZNE), public sector projects can present a stronger case for implementing these measures and enhance any available opportunity to receive EE funding in order to complete these projects. Additionally, collaboration and information sharing serves to further the understanding of the EE value proposition to public customers and their communities—thus engaging the right individuals to garner support for EE and achieve substantive change. Lastly, this collaboration and information sharing results in cost savings, as similar efforts are not duplicated unnecessarily.

To effectively capture and manage customer progress, SDG&E, in consultation with public sector customers, will create tools and systems that are necessary to promote effective collaboration between players across the public sector. Such tools would allow SDG&E and its customers to view EE information, track and manage performance, and follow program applications and participation through a straightforward and transparent process.

Sample Tactics

Planned activities in support of Goal I (Empower Leaders):

- Through participation in best practices events and conferences, SDG&E can more effectively connect public sector leaders to best practices experts, information, and tools. The following are some examples of SDG&E's public sector collaboration:
    - San Diego Regional Climate Collaborative,[89] SANDAG's Energy Working Group, San Diego Regional Energy Partnership, subregional energy action collaboratives (North Coast EAC, SoBEAC, etc.)
    - Institutional partnerships, including the California Community Colleges (CCC), University of California/California State University (UC/CSU), State of California, and the California Department of Corrections partnerships
    - Statewide Best Practices Coordinator, Statewide Energy Efficiency Collaborative (SEEC), inter-regional collaboration with Program Administrators
    - CPUC Energy Division, California Energy Commission (CEC)
    - Southern California Tribal Chairmen's Association (SCTCA), K-12 Schools Sustainability Strategy Collaborative
- To effectively capture and manage customer progress, SDG&E will develop and manage a **collaboration platform** that covers all public sector customers—as well as those across other sectors. This tactic is addressed in more detail in Goal II.
- Development of **stakeholder engagement plans** in order to better understand those customers' needs and establish concrete actions to maintain strong relationships with them.
- SDG&E will continue to provide, and enhance, periodic **energy efficiency fact sheets** to highlight the energy efficiency progress made within a leader's jurisdiction. These fact sheets arm local, state and national leaders with information to help promote the benefits of EE and the accomplishments of their jurisdiction.

Public Goal 2: Eliminate Barriers to Public Sector Participation by developing tailored solutions and financing options

The Market Characterization section in this document describes the various challenges that public entities face in performing EE activities. From securing funding and approvals for EE projects to implementing EE measures and collecting incentives, public customers must navigate programs that may not fully meet their unique needs. Because of these barriers, it is difficult for public entities to make quick and significant progress toward EE mandates.

This goal focuses on how SDG&E will work with public customers to encourage participation in EE service offerings and programs—and to facilitate progress towards ZNE in their facilities.[90] These strategies are designed to alleviate the burden on our public customers—and to maximize the benefits and support to stakeholders across the public sector.

[89] 2013 – 2014 SDG&E Local Government Partnerships PIP, p. 2. http://eestats.cpuc.ca.gov/EEGA2010Files/SDGE/PIP/2013/Clean/12%20SDGE%20LGP%20PIP%20Clean%204_23_13.doc

[90] All new State of California buildings and major renovations beginning design after 2025 must be constructed as Zero Net Energy facilities. Executive Order B-18-12. https://www.gov.ca.gov/news.php?id=17508

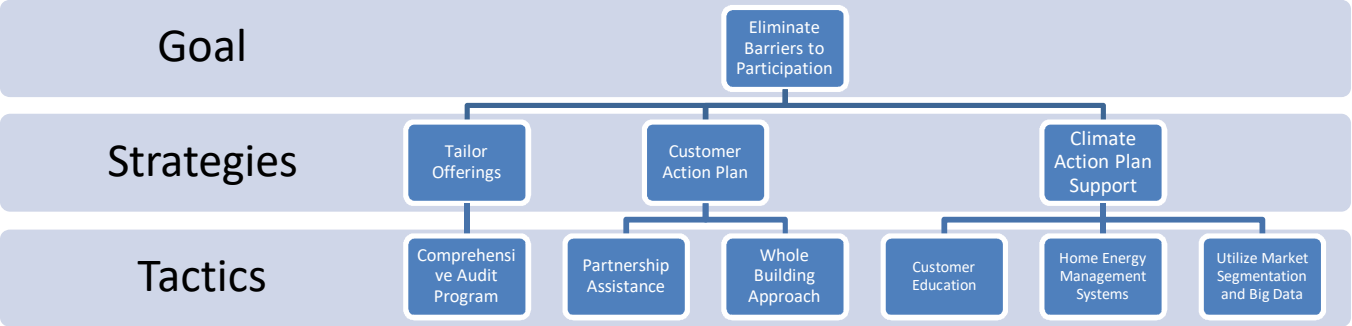


Figure Pub-15: Goal 2 Strategies and Tactics

Goal	Strategy	Tactics	New, Existing, Modified	Short, Mid, Long-Term
Eliminate Barriers to Public Sector Participation	• Tailor offerings to meet the unique needs of public customers • Develop a public sector customer action plan to facilitate participation • Equip public customers with the tools they need to succeed in Climate Action Planning • Enable EE projects through financial solutions	Leverage **Comprehensive Audit Program**	E	Short
		Develop and create a set of **unique effective useful life (EUL) values** for public sector buildings	M	Mid
		Partner to provide the EE support that best matches the self-sufficiency level of each public entity	M	Mid, Ongoing
		Create a **whole building approach**	N	Mid
		Increased incentives for high performers	M	Short
		Create **one-stop shop** for public customers	M	Mid, Long-Term
		Provide **robust CAP support** services	E	Short
		Create public sector **OBF** offering	M	Short
		Help each type of public entity stand up its own **revolving fund**	N	Mid, Long-Term
		Identify alternative project **financing solutions**	**N**	**Short**
		Deemed Rebates and Calculated Incentives	**M**	**Short**
		Direct Install	**M**	**Short**
		On Bill Financing	**M**	**Short**
		Premium Efficient Cooling	**M**	**Short**
		Comprehensive Audit Programs	**E**	**Short**
		Local Government and Institutional Partnerships	**M**	**Short**

Strategy: Tailor offerings to meet the unique needs of public customers

The Market Characterization section in this business plan describes how public entities have unique challenges that must be met in order for EE projects to succeed. These include longer project lead times, financing requirements, and more complicated governance around approvals to proceed with EE initiatives.

In tailoring EE assistance to meet the needs of our public customers, it is critical to develop offerings that align to the timing needs of public sector projects. Because the lead times for such projects extend beyond those of projects in other sectors, it is crucial to build flexibility around timing into SDG&E's public sector offerings. In addition to longer lead times, the timelines surrounding other aspects of a project's life cycle vary significantly for the public sector (including dependencies tied to approval gates, extended governance requirements, releases of incremental funding throughout the project, etc.); for this reason, EE offerings must be tailored to support a wider spectrum of project timing needs in order to be useful for public entities.

Strategy: Develop a public sector customer action plan to facilitate participation

As discussed in the Barriers to Success section, the current EE offerings are not tailored to public sector needs, and the available processes and tools are not intuitive enough for customers to develop a clear path forward that will help them to achieve progress toward ZNE. Additionally, SDG&E recognizes that the public customer focus goes beyond just EE, and that it is necessary to understand the customer's complete set of priorities in order to help them integrate EE as a core component. Thus, it is critical to define the complete customer perspective and employ a tailored approach for each public customer type—and to determine the appropriate degree of customization for an approach based on the public customer's readiness and level of involvement.

In order to achieve the Governor's ZNE goals, SDG&E must incorporate EE as a key component of a public sector customer's strategic direction. This "concierge approach" bundles all the relevant energy components, including the following:

- benchmarking
- rates and usage
- IDSM
- Behavioral
- GHG inventories and related services
- rebates/incentives
- financing
- implementation

To implement this approach, SDG&E will put into place a user-friendly platform that guides public customers—and any other customer using this platform—through those EE offerings that best match the needs of that organization. Reaching across sectors, SDG&E will streamline its program offerings and participation process in order to improve the EE experience for all customers. By creating a solution that can serve as a collaboration platform, SDG&E and its customers can view EE information, track and manage performance, and follow program applications and participation through a straightforward and transparent process. As an integral part of the customer's holistic approach, this platform will be available to serve every type of public customer within SDG&E's territory—including rural, hard-to-reach, and disadvantaged communities.

Strategy: Equip public customers with the tools they need to succeed in Climate Action Planning

A key distinction of public agency roles in the Market Characterization section emphasizes how these organizations have been charged with developing Climate Action Plans (CAPs) and Energy Action Plans (EAPs), and how these plans will continue to play a greater role in public sector decision making as pressure to meet set EE goals increases. Thus, SDG&E will work with public entities to assist them in establishing, tracking, and achieving their EE CAP and EAP goals. SDG&E already provides significant support to its public sector customers as they work to develop and implement the energy efficiency portions of their climate action plans (including funding for EE-specific CAP studies and GHG inventories). Since many of the CAP and EAP goals are tied to reach codes, SDG&E will work collaboratively with public customers in developing tailored approaches to meet or exceed these codes over time. Specifically, SDG&E will continue to provide technical support to public entities, and will work with its public sector customers to leverage other resources to further their progress toward CAP and EAP EE goals. SDG&E will also continue to work with public customers to provide them with all available data[91] in order to meet their needs and to encourage informed decision making.

Strategy: Enable EE projects through financial solutions

In order to mitigate some of the funding and procurement challenges described in the Market Characterization section, SDG&E will modify existing and develop new financial solutions that are specific to public sector entities. These financial solutions will be designed to address the major challenges that public customers face, and to facilitate the completion of EE projects across public entities. Such financial solutions will include tailoring current OBF loan terms and limits to better suit the needs of the public sector, support creation of an EE revolving fund (or similar EE funding solutions) for public entities, and support in pursuing alternative funding sources.

Sample Tactics

Planned activities in support of Goal II (Eliminate Barriers to Public Sector Participation):

- Leverage **Comprehensive Audit Program** to track and manage actions taken in response to audits performed for public entities.
- Develop and create a set of **unique effective useful life (EUL) values** for public sector buildings. Feedback from SDG&E customers across various public sector sub-segments indicates that current Database for Energy Efficient Resources (DEER) EUL values are not representative of real-world public sector equipment lives.
- **Partnership assistance**. Partnerships—both formal and informal—are designed to create dynamic, collaborative working relationships between IOUs, state or local governments, and agencies or educational institutions. From a **partnerships perspective**, SDG&E aims to provide the EE support that best matches the capacity of each public entity. The following are some key activities that are slated to support this objective:
    - **Provide more robust services to non-partnered entities**. Because many non-partnered entities (informal partners) hold the potential to yield significant energy savings given the appropriate level of assistance, SDG&E will boost its support to

[91] SDG&E will provide all available data that complies with legal privacy requirements, CPUC directives, or any other regulatory directives.

these players. By providing some support to those entities who can commit to EE savings goals but are not ready to pursue full/formal partnerships, SDG&E can encourage incremental progress toward savings goals through alternatives to a traditional partnership agreement. Currently, SDG&E provides this support to local governments through its Emerging Cities and SANDAG Energy Roadmap programs, but the aim is to expand this support beyond local governments to all qualifying public entities (institutions, rural and disadvantaged communities, special districts, water districts, tribal nations, federal agencies, etc.). It is important to note that SDG&E will engage with rural, hard to reach communities, as well as disadvantaged or underserved communities (which may include portions of a larger city within SDG&E's territory); this aspect of the strategy is especially beneficial to smaller partners and may yield significant progress toward EE goals in the long term.

- Rollout of SDG&E **whole building approach**. The whole building, meter-based approach to energy efficiency emphasizes comprehensive retrofits and is in line with California's **Error! Reference source not found.** to reach ZNE in residential and commercial buildings.[92] Specifically, SDG&E will introduce its whole building approach through the following sequence:
    - **Whole building guidance development**. SDG&E will develop guidance that helps decision makers determine the optimal combination of upgrades and/or retrofits for specific building types. Public entities can then leverage this guidance both internally (to implement whole building projects for public sector facilities) and externally (to educate constituents and customers on whole building measures that can be taken across all sectors).
    - **Whole building program for public sector**. SDG&E will leverage its internal whole building expertise, together with the information that external entities gather from their own successful whole building efforts. An important component of this whole building, meter-based approach is monitoring-based commissioning (MBCx)[93], which has been successfully implemented by SDG&E's higher education customers for a number of years. Using this value combination of information and expertise, SDG&E can develop a whole building program for its public sector customers.
- **Explore increased incentives for high performers**. For public sector projects and programs that exceed performance expectations, SDG&E will offer higher incentives. In order to establish this practice, SDG&E will develop guidance in collaboration with high performing stakeholders that establishes clear criteria for high performance (i.e., projects and programs that are cost effective, high impact, comprehensive, or exceed expectations for energy savings).
- Develop an offering that serves as a **one-stop shop for public customers**. While this offering would be reminiscent of the Business Energy Solutions program on the commercial side,[94] its public sector focus would take into account the unique considerations specific to public customers (such as approval processes and timing, procurement requirements, etc.).
- Provide **robust CAP support** services, including:

[92] California Energy Efficiency Strategic Plan, CPUC, January 2011, p. 6. http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=5303

[93] "One Lawrence Berkeley National Laboratory (LBNL) study found an average annual energy savings of 10 percent with buildings subject to MBCx; most measures implemented in that study also yielded a payback period of less than two years." https://www.esource.com/TAS-RB-112/MBCx-Savings

[94] http://www.sdge.com/business/sdges-business-energy-solutions-program.

  - GHG Emission Inventories
  - Data sharing[95]
- **Public sector OBF offering**. SDG&E will pursue modifications to its existing OBF program rules to enable larger, more comprehensive projects to be funded. Examples of these modifications include increasing the maximum simple payback and increasing the loan limit per meter.
- **EE funding solutions**. A revolving EE fund ensures the cost savings of one energy efficiency project can be rolled into the next, and removes barriers to future project implementation, such as competition for funding. SDG&E will develop a series of ready-to-use options designed to **help each type of public entity create its own revolving fund—or similar funding solution**. Once the ready-to-use processes are established, SDG&E can provide comprehensive support for the creation of one revolving fund for each interested public customer. This support may include the following:
  - **Identify successful process**. Educate public customers on the University of California's, or the City of San Diego's successful creation of dedicated funding sources for energy efficiency and/or sustainability projects—and any other revolving funds that occur over time.
  - **Customize process to meet specific organization's needs**. Work with each interested public entity to develop customized process steps that must be taken to meet that customer's requirements for revolving fund standup.
  - **Support stakeholder effort**. Engage stakeholders to facilitate the creation and use of revolving funds in the EE arena, and to garner support for these efforts.
- Alternative project financing solutions may include:
  - The California Infrastructure & Economic Development Bank's SWEEP, ISFR, and CLEEN programs[96]
  - Statewide IOU finance pilot programs (i.e. On-Bill Repayment)
  - Private lenders

Public Goal 3: Influence Private Sector EE Activities through reach codes and engagement

SDG&E recognizes that public entities make decisions that impact customers across all sectors. Not only do public entities offer information and guidance to their customers, but they also hold the authority to mandate activities in support of energy efficiency progress. Most notably—and in alignment with the Big Bold Energy Efficiency Strategies in the California Energy Efficiency Strategic Plan—public entities support progress toward the statewide goal of all residential new construction being ZNE by 2020, and all commercial new construction being ZNE by 2030. Such mandates can have broad reach and will influence the progress that private sector customers make toward EE goals. This unique perspective opens the opportunity for the public sector to drive awareness and reach wide-ranging audiences to demonstrate the value of EE. Because public entities serve as trusted sources of information for their constituents and have robust communication channels in place, they can leverage these channels to drive substantive and necessary change. Additionally (and unlike organizations in other sectors), public entities can offer valuable incentives to encourage a shift in constituent behavior.

[95] SDG&E will provide all available data that complies with legal privacy requirements, CPUC directives, or any other regulatory directives
[96] http://www.ibank.ca.gov/

With this perspective in mind, SDG&E will work together with key players in the public sector in striving to achieve an innovative, connected, and sustainable energy future. Our strategies to boost private sector participation emphasize innovative, customer-specific actions that are most effective in generating results and maximizing energy savings across multiple sectors.

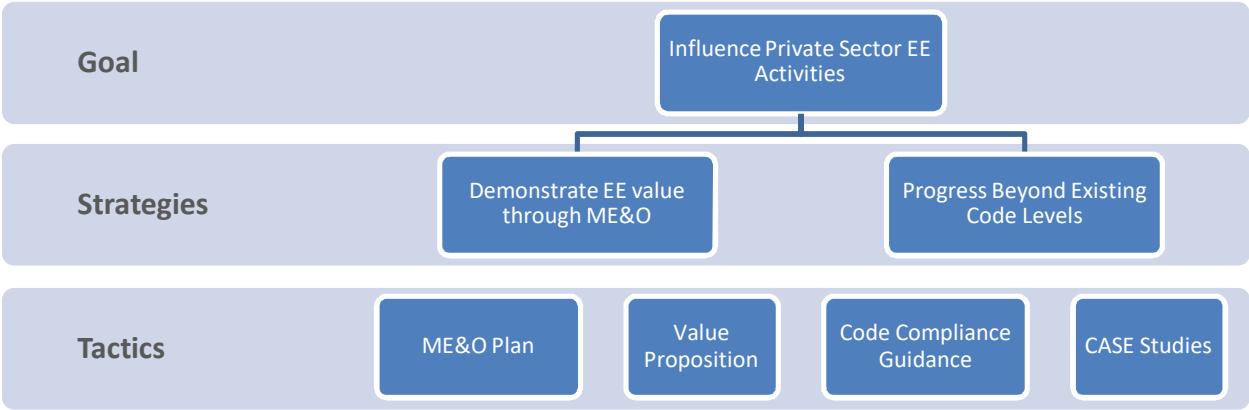


Figure Pub-16: Goal 3 Strategies and Tactics

Goal	Strategy	Tactics	New, Existing, Modified	Short, Mid, Long-Term	EM&V Reference
Influence Private Sector EE Activities	• Demonstrate EE value through enhanced Marketing, Education & Outreach (ME&O) • Encourage progress beyond existing code levels	Improve **code compliance**	N	Mid	
		Develop an **ME&O plan** for each type of public entity	M	Short	
		Develop and communicate a **clear and consistent value proposition** for reach codes	M	Mid, Long-Term	
		Develop **CASE studies**		Short	

Strategy: Demonstrate EE value through enhanced Marketing, Education & Outreach (ME&O)

In the Market Characterization section of this document, the discussion introduces how the public sector plays an important role in influencing energy attitudes and actions across customer classes in SDG&E's territory. Through collaboration with its public sector customers, SDG&E can quickly and effectively reach a large audience in order to inform stakeholders about the value that EE offers to them, their organizations, and their communities. Aided by the support of SDG&E's marketing, education, & outreach (ME&O) teams, SDG&E will work closely with each type of public customers to develop and manage the best-fit ME&O approach. This approach would establish a series of ME&O

plans that determine the most effective means to (1) disseminate actionable guidance throughout their jurisdictions, (2) engage key players, and (3) maintain an open dialogue between SDG&E and its public customers and stakeholders.

Strategy: Encourage progress beyond existing code levels

SDG&E understands the challenges associated with conventional reach code adoption:

- Local governments are faced with lengthy approval processes that extend the timeline for reach code standup,[97] while the time frames to collect incentives from energy savings continue to shrink.
- The all-or-nothing approach to mandating rigid requirements (i.e., adoption of formal reach codes) does not incentivize incremental progress (i.e., savings above code but below reach code levels).
- The lack of a clear and consistent value proposition for reach codes has resulted in concerns that the adoption of reach codes may slow economic progress. [98]

Given the above challenges, it is critical that SDG&E works with local governments and key stakeholders to provide a variety of options that empower public entities to take those steps that are realistic for them in support of long-term ZNE goals. Depending on how aggressively a local government chooses to push for progress toward ZNE, SDG&E will provide two sets of options within this strategy:

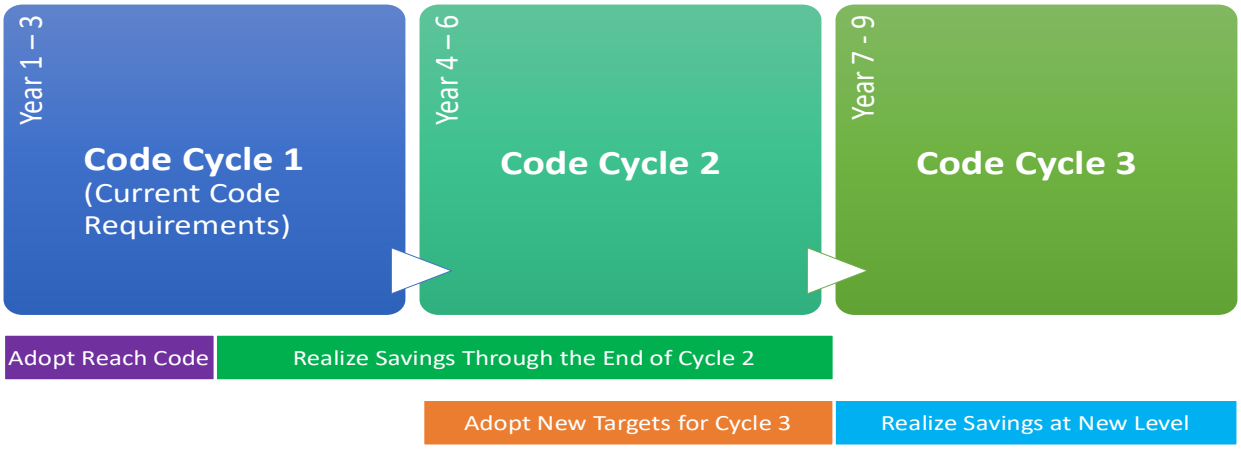
- For local governments that want to encourage incremental progress, SDG&E will equip local governments with the information required to implement policies and take actions that **move beyond existing code**. Rather than presenting strict reach code adoption as the only way forward, SDG&E will work closely with local governments to offer a set of scalable options that allow for varying degrees of progress. For example, governments can set percentage targets above existing code, which would provide flexibility in how constituents achieve beyond-code targets.
- In addition to encouraging incremental progress, SDG&E will collaborate with local governments to **facilitate creation of "super reach codes"** to mitigate timing risks and maximize savings realized. Rather than fighting the clock in order to adopt reach codes that will only be valid for the remainder of the Title 24 code cycle, SDG&E will work with local governments to anticipate mandated code shifts that would fall two code cycles ahead (i.e., six years into the future). This way, local governments can establish reach codes that would yield savings beyond the code cycle that immediately follows the current year, and impacted stakeholders can take advantage of longer time frames to claim savings.[99]

[97] Despite this challenge, SDG&E is working together with the City of San Diego to support expedited permitting for applicants implementing EE measures.

[98] Businesses have voiced concerns over increased code requirements, thus signifying the importance of demonstrating the value of above-code progress to all involved stakeholders.

[99] This path is only possible for technologies available at the time of "Super Reach Code" adoption, as technologies mandated two code cycles in the future may not be widely available.

Figure Pub-37: Adoption and Savings Cycles for "Super Reach Codes"



For both paths, SDG&E will work with local governments to communicate a clear and consistent value proposition for progress toward ZNE. By helping public customers and their communities to understand the value of EE, SDG&E and the public sector will establish the foundation for increased knowledge and support for EE. Specifically, SDG&E will develop messaging that clearly defines the need for reach codes, as well as their benefits to impacted stakeholders. This value proposition will be communicated to local governments and concerned stakeholders in order to facilitate a dialogue on the importance of making progress toward ZNE—and employing reach codes as a tool to achieve these overarching goals.

Sample Tactics

Planned activities in support of Goal III (Influence Private Sector EE Activities):

- Empower public customers to improve **code compliance** by establishing **guidance** on how to realize improvements and by communicating this information across all major stakeholder groups.
- Develop an **ME&O plan** for each type of public entity that will cover the products that SDG&E will commit to developing, as well as the activities/events that SDG&E will commit to supporting. The plan will also specify time frames surrounding all products and activities that will be developed and/or performed.
- SDG&E will develop and communicate a **clear and consistent value proposition** for reach codes, backed by concrete data from technical studies.
- Develop **Cost-Effectiveness studies**

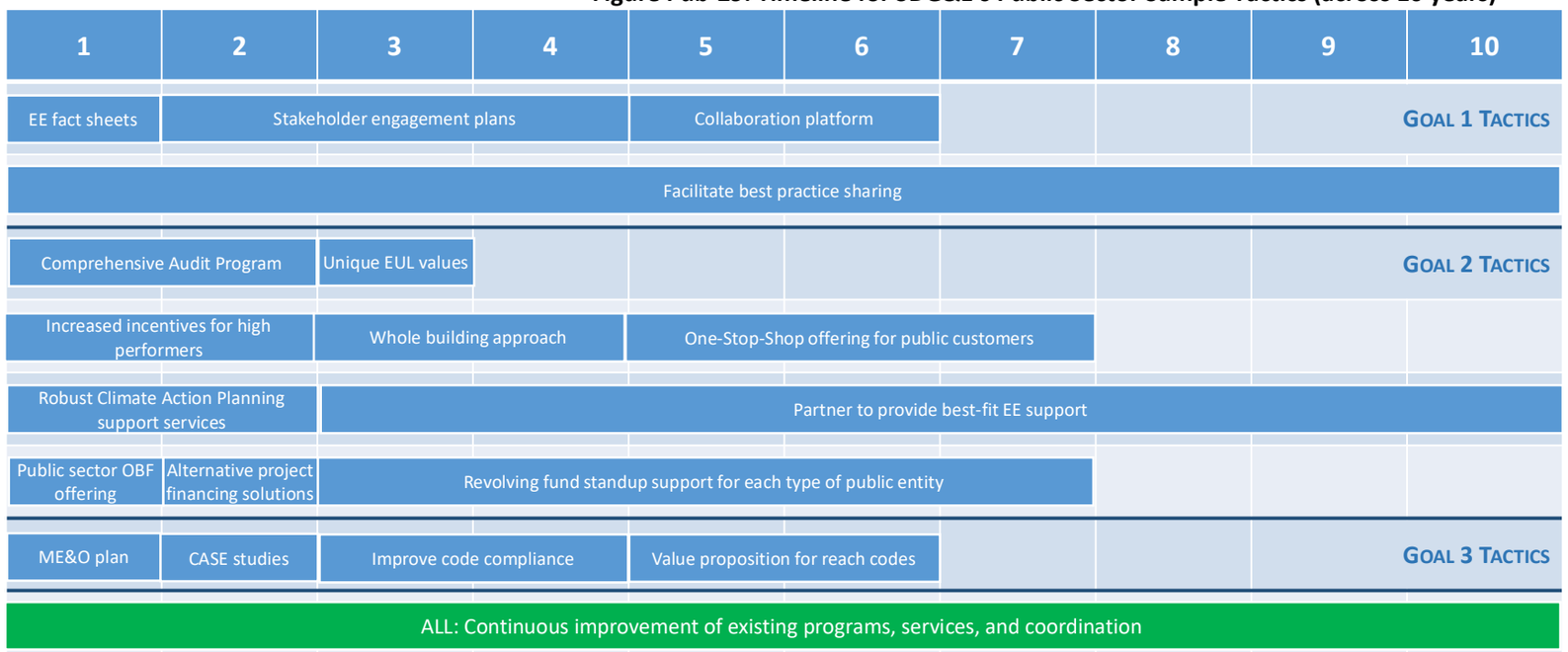
Figure Pub-28: Crosswalk of SDG&E's Public Sector Strategies and Barriers[100]

		Barriers to Success					
		B1: Staff Bandwidth	B2: Technical Expertise	B3: No Universal Acceptance of Value Proposition	B4: Funding and Procurement Challenges	B5: Current Processes and Tools Are Not Intuitive	B6: Mismatch between Public Sector Timing and Available Offerings
Goal 1: Empower Leaders	1. Equip leaders with knowledge and tools to make informed decisions	X		X*	X		
	2. Collaborate and share best practices with key players		X	X*		X	
Goal 2: Eliminate Barriers to Public Sector Participation	3. Tailor offerings to meet the unique needs of public customers	X	X		X	X*	X
	4. Develop a public sector customer action plan to facilitate participation			X	X	X*	X
	5. Equip public customers with the tools they need to succeed in Climate Action Planning			X		X*	
	6. Enable EE projects through financial solutions				X*	X	
Goal 3: Influence Private Sector EE Activities	7. Demonstrate EE value through enhanced ME&O			X*		X	
	8. Encourage progress beyond existing code levels			X*			X

[100] Asterisk indicates key strategy

From a timing perspective, SDG&E's short-term efforts will focus on assessing and optimizing its existing programs and services in order to maximize the value to its public sector customers—and to prepare for the rollout of new initiatives that will address the unique challenges that public entities currently face. The efforts that follow—in the medium and long term—will focus on implementing new strategies and tactics while maintaining effective and efficient EE program operations. This approach optimizes existing resources to maintain quality and reliability in SDG&E's current performance, while dedicating a combination of available and new resources to the standup of new initiatives.

Figure Pub-29: Timeline for SDG&E's Public Sector Sample Tactics (across 10 years)



Public Sector Metrics

Problem Statement	Market Barriers	Desired Sector Outcome (Goal)	Intervention Strategies	Sector Metric	Baseline	Metric Source	Short Term Target (1 – 3 Years)	Mid Term Target (4 – 7 Years)	Long Term Targets (8 – 10+ years)
Priorities Outnumber Available Resources	B1: Staff Bandwidth B2: Technical Expertise B4: Funding and Procurement Challenges	Goal I: Empower Leaders	1. Equip leaders with knowledge and tools to make informed decisions 2. Collaborate and share best practices with key players	**Number of decision-makers engaged in EE[101]**	Current level of decision makers engaged	Semi-Annual Strategic Plan Updates			
				Number of San Diego regional leaders participating in statewide EE collaboration	Current level of SD regional leader participation	Conference attendance, surveys			
Gap between Current Offerings and Public Customer Needs	B3: No Universal Acceptance of Value Proposition B4: Funding and Procurement Challenges B5: Current Processes and Tools Are Not Intuitive B6: Mismatch between Public Sector Timing and Available Offerings	Goal II: Eliminate Barriers to Public Sector Participation	3. Tailor offerings to meet the unique needs of public customers 4. Develop a public sector customer action plan to facilitate participation 5. Equip public customers with the tools they need to succeed in Climate Action Planning 6. Enable EE projects through financial solutions	**Increased number of public entities with an established EE Goal (i.e., CAP or kWh savings goal)**	Current number of public entities with an EE goal	Program data			
				Audits resulting in action (at least one implemented measure)	Current audit conversion rate[102]	Program data			
Challenges to Project Enablement	B3: No Universal Acceptance of Value Proposition B5: Current Processes and Tools Are Not Intuitive B6: Mismatch between Public Sector Timing and Available Offerings	Goal III: Influence Private Sector EE Activities	7. Demonstrate EE value through enhanced ME&O 8. Encourage progress beyond existing code levels	**Increase in absolute number of sector-wide implemented EE measures**	Sector-wide individual EE measure adoption	Program data			
				Increased voluntary progress beyond existing code[103]	Number of partners that have advanced above code.	Program data			

[101] A decision maker is any individual with the authority to approve EE projects. Essentially, these are the leaders that financially sponsor projects, approve and release funding, and guide their organizations' strategic direction with regards to EE. This metric will be managed and tracked by years at the business plan level, and it will be managed more closely (i.e., by quarters, months, or other appropriate time frames) at the implementation plan level.

[102] SDG&E's Comprehensive Audit Program has been tracking detailed audit results and will be a key point of collaboration in tacking and managing this metric.

[103] This metric can refer to reach codes, or to progress past code at a certain rate.

Public Sector EM&V Considerations

Because the public sector is a newly defined component of the EE realm, the information that specifically covers this group of customers is limited. Given the lack of past focus on this grouping, the following information gathering efforts—which may include data calls, formal studies, and various other techniques for obtaining information—would be valuable in enhancing overall knowledge of the public sector needs, as well as in more accurately assessing the expected effectiveness of SDG&E's EE goals and strategies.

Information Need	Relevant Area to Realize Value
Assessment of EE program offerings and services (effectiveness, participation, ROI, etc.)	Overall value (This would guide how best to use program offerings and services in order to optimize EE performance across the public sector)
Effectiveness assessment of various EE pilots and/or initiatives that have been completed (whole building approach, revolving fund standup, etc.)	Overall value (This would highlight those efforts that yield the best results for public entities and can guide SDG&E's focus on supporting those that provide the best value to public customers) Especially relevant to Revolving EE Funds strategy and Holistic Customer Approach strategy
Analysis of EE resources across the public sector (staffing levels, expertise, funding trends, etc.)	Barriers Discussion (This would enhance SDG&E's understanding of public sector landscape, the challenges the sector faces, and what is necessary to bridge the gap)
EE project life cycle assessment for the public sector (lead times, procurement process, implementation success rates, etc.)	Barriers Discussion (This would enhance SDG&E's understanding of the unique project life cycle for the public sector and what is required to achieve a successful outcome)
Effectiveness assessment of collaboration, knowledge sharing, and ME&O	Lead By Example strategy; ME&O strategy
Reach codes analysis (adoption, effectiveness, constituent responses, impact on EE savings, impact on economic environment, etc.)	Reach Codes strategy
Effectiveness assessment of partnerships	Access Through Partnerships strategy
Effective Useful Life study for public sector equipment	Overall value (This would guide the parameters for program offerings and services that are available to public customers)

Information Need	Relevant Area to Realize Value
Potential study for public sector	Overall value (This type of study does not exist for the public sector)
Other information gathering (marketing analytics, saturation reports, advisor surveys, customer satisfaction surveys, etc.)	Overall value (This information is either missing or limited for the public sector, and it would be valuable in responding SDG&E's customer needs)

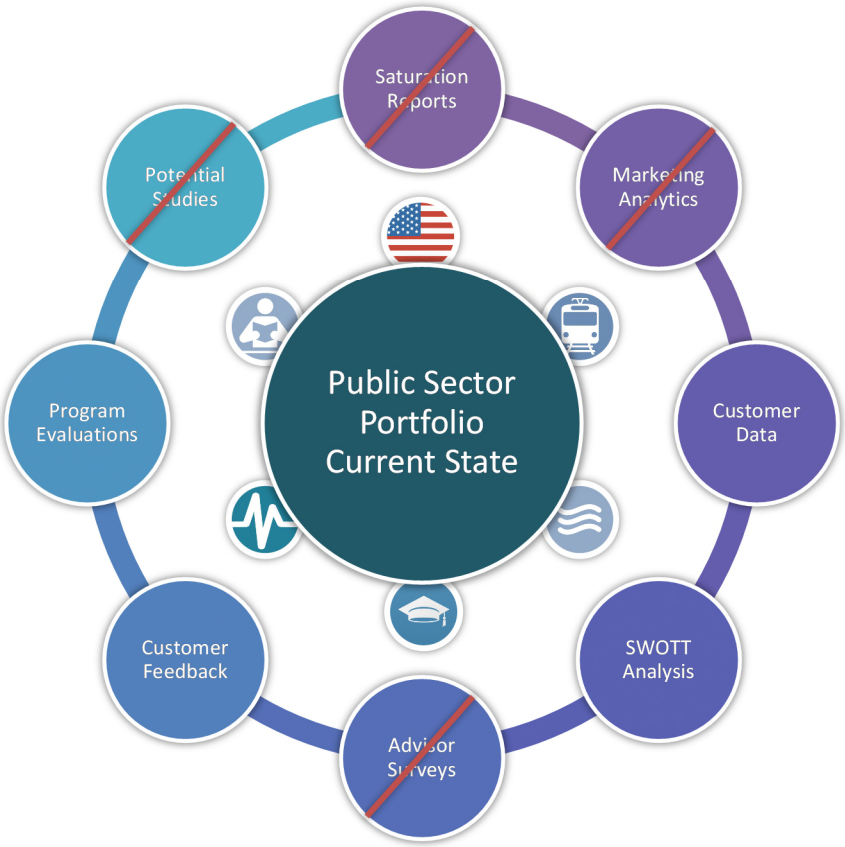


Figure Pub-20: Missing data summarized in Stage I

Program Coordination

Local Government Partnership Statewide Consistency

Over the last 10 years, California's four IOUs have closely collaborated with local partners to make Local Government Partnership (LGP) programs operate more effectively and efficiently for customers and the communities served. This includes making program offerings, where possible, more consistent across the state. There have been a number of LGP activities that have aligned statewide over the past several years including the statewide CA Long-term Energy Efficiency Strategic Plan (CEESP) menu, the streamlined statewide Strategic Plan Semi-Annual Reporting template, and LGP performance management metrics. Other activities have aligned across multiple IOUs and are on their way to become

consistent statewide, such as expanded direct install program offerings, and a move to regionalize partnerships[104]. The IOUs, however, realize that there is still much room for improvement. Over the next few years, the IOUs will work closely with local partners to drive toward greater consistency across the state, while allowing partners to retain their ability to tailor programs to their local needs.

One opportunity for improving consistency across IOUs is in regions where multiple IOUs are administering a single LGP. While all IOU's operate a model that focuses on the three pillars of municipal retrofits, strategic plan support, and core program coordination, each IOU offers its own set of LGP program guidelines resulting in some inconsistency in the delivery of energy efficiency resources within a given county or region. Moving forward, IOUs would adopt consistent program approaches within these multi-IOU partnerships. For example, PG&E is exploring adopting SCE's Energy Leader model[105] and SCE is considering adopting PG&E's direct install model in LGPs where both PG&E and SCE are active. In addition to aligning programs, IOUs are considering other strategies to improve the consistency of LGP administration across multi-IOU LGPs, such as developing consistent reporting requirements, offering similar contract terms and duration, and establishing a lead IOU for each LGP to coordinate joint-program activities within a region.

The IOUs are also working on aligning statewide across Strategic Plan activities. Currently, there is a statewide menu for Strategic Plan Activities as well as a statewide template for Strategic Plan Semi-Annual Reporting. Going forward, the IOUs will look to SCE's new Strategic Plan model for opportunities to be more consistent statewide.

Supporting local governments' access to non-EE funding sources provides another opportunity for statewide consistency. The IOUs would work with the Statewide Best Practices Coordinator or another third party entity to identify and promote alternative funding sources (both internal and external to IOUs). These sources could be used to strengthen and supplement the work that local governments are already pursuing (e.g., providing broader GHG reduction funding). Funding opportunities could be documented and managed in a database that will be made available to all local governments statewide. In addition, IOUs will explore leveraging LGP resources such as the SEEC Forum and All Partner meetings to provide information and support for alternative funding opportunities (such as Cap and Trade Funding, CEC Grants, Federal Grants, etc.).

As Core programs move to statewide implementation, IOUs anticipate that LGPs will benefit from these changes as partnerships actively leverage these Core programs statewide, such as Commercial HVAC, Savings by Design, Primary Lighting, and Emerging Technology. In support of continuous improvement of statewide consistency, the IOUs will utilize the CAEECC Public Sector Sub-committee on an on-going basis to discuss opportunities to improve program administration, share best practices, and provide a venue to determine whether a given solution should be adopted across the state. Other future opportunities for greater statewide consistency include contracting, Core program coordination, and transitioning partnerships to an IDSM focus.

The ultimate goal of EE market transformation programs is to drive the market to a point where the adoption of all cost-effective energy efficiency is a standard practice. To that end, over the coming years the IOUs will work with key stakeholders to develop a long term transformational partnership model that drives partners to become self-sustaining leaders in energy efficiency. Some potential ideas may

[104] Partnership regionalization does not apply to SDG&E.

[105] SDG&E will also explore adopting a tiered incentive structure.

include adopting energy efficiency revolving funds, encouraging a self-funding model for energy managers, and leveraging other sources of funding. These are a few of the potential options that would be considered by IOUs and stakeholders throughout the state in the development of this new model.

Institutional Partnership Statewide Consistency

As ordered in CPUC Decision R.13-11-005, the institutional partnerships ("IPs") will be managed by a "lead PA." They are:

- Two statewide higher education partnerships: the University of California and California State University EE Partnership and the California Community Colleges EE Partnership; and
- Two statewide partnerships with departments of the state government: the State of California EE Partnership (which works with the Department of General Services), and the California Department of Corrections and Rehabilitation (CDCR) EE Partnership.

The PAs are currently working with the statewide IP customers to determine the statewide program details, but this section will include: statewide PA lead, how lead PA will operate IOU/PA lead coordination.

Additionally, in support of the Governor's Executive Order B-18-12[106] requiring State of California-owned facilities to reduce energy usage by 20% by 2018, IOUs will continue to engage and provide necessary technical support to agencies that are poised to deliver significant energy savings, such as California Department of Corrections and Rehabilitation, Department of General Services, and Judicial Council of California (formerly known as the Administrative Office of the Courts)."

Cross-Cutting Coordination

WE&T

As a cross-cutting program, Workforce, Education and Training (WE&T) is critical to the success of public sector goals by (1) highlighting the value of EE, (2) promoting market acceptance by educating both internal public stakeholders and external constituents on how to enable EE projects and improve compliance, and (3) ensuring that a skilled and trained workforce properly installs and maintains equipment leading to greater EE savings. SDG&E's WE&T program has and will continue to focus on the following areas to engage with both public customers and the constituents within their territories. Looking ahead, the WE&T program will continue to support the following areas and will expand or contract based on market and potential data forecasts:

- Building Design & Construction
- Building Performance
- Codes & Standards[107]
- Food Service
- Home Performance / Whole House

[106] https://www.gov.ca.gov/news.php?id=17508

[107] For more information on the impact of the Codes & Standards education that WE&T provides, please refer to the following: Opinion Dynamics, 2010, p. 77, http://www.calmac.org/publications/06-08_Statewide_Education_and_Training_Impact_Eval_Vol_I_FINAL.pdf.

- HVAC
- Lighting
- Marketing / Finance / Sales / Real Estate
- Renewable Energy
- Sustainability
- SDG&E's Rebate & Incentive Programs

More details on these efforts are provided in the WE&T chapter of this Business Plan.

Emerging Technology

The statewide Emerging Technology Partnership (ETP) has a number of long-running partnerships with public entities that have proven to be beneficial for both sides and have moved statewide initiatives forward. Entities with whom the ETP has collaborated includes schools and universities, hospitals, water and waste water treatment facilities, military bases, and federal, state, county, and local government agencies. The ETP supports these entities by screening technologies that can be used in the implementation of Executive Order B-18-12, helping to identify energy-saving technologies that are economically viable for cash-strapped agencies, and exploring innovative new solutions for which some public buildings are uniquely positioned to adopt.

Across California, the ETP is assisting in public sector efforts to implement state initiatives. These initiatives include Executive Order B-18-12 which stipulates that state agencies reduce grid-based energy purchases by at least 20% by 2018 and incorporate building commissioning into projects to help ensure new buildings perform at maximum efficiency. The statewide ETP helps to advance these efforts by evaluating commissioning solutions and offering support for technologies that can decrease overall energy expenditures specifically in the public sector, such as recent projects on LED street lighting and municipal water distribution leak analysis.

Taking a broader view, many public sector customers face capital constraints, particularly at the local level. For these customers, the traditional ET support for legacy efficiency programs that help remove financial obstacles to adopting energy-saving technologies is critical. As such, even as the ET portfolio diversifies over the coming years to include new and innovative types of solutions, the statewide ETP is also committed to maintaining a robust set of "traditional" measures in the ET portfolio. This approach will help program implementers maintain a suite of measures that can benefit any public sector customer.

Conversely, the economics of the public sector sometimes allows facilities to explore efficiency upgrades with a payback period that would be out-of-reach for cash-strapped SMB or industrial customers. For theses public sector customers, ETP can offer expertise and support for pilot demonstrations. The ETP also works to accelerate the time-to-market for emerging solutions that may be too new or difficult to justify for a mom-and-pop business but may be a good fit for some public facilities. These sorts of activities align well with SB 350, which calls for a doubling of previous EE goals and will require adoption of innovative new solutions.

Codes and Standards

Public sector customers play an important role in Codes & Standards implementation, particularly as it relates to enforcement and adoption of reach codes. SDG&E will work with public sector customers in efforts to integrate their activities, where applicable, with the Codes & Standards program. This will include providing assistance for code enforcement and offering resources for communities that wish to pursue reach codes.

Financing

SDG&E will provide more financing opportunities and make financing programs easier to use. Traditional financing programs—such as SDG&E's On-Bill Financing—are ideal starting points and can be modified to better meet public sector needs. Although public customers easily qualify for these services, obtaining approval for and setting aside up-front funding for projects continues to be a challenge. SDG&E understands this environment and has incorporated options within the Financial Solutions strategy for public customers to mitigate such challenges and secure the required funding for EE projects. Financing options are discussed in further detail under Goal III, which focuses on improving public customers' access to assistance.

Statewide Cross-Cutting Programs

Since Emerging Technologies, Codes &Standards, and aspects of Financing will be transitioning to statewide programs that may be administrated outside of SDG&E, this section will be updated with more details after the lead PAs are selected in the upcoming weeks.

Industrial Sector

Chapter Summary

The California Energy Efficiency Strategic Plan's Vision for the Industrial Sector

"California industry will be vibrant, profitable and exceed national benchmarks for energy efficiency and resource management."

San Diego is home to more than 3,000 manufacturing companies, and in 2014, the manufacturing industry in San Diego supported more than 96,000 jobs. Manufacturing accounts for 10% of all establishments and 15% of all paid employment in San Diego[108]. San Diego's jobs in this sector range from defense and aerospace to computer electronics and solar panels, to biotechnology. However, while a variety of manufacturing establishments make San Diego their home, San Diego still is not considered a "manufacturing boomtown"[109]. The industrial sector makes up only 8% of the total consumption within SDG&E's service territory. Much like the other sectors in the service territory, the majority of customers in this sector are in the small to medium size range with 96% of the accounts being under 200kW.

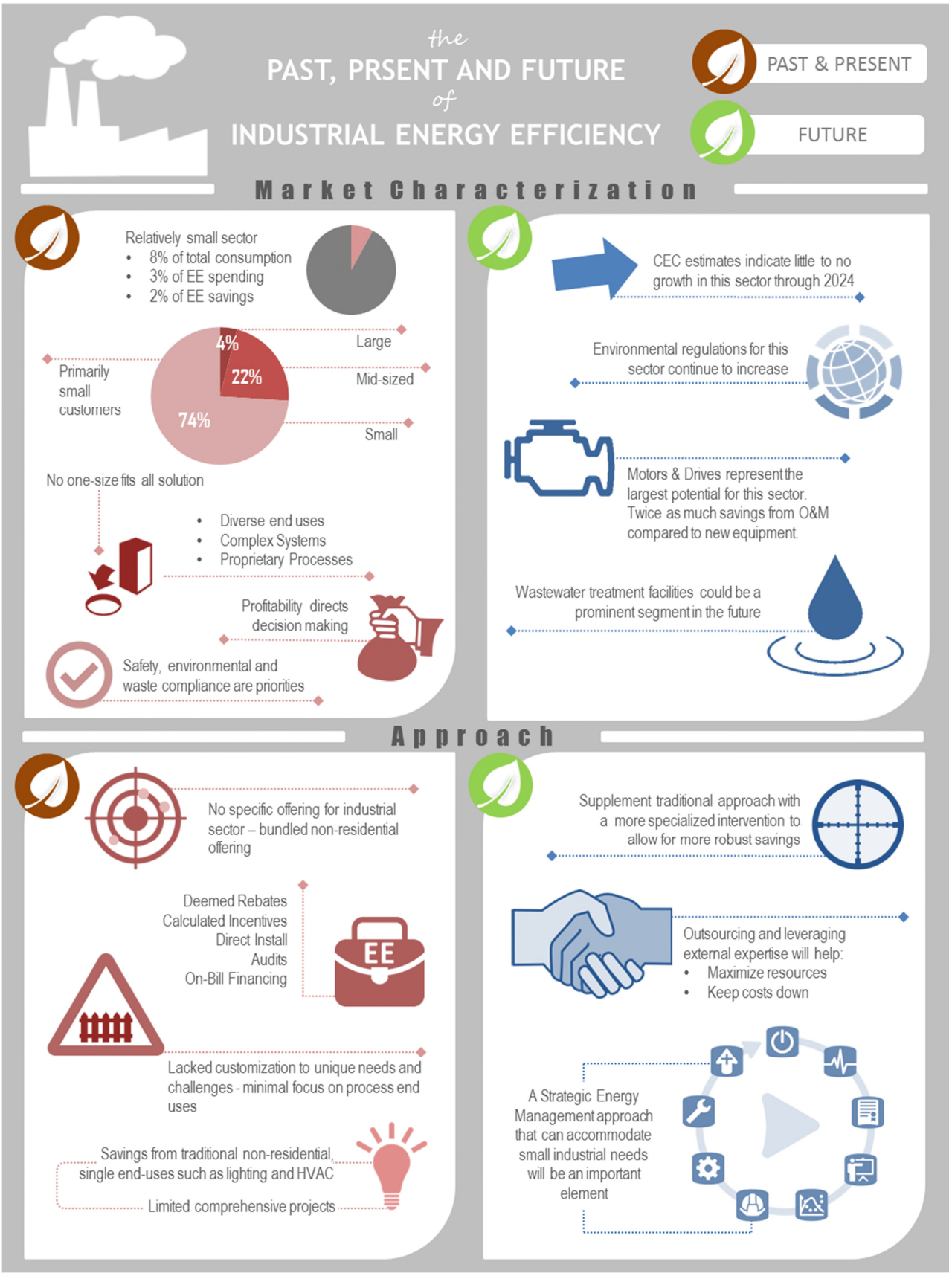
To support the EE Strategic Plan vision, SDG&E's mission for the industrial sector is to educate and enable customers on their path to increased sustainability by providing targeted energy tools and solutions and continuous improvement offerings. To accomplish this mission, SDG&E has established the following industrial sector goal:

- Industrial Goal 1: Double the Energy Efficiency Participation by the Industrial Sector.

To reach these goals, SDG&E has developed a number of strategies and tactics to address the challenges faced by industrial customers. Because different industries within the industrial sector often require very specialized skills, SDG&E intends to increase its use of third-party contractors with industrial experience. As with other sectors, SDG&E will provide customers with longer-term, more comprehensive solutions. One key element of this migration is the Strategic Energy Management (SEM) program which promises to assist customers take a long-term approach to energy efficiency and sustainability. SEM is thus well suited to the industrial segment and will become a cornerstone of SDG&E's industrial strategy.

As a trusted energy advisor, SDG&E will create the foundation for an innovative, connected and sustainable energy future in collaboration with key stakeholders. With a long history of servicing the region and a deep understanding of local concerns and business drivers, SDG&E is uniquely positioned to work with local industrial customers of all sizes as well as the third party entities that serve them, to continue achieving California's significant energy reduction goals. This business plan identifies goals that will help customers move to the next level of energy efficiency implementation. SDG&E has developed the strategies and tactics described in this plan to complement the existing offerings and move customers towards a more comprehensive and sustained approach to energy efficiency implementation.

[108] San Diego Regional Economic Development Corporation
[109] March 2014 data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages


the
PAST, PRSENT AND FUTURE
of
INDUSTRIAL ENERGY EFFICIENCY
PAST & PRESENT
FUTURE
Market Characterization
Relatively small sector
• 8% of total consumption
• 3% of EE spending
• 2% of EE savings
4%
22%
74%
Large
Mid-sized
Small
Primarily small customers
No one-size fits all solution
• Diverse end uses
• Complex Systems
• Proprietary Processes
Profitability directs decision making
Safety, environmental and waste compliance are priorities
CEC estimates indicate little to no growth in this sector through 2024
Environmental regulations for this sector continue to increase
Motors & Drives represent the largest potential for this sector. Twice as much savings from O&M compared to new equipment.
Wastewater treatment facilities could be a prominent segment in the future
Approach
No specific offering for industrial sector – bundled non-residential offering
Deemed Rebates
Calculated Incentives
Direct Install
Audits
On-Bill Financing
EE
Lacked customization to unique needs and challenges - minimal focus on process end uses
Savings from traditional non-residential, single end-uses such as lighting and HVAC
Limited comprehensive projects
Supplement traditional approach with a more specialized intervention to allow for more robust savings
Outsourcing and leveraging external expertise will help:
• Maximize resources
• Keep costs down
A Strategic Energy Management approach that can accommodate small industrial needs will be an important element

Approach to Achieve Industrial Sector Goals

San Diego Gas & Electric, in collaboration with key stakeholders, will create the foundation for an innovative, connected and sustainable energy future. SDG&E seeks to educate and enable customers on their path to increased sustainability, by providing targeted energy tools and solutions, and strategic energy management offerings.

SDG&E's market analysis and stakeholders have identified a number of consistent barriers for this sector. SDG&E has analyzed these barriers and considered the direction set by the California Energy Efficiency Long-Term Strategic Plan to determine the goals needed in order to establish a unified, achievable framework that will yield concrete results in support of the mission and vision of the industrial sector. These barriers are discussed in the figures below and explored further in the market characterization and segmentation section.

In summary, the barriers for this sector can be characterized by these three statements:

- Diverse, highly complex systems means that no one approach will meet all needs.
- Industrial organizations assess opportunities based on a number of considerations, energy efficiency offerings being just one of many topics competing for priority of resources and funding.
- Even if capital is available for projects, some customers may be unwilling to participate due to other factors such as risk aversion, internal processes, and/or difficulty or unwillingness to comply with increasing regulations.

To focus on the complicated needs of the Industrial sector, SDG&E has developed an overarching goal to address the need to increase energy savings. The relationship between the identified problems, the established goals, and the markets these goals address is summarized in Figure Ind-1.

Figure Ind-1: Industrial Market Characteristics and Problems Overcome by Goals

		Targeted by Strategies supporting Goals		
Problem	**Goal**	**Customer Size**	**Market Segments**	**End-Uses**
Complex, specific processes require specialized knowledge	1. Double EE Participation by the Industrial Sector	Small, Medium, Large	Sand & Gravel, General Manufacturing, Large Manufacturing, Electronics/Telecommunications, Biotech, Laboratories, and Research	Compressed Air, Process Heat, Process Refrigeration, HVAC, Lighting, Water Heating
Many priorities competing for resources and funding				
Risk aversion and internal processes				

This chapter outlines the overarching goal that sets the direction for SDG&E's industrial sector energy efficiency efforts, as well as the key strategies and tactics that support those goals. SDG&E's industrial sector goal is:

- Industrial Goal 1: Double the Energy Efficiency Participation by the Industrial Sector

This goal and the existing core program components will be used to reach savings goals based upon approved budgets. The following figures outline the proposed energy efficiency goals and budget for SDG&E's industrial sector.

Figure Ind-2: Industrial Sector Annualized Savings Goals

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
GWh	TBD	TBD	TBD
MW	TBD	TBD	TBD
MMTherms	TBD	TBD	TBD

Figure Ind-3: Industrial Sector Annualized Budget

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
Annual Budget	TBD	TBD	TBD

It is important to recognize that SDG&E developed the goals, strategies, and tactics described in this business plan to complement, and not replace, the current financial incentives, financing, outreach and education, technical assistance, and other program level interventions that have been proven successful in assisting customers with their facility upgrades and energy savings ventures.

Industrial Market Characterization and Segmentation

> *"In 2012, manufacturers accounted for 74 percent of industrial energy consumption, which represents 24 percent of all energy consumed in the United States."*
>
> - *Barriers to Industrial Energy Efficiency, U.S. Department of Energy – Report to Congress, June 2015*

Energy consumption by industrial users, primarily manufacturing-related, in the United States receives much focus and scrutiny because of its large impact the economy and scale. While quite diverse, SDG&E's industrial sector has significantly smaller consumption when compared to other service territories even just within California. This difference is illustrated in Figure Ind-4. In addition, as noted in the Industrial Sector Summary, most local industrial accounts are "small-sized", with almost three-quarters of accounts registering 20 kW of demand or less. Comprising roughly 8% of SDG&E's service territory consumption, San Diego industry exists on a smaller scale.

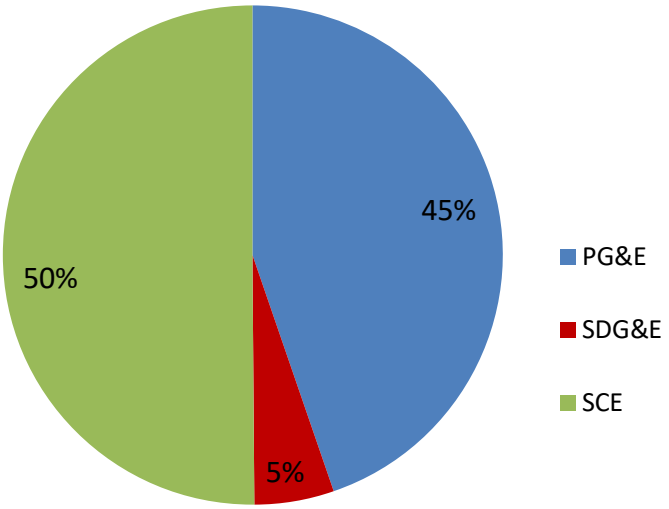


Figure Ind-4: CEC Usage Data by CA IOU - Industry + Mining & Construction

While manufacturing of various types makes up most of our industrial sector, based on NAICS code segmentation, the region is not known for massive industry, which constrains overall sector opportunities. Comparing the number of manufacturing jobs in San Diego to the Los Angeles regions shows Los Angeles with more than five times the number of jobs.[110] This comparison and that to other major U.S. cities is shown in Figure Ind-5 on the next page.

[110] Bureau of Labor Statistics, March 2014

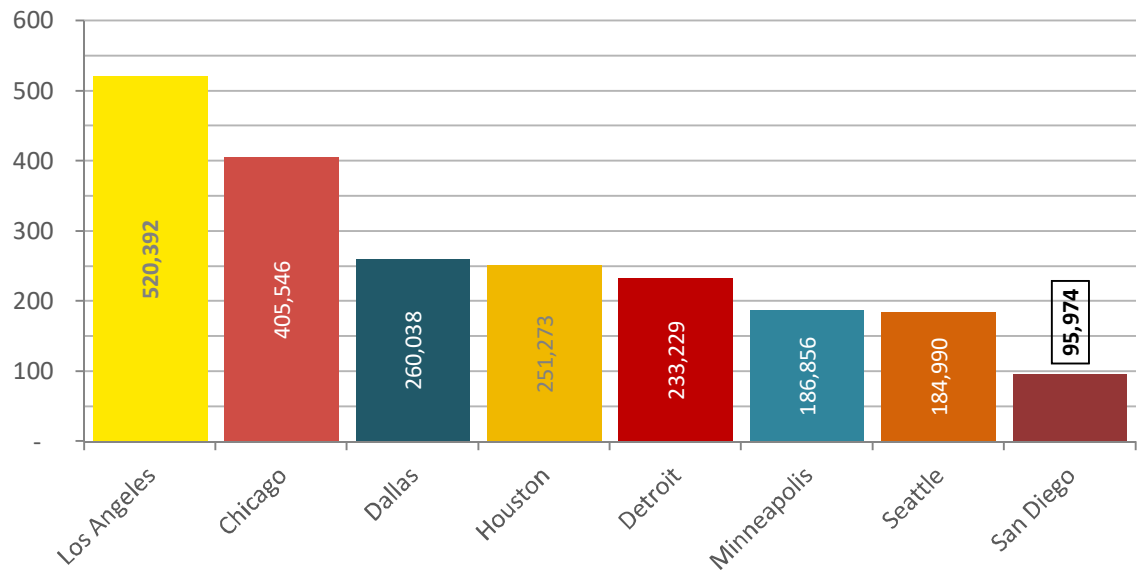


Fig Ind-5: Manufacturing Jobs Per Region

"Identifying remaining energy efficiency opportunities requires an understanding of sector-specific technologies, customer behaviors and needs, and dynamic regulatory and market forces. Furthermore, given the heterogeneous nature of this market, it is quite likely that one size does not fit all."

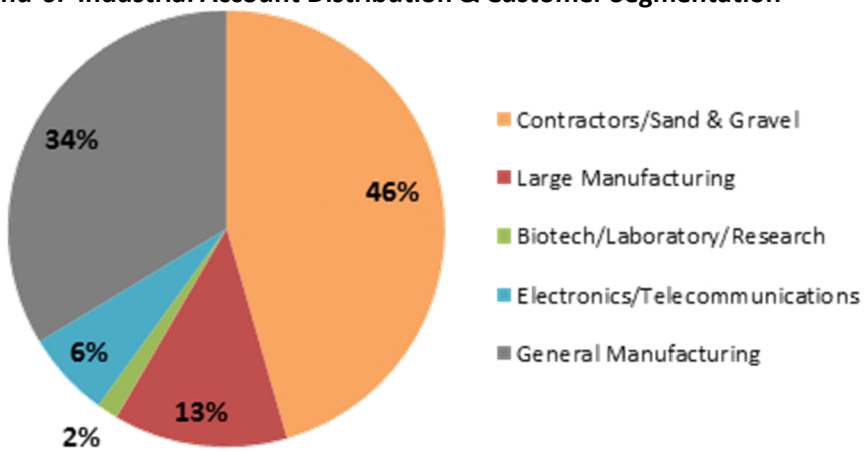
- Measure, Application, Segment, Industry (MASI): Finding the Remaining Energy Efficiency Potential through Market Assessment, ACEEE Summer Study on Energy Efficiency in Industry, 2015

Industrial sector customers can be characterized by highly complex systems which exist within diverse, heterogeneous, customer segments. As no one size fits all, the diversity of the sector necessitates a customized approach to energy efficiency which can be expensive.

Market segmentation provides additional insights that can inform targeting, strategy, and program design. Utilizing the North American Industry Classification System (NAICS) designations, SDG&E has categorized its industrial accounts by industry type, grouped them by similar energy usage patterns, and found that the majority fall into five main segments:

1. Sand, Gravel & Contractors	**Industry contractors and construction (plumbing, electrical, heating, A/C, special trades, roofing, etc.), natural gas extraction, landscape and masonry**
2. General Manufacturing	Commercial bakeries & breweries, machine shops, fabric, plastic, textile and woodworking manufacturing.
3. Large Manufacturing	Aircraft, engine, bicycle, turbine, A/C and commercial refrigeration manufacturing
4. Electronics/Telecommunications	Manufacturers of communications, audio/visual, TV/Radio, computer and circuit assembly and other electronic equipment
5. Biotech, Laboratories, and Research	Pharmaceutical, biological, medicinal an botanical manufacturing

Figure Ind-6: Industrial Account Distribution & Customer Segmentation[111]



Each of these segments presents unique challenges when seeking to implement more efficient equipment and processes. Specifically, the Sand, Gravel and Contractor segment proves challenging to address because the majority of their work is performed at construction sites, rather than in a single facility. Though they are classified as industrial based on their NAICS classification, this sector aligns more closely with the commercial sector when it comes to assessing for energy efficiency opportunities. The actual sand and gravel facilities are typically offices and warehouses, which suggest many synergies with the commercial sector.

"California industry is highly diverse in type, size, and operation; uniform programs often will not match corporate or facility needs."

- *California Energy Efficiency Strategic Plan, January 2011- Industrial Sector*
-

Each segment has unique consumption patterns as well as program participation trends that are discussed below. By understanding customer segmentation, market characterization, and past participation trends, SDG&E seeks to design a focused portfolio of offerings that will efficiently enable the industrial sector to participate at a greater rate than in the past.

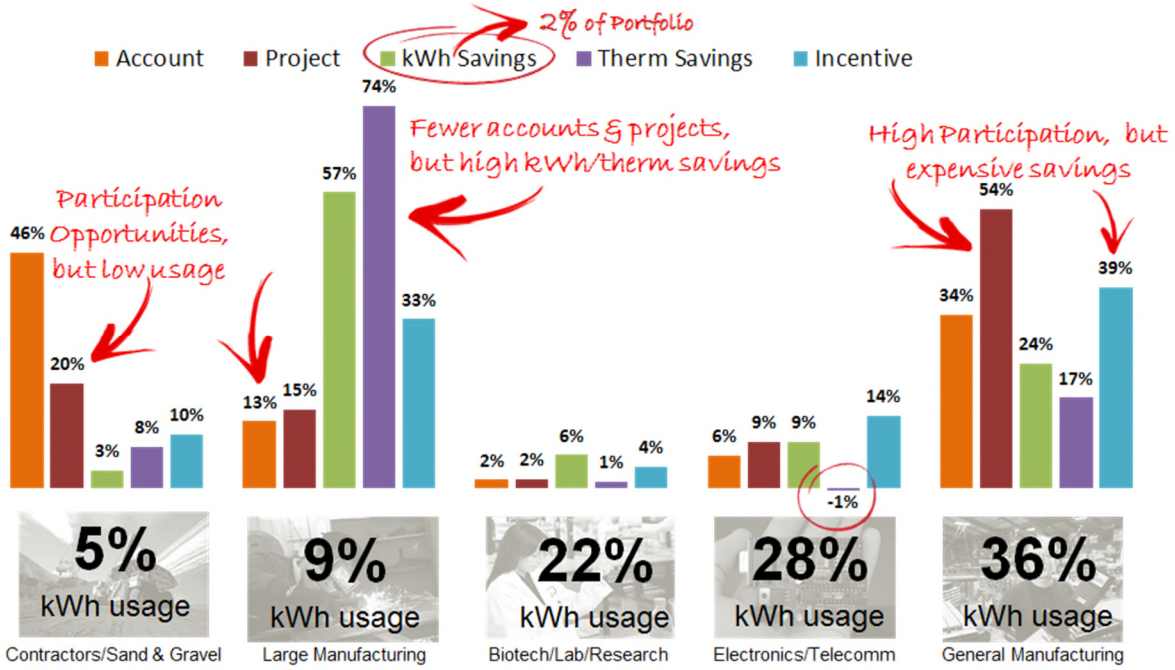
Looking at participation in the 2013-2015 program cycle, certain trends emerge. The pie charts below describe the industrial sector by segment in terms of:

- percent of industrial accounts,
- percent of projects completed, and
- percent of electric energy (kWh) and gas (therm) savings.

Further analysis shows approximately 60% of electric usage and 64% of gas usage comes from only 21% of industrial accounts in three customer segments, as shown in Figure Ind-7 below.

[111] Source: SDG&E Industrial Account Distribution & Customer Segmentation (2013-2015)

Figure Ind-7: Historical Program Participation and Results[112]



As shown in Figure Ind-6, the Sand and Gravel Contractors and General Manufacturing segments are the largest in the industrial sector, making up 46% and 34%, respectively, of industrial customer accounts. These also have the highest program participation rates (20% and 54% of projects, respectively, in Figure Ind-7, above) in terms of project count. In contrast, it is the Large Manufacturing that claims the largest electric and gas savings.

"Similar to other manufacturing industries, cement and concrete manufacturers tend to view their individual processes as proprietary. Thus, the improvement potential of any particular manufacturer cannot be precisely predicted."

- KEMA – Industrial Sectors Market Characterization – Cement and Concrete Industry

The industrial sector contains some of the most highly specialized processes as well as some that are very proprietary in nature. In some industry segments, such as in the chemical industry, the highly specialized processes in place create further barriers to implementing energy efficiency by adding complexity to project evaluations, customer decision making, and implementation itself.[113] Some sector-specific savings opportunities may not be considered economically viable due to the size of investment required and/or longer payback periods. Furthermore, if a process is also considered proprietary, this may be yet another hurdle which must be overcome as customers may be more reluctant to change or allow scrutiny of a patented process. Conversely, some industries and sub-segments where less competition exists may see more collaboration take place. This may be particularly true in the wastewater treatment facilities as they are generally utility agencies and do not overlap service areas.[114]

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[112] Source: SDG&E Energy Efficiency Programs (2013-2015)

[113] KEMA – Industrial Sectors Market Characterization: Chemicals Industry

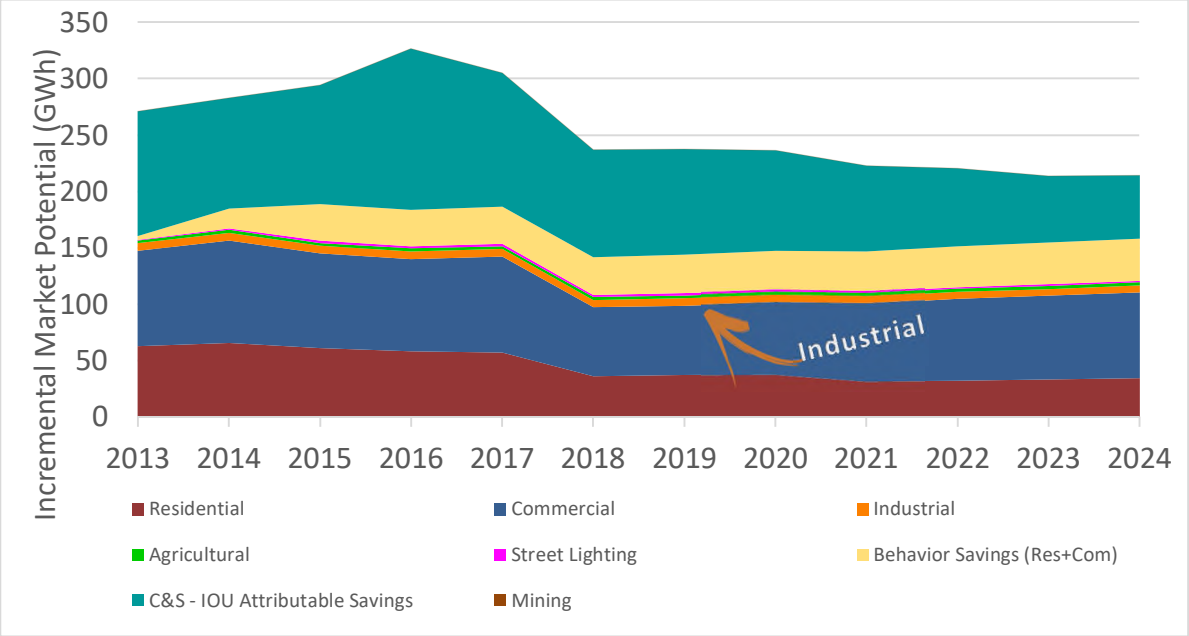
[114] Measure, Application, Segment, Industry (MASI): Finding the Remaining Energy Efficiency Potential through Market Assessment, ACEEE Summer Study on Energy Efficiency in Industry, 2015

Competing priorities for capital seems to be more prevalent in industry than merely just access to capital. The industrial sector is highly regulated in areas such as environment, waste, and safety, creating competition for time and resources. Historic participation in SDG&E's OBF program indicates financing within the industrial sector is utilized at a lower rate overall than in other non-residential sectors, but still plays a role in assisting customers with energy efficiency based on their demand size and project cost. For customers who do have access to capital, significant competition exists for these resources and customers are looking for low risk opportunities to assign this capital. SDG&E historic program participation data shows that the industrial sector accounted for a very small percentage of participation in the On-Bill Financing (OBF) program. Though this could also be due to a lack of awareness or size differences between the eligible sectors, it more likely indicates that industrial customers do not seek out energy efficiency projects.

Energy Efficiency Market Potential

The 2013 California Market Potential Study by Navigant provided data on energy efficiency market potential by utility, sector, and end-use. Figure Ind-8 shows incremental market potential (in GWh) by sector. The industrial sector potential remains relatively constant throughout the time period.

Figure Ind-8: SDG&E Industrial Incremental GWh Market Potential[115]

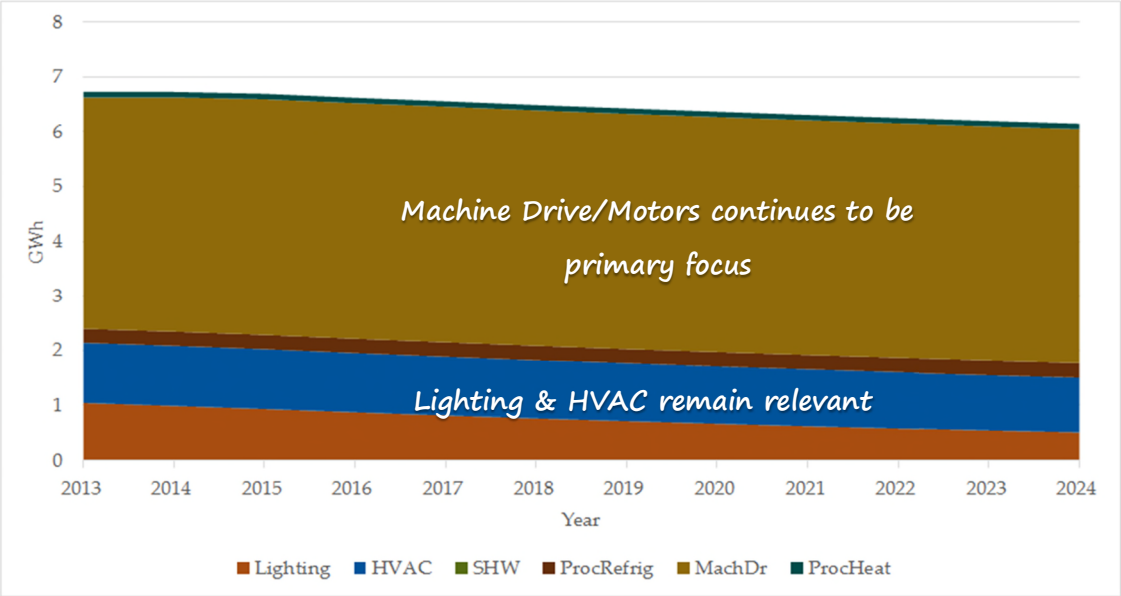


Looking closer at the incremental market potential by end use, there are indications that, for the industrial sector, lighting and HVAC will continue to be the relevant contributors to the portfolio savings, but machine drives and motors are expected to have the largest savings potential. According to the 2010 Manufacturing Energy Consumption Survey (MECS), machine drives represent anywhere from 30 to 88 percent of facility electricity use depending on the industry.[116]

[115] Source: Energy Efficiency Potential and Goals Study for 2015 and Beyond

[116] Measure, Application, Segment, Industry (MASI): Finding the Remaining Energy Efficiency Potential through Market Assessment , ACEEE Summer Study, 2015; MECS http://www.eia.gov/consumption/manufacturing/

Figure Ind-9: Industrial Incremental Market Potential – GWh (SDG&E Territory)



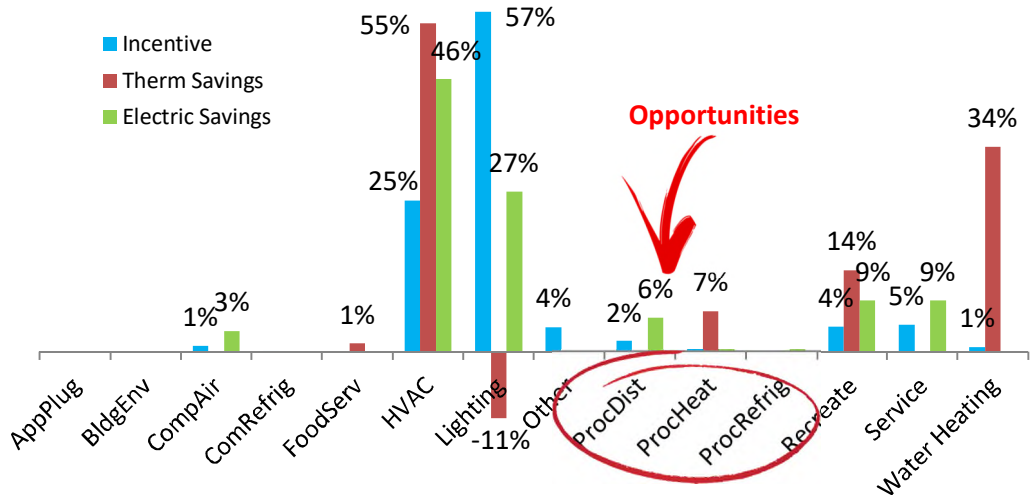
The potential study results support notions of moving beyond equipment-focused programs to address and transform customer business practices[117]. Approaches to addressing the whole building should be the main area of focus.

Industrial Sector End-Uses

As described in the 2015 California Market Potential Study by Navigant, machine drive and motors will be a large focus for this sector however our approach will change because there is twice as much potential from operations and maintenance compared to new equipment. There is not a California Industrial End Use Study to utilize for additional insights so SDG&E is looking at both the Market Potential Study and past program participation to provide indications of focus for this plan. Figure Ind-10 represents a historical look at end-use participation, based on savings, for the industrial sector. This assessment shows that HVAC, lighting, and water heating were the top three end-uses. There is also opportunity to explore the process end-uses given the diversity and complexity that this sector embodies.

[117] Wallner, et. al. More than High Efficiency Motors Market Transformation for Industrial SEM

Figure Ind-10: Historical Incentive/Savings by End Uses[118]



Future Trends

Looking at the consumption trends provided by the CEC and illustrated in Figure Ind-11, overall consumption is trending upwards and specifically in the residential and commercial sectors. In contrast, the trend shows the industrial sector consumption staying relatively flat. As a result, SDG&E cannot expect to achieve its increases in energy efficiency savings through sector growth alone. Rather, SDG&E will need to implement new and creative methods to reach a higher percentage of its industrial customers.

One trend benefiting this sector is the focus on the competitiveness of ports within California. This trend was formalized by the passage of AB 628 which among other topics calls for assessment and implementation of energy efficiency. Since industrial customers are large energy users at ports, SDG&E will focus particular attention of these customers at the Port of San Diego.

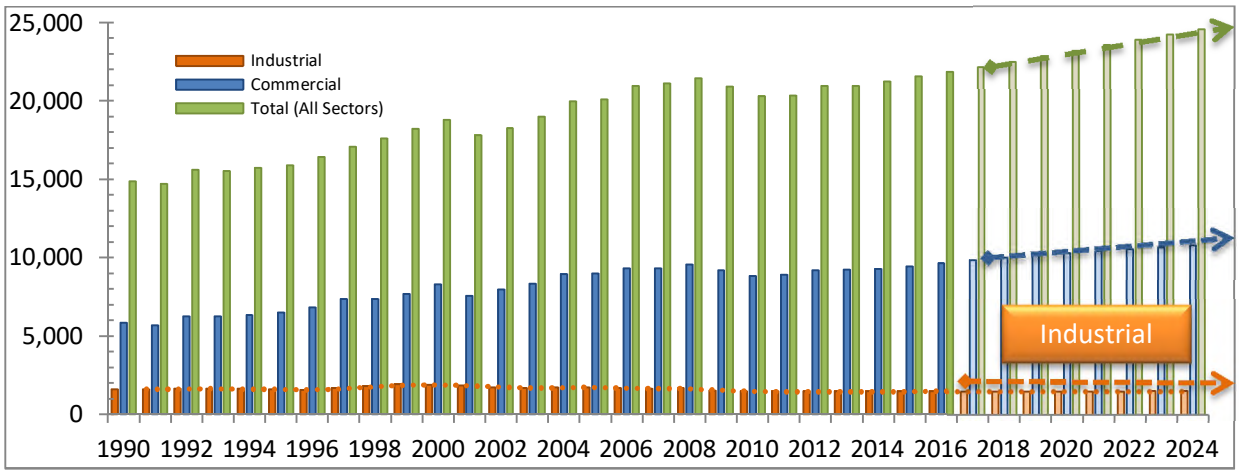


Figure Ind-11: Sector Consumption Trends

[118] Source: SDG&E Program Data (2013-2015)

Legislative Impacts on Strategy

Legislative mandates, specifically Senate Bill (SB) 350 and Assembly Bills (AB) 793, 758 and 802, have been incorporated in this business plan both implicitly and explicitly. Generally, the industrial goals and strategies have been developed to capture additional savings beyond those that existing program design has been able to capture. Such strategies are aimed at doubling energy savings as required by SB 350. Under AB 802, SDG&E will work with customers to unlock saving from inactive projects in existing buildings. Further, as described above under Future Trends and below with strategies, AB 628 has a direct impact on the focus of SDG&E's approach to the industrial sector by focusing EE effort on industrial customers at the Port of San Diego.

The table on the following page summarizes these policy drivers and how this business plan address each one.

INDUSTRIAL		
Policy Driver	**Specific Requirement / Guidance**	**Business Plan Response**
SB 350 – Clean Energy and Pollution Reduction Act of 2015	* Achieve a cumulative doubling of savings in electricity and gas retail customers' final end uses by 1/1/30. * The CEC shall adopt a responsible contractor policy to ensure that ratepayer-funded EE retrofits meet high-quality performance standards and reduce energy savings lost or foregone due to poor-quality workmanship.	* Double sector's participation by working with third parties to design offerings that leverage audits/benchmarking, financing, innovative incentives, and Strategic Energy Management.
AB 793 – Energy Management Technology Incentive Offering	Must develop programs by 1/1/17 that provide incentives to help residential and small/medium business customers acquire energy management technology and educate them about these programs.	* Not applicable to sector
AB758 – Existing Buildings Energy Efficiency Action Plan	Strategy 2.2.5 - Develop multiyear, sector-specific energy plans to implement energy and water efficiency improvements for property owners.	* Expand Strategic Energy Management offering by leveraging the SW downstream model for consistency. * Educate and train industrial customers on to identify process savings and how to achieve deeper savings through Strategic Energy Management.
AB 802 – Benchmarking and Changes to Energy Efficiency Baselines	Benchmarking - By 1/1/17, for multi-unit buildings, utilities must provide aggregated energy usage data to its owner, its agent or the building operator. Commission will set requirements for public disclosure of information for benchmarking purposes. Baselines - Authorizes utilities to provide incentives to customers for energy efficiency projects based on normalized metered energy consumption as a measure of energy savings.	* Leverage third-party community knowledge and expertise to design programs that provide customers assistance in benchmarking their facilities and using this information to develop actionable energy management plans. * Expanding opportunities for customers to utilize pay-for-performance incentives based on normalized metered energy consumption.
AB 628 – Energy Management Plans for Harbor and Port Districts	CPUC shall encourage utilities to work with ports to develop, implement and administer energy management plans.	* Will work actively with the Port of San Diego to help the Port assess opportunities for and implement energy efficiency projects

Goals, Strategies, and Tactics for the Industrial Sector

In order for industry to make significant gains in energy efficiency, there must be greater awareness and knowledge sharing about programs, resources, and practical methods that can help industrial plants identify, develop, and document energy efficiency improvements and their economic benefits."

- California Energy Efficiency Strategic Plan, January 2011- Industrial Sector

As discussed in this plan, the industrial market in San Diego represents a relatively small portion of the service territory (only 8% of total consumption) when compared to other areas of California and is made up of smaller customers as well (74% are under 20kW). According to the CEC, the forecasts are that consumption in this sector will not grow through 2024.

Barriers to industrial customer participation in energy efficiency programs can be summarized in three ways:

- Industrial customers have diverse, highly complex systems which means that no one approach will meet all needs.
- Industrial customers assess opportunities based on a number of considerations; energy efficiency offerings are just one of many topics competing for priority of resources and funding.
- Even when capital is available for projects, some customers may be unwilling to participate due to other factors such as risk aversion, internal processes and compliance with regulations.

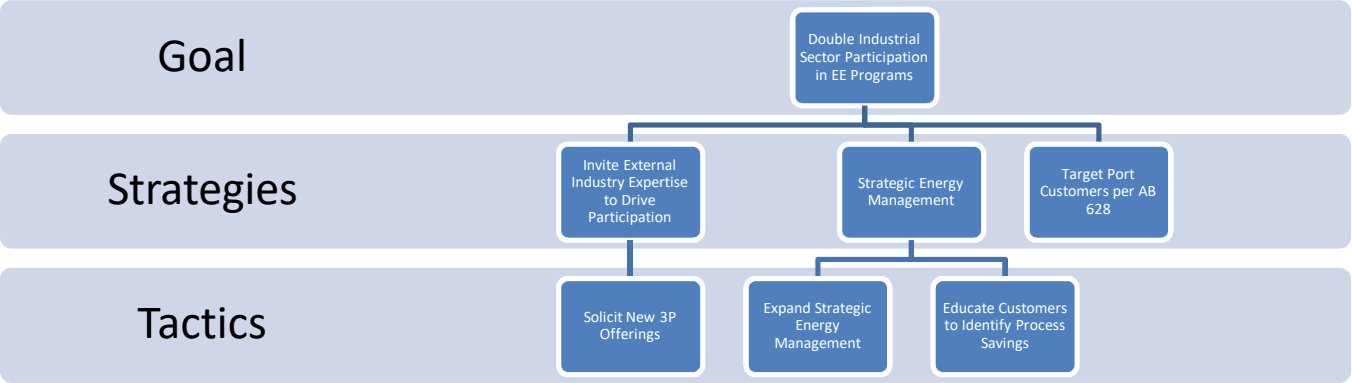
With these attributes in mind, SDG&E has created goals, strategies and tactics that are intended to remove barriers and attract both customers and vendors to energy efficiency. Figure Ind-14 below summarizes this approach.

Figure Ind-14: Goals/Strategies/Tactics Summary

Goal	Strategy	Tactics	New, Existing, Modified	Short, Mid, Long-Term
Double the Energy Efficiency Participation by the Industrial Sector	• Add value by bringing external industry expertise that will drive customer participation in programs and encourage customers on continued path towards deeper savings. • Target Port Customers per AB 628	• Solicit third parties that can provide offerings that include: • Audits & Benchmarking as appropriate • Energy management plan • Financing • Incentives	Modified	Short
			New	Short
	• Unlock deeper savings through Strategic Energy Management Offering	Expand Strategic Energy Management offering by leveraging the SW downstream model for consistency	New	Short
		Educate and train industrial customers to identify process savings and how to achieve deeper savings through Strategic Energy Management.	Modified	Short

Industrial Goal 1: Double the Energy Efficiency Participation by the Industrial Sector

The industrial sector has been historically underrepresented in the energy efficiency arena for a number of reasons. Industrial sector customers tend to have highly specialized, sometimes proprietary systems which necessitate a customized approach to energy efficiency, but can inhibit cost effectiveness. Also, energy efficiency competes for customer attention and financing.



Strategy: Add value by bringing external industry expertise that will drive customer participation in programs and encourage customers on continued path towards deeper savings.

As discussed in this plan, the "one size fits all" approach that SDG&E has previously deployed has been more effective in other sectors than in the industrial sector. For example, when evaluating the savings for this sector, the end-uses mirrored those of the commercial sector. Based on these similarities, one might deduce that Trade Professionals in San Diego are not incented to provide tailored offerings for this sector. Solicitations to identify industry experts to provide tailored offerings will increase the participation for the industrial sector and prepare customers for Strategic Energy Management.

Strategy: Unlock deeper savings through Strategic Energy Management Offering

Due to the complexity and variability of this sector, a strategic energy management approach has the potential to yield the most far-reaching benefits. The Navigant potential study shows the largest industrial sector opportunities in the operations and maintenance of HVAC and machine drives/motors. In order to tap into this potential, customers will need assistance institutionalizing practices which will sustain long-term savings. As noted in the "Strategic Energy Management Programs: Tapping Large Customers for Deep and Continuous Energy Savings" report published by ESource, SEM is a vehicle to do this work by motivating customers "to make one-time capital improvements […and] embed long-term energy-management practices within companies".

Strategy: Target Customers at the Port of San Diego per AB 628

Assembly Bill 628 provides ports in California and their utilities the opportunity to collaborate on an Energy Management Plan designed to provide energy cost certainty, promote sustainability, and make the port more competitive. As part of that effort, SDG&E intends to contract with one or more third-

party entities to focus on the specific needs of the Port of San Diego and the customers within the port. Many of the largest energy users at the port are industrial customers. Thus, this specific strategy may have a meaningful impact on the overall sector's success. As with the first strategy listed above, the primary focus of this strategy will be to provide a comprehensive and customized solution to each industrial customer.

Tactics

While the specific tactics used for implementation will be designed by the selected third-party Implementer(s) the following are tactics that are likely to be used:

- Solicit third parties that can provide offerings that include:
    - Audits & Benchmarking as appropriate
    - Energy management plan
    - Financing
    - Incentives
- Expand Strategic Energy Management offering by leveraging the SW downstream model for consistency
- Educate and train industrial customers on to identify process savings and how to achieve deeper savings through Strategic Energy Management.

Industrial Sector Metrics

Energy Efficiency Business Plans: Sector Metric Table - Industrial Sector

Problem Statement	Market Barriers	Desired Sector Outcome	Intervention Strategy	Sector Metric	Baseline	Metric Source	Short Term Target (1-3 years)	Mid-Term Target (4-7 years)	Long Term Target (8-10 years)
The industrial sector has largely been underrepresented in the SDGE portfolio. Industrial sector customers tend to have highly specialized, sometimes proprietary systems which necessitate a customized approach to energy efficiency, but can inhibit cost effectiveness. Also, energy efficiency competes for customer attention and financing.	1. Diverse, highly complex systems means that no one approach will meet all needs	Increased participation and encourage deeper savings	Add value by bringing external industry expertise that will drive customer participation in programs and encourage customers on continued path towards deeper savings	Industry customer projects month over month growth	Current number of industrial customers	Program data base			
	2. Industrial organizations assess opportunities based on numbers considerations, energy efficiency offerings being just one of many topics competing for priority of resources and funding		Unlock deeper savings through Strategic Energy Management Offering	Savings attributed to industrial customers engaged in SEM offering vs those not	Current and ongoing savings associated with non-participant customers	Program data base			
	3. Even if capital is available for projects, some customers may be unwilling to participate due to other factors such as risk aversion, internal processes and compliance with increasing regulations								

PA/Program Coordination

SDG&E will create strong ties with industry, stakeholder groups and other PA's to gather best practices and lessons learned that will inform future design.

Cross-Cutting Coordination

Description of how cross cutting activities are addressed in customer sector strategies.

WE&T

As a cross-cutting program, WE&T is critical to building customer demand by highlighting the value of EE, promoting market acceptance by educating trade professionals on how to maximize sales through the value proposition, and ensuring that a skilled and trained workforce properly installs and maintains equipment leading to greater EE savings. SDG&E's WE&T program has and will continue to focus on the following areas to engage with industrial customers. Looking ahead, the WE&T program will continue to support the following areas and will expand or contract based on market and potential data forecasts:

- Building Design & Construction
- Building Performance
- Codes & Standards
- HVAC
- Lighting
- Renewable Energy
- Sustainability
- SDG&E's Rebate & Incentive Programs

More details on these efforts are provided in the WE&T chapter of this Business Plan.

Financing

SDG&E will provide more financing opportunities and make financing programs easier to use. Traditional financing programs, such as SDG&E's On-Bill Financing, are helpful tools to encourage participation in IDER programs. Although most customers qualify, trade professionals often must front the project costs for their customers until a project is completed, at the risk of the customer being disqualified from financing if the project scope changes.

Statewide Crosscutting Programs

Since Emerging Technologies, Codes &Standards, and aspects of financing will be transitioning to statewide programs that may be administrated outside of SDG&E, this section will be updated with more details after the lead PAs are selected in the upcoming weeks. Please note that although the WE&T Connections program will also be administered statewide, it focuses on K-12 education and isn't relevant to this sector.

Evaluation, Measurement, and Verification (EM&V) Considerations

The industrial sector has historically been difficult to analyze, due to the large consumption that makes EE savings appear as "noise" in the data, with multiple processes at industrial sites complicating the evaluators' ability to isolate effects of EE interventions. SDGE will examine this sector using a similar approach to that of other sectors contained in this business plan. The primary focus will continue to be to use net metered consumption data, while reserving additional methodologies where that exercise proves unfruitful. The basic approach is as follows:

- Measure impacts with Normalized net-metered energy usage based on AMI data
- When necessary turn to additional methodologies including modeling (see below)
- Regular strategy and implementation metric tracking and providing
- Casual analysis between metrics and strategies, and "success" i.e. are these the correct metrics to drive program success?

These evaluation approaches will be used in concert to gain a complete picture of the sector across time, and at various intervention points.

IPMVP

The evaluation efforts, in concert with process evaluations coordinated among the statewide EM&V team, will implement the International Performance Measurement & Verification Protocols (IPMVP). Under IPMVP, there are four high-level M&V options:

- Option A: Retrofit Isolation: Key Parameter Measurement;
- Option B: Retrofit Isolation: All Parameter Measurement;
- Option C: Whole-Building; and
- Option D: Calibrated Simulation.

Whereas Options A and B isolate individual systems or equipment, Option C and D generally consider the whole building. Option C will be the default M&V method employed so long as savings register at the whole building level. However, in the event that savings are not as great as expected, SDG&E will employ Options A or B.

Option C – Whole-Building
As stated above, Option C is the preferred M&V methodology, using AMI billing data to produce net metered consumption data across time, and to establish a "baseline" consumption case. IPMVP Option C entails creating energy use models for each metered utility entering a building using whole-building interval trend data. In order to create accurate energy models, at least twelve consecutive months of baseline and post-implementation whole-building energy trends shall be collected. The purpose of this requirement is to ensure that energy use is trended over a period which captures a range of independent variables (IVs -- typically outside air temperature) representative of most of the annual operating conditions.

Options A and B – Retrofit Isolation
Options A or B can be used if energy savings are expected to be very small compared to whole-building energy use and discrete measures are being implemented which can easily be calculated and supported by baseline and post-project sub-metered or spot measured data. Measurement periods for these

Options should attempt to follow the requirements detailed in the Option C section; however shorter trending periods may be warranted depending on the equipment and measures being modeled.

Option D – Calibrated Simulation

Option D should be used only if either baseline or post-project whole-building trend data is unavailable. Use of Option D entails creating a whole-building energy use model and calibrating it to either baseline or post-project energy use. Depending on which data set the model is calibrated to, energy efficiency measures will then be implemented or un-implemented in the model to represent the actual project scope.

On a more regular basis, EM&V will be engaged in measuring sector and implementation level metrics. SDG&E EM&V suggests two types of analysis related to metrics. The first capitalizes on the objective of the metric as a quick indicator of programmatic success or direction, without the necessity of a full scale, resource intensive impact evaluation. This first type of analysis will use summary statistics to understand how the sector, program, and individual interventions are changing, operating, or succeeding over time. EM&V will provide program staff a regular report that tracks individual metrics overtime.

Additional analysis will become necessary over time. Eventually metrics themselves will need to be tested, specifically whether or not a metric is appropriate. This analysis requires significant savings and metrics data, thus the timeline will need to be determined at a future point. This analysis will likely be a simple OLS regression to test correlations between metrics and savings. Where evaluators identify metrics that are significant and positive, we can further engage our programs to address these metrics. Where we find individual metrics that lack significance or are negatively correlated, programs can stop that activity and reallocated resources to addressing other positive and significant metrics.

This plan is presented independent of the statewide EM&V efforts included in the CA EM&V Research Roadmap. Additional evaluation will occur within that forum that will provide significant programmatic feedback to the industrial staff.

Agricultural Sector

Chapter Summary

> **The California Energy Efficiency Strategic Plan's Vision for the Agricultural Sector**
> "Energy efficiency will support the long-term economic and environmental success of California agriculture."

Although not one of the SDG&E's larger energy consuming sectors, representing 2% of total electric consumption, the agricultural sector plays an important role in the area's economy and faces significant challenges. SDG&E can help alleviate these challenges with strategies that improve energy and resource efficiency for its diverse set of agricultural customers.
SDG&E has served the sector with programs that seek to improve both water-use and energy efficiency; however, California's acute water shortages have only worsened the sector's plight and more must be done to help these customers control energy costs and remain economically viable. Energy savings performance in this sector from 2013-2015 represented only 0.2% of total electric savings, thus a new approach is warranted and this business plan lays out a plan for the agricultural sector that will seek to leverage the expertise of third-party providers and offer tools and strategies that enable customers to reduce energy costs and save water.

Consistent with the EE Strategic Plan, SDG&E's mission for the agricultural sector will rely upon cultivating relationships with the agricultural community and supporting the sector's long-term economic and environmental success. To accomplish this mission, SDG&E has established the following agricultural sector goal:

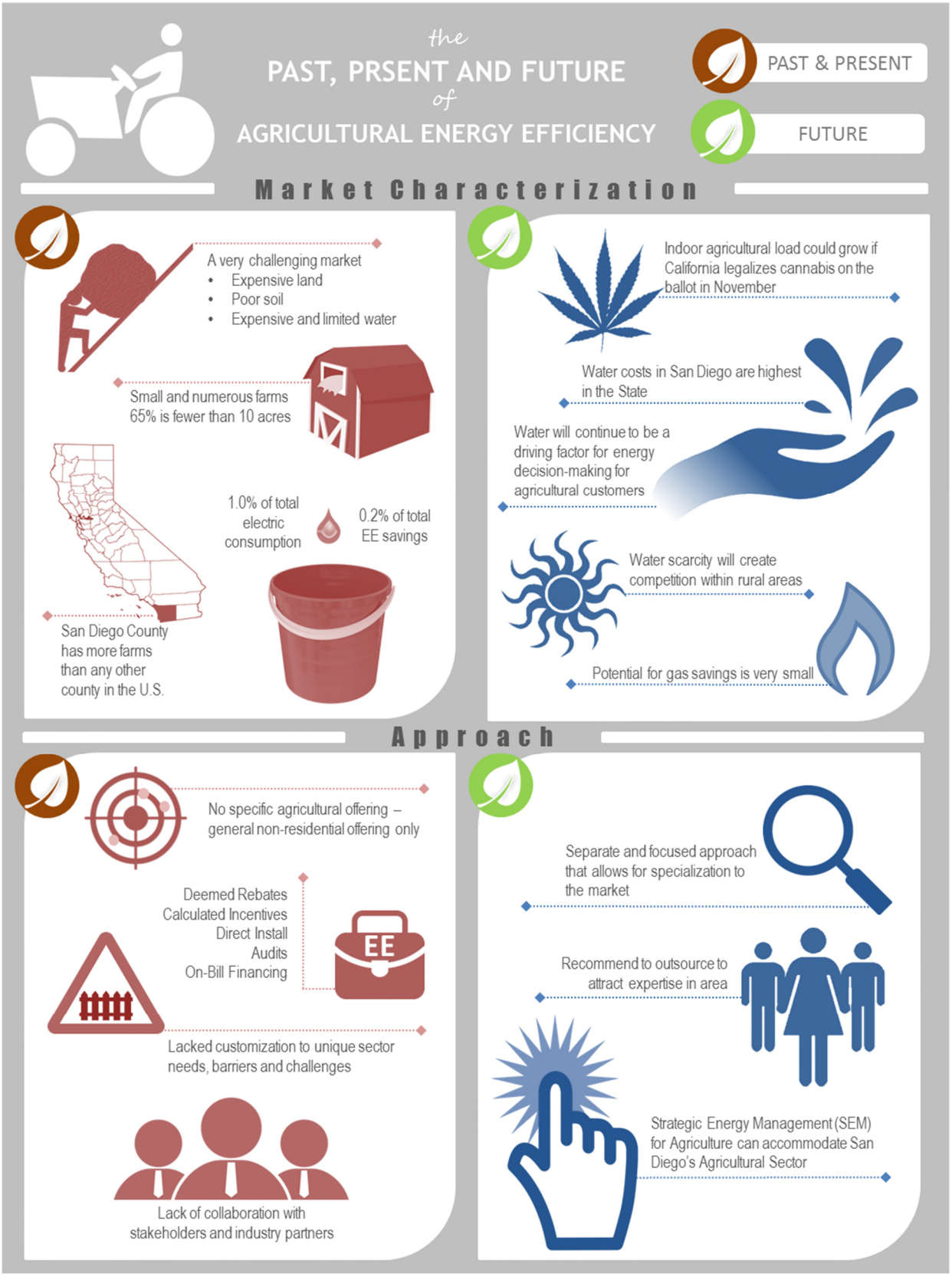
- Agricultural Goal 1: Double the Energy Efficiency Participation by the Agricultural Sector
- Agricultural Goal 2: Provide the Agricultural Sector a Solution Addressing the Water/Energy Nexus

SDG&E has struggled to engage the agricultural sector in its programs, and efforts to engage agricultural customers are complicated by the large number of small farms and agricultural businesses. Evergreen Economics performed a study of SDG&E's agricultural segment. The findings of that study are described within this chapter; however, they indicate that the manner in which SDG&E has implemented agricultural programs has not been wildly successful and therefore a completely new approach is warranted.

SDG&E believes that San Diego agricultural sector's profile requires a customized approach that focuses on the unique requirements of this sector. A number of tactics are expected to be employed to address this need but the proposed strategies are leveraging the statewide Strategic Energy Management program and using the knowledge and expertise of the market by using third-party contractors as the implementer of EE for the agricultural sector. This approach is consistent with the advocated position of a number of stakeholders in the CAEECC process.

The possible legalization of cannabis in the state may also change the character of the agricultural industry in San Diego and require a marked change in the way SDG&E addresses the sector. As a potentially large energy user, cannabis farming could negate much of the energy savings that the sector

hopes to achieve. This means that extra effort may be required to ensure that this sub-segment has ample opportunities to pursue energy efficiency.


the
PAST, PRSENT AND FUTURE
of
AGRICULTURAL ENERGY EFFICIENCY
PAST & PRESENT
FUTURE
Market Characterization
A very challenging market
• Expensive land
• Poor soil
• Expensive and limited water
Small and numerous farms
65% is fewer than 10 acres
1.0% of total electric consumption
0.2% of total EE savings
San Diego County has more farms than any other county in the U.S.
Indoor agricultural load could grow if California legalizes cannabis on the ballot in November
Water costs in San Diego are highest in the State
Water will continue to be a driving factor for energy decision-making for agricultural customers
Water scarcity will create competition within rural areas
Potential for gas savings is very small
Approach
No specific agricultural offering – general non-residential offering only
Deemed Rebates
Calculated Incentives
Direct Install
Audits
On-Bill Financing
EE
Lacked customization to unique sector needs, barriers and challenges
Lack of collaboration with stakeholders and industry partners
Separate and focused approach that allows for specialization to the market
Recommend to outsource to attract expertise in area
Strategic Energy Management (SEM) for Agriculture can accommodate San Diego's Agricultural Sector

Approach to Achieve Agricultural Sector Goals

Historically, SDG&E has been challenged to effectively penetrate the agricultural sector; however, given the analysis included in this plan, and a scan of the future trends that will impact this sector, SDG&E will seek to take new approaches to this market. SDG&E's market analysis and stakeholders have identified a number of consistent barriers to address in this plan. SDG&E has analyzed these barriers and considered the direction set by the California Energy Efficiency Long-Term Strategic Plan to determine the goals needed in order to establish a unified, achievable framework that will yield concrete results in support of the mission and vision of the agricultural sector.

SDG&E has previously implemented the agricultural offerings in conjunction with the commercial offerings providing one over-arching deemed program and one over-arching calculated program. Moving forward, this sector will need a separate and focused approach that allows for specialization to the agricultural market.

The Evergreen Economics 2015 Agricultural Sector Market Study had the following findings:

- SDG&E agriculture customers are interested in saving water, and are also interested in water-related measures.
- Agriculture customers may be more receptive to marketing and measure offerings if they are described in their own industry terms.
- When presenting to trade associations, use case studies that feature participating customers.
- Customers report lack of awareness and lack of having enough information as the two largest barriers to participating in SDG&E's programs.
- There are additional measures that save energy in this sector offered by other (non SDG&E) utilities that SDG&E might consider offering.
- About half of customers report that rebate amounts are too low, and most of the remainder report that the rebate amounts are just right.
- Crop-producing customers report that they would be a lot more likely to participate in SDG&E's offerings if there was the ability to get incentives at the supplier level.

Based on the study findings, Evergreen Economics made the following recommendations for SDG&E to consider:

- Focus on both money and water savings wherever possible when marketing energy efficiency options to the agriculture sector. SDG&E could consider marketing their on-site audit as an irrigation checkup in order to appeal to the customer desire to save on water costs.
- Utilize agriculture specific terms for measures that can be utilized across industries in order to improve the odds that agriculture customers who are looking for assistance will easily find their offerings.
- Expand the use of customer testimonials to SDG&E's website.
- Continue working with industry organizations to inform and educate customers with the intent of increasing awareness of program offerings.
- Consider changing the way that the greenhouse cover is presented (and calculate the incentive per roll rather than per square foot).
- Consider a midstream rebate approach for crop producing (indoor and/or outdoor) growers.
- Consider connecting the data collected in the mail survey to customer information.

Both SDG&E's program data and the findings and recommendations of this study indicate that the manner in which SDG&E has implemented agricultural programs has not been wildly successful and therefore a completely new approach is warranted. Various stakeholders in the CAEECC process have advocated for a more market based approach by leveraging the contractor community. Given its performance to date with the agricultural sector, SDG&E sees this sector as an excellent opportunity to pursue stakeholder recommendations and collaborate with third-party implementers to better serve this market. As such SDG&E intends to issue solicitations for this entire sector to third parties that are embedded in the agricultural markets, have relationships with distributers and suppliers, and can achieve the energy savings goals.

To focus on the overwhelming importance of water the agricultural sector, SDG&E has developed a specific Goal to address the connection between water and energy. The relationship between the identified problems, the established goals, and the markets these goals address is summarized in Figure Ag-1.

Figure Ag-1: Agricultural Sector Market Characteristics and Problems Overcome by Goals

		Targeted by Strategies supporting Goals		
Problem	**Goal**	**Customer Size**	**Market Segments**	**End-Uses**
Marketing not specific to Ag nor presented in effective manner	1. Double EE Participation by Ag Sector	Small, Medium, Large	Nursery & Cut Flower Products, Fruit & Nuts, Vegetables, Livestock & Poultry, Livestock & Poultry Products, Misc Products & Services	Bldg Env, HVAC, Irrigation, Lighting, Water Heating
Desire for mid/upstream incentives				
Lack of awareness & sufficient info on EE				
Focus on water	2. Provide Ag Sector a Solution Addressing the Water/Energy Nexus	Small, Medium, Large	Nursery, Fruit & Nuts, Vegetables, Livestock & Poultry	Irrigation, Water Heating

This chapter outlines the overarching goals that set the direction for SDG&E's agricultural sector's energy efficiency efforts in the coming years. SDG&E's agricultural sector goals are:

- Agricultural Goal 1: Double the Energy Efficiency Participation by the Agricultural Sector
- Agricultural Goal 2: Provide the Agricultural Sector a Solution Addressing the Water/Energy Nexus.

These goals and the programs that will be designed and implemented will be used to reach savings goals based upon approved budgets. The following tables outline the proposed energy efficiency goals and budget for SDG&E's agricultural sector.

Figure Ag-2: Agricultural Sector Annualized Savings Goals

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
GWh	TBD	TBD	TBD
MW	TBD	TBD	TBD
MMTherms	TBD	TBD	TBD

Figure Ag-3: Agricultural Sector Annualized Budgets

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
Annual Budget	TBD	TBD	TBD

Overview of Current Offerings

As discussed, the current offerings are often bundled into standard programs as listed below. This approach has not been as effective as it could be and therefore, the correct offerings are not being proposed in the traditional sense. All of the components needed for the agricultural sector will now be bundled into a sector level solicitation. It will be critical that agricultural customers receive the benefits of the existing core programs but that they are offered in a way that is appropriate for the agricultural sector. The core programs that have been offered in the past are:

- Comprehensive Audit Program
- Energy Efficiency Business Rebates
- Energy Efficiency Business Incentives
- Business Energy Solutions
- Premium Efficiency Cooling
- Retrocommissioning
- Savings By Design
- Locational Energy Efficiency
- On-Bill Financing

The strategies and tactics proposed in this business plan will explore the use of third parties to design, deliver, and drive participation for the agricultural sector.

Agricultural Sector Market Characterization

"It is important to consider that San Diego County houses a unique agriculture community with smaller than average farms, a dry climate, high water costs and many high value per acre crops."

- SDG&E Agricultural Market Study, Evergreen Economics, 2015

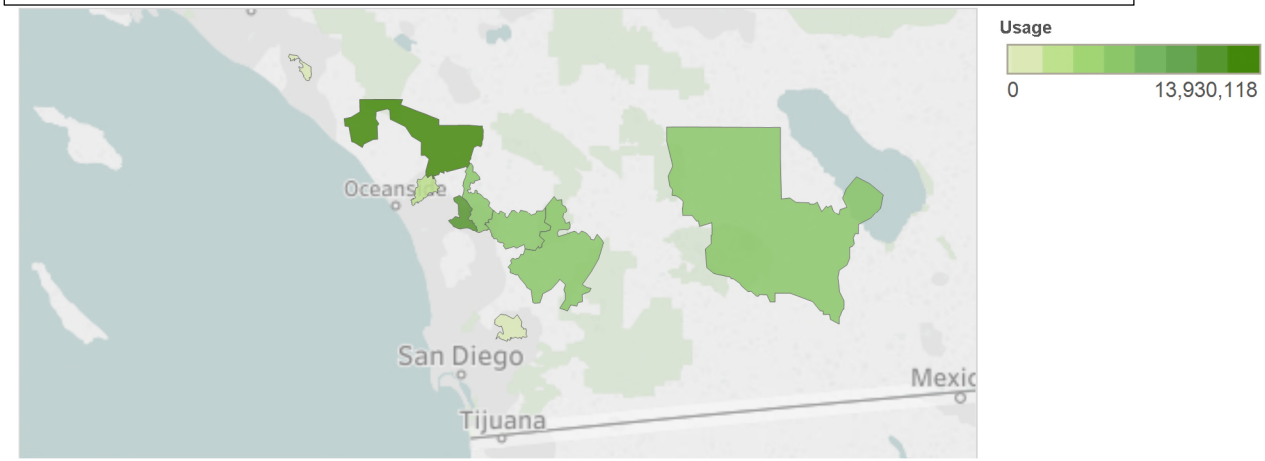
San Diego County has a geographic area of 4,200 square miles. Within that geographic area, there are more than 5,732 farms; more than any other county in the United States. In 2014, San Diego County agriculture covered 268,620 acres (10% of the County acreage) and contributed approximately $1.8

billion to the economy. San Diego County farmers produce more than 37 commodities that are valued in excess of $1 million each.[119]

According to the San Diego County Directory & Guidelines for Agricultural Enterprises created by the University of California, San Diego County's agricultural sector can best be characterized by five main features: [120]

- **Mild Climate** – San Diego has a mild, Mediterranean climate. With an average temperature of 63 degrees and ample amounts of sunshine, San Diego County's climate is capable of year-round production for many crops.
- **Expensive Land** - Land values in San Diego tend to trend more with real estate values than agricultural inputs and values. San Diego County has some of the highest prices for farmland in the country.
- **Poor Soils** - Only six percent of the soils in the County are considered prime for agricultural use. Soil improvement is a major task for any San Diego farmer.
- **Expensive Water** - Not only is water availability an issue that is plaguing the State, but the cost of the water that is available is extremely expensive and can reach over $600/acre foot, some of the highest in the State. The report notes that water rates in the County can be as high as 30-times more than those of the Central Valley or Imperial Valley.
- **Small and Numerous Farms** – With more than 5,732 farms, San Diego County has more farms than any other county in the U.S. The average farm size in California is 334 acres, which is below the national average of 438 acres. According to the San Diego Farm Bureau, sixty-five percent of farms in the county have fewer than 10 acres, meaning that while San Diego has a large number of farms, they are predominantly small.

Agricultural Usage by Zip Code - Accounts with peak demand greater than 200kW

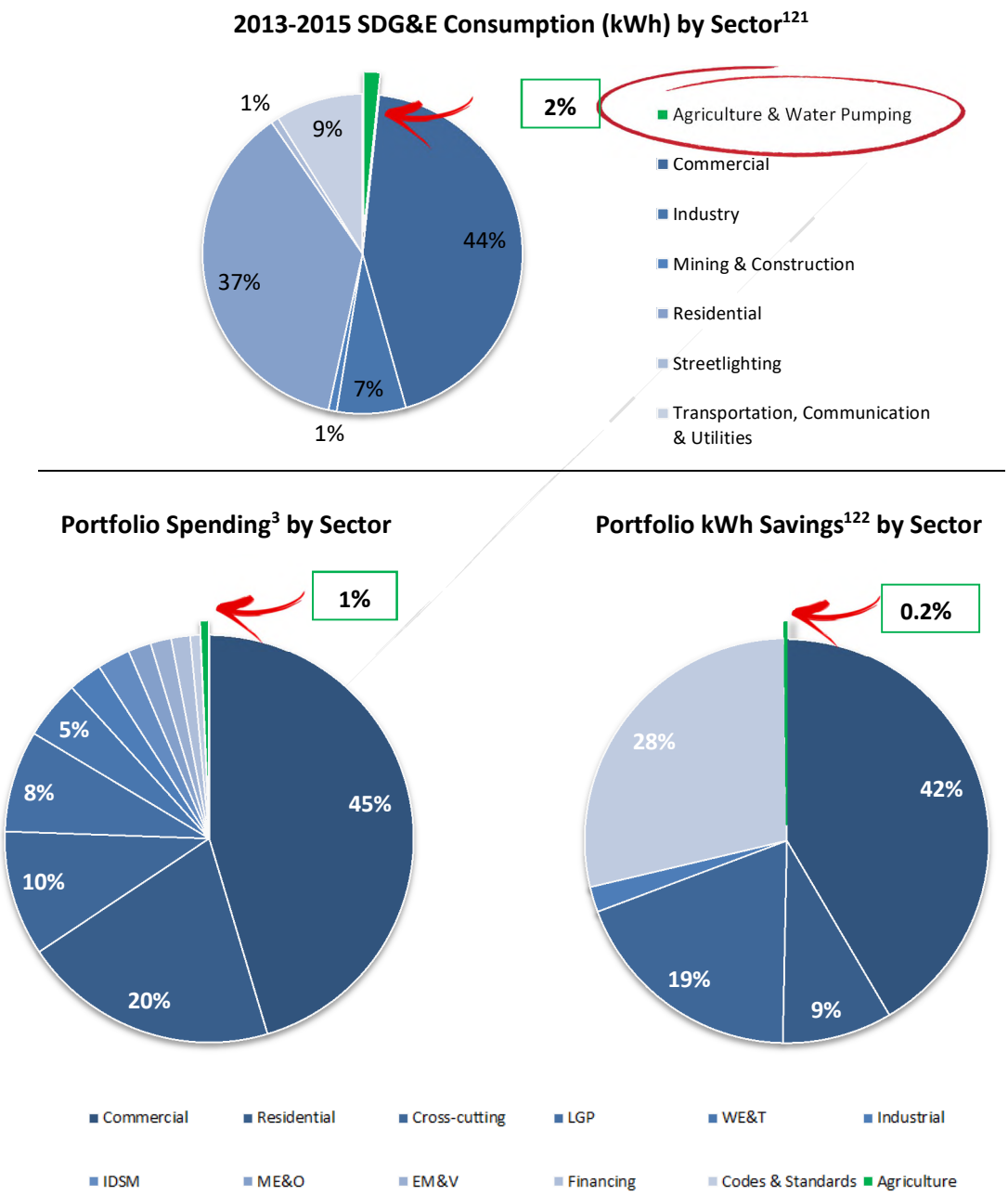


[119] 2014 County of San Diego Crop Statistics & Annual Report
[120] http://cesandiego.ucdavis.edu/files/54278.pdf

Agriculture in SDG&E's Energy Efficiency Portfolio

When looking at the 2013-2015 Program Cycle, the agricultural sector represented 2% of the electric consumption, or 1,060 GWh, 1% ($1.8M) of all energy efficiency spending, and 0.2% (1.2 GWh) of the portfolio savings within SDG&E's service territory, as shown in Figure Ag-4.

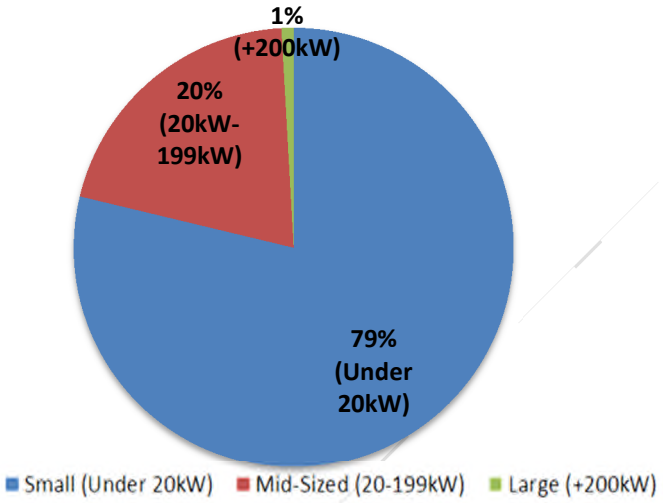
Figure Ag-4: Agricultural Sector's share of SDG&E Consumption, Spending, and Savings



[121] Source: CEC - Kavalec et al., 2013. California Energy Demand 2014-2024
[122] Source: SDG&E 2013-2015 EE Programs

In line with the other customer sectors in SDG&E's service territory, the data displayed in Figure Ag-5 shows that majority of SDG&E's agricultural customers are very small (under 20kW). Small customers are typically challenged when it comes to planning and implementing energy efficiency improvements.[123] SDG&E defines customers by the distribution of their demand, ranging from small customers (<20kW), to medium customers (20-199kW), to large customers (>200kW).

Figure Ag-5: Agricultural Customer Size[124]



Market Segments

Market segmentation provides additional insights that can inform targeting, strategy, and program design. SDG&E has historically characterized the agricultural sector within the territory as one segment: growers. Further analysis and a market characterization study of agricultural accounts shows that greater differentiation is possible, such as between livestock and poultry, livestock and poultry products, and miscellaneous products and services that include industries like apiculture, cattle feedlots, and aquaculture.

The SDG&E Agricultural Sector Market Study that was conducted by Evergreen Economics Inc. in 2015 identified these main Agricultural segments:

- Nursery & Cut Flower Products
- Fruit & Nuts
- Vegetables
- Livestock & Poultry
- Livestock & Poultry Products
- Miscellaneous Products and Services (including apiary)

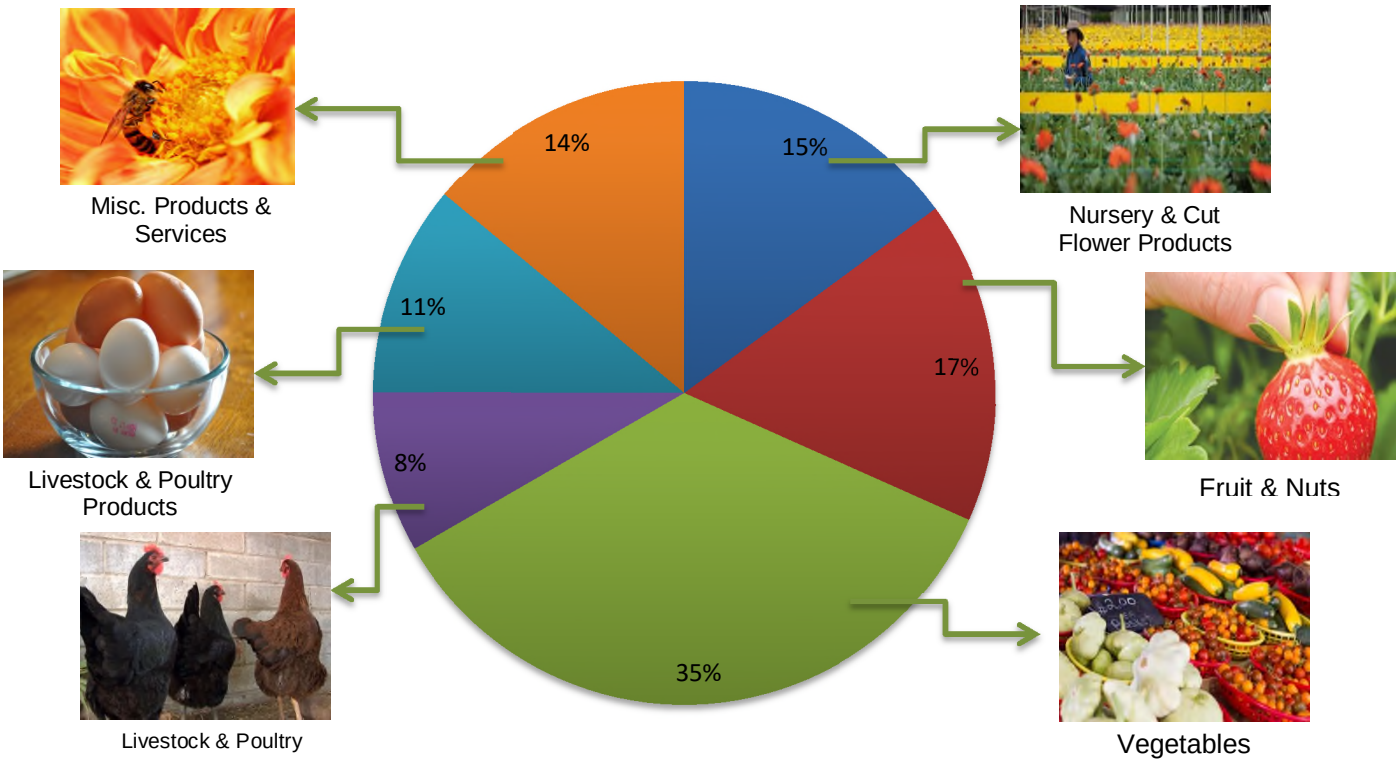
All these segments have previously been reported under the NAICS designation of "Growers". While there is still additional work to further dissect the Misc. Products and Services segment, the other 5

[123] The EE Policy Manual defines Very Small "Hard-to-Reach" Customers as those with demand less than 20kW, gas consumption less than 10,000 therms, fewer than 10 employees, and/or having leased or rented facilities.
[124] Source: SDG&E Agricultural Customer Distribution (2013-2015)

segments directly align with the major crops categories outlined in "2014 County of San Diego Crop Statistics & Annual Report".

Figure Ag-6 below represents the distribution of accounts by sub-segment for approximately 2,300 [125]total agricultural accounts.

Figure Ag-6: Account Shares by Agricultural Sub-Segment



There are some key observations that can be surmised from assessing the sub-segment distribution for this sector within San Diego County. The Vegetable sub-segment is the largest, containing approximately 800 accounts. The Fruits & Nuts sub-segment is the next largest with approximately 400 accounts. These two sub-segments alone make up more than half of the sector's electric usage (~56%). The remaining sub-segments are quite small, totaling about 1,100 accounts, but they make up the remaining 44% of the electric consumption.[126]

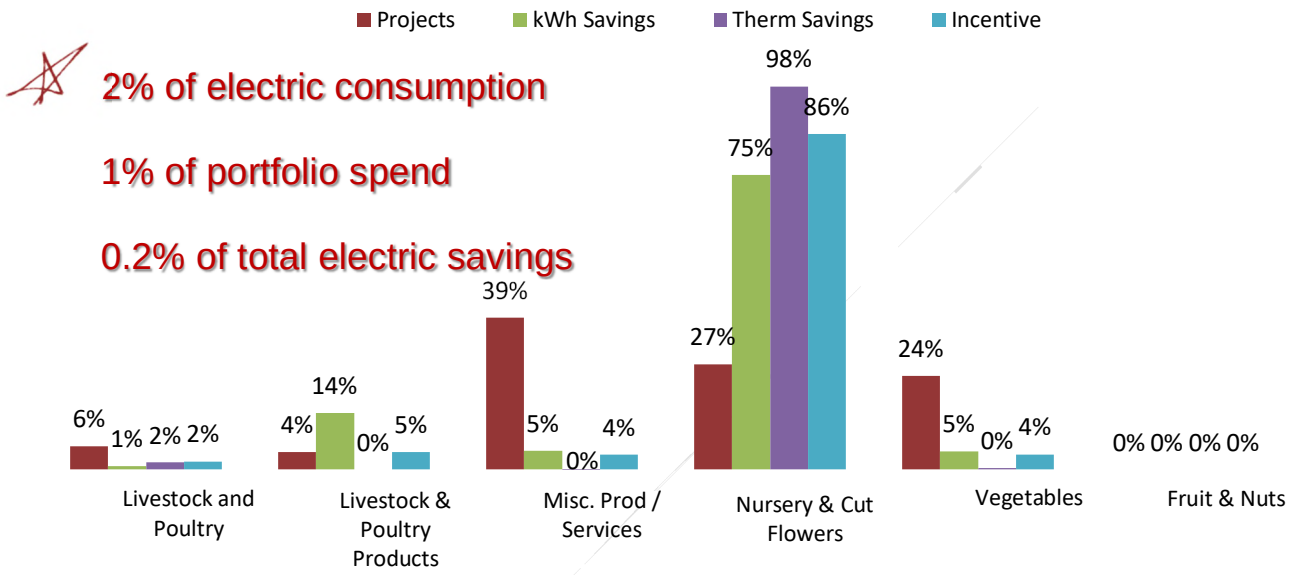
Each sub-segment has unique consumption patterns and needs that may influence their program participation. By understanding these participation patterns and trends, SDG&E will propose offerings that better suit each of these unique segments.

[125] Represents number of accounts on an agricultural rate
[126] SDG&E market characterization study and customer information system data

Looking at participation in the 2013-2015 program cycles, certain trends emerge. Figure Ag-7 below describes the historical energy efficiency projects and participation by agricultural sector. This historical look is separated out by sub-segment and includes:

- percent of accounts for that sub-segment,
- percent of projects completed,
- percent's of electric energy (kWh) and gas (them) savings
- Percent of incentive paid.

Figure Ag-7: Historical Energy Efficiency Projects

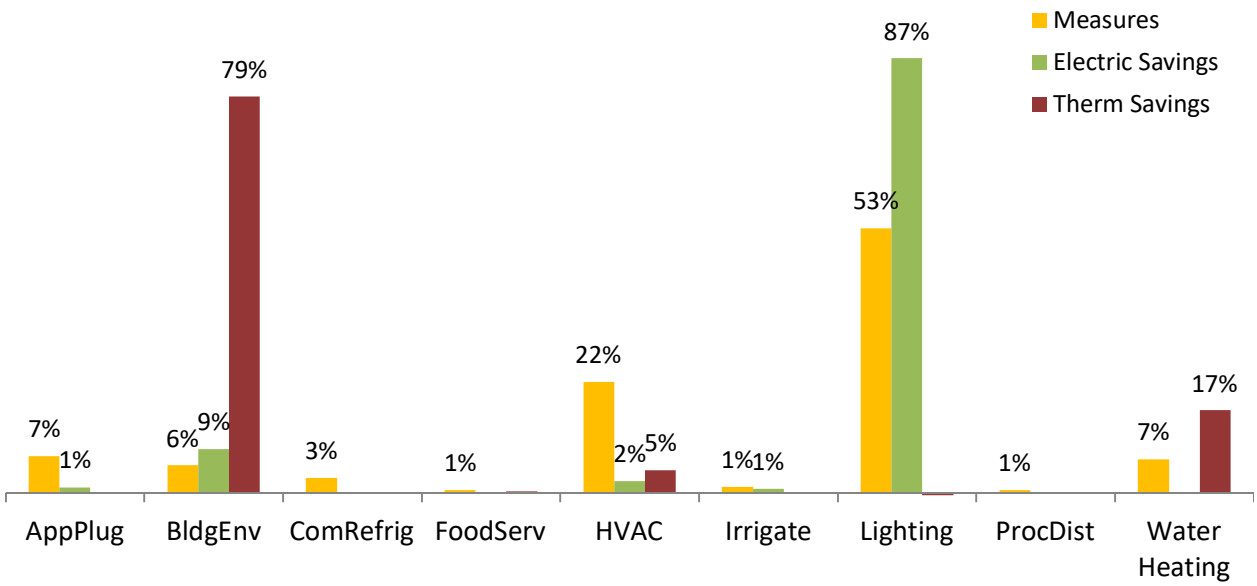


Although we see participation in a few segments, the majority of the sector savings came from a single segment, Nursery & Cut Flower Products. While the Vegetable segment represents the most consumption within the sector, their savings relative to their participation is lower than expected. Other opportunities will be to look into the Fruit & Nut segment to understand the lack of participation.

Agriculture Sector End-Uses

When analyzing the historical program participation for this sector by end-use, it is clear that a few key measures make up the majority of the projects. Figure Ag-8, below, outlines historical savings by end-use.

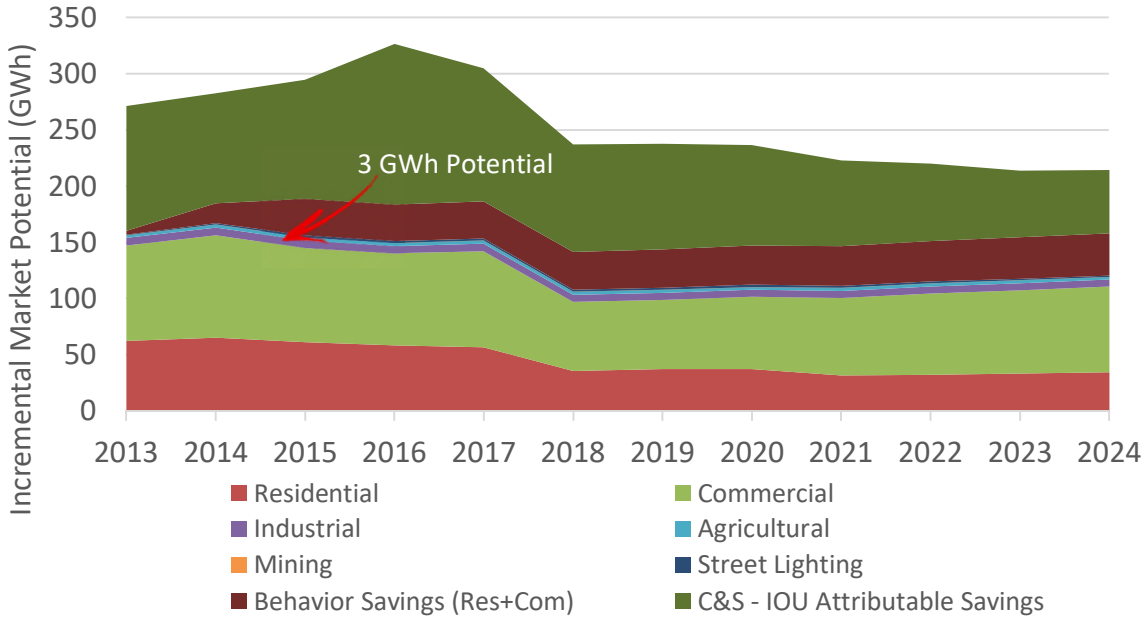
Figure Ag-8: Historic Savings by End-Use



Of note is the high gas savings that has been seen in the building envelope category. The measures that contributed to the savings in this category included greenhouse heat curtains and infrared film for Greenhouses. Also of note is the water heating category which included measures such as pipeline insulation and hot water line Insulation. These measures seem like the most likely candidates given the types of segments that are prominent in the SDG&E service territory. Moving forward, it will be important to identify additional measures to offer this segment as many of the gas measures noted are now considered to be maintenance and standard practice and therefore are not eligible for incentive or rebate. Lighting continues to be a prominent end-use and it is expected to grow if the cannabis market becomes legalized in California. More about this future trend will be discussed later in this plan.

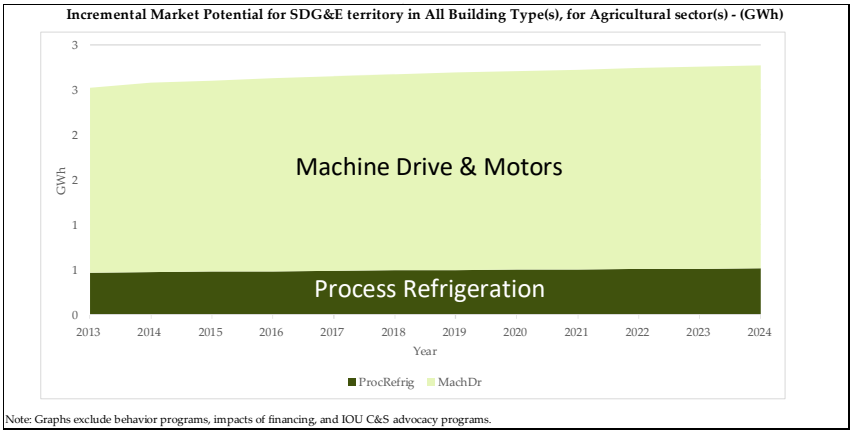
Energy Efficiency Market Potential

Figure Ag-9: SDG&E Agricultural Incremental GWh Market Potential[127]



When assessing potential in the agricultural sector, it's always important to see the potential in relation to the overall portfolio potential. The potential for SDG&E's agricultural sector is very small compared to the overall portfolio and is forecasted in the Navigant Statewide Potential Study to be only 3 GWh consistently through 2024; however, to reach the SB 350 goal of doubling energy efficiency exploring all opportunities is important. Further, as a major consumer of water, agriculture plays a key role in the water-energy nexus.

Figure Ag-10: End-Use Potential for Agricultural Sector



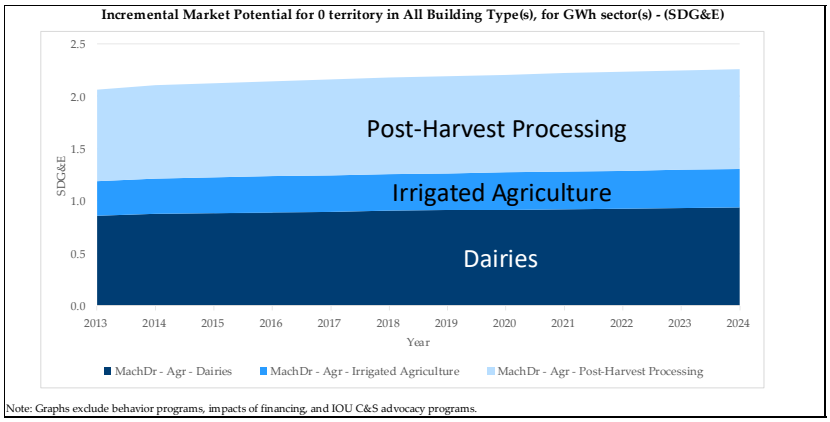
To further assess what makes up the Agricultural potential, end-use potential is analyzed. The predominant end-use categories that make up the potential for this sector are Process Refrigeration and Machine Drive/Motors. Figure Ag-10 shows the potential by end-use category.

[127] Source: 2013 California Statewide Market Potential Study, performed by Navigant.

Not only do machine drives and motors have the highest end use potential, this potential is also increasing over time. According to the Navigant potential study, over half of the potential savings for Agricultural was identified as operations and maintenance (O&M).

Since machine drives and motors have the largest potential, SDG&E assessed the building types that were found for this end-use. Post-Harvest Processing, Dairies, and Irrigated Agriculture were the only three building types found as shown in Figure Ag-11. The main focus for these end-uses and building types will be on O&M.

Figure Ag-11: Ag Building Type Potential



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Future Trends

Two major trends that will impact this sector in the San Diego region are:

- Water scarcity
- Cannabis legalization in California

Agriculture in California will continue to be challenged with trying to stay productive, prosperous and relevant in the face of what is being referred to as a potential "megadrought" in the future. [128] With water costs in San Diego County already being amongst the highest in the state [129], water will continue to be a driving factor in how San Diego agricultural customers make their decisions on where to spend their resources. Water scarcity will also create competition with rural areas for this resource. Many farmers will make production decisions with less than historically available quantities of irrigation water and higher levels of uncertainty in the 21st century.[130]

California could join the ranks of Colorado, Washington and Oregon with a measure to legalize cannabis on the ballot in November. SDG&E

> "Money and Water related savings were identified as higher priorities than energy savings."
>
> - SDG&E Agricultural Market Study, Evergreen Economics, 2015

> "Given the size of California's relative population and medical marijuana market, the potential California recreational cannabis market alone could be twice the size of the Colorado, Washington, Oregon and Alaska markets combined, and may generate enough tax revenue and retail sales to impact national opinion and subsequently, federal legislation."
>
> -SDG&E Cannabis Agricultural Energy Demand Study, Evergreen Economics, 2016

[128] Measure, Application, Segment, Industry (MASI): Agriculture, Navigant Consulting for Southern California Edison, 2015, p. 43.

[129] http://cesandiego.ucdavis.edu/files/54278.pdf

[130] http://californiaagriculture.ucanr.edu/landingpage.cfm?article=ca.v054n04p16&fulltext=yes

commissioned a study by Evergreen Economics to explore the potential impacts in the San Diego region if this ballot measure passes. It is estimated that energy will account for at least half of the operating costs for indoor growers and almost all utilities, in states where cannabis is legal, interviewed for the study saw an increase in energy demand once the crop was legalized.

Legislative Impacts on Strategy

Legislative mandates, specifically Senate Bill (SB) 350 and Assembly Bills (AB) 793, 758 and 802, have been incorporated in this business plan both implicitly and explicitly. Generally, the agricultural goals and strategies have been developed to capture additional savings beyond those that existing program design has been able to capture. Such strategies are aimed at doubling energy savings as required by SB 350. Under AB 802, SDG&E will work with customers to unlock saving from inactive projects in existing buildings.

The table on the following page summarizes these policy drivers and how this business plan address each one.

AGRICULTURAL		
Policy Driver	**Specific Requirement / Guidance**	**Business Plan Response**
SB 350 - Clean Energy and Pollution Reduction Act of 2015	* Achieve a cumulative doubling of savings in electricity and gas retail customers' final end uses by 1/1/30. * The CEC shall adopt a responsible contractor policy to ensure that ratepayer-funded EE retrofits meet high-quality performance standards and reduce energy savings lost or foregone due to poor-quality workmanship.	* Programs will increasingly link the issue of water scarcity and cost to offerings for agricultural customers with the aim of serving two purposes - reducing water use while improving agricultural sector energy efficiency. * SDG&E will cultivate stronger relationships with the agricultural community and support the long-term economic and environmental success of the sector.
AB 793 - Energy Management Technology Incentive Offering	Must develop programs by 1/1/17 that provide incentives to help residential, and small/medium business customers acquire energy management technology and educate them about these programs.	* Offerings available to small commercial customers through the Commercial strategies and tactics will also apply to Agricultural customers, most of whom run smaller farms.
AB758 - Existing Buildings Energy Efficiency Action Plan	Must develop programs by 1/1/17 that provide incentives to help residential and small/medium business customers acquire energy management technology and educate them about these programs.	N/A
AB 802 - Benchmarking and Changes to Energy Efficiency Baselines	Benchmarking - By 1/1/17, for multi-unit buildings, utilities must provide aggregated energy usage data to its owner, its agent or the building operator. Commission will set requirements for public disclosure of information for benchmarking purposes. Baselines - Authorizes utilities to provide incentives to customers for energy efficiency projects based on normalized metered energy consumption as a measure of energy savings.	* Online platform available to Commercial customers will also provide Agricultural customers improved opportunities to access program offerings and control their energy use.

Goals, Strategies, and Tactics for the Agricultural Sector

SDG&E's market analysis, studies commissioned by SDG&E and others, and input from stakeholders highlights consistent themes with respect to barriers agricultural customers face in adopting more energy efficient behaviors. SDG&E has analyzed the problems and barriers faced by these customers to

establish goals and strategies to overcome these issues and allow agricultural customers to realize the benefits of energy efficiency and the services offered by SDG&E's programs.

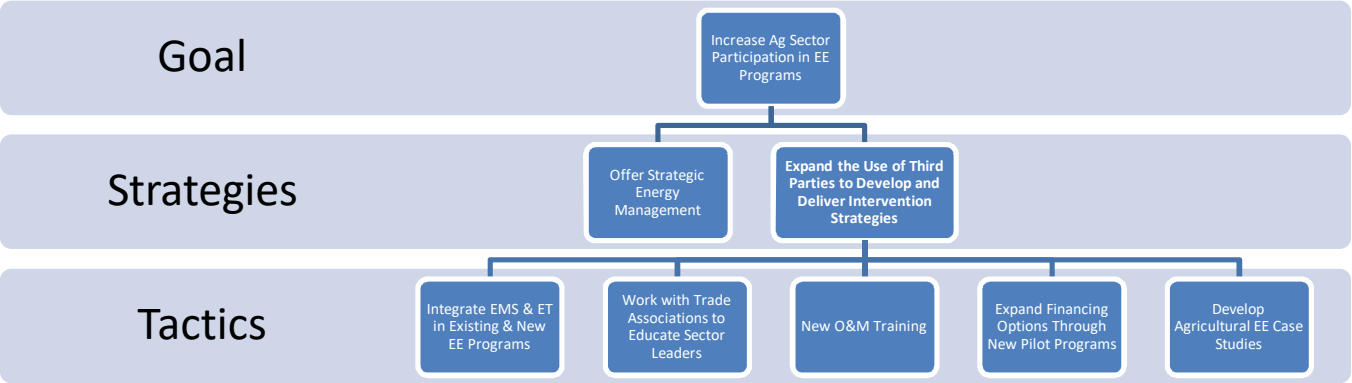
With these attributes in mind, SDG&E has created goals, strategies and tactics that are intended to remove barriers and attract both customers and vendors to energy efficiency. Figure Ag-12 below summarizes this approach.

Figure Ag-12: Goals/Strategies/Tactics Summary

Goal	Strategy	Tactics	New, Existing, Modified	Short, Mid, Long-Term
Double the Energy Efficiency Participation by the Agricultural Sector	• Expand the use of Third Parties to develop and deliver intervention strategies.	• Solicit third parties that can provide offerings that include: • Energy Management Systems and Emerging Technologies • Working with trade associations to educate sector leaders • New operation and maintenance training • Expanding financing options • Develop Agricultural EE case studies	Modified	Short
	• Leverage Strategic Energy Management (SEM)	Expand Strategic Energy Management offering by leveraging the SW downstream model for consistency	New	Short
		Educate and train agricultural customers to identify process savings and how to achieve deeper savings through Strategic Energy Management.	New	Short
Provide the Agricultural Sector a Solution Addressing the Water/Energy Nexus	• Expand the use of Third Parties to develop and deliver intervention strategies.	• Solicit third parties that can provide offerings that include: • Address water savings solutions • Partnering with water agencies to develop shared offerings • Water/Energy management systems and emerging technologies	Modified	Short

Agricultural Goal 1: Double the Energy Efficiency Participation by the Agricultural Sector

As described above in this chapter, energy savings attributable to the agricultural sector has been proportionally lower than other sectors. Yet, agriculture is an important part of the San Diego economy and increasing the sectors participation in EE by a meaningful margin is a reasonable goal. Thus, SDG&E aims to double participation of this sector.



Strategy: Expand the Use of Third Parties to Develop and Deliver Intervention Strategies

SDG&E's market analysis and review of its current approach indicate that two major changes are necessary. First the general non-residential program offerings must be combined and customized for the Agricultural sector. Doing so will enable design of an offering focusing on the needs of agricultural customers. Second, communications and marketing must be sector and sub-sector specific. SDG&E believes that the best approach to delivering such a customized solution is through one or more third-party programs.

Tactics

While the details of the agricultural program(s) offering will be designed by the selected implementers. This strategy will seek to find third-parties that can provide offerings that include:

- Energy management systems and emerging technologies
- Working with trade associations to educate sector leaders.
- New operation and maintenance training
- Expanding financing options through the new IOU financing pilot programs and other financing products.
- Develop agricultural EE case studies.

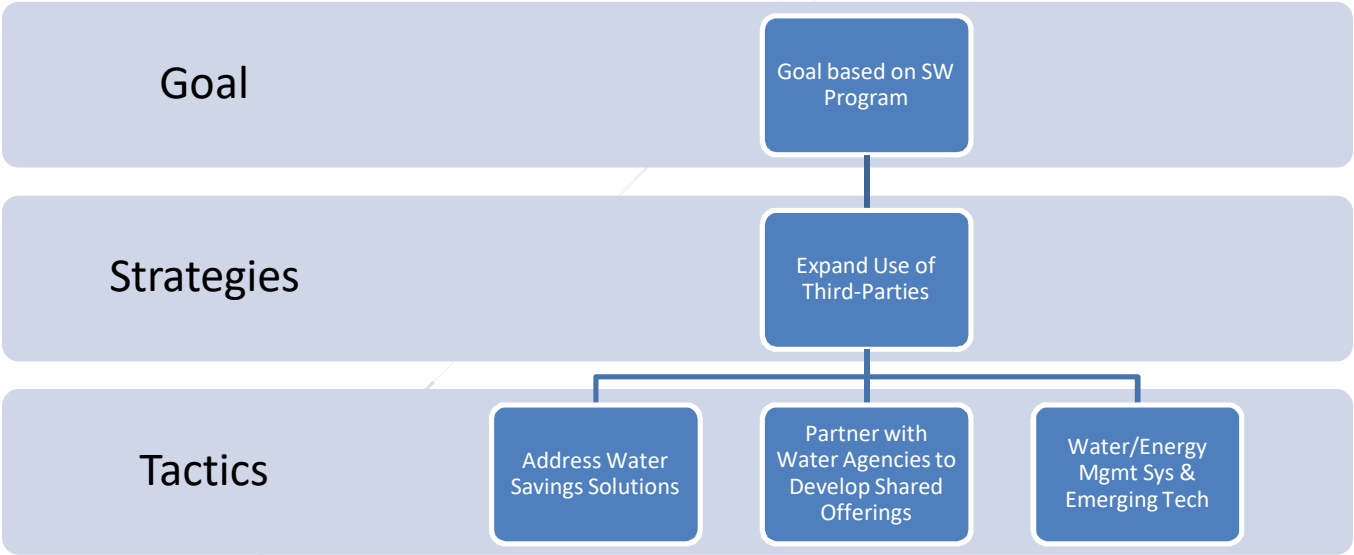
Strategy: Leverage Strategic Energy Management (SEM)

The market analysis provided above indicates that knowledge of EE programs, understanding of EE value, and connecting EE to the various core businesses within the Agricultural sector are all barriers to participation and savings. The Strategic Energy Management (SEM) program is designed to overcome just such barriers and is expected to deliver significant energy savings. The program is likely to be administered on a state-wide basis; however, implementation will occur within SDG&E's service territory. SDG&E hopes that this program will overcome some of the barriers faced by the Agricultural sector and deliver meaningful energy savings.

Agricultural Goal 2: Provide the Agricultural Sector a Solution Addressing the Water/Energy Nexus

> *A 2015 study by Evergreen Economics on San Diego Gas & Electric (SDG&E)'s agricultural sector concluded that IOUs' pursuit of energy savings from this sector is increasingly misaligned with most farmers' motivations, as water (rather than energy) is of primary concern under current conditions.[131] The study recommended that IOUs "improve and prioritize energy efficiency agricultural program offerings relevant to water conservation and the water-energy nexus [and] provide guidance and training on how to utilize tools to establish and maintain optimal irrigation practices."[132]*

The agricultural sector has been historically underrepresented in the energy efficiency arena for a number of reasons. As is true in other sectors, energy efficiency is not the top priority for agricultural customers. With the recent drought in California, the agricultural sector has been much more focused on its water consumption, rather than its energy consumption. Thus SDG&E proposes its second goal be focused on the connection between the use of water and consumption of energy. SDG&E believes that if this connection can be successfully addressed the energy savings from this sector could be relatively significant.



Strategy: Expand the Use of Third Parties to Develop and Deliver Intervention Strategies

The strategy for the Goal 2 is the same as for Goal 1 and thus they are interconnected from an implementation standpoint. The concept is that one or more third-party implementer can leverage its expertise in agricultural irrigation and/or relationships with water agencies serving the Agricultural sector to create an offering that saves both water and energy.

Tactics

While the details of the agricultural program(s) offering will be designed by the selected implementers. This strategy will seek to find third-parties that can provide offerings that include:

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[131] Evergreen Economics, SDG&E Agricultural Sector Market Study, March 26, 2015, p 26.

[132] Evergreen Economics, SDG&E Agricultural Sector Market Study, March 26, 2015, pp. 29-31.

- Addressing water saving solutions;
- Partnering with water agencies to develop shared offerings; and
- Water/energy management systems and emerging technologies.

Agricultural Sector Metrics

Energy Efficiency Business Plans: Sector Metric Table - Agriculture Sector									
Problem Statement	**Market Barriers**	**Desired Sector Outcome**	**Intervention Strategies**	**Sector Metric**	**Baseline**	**Metric Source**	**Short Term Target (1-3 years)**	**Mid Term Target (4-7 years)**	**Long Term Targets (8-10+ years)**
1. Low program participation overall	-Money and water savings trump energy savings -Lack of awareness and information	1. Increased participation across the sector.	1. Expand the Use of Third Parties to Develop and Deliver Intervention Strategies	Percentage increase in agriculture customers participating across programs	Current number of ag customers	Program database			

PA/Program Coordination

SDG&E will coordinate with the lead SW program administrator as well as other stakeholders to ensure that the offerings in SDG&E's service territory are successful.

Cross-Cutting Coordination

Description of how cross cutting activities are addressed in customer sector strategies.

WE&T

As noted in the strategies above, this sector is highly specialized and SDG&E is recommending to outsource targeted and potentially on-site training. However, as a cross-cutting program, WE&T provides a wide array of training that may be beneficial to customers in this sector. SDG&E's WE&T program has and will continue to focus on the following areas to engage with both agricultural customers and the trade professionals who support them. Looking ahead, the WE&T program will continue to support the following areas and will expand or contract based on market and potential data forecasts:

- Building Design & Construction
- Building Performance
- Codes & Standards
- Food Service
- HVAC
- Lighting
- Renewable Energy
- Sustainability
- SDG&E's Rebate & Incentive Programs

More details on these efforts are provided in the WE&T chapter of this business plan. In addition, once the implementers are selected, the WE&T program will collaborate with them to ensure that this sector has access to a comprehensive WE&T offerings.

Financing

Improve Financing Opportunities

SDG&E will provide more financing opportunities and make financing programs easier to use. Traditional financing programs, such as SDG&E's On-Bill Financing, are helpful tools to encourage participation in IDER programs. Although most customers qualify, trade professionals often must front the project costs for their customers until a project is completed, at the risk of the customer being disqualified from financing if the project scope changes.

Financing options will be included across all of our commercial sector goals.

Statewide Crosscutting Programs

Since Emerging Technologies, Codes & Standards, and aspects of financing will be transitioning to statewide programs that may be administrated outside of SDG&E, this section will be updated with more details after the lead PAs are selected in the upcoming weeks. Please note that although the WE&T Connections program will also be administered statewide, it focuses on K-12 education and isn't relevant to this sector.

Agricultural Sector EM&V Considerations

Consistent with the EM&V approaches documented in each SDG&E business plan sector, the agricultural sector will primarily rely on metered data to evaluate programmatic savings. The general approach (where applicable) includes:

- Normalized net-metered energy usage based on AMI data
- Regular strategy and implementation metric tracking and providing
- Casual analysis between metrics and strategies, and "success" I.e. are these the correct metrics to drive program success?

These three evaluation approaches will be used in concert to gain a complete picture of the sector across time, and at various intervention points. In addition to net-metered approaches, SDG&E will work within the statewide EM&V research roadmaps to address process evaluation needs.

The agricultural sector EM&V effort will begin with the implementation of the business plan and occur at regular and ongoing intervals. Metrics and savings will be tracked quarterly, biannually, or annually dependent on evaluation and programmatic need and constraints, including EM&V resources.

AB802 dictates savings will be measured using net metered data. For the agricultural sector, SDG&E EM&V will use pre-post testing, based on forecasting models that predict usage absent program intervention and then compare that predicted usage to actual metered consumption. This will require determining a methodology to forecast what usage would have been absent of the program intervention. There are many potential methodologies including simply pre/post testing, ARIMA models, VAR and VEC models, etc. For an example methodology please see the Statewide HVAC evaluation titled *AMI Billing Regression Study*[133]. SDG&E will likely have to test multiple models once data is collected, cleaned, and analyzed. There is simply no "one size fits all" approach.

This challenge is of particular interest with cannabis growers coming online. Conducting an ARIMA or other time series forecast will not be possible where growers are new customers lacking historic consumption data. Using regression analysis, with significant data collection, it is possible to develop models that account for consumption through various quasi-experimental methods, largely those that use cross-sectional, time series or panel data. A central activity will be collecting robust data, as growers come online, to ensure the opportunity to conduct such analysis.

EM&V will also be engaged in measuring sector and implementation level metrics. SDG&E EM&V suggests two types of analysis related to metrics. The first capitalizes on the objective of the metric as a quick indicator of programmatic success or direction, without the necessity of a full scale, resource intensive impact evaluation. This first type of analysis will use summary statistics to understand how the sector, program, and individual interventions are changing, operating, or succeeding over time. EM&V will provide program staff a regular report that tracks individual metrics overtime.

Additional analysis will become necessary over time. Eventually metrics themselves will need to be tested, specifically whether or not a metric is appropriate. This analysis requires significant savings and metrics data; thus the timeline will need to be determined at a future point. This analysis will likely be a simple OLS regression to test correlations between metrics and savings. Where evaluators identify metrics that are significant and positive, we can further engage our programs to address these metrics.

[133] Evergreen Economics, "AMI Billing Regression Study," Calmac ID SCE0383.01 (March 16,2016)

Where we find individual metrics that lack significance or are negatively correlated, programs can stop that activity and reallocated resources to addressing other positive and significant metrics.
This plan is presented independent of the statewide EM&V efforts included in the CA EM&V Research Roadmap. Additional evaluation will occur within that forum that will provide significant programmatic feedback to the program administrators and implementers.

Emerging Technologies

Chapter Summary

ETP overview

California's ambitious energy efficiency and greenhouse gas reduction goals (SB 350) require an acceleration of the product development, assessment, and deployment lifecycle for demand-side management (DSM) technologies so that program implementers may offer customers the high efficiency equipment they need to reduce energy use.

However, the need for rapid innovation is paired with the need for low-risk, reliable, cost-effective technologies whose energy savings can be realized and scaled for the vast and varied California marketplace.

The Emerging Technologies Program (ETP[134]) is a non-resource program that supports the California ratepayer-funded programs[135] in this challenge by fulfilling six objectives:

1) identifying technologies with verifiable energy savings that may be considered by program administrators (PAs) for incentive programs,

2) filtering out technologies that are not appropriate for the California market, so that ratepayer-funded programs do not waste resources in developing measures[136] that cannot deliver reliable energy savings,

3) supporting and working with technology developers to help inform future product development, so that they may ultimately build a mature supply chain for new measures,

4) coordinating information exchanges across internal organizations, PAs, and other technology assessment organizations, and

5) helping program managers reduce risk by testing new solutions on a limited scale in the market.

6) supporting market transformation (MT) by testing and supporting program deployment of measures destined for codes and standards over the mid- to long-term

ETP's primary stakeholder and target audience is the program administrator, not the consumer or technology end user[137].

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[134] In this document, the acronym "ET" refers to emerging technologies (or the emerging technology sector in general), or to the activities of an emerging technology workgroup within a single company. The acronym "ETP" refers to the statewide Emerging Technology Program, an organized, collaborative effort of ET workgroup stakeholders from each IOU. The ETP supports increased EE market demand and technology supply by contributing to the development, assessment, and deployment of new and under-utilized EE measures (that is, technologies, practices, and tools).

[135] See Appendix A for more details.

[136] A technology becomes a "measure" when a program manager "adopts" it into an incentive program. For custom projects, "adoption" occurs when the incentive application is approved.

[137] This is verified in a recent evaluation of the ETCC website (the primary means by which ETP disseminates its reports): only 7 of 81 survey respondents said they were just ET consumers, while all others categorized

ETP is designed to help program administrators meet the energy reduction needs California through cost effective measures that deliver reliable energy savings. ETP supports the ambitious objectives in the California Strategic Plan and legislative initiatives by directly supporting the Codes and Standards program and IOU customer programs designed to meet those objectives. An innovative technology requires an effective incentive program to gain traction on the market; without this ETP's efforts would merely be an interesting academic exercise. As a non-resource program, ETP provides information to program managers and designers who make the ultimate decision of which technologies to offer through incentive programs; these program managers also design market interventions to promote customer use of EE technologies. ETP itself does not conduct any market interventions or directly achieve market transformation.

In the technology development continuum that spans the range from initial ideation, through research and development (R&D), to prototyping and ending with commercialization, ETP's contribution is during the technology assessment and validation stages, usually post-commercialization. ETP depends on technology developers and manufacturers to create new technologies and potential products for consideration in PAs' resource programs and/or codes and standards portfolio. ETP itself cannot innovate new products and is not a technology research and development (R&D) program. On the other end of the continuum, ETP relies on program implementers to conduct marketing and outreach around new measures; ETP is not designed to provide product information directly to the mass market as do consumer product testing entities such as Consumer Reports or CNET Reviews. Finally, ETP does not provide nor set incentives for the measures. It is important for stakeholders to understand ETP's role so that its achievements and boundaries can be recognized. In an environment where portfolio cost-effectiveness is harder and harder to achieve, and every ratepayer dollar must be carefully directed, ETP's ultimate role is to help PAs and program designers of California ratepayer-funded programs to decide which technologies can meet California's energy needs. It is also important for stakeholders to understand that technology development is a non-linear process.

Changes in ETP design

ETP's three core strategies (corresponding to its three subprograms) remain the same but will be coordinated and optimized through statewide administration. The Statewide (SW) ETP activities will be guided by new Technology Priority Maps (TPMs), which will be developed by a single SW PA with input from the other utilities. These TPMs will include technologies that are candidates for market transformation interventions and for codes and standards.

The new coordination and optimization will require one to two years to ramp up due to a need to develop the TPMs as well as the new program data tracking infrastructure needed to implement the program as a statewide program'. However, the ETP is structured so that this ramp up period should have little impact on ETP's functions.

Historically, the ETP allocated approximately 40-45% of the budget to Technology Assessment (TA), 45-50% of the budget to Technology Introduction Support (TIS), and 5-15% of the budget to Technology Development Support (TDS). The SW ETP has four overarching objectives to reflect the new statewide nature of the ET Program.

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themselves as EE professionals, ET developers, vendors, manufacturers and distributors. The evaluators concluded that ETP was successful in reaching its intended target audience. (*PY2013-2014 Emerging Technology Program Targeted Effectiveness Study Report*, ODC, 2015)

ETP's three objectives

The ETP has been redesigned to be responsive to D.16-08-019, which specifies that ETP be administered as a SW program. The four IOUs will address the following three overarching objectives:

Objective 1: Use Technology Priority Maps (TPM) to ensure high priority areas are met

To address the need "to ensure all high priority areas are addressed[138]", the SW ETP will use collaboratively designed TPMs to drive the ETP research agenda during the five-year period in this business plan. SW ETP will use existing technology roadmapping efforts whenever possible to create TPMs to align with California policy and customer needs. These TPMs will seek to identify good candidates for all utility programs including market transformation initiatives (such as Codes and Standards).

Objective 2: Support a healthy technology pipeline

The SW ETP projects will be designed to encourage manufacturers and technology developers to create technologies that help PAs achieve their energy efficiency goals.

Objective 3: Reduce risk to utility programs

The SW ETP technology assessment projects will also be designed to ensure that the technologies and solutions the PAs offer will have verifiable energy savings. This is accomplished in part by early vetting of technologies and solutions that are candidates for inclusion into an EE portfolio. These assessment activities are designed to help program managers create measures that have a more robust level of assured savings.

Why ETP is needed

To support PAs effectively, the statewide ETP conducted over 300 technology assessments and over two dozen demonstrations and showcases in the 2013-2015 program cycle. These efforts have supported the development or enhancement of numerous new EE program measures, education programs, and codes and standards. Equally importantly, these efforts have filtered out inappropriate technologies that are not suited for California ratepayer programs, allowing program designers and implementers to direct limited resources to measures with reliable savings.

This work is an important component of utility EE efforts for numerous reasons. First, California's ambitious energy savings and greenhouse gas reduction goals coupled with the continuously declining costs of generation place great pressure on ratepayer programs to stay cost effective. Program implementers assume much of the portfolio risk that is inherent with offering any new or unproven technologies to customers, which can manifest in evaluation studies as low realization rates.[139] By managing some risk through vetting by ET programs, EE PAs maximize their impacts and cost-effectiveness.

[138] D.16-08-019, p. 63, Footnote 23
[139] CITE

ETP and Market Transformation. D.16-08-019 requires SW programs to be designed to achieve market transformation. Because ETP does not intervene in the market, it is not able to achieve market transformation on its own. However, it can provide critical support to programs that do intervene in the market. ETP is ideally suited to support market transformation in three specific ways.

1) The SW ETP will support market transformation by helping to "bring the next generation of even more efficient technologies, processes or design solutions to the market"[140] ETP will do this by working with technology developers and manufacturers to design specifications for new products. ETP has done this in the past through individual projects with manufacturers as well as through strategic cross-IOU collaborations, including the Western HVAC Performance Alliance (WHPA, http://performancealliance.org/), which was created by a SW IOU task force including ETP. WHPA has contributed a number of standards and updates to ASHRAE Standard 90 and Standard 180 and Title 24.
2) The SW ETP can also help "bring the next generation of even more efficient technologies, processes or design solutions to the market" through the TIS subprogram. While ETP's TIS efforts are on a small scale and not expected to reduce market barriers measurably, critical data can be gathered to inform future ET studies as well as inform program designers about a technology's market viability.
3) The SW ETP will support market transformation by continuing to conduct studies in collaboration with the Codes & Standards program so that technologies can be adopted into codes and standards. ETP is a long-standing partner to the Codes & Standards program in their efforts to gather data for Codes and Standards Enhancement (CASE) reports.

Although ETP can be the utilities' first step in initiating market transformation for efficient technologies, which can eventually end up with the higher efficiency technologies becoming a codified baseline, Figure 1 shows that the utilities draw from multiple sources throughout their program portfolio. PA incentive programs can draw from many sources for new measure ideas, the ETP being one source. Likewise, the Codes & Standards Program can draw from multiple sources for new potential codes, with PA incentive programs being one source. In some cases Codes & Standards can bypass the process of vetting the technology in the market, which accelerates code development but may increase the risk that the technology is not viable in the market.

[140] CITE

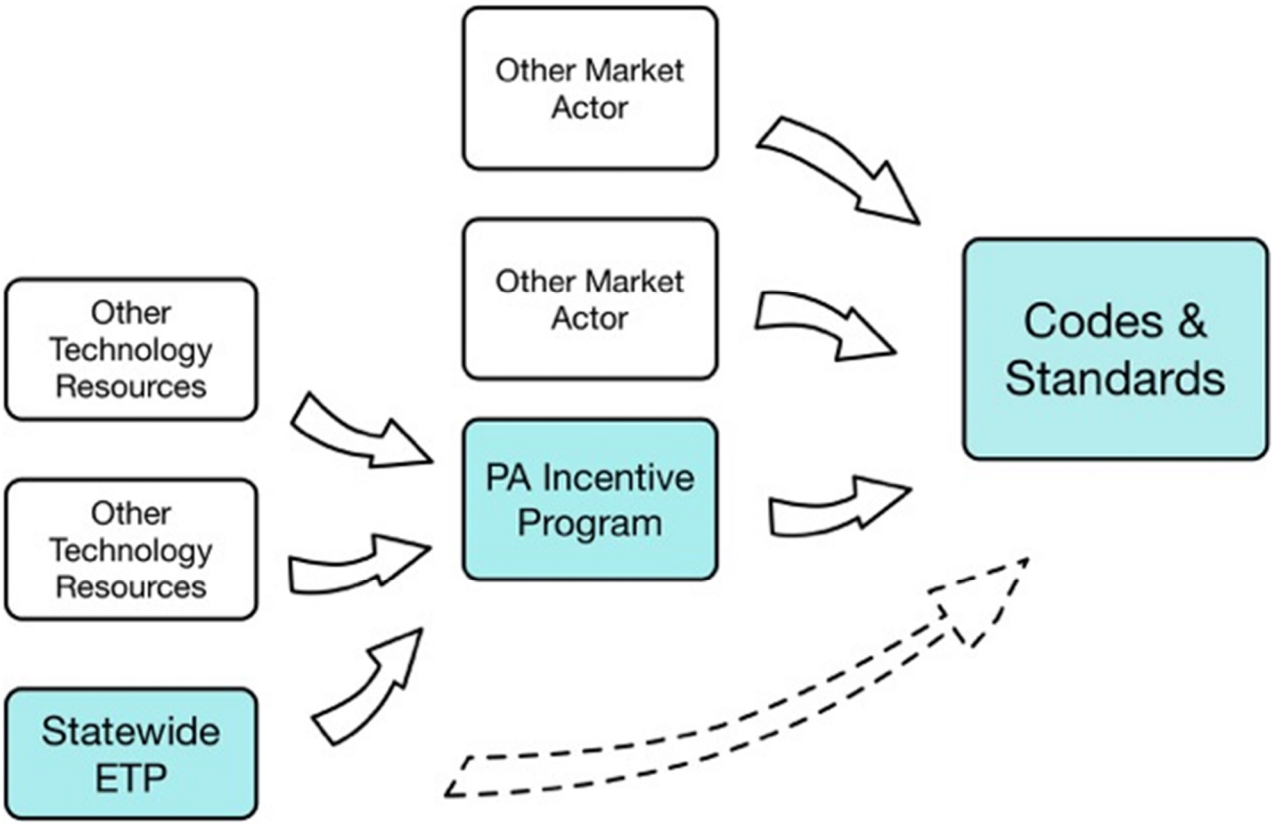


Figure 4: Programs use multiple sources of ideas for new measures; C&S uses multiple sources of ideas for new codes.

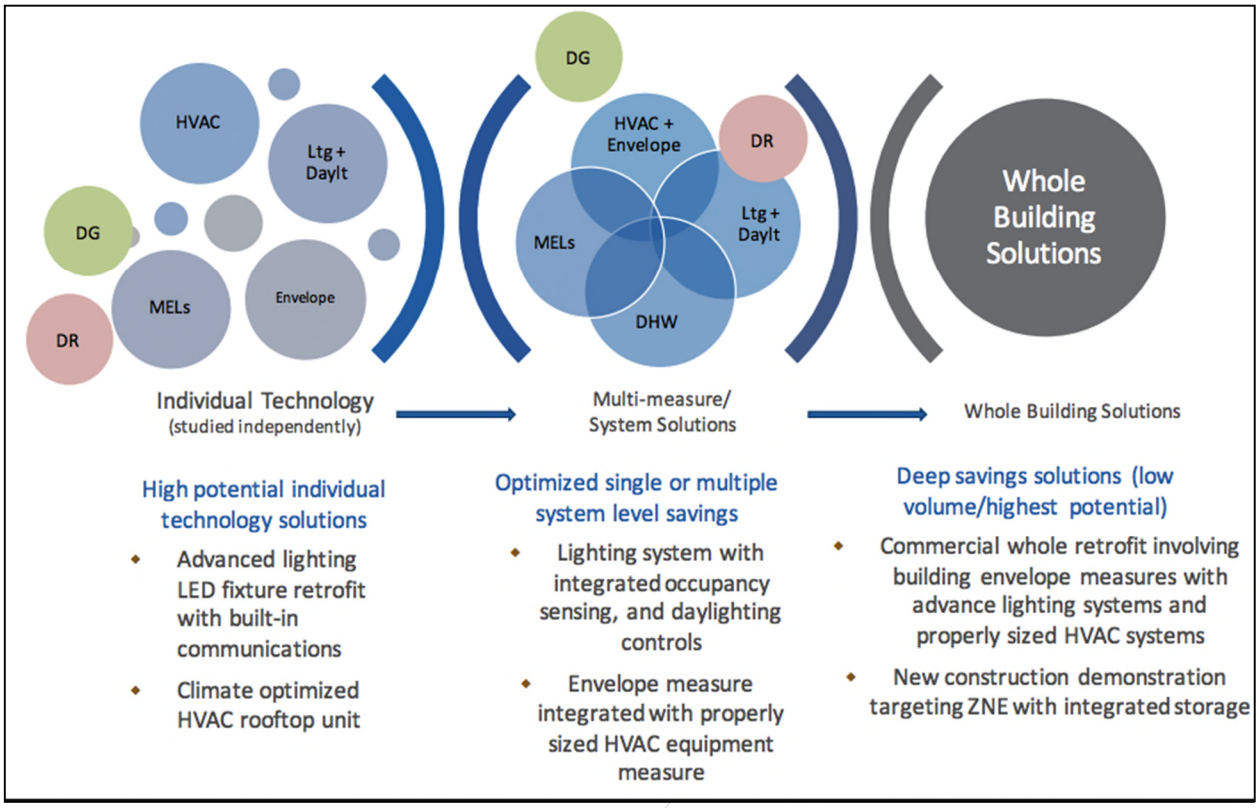
Vision

Trends and drivers

The statewide ETP is working to leverage various emerging industry and policy trends. These trends reflect an evolving marketplace where previously complex solutions have become technically feasible, where data are gathered and used in new ways, and where products go beyond simple "plug and play" gadgets and become complex, interrelated ecosystems.

One of the most far-reaching trends is the increasing interplay between the ETP's traditional role of supporting EE efforts and its growing role in supporting other utility activities, such as distributed generation, demand response, and energy storage. This new integration of activities offers utilities the potential to provide greater value to customers by moving to a model of DSM procurement that can address grid needs flexibly in real time.

Figure 2. Whole Building Solutions Diagram



Over the years, the ETP has evaluated many individual technologies that save customers energy, including advanced lighting and HVAC products (left). Because repeatedly reaching customers with one-time EE measures can be difficult, the ETP also pursues integrated solutions that bring together several stand-alone technologies into a single package (center). Deeper savings can be realized by going beyond integrated systems to offer whole-building solutions (right). Treating a home or commercial building in a holistic manner can have additional customer benefits, such as added controls, increased comfort or making achieving energy goals easier.

Moving forward, the ETP will continue activities in all three areas depicted in Figure 2 but will strive to deliver more precisely-targeted solutions that are tuned to a customer's specific needs and energy savviness, while also supporting a larger engagement strategy. In turn, the understanding gained of how various customer markets embrace different EE strategies will help the ETP further refine technology delivery approaches.

Another trend relates to data analytics. There has been a proliferation of new data streams (energy usage via mobile apps and consumer "big data") coupled with new analytical tools. One example is Green Button, a White-House-led initiative that can provide residential and business customers' energy usage data to third party vendors, thus empowering the customers to make better, data-driven energy decisions via new value-added services. These new tools and data can potentially streamline and accelerate ET and support Measurement and Verification (M&V) approaches.

Furthermore, understanding data streams and using them better allows utilities to unlock greater customer savings by developing new behavioral programs and/or augmenting existing ones. A host of new products in this area, such as energy management systems (EMS) that intelligently optimize a

building's operations in real time, are showing early success in targeting customers and delivering savings in the residential and commercial sectors. EMS have become increasingly powerful in recent years with the proliferation of inexpensive building sensors, enhanced wireless communication capabilities, and increasingly intelligent automation and analytical functionality.

Another important technology trend is the evolution of product life cycles. As more devices are connected to the Internet, traditional "widgets" can now be upgraded through a simple software update, which means that older products can always have the latest software features. This can have implications for both market adoption and savings potential. The software development cycle is faster than for hardware, so the marketplace now evolves more rapidly, and because installing new software costs much less than hardware, this evolution could reduce adoption barriers by enabling product upgrades instead of replacements. Additionally, software patches can convert an already-installed technology instantly to a new product with totally different energy characteristics that adapts to changing needs.

These technology trends could enable a shift away from stand-alone technologies to thinking more holistically about multiple systems or entire buildings. There is interplay between different systems in a building, such as a lighting system that works in conjunction with an HVAC system to meet certain energy strategy while maintaining service levels.

By thinking about building systems holistically, it is possible to design spaces so that newly added components don't interfere with the energy savings or other operational parameters of existing components. Furthermore, as utility EE portfolios mature, many of the easy energy savings opportunities for individual products are no longer available. Though not yet practiced widely, bundling a set of technologies that individually offer low savings potential into one large package will allow utilities to tap into a wealth of new operational synergies, leading to new savings opportunities.

Gaps and barriers

Three categories of barriers challenge work in the ET sector: technical barriers, market barriers, and policy and regulatory barriers. Though challenging to overcome, leaving these issues unaddressed hampers ET activities and limits the potential success of utility EE programs. Furthermore, many of these gaps and barriers present potential opportunities for ETP and some of the wider efforts it supports. For a full description of those and other opportunities, refer to the section “Long Term ETP Opportunities.”

Because ETP is not a customer-facing program, it cannot intervene in the market to overcome most of the market barriers. The market barriers below are ones in which ETP has an opportunity to contribute to interventions from the customer-facing programs.

Technology barriers

- Based on ETP’s experiences, ETP observes that there is a lack of interoperability among systems in the absence of industry standards[141], and
- ETP observes that there are digital barriers, such as cybersecurity or data format integration.

[141] Cite grid alliances, Zigbee Alliance.

Market barriers

- Reluctance of retailers, trade allies, and/or contractors to embrace new technologies that require unwanted changes in their business models[142]. (For example, a plumber making a service call might encourage a customer to purchase a less-efficient traditional water heater because the plumber is unfamiliar with the installation requirements for a more advanced, higher-efficiency heat pump water heater.) ETP can help WE&T address some instances of this market barrier by helping to design courses that help train contractors on proper installation methods.

- Split incentives[143] between tenants and landlords can hinder adoption of EE technologies in rental properties. ETP can help the Codes & Standards program with development of new codes that require the installation of high efficiency equipment.

- IOUs may not understand customer needs or market drivers well enough to deliver appropriate offerings. ETP can help resource program managers by conducting customer research on specific emerging technologies to reduce information costs[144] of understanding customer responses to those technologies[145].

Policy and regulatory barriers

- Evolving policies for behavioral interventions. ETP can help inform policy makers by gathering data and developing tools to help measure impacts of behavioral interventions. In 2016, ETP developed a validated scale that can be used to measure the relative effectiveness of different behavioral interventions[146].
- Policies that can slow digital innovation, such as current customer confidentiality regulations that limit access to AMI data[147]. ETP can help by working with vendors that allow customers to access their own data while anonymizing customer data to the vendor.
- Different proceedings[148] for EE, Demand Response (DR), and Distributed Generation (DG) programs create funding silos and prevent coordination of integrated DSM (IDSM) projects and customer incentives. ETP can help by testing energy management systems that can accommodate EE, DR, and DG technology, in anticipation of policy updates that remove those funding silos.

The statewide ETP continues to address these barriers by evaluating technical performance and product readiness (scalability), providing market data to facilitate better EE program design, and will be supporting the development new measurement and verification.

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[142] Eto, Schlegel, and Prahl, 1996.
[143] Ibid.
[144] Ibid.
[145] Note that market characterization studies that include uncovering market barriers and describing supply chains are under the purview of EM&V. ETP does not conduct market segment characterization studies, but instead conducts limited customer research specific to a particular emerging technology.
[146] http://etcc-ca.com/reports/dimensions-energy-behavior-psychometric-testing-scales-assessing-behavioral-interventions
[147] These issues are currently being addressed by the CPUC Energy Data Access Committee, http://www.cpuc.ca.gov/General.aspx?id=10151
[148] Cite proceedings here.

Support for regulatory and legislative initiatives

Through ETP's direct support of the portfolio, the ETP also works to advance underlying state initiatives and policies, including SB 350, AB 802, and AB 793. Chief among these is the California Long-Term Energy Efficiency Strategic Plan (CLTEESP), which describes such major long-term initiatives as transitioning the state's building inventory to Zero Net Energy (ZNE), accelerating the development and adoption of next-generation lighting and HVAC technologies.[149] Overall, 86% of ETP projects align with CLTEESP, according to an evaluation commissioned by the Energy Division[150]. ETP, however, cannot be described as directly answerable to these legislative initiatives because all energy savings objectives are delivered through resource programs; ETP is not a customer-facing program and does not intervene in the market.

In addition to the overarching CLTEESP, ETP is working to support a number of more focused state policies, including:

- AB 802, which includes "to-code" improvements for underperforming buildings (stranded savings), facilitates enhanced access to building performance data, and paves the way to meter-based savings for customers. In some cases, meter-based savings can require extensive submetering, and ETP has begun to assess micro current transformer (micro-CT) sensors that may someday provide inexpensive and accurate submetered data.
- SB 350, which seeks to double efficiency goals in the state's building stock by 2030. ETP sees integrated solutions as a key path towards doubling energy savings.
- AB 793, which seeks to enable smarter energy management through advanced technologies. ETP continues to assess data display and presentation solutions that can drive residential and non-residential energy savings.

ETP Program Model

The SW ETP will continue the three core strategies

The Statewide ET Program will continue to use the three core strategies that form the basis of ETP's three subprograms: the Technology Development Support (TDS), Technology Assessment (TA), and Technology Introduction Support (TIS) subprograms.

Strategy 1: Support Technology Developers

In an effort to sustain or increase EE technology supply, ETP seeks opportunities to support EE technology development. During TDS, ETP works with technology developers to assist them in taking early-stage technologies or concepts and transforming them into market-ready products, helping bridge the gap between R&D and the market. An example of a support effort would be the development of performance specifications for a technology allowing manufacturers to better target their development efforts. The TDS process has contributed to the development of more energy efficient technologies such as televisions, computer monitors, illuminated signs, and lighting fixtures.

ETP also provides training and networking for entrepreneurs and companies offering energy saving technologies at Technology Research Innovation Outreach (TRIO) events. TRIO is designed to encourage

[149] California Energy Efficiency Strategic Plan, January 2011 Update, §2.1.1.
[150] Calmac, 2015 http://tinyurl.com/gtpjv8r

submission of ET project ideas using new, innovative technologies by providing information to entrepreneurs, universities and investor firms to help them understand the utility environment. These outreach events also educates technology developers on tools necessary to develop cost-effective energy efficiency and integrated demand-side management technologies, programs or professional service support.

Because technology developers are sometimes inexperienced in working with utilities and DSM programs it is important to engage them early in the development phase to maximize product impacts and ensure a healthy pipeline of measure-ready technologies. ETP will continue to support technology developers in the following ways:

- Work with product developers during the design phase to include energy performance specifications that would make the products appropriate for incentive programs, and
- Motivate product developers to build integrated solutions.
- Develop a long-term vision to identify market gaps for technology innovation
- Enhance partnerships with the California Energy Commission (CEC) Electric Program Investment Charge Program (EPIC) and Public Interest Energy Research (PIER), as well as the U.S. Department of Energy (US DOE) and other out-of-state partnerships.

Implementation metrics will be detailed in the Implementation Plans, but may include tracking activities such as the number of technology development projects launched and number of outreach events held around research priorities.

Strategy 2: Assess Technologies

ETP's core competency is in assessing the performance claims and overall effectiveness of energy efficient measures that are new-to-market or under-utilized. These assessments may build on data or information from testing at customer or field sites, laboratory testing, or other primary research studies. Assessments can also generate the data necessary for energy efficiency rebate programs to estimate energy savings over the life of the measure. These assessments support the entire program portfolio, from incentive programs to market transformation initiatives (including the Codes and Standards program).

Assessment proposals are screened before an assessment is initiated. In the new SW PA model, ETP will develop a common set of screening criteria. These may include consideration of:

- The measure's alignment and projected contribution to energy efficiency program strategies and California Energy Efficiency Strategic Plan goals,
- The degree to which the assessment impacts the measure's adoption rate
- The information necessary for energy efficiency program inclusion and the effectiveness of an assessment in producing this information
- Resources necessary to execute the assessment.

The CA IOUs have developed state-of-the-art test facilities staffed with knowledgeable engineers and scientists to ensure that technology lab assessments are conducted properly. These facilities focus on a variety of key end-use measure types, including refrigeration, lighting, water heating, and air conditioning.

Technology assessment efforts seek to address measure development barriers. In doing so, it allows EE portfolios to evolve to be more solution-driven rather than the traditional technology-driven approach. Specifically, the ETP TA activities include:

- Working to develop a framework that transitions away from the traditional DSM model to consider DSM as a grid resource, and
- Studying advanced methods to evaluate savings, particularly with integrated or whole-building solutions.
- Conducting customer segment-focused studies in support of solution-based interventions
- Conducting studies focused on the performance of integrated solutions and/or meter-based approaches, and
- Supporting development of new, targeted, technology-based measures for EE programs.

Implementation metrics will be detailed in the Implementation Plans, but may include tracking number of customer segment-focused studies in each relevant business practice area, number of studies of the performance of integrated solutions and/or meter-based approaches, and number of measures offered by programs that were directly supported by ETP studies. Note that ETP does not make the final decision on which measures are offered by programs.

Strategy 3: Support Market Introduction of Emerging or Underutilized Technologies

ETP's support of market introduction projects has the dual objectives of gathering in-situ data on customer experiences while increasing market exposure or awareness of emerging and under-utilized technologies. Introduction efforts may include demonstration of the energy savings potential of individual technologies (or a group of technologies) to assist in market penetration. The ET Program may also assemble the appropriate market actors for first-hand experiences with new technologies in real world settings or educate contractors on the benefits and proper installation techniques of new technologies. Additionally, the Technology Resource Innovator Program (TRIP) administers targeted, technology-focused solicitations in order to pair under-utilized, market-ready technology providers with experienced third-party implementers. These early introduction activities are conducted on a limited scale to control the variables that would affect customer experiences.

- Once products reach the marketplace, EE programs employ ETP-gathered data to inform incentive structures and address gaps in customer knowledge, and
- By seeking to understand the non-energy benefits of new technologies, the ETP can identify additional drivers for adoption, such as enhanced security, comfort, or productivity.

ETP's efforts help overcome traditional market barriers and move toward a more comprehensive portfolio by developing a robust suite of integrated solutions for deeper savings, while simultaneously retaining traditional measures. Specifically, the ETP's technology introduction support efforts include:

- Supporting a pipeline of opportunities for the EE portfolio that balances traditional measures and products with integrated solutions.
- Supporting development of new methods to calculate energy savings from integrated and whole-building solutions
- Conducting market studies focused on barriers to and drivers toward adopting integrated solutions
- Conducting small, targeted field deployments to test innovative offerings around integrated solutions, and
- Continuing to pursue traditional ET business roles in technology assessment that validates performance

Implementation metrics will be detailed in the Implementation Plans, but may include tracking number of market studies focused on barriers to and drivers toward adopting integrated solutions, and number of field deployment studies.

These future opportunities, solutions, and strategies build on years of ETP success in effectively supporting EE efforts that help bring new products to market. Among the past successful ETP initiatives are work on:

- LED streetlights
- Advanced lighting controls
- Advanced rooftop packaged units
- Ventilation controls
- Fault detection and diagnosis tools
- ZNE demonstrations
- Tankless hot water heaters
- Ozone laundry, and
- Tier 2 advanced power strips.

In the wake of successful market adoption of these solutions, the statewide ETP is now gearing up to pursue the future opportunities described above.

Technology Priority Map (TRPM)

At the core of this Statewide approach will be the Technology Priority Maps (described in Section 6), a planning instrument developed by the SW PA which will "ensure all high priority areas are addressed" by aligning activities across the state with the priorities outlined in the Maps.

ETP uses the term "technology research priority map" because the term "technology roadmap" is too prescriptive for a rapidly evolving *measure* landscape. ETP believes that over the period covered by this business plan, the continuously decreasing costs of centralized generation will make many traditional measures no longer cost effective, necessitating the creation of new avenues to achieving energy savings. One such new avenue was created with AB 802, which allows claiming of stranded savings[151], which can be claimed without any emerging technologies at all. As research priorities change, TPMs and associated projects can be sunsetted without penalty to decrease program costs.

The TPMs will be developed after a review of each PA's existing ET roadmaps, and will leverage existing technology roadmaps from other entities such as CEC, EPIC, and DOE. ETP also intends to ask the ETCC Advisory Council for their insights on technology research priorities, and will also seek stakeholder input on these priority maps.

ETP expects that the TPMs can be developed within the first year of the new SW model. It is important to note that each IOU already has internal technology roadmaps that they have been using to meet the needs of their own utility. During the initial TPM map development period, each IOU will continue to use their own maps, which should merge seamlessly with the TPM, once developed. After the initial TPMs

[151] Stranded savings refer to the savings potential of replacing old, highly inefficient equipment with equipment that meets current codes. Prior to AB 802, only equipment with above-code efficiency have qualified for rebates or incentives .

have been developed, updates will occur at least once per 5-year business cycle, or more frequently on an as-needed basis if all PAs agree.

The ETP is and will continue to be proactive in seeking out new technologies. This is accomplished through a variety of channels, including through partnerships, market scanning activities, attending conferences, and employing subject matter experts in specific technology areas. This allows the ETP to uncover market trends, determine which technologies have high potential, and present only technologies with reliable energy savings to program administrators.

ETP recognizes that the TPMs should follow development of new technology or measure trends, and will not rigidly follow a TPM for the sake of adherence. However, ETP intends to draw upon the expertise of advisors such as the Emerging Technologies Coordinating Council (ETCC) Advisors when considering whether to sunset a TPM and its associated projects. ETP will also seek stakeholder feedback before making a final decision.

Collaboration, Outreach, and Information Dissemination

To advance the goals of the ETP, provide added transparency, and create a technology marketplace the ETP engages in a number of outreach and information dissemination activities.

Emerging Technology Coordinating Committee (ETCC)

The primary avenue for collaboration among ETP members is through the Emerging Technology Coordinating Committee (ETCC). ETCC's coordination strategy is to bring together member utilities (including their ET and ET-related departments, such as EE, DG, and DR), national and international ET groups, and technology stakeholders in order to provide a common framework for assessment, reporting, and program development.

This strategy has had a beneficial outcome in reducing duplicate efforts in technology development and assessment, product introduction support, and vendor relationships. Furthermore, by combining the efforts of multiple major utilities, this kind of collaboration can help achieve the "critical mass" that encourages developers and manufacturers to develop CA-appropriate technologies.

ETCC activities include a number of outreach components to ensure that the statewide ETP works in as transparent and effective a manner as possible. To that end, ETCC holds quarterly meetings around the state that are aimed at particular customer segments (commercial, residential, industrial, agricultural, and integrated systems) with the goal of highlighting innovation in each sector.

The ETCC also holds a major conference — the ET Summit — every two years that brings together over 500 emerging technology stakeholders, including leading experts, product developers, entrepreneurs, regulators, investors, delegates from government agencies, gas and electric utilities, and academia.

Other ETCC events include symposia that educate third parties on doing business with utilities, Open Forums that serve as platforms for tech companies to introduce their products to utilities, and regular ETCC Advisory Council activities that bring North American utility and industry ET voices to the ETCC.

Third party solicitations

The Technology Resource Innovator Program (TRIP) administers targeted, technology-focused solicitations in order to pair under-utilized, market ready technology providers with experienced third party implementers. TRIP aims to achieve greater market acceptance of new technologies through customer incentives, education, and technical assistance to help overcome market barriers. Participants in the TRIP program may include entrepreneurs, third party vendors, investors, EE and DR companies, and universities. Winning bidders will be funded by ETP and their contracts will be managed through the IOU third party programs.

In addition to TRIP, ETP has supported IDEEA365 solicitations by reviewing bids that include an emerging or underutilized technology, and when appropriate, has considered non-winning technology vendors as candidates for partnering on technology assessments.

Other ET Collaborations

Though ETCC is the largest collaborative effort across the ETP, the constituent utilities are highly active in a number of additional consortia, initiatives, and groups. Partners of these collaborative efforts fall into six categories:

1. Technology adopter groups, including owners, tenants, and property managers.

2. Utility stakeholders, including utility ET groups in California and other states as well as non-ET utility stakeholders, such as staff working on electric vehicles (EVs), energy storage, and distributed generation, and utility marketing, legal, and regulatory departments.

3. Research entities, including the Lighting Technology Center, Western Cooling Efficiency Center (which was co-founded by the IOUs and UCDavis), national laboratories, and the Advanced Research Projects Agency-Energy (ARPA-E), as well as individual researchers funded by the US DOE.

4. EE technology commercialization actors, including technology developers and financiers as well as clean tech accelerators such as:
    - US DOE's FloW (First Look West, a regional component of US DOE's National Clean Energy Business Plan Competition)
    - Cleantech Open (a nonprofit organization for clean tech entrepreneurs), and
    - The CalSEED (California Sustainable Energy Entrepreneur Development) Initiative.

5. The CEC's Efficiency and R&D Divisions, including the EPIC and PIER programs.

6. Strategic organizations and consultants, including the Consortium for Energy Efficiency (CEE), E Source, New Buildings Institute (NBI), American Council for an Energy-Efficient Economy (ACEEE), Davis Energy Group, Fisher Consulting, Electric Power Research Institute (EPRI), Gas Technology Institute (GTI), and engineering firms.

ETP has a long history of strategic collaborations both across utilities and with the entities listed above. Some recent successes include:

1. Western HVAC Performance Alliance (WHPA, http://performancealliance.org/), described earlier.

2. West Coast Utility Lighting Team (WCULT), which is a spin-off of ETP that originally addressed technical issues in lighting and then expanded to address program operation and lighting market barriers across five states.

3. ET Lighting Group (as yet unnamed), a spin-off of WCULT that returns to its technical roots. Research on emerging lighting technologies had taken a back seat as WCULT expanded to address programmatic issues.

4. Energy Efficient Laboratories, the electric utilities recently started a collaboration with the Center for Energy Efficient Laboratories and have to date funded a market research study on energy efficiency in laboratories. This market study will inform a research priority map to guide future ET projects in this field.

How Does the ETP Support Other Utility Efforts?

The ETP supports the EE program portfolio in several ways. Utility programs benefit from reduced savings risk: ETP provides key support in identifying technology trends by scanning and evaluating new technology opportunities in a robust, deliberate manner that helps mitigate the risks of adopting new EE measures. This ensures that a reliable, predictable resource base exists for EE efforts. By identifying products that are too immature for the market, ETP activities can mitigate the risk of underperforming technologies.

ZNE

ETP provides core support to ZNE and also collaborates with ZNE on projects: California's ambitious ZNE goals include recommendations to build new, resilient buildings and improve existing buildings and communities that not only provide comfort and low operational costs to occupants, but support enhanced grid reliability[152].

ETP has worked closely with the building and design community to construct residential communities and retrofit commercial buildings that demonstrate value to both the owners and occupants, as well as the capabilities to reduce and dispatch electric loads in real-time to address grid constraints and needs. The results from those initial efforts have demonstrated benefits to the grid, while attracting the building and design community.

Customer programs as grid resources

With the rapid increase of both utility-scale renewables and behind-the-meter[153] (BTM) distributed energy resources (DER) on the grid, it is becoming increasingly challenging to manage the imbalance

[152] California Long Term Energy Efficiency Strategic Plan, CPUC, 2011.
[153] "Behind the meter" refers to any activity, technology, or infrastructural elements that occur before electricity or gas enters a customer's home or business through the meter. This includes centralized generation and transmission, grid management, and utility storage.

between power supply and demand in real-time, particularly because the balance can fluctuate within seconds. These fluctuations occur at both the system-wide level and at the neighborhood level (e.g. substation, transformer). Fortunately, ETP can play a role in helping to overcome such grid challenges by working in concert with programs and technologies on both sides of the meter to deliver resources capable of responding to grid needs.

How ETP collaborates with other programs

In the vision of Integrated Demand Side Management (IDSM), PAs can combine different types of BTM technologies into one incentive program for end customers. In such a scenario, EE technologies would combine on-site solar, battery storage, and/or traditional and new demand-response technologies. Such a system would provide dispatchability of certain loads (e.g. lighting, HVAC) and the battery systems for both the utility and the wholesale markets.

One strategic way to align those efforts would be to place the IDSM-capable technologies into the SW ETP Technology Research Priority Map (TRPM) and run joint technology assessments, scaled projects, and demonstration showcases together with the other BTM teams, when applicable. ETP has and will continue to coordinate with DSM in the future, including:

- Collaborating with Demand Response (DR) and EM&T programs to discover and validate technologies that provide value in terms of reduced energy consumption during peak hours. One of many examples of such a technology is Energy Management Systems (EMS).
- Researching the potential of combined building EMS, solar, storage, and DG for the small- and mid-sized commercial segment. This research could not only validate energy savings, but may also help to better understand the customer value of these combined systems and highlight potential barriers to adoption.
- ETP has collaborated with Electric Vehicle (EV) teams to understand the EV charging infrastructure with the eventual goal of delivering effective energy management options using advanced controls that will facilitate time-of-need charging.

TDSM or Locational/Preferred Resources

In the future, IDSM efforts could be targeted to specific physical locations on the grid where there, an effort known as targeted demand side management (TDSM). TDSM greatest value is in allowing for the deferral of capital investments on the grid through targeted load reduction specifically at the place where grid investment is needed (e.g. substations, feeders, transformers, etc.).

Working closely with both the other BTM and grid-side teams, ETP brings an EE element to all locational targets on the grid. This can be achieved through joint pilots in targeted locations, as well as projects to determine which EE technologies are applicable based on load shapes, customer segments, and operational processes.

The ETP also helps enable "Locational DSM" endeavors to increase grid reliability and/or defer infrastructure upgrades by:

- Collaborating with internal groups and other programs, such as the DR and DG programs to identify how demand-side energy management systems interact with the grid, and
- Running field deployments that evaluate relevant technologies such as residential battery storage, combined heat and power (CHP), solar, and building EE technologies.

Benefits for Diverse Stakeholders

Customer benefits

The work of the statewide ETP impacts a diverse array of customers through utility resource acquisition programs across California's geographical regions and market sectors, including the residential, commercial, industrial, agricultural, and public sectors. Regardless of location or segment, the most important customer needs are for comprehensive solutions and low costs.

However, ETP itself is not a customer-facing program. Rather, it supports the utilities by ensuring the availability of appropriate measures for customer incentive programs. Because energy is a low priority for many customers, bundling energy-saving opportunities together into multi-measure or whole-building offerings and offering upstream and mid-stream solutions are effective strategies to achieve savings goals. To reach these goals and help utilities serve customers effectively, ETP evaluates technologies that support the development of new, cost-effective EE measures while helping to sustain legacy programs.

The ETP's work can impact customers indirectly. End-use customers can benefit through the reduction in time it takes viable new products to enter the marketplace due in part to ETP's assurance to program managers that an emerging technology is suitable for their program. However, the baseline for the counterfactual is extremely difficult to establish: evaluation studies assessing the effectiveness of utility incentives in accelerating CFL adoption rate in California had difficulty finding a comparison state due to California's progressive populace. Also, because ETP does not set incentives or design outreach, the ultimate adoption rate is not within ETP's sphere of influence.

Partner benefits

Internal Partners

The ETP program collaborates closely with other utility departments, such as C&S. This collaboration can help advance mutual goals, such as understanding motivations and overcoming barriers among home buyers and builders in order to meet ZNE mandates.

Additional collaborative efforts between ETP and C&S may include:

- Joint memberships in organizations such as the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), which brings together emerging technology experts, leaders from the HVAC industry, and C&S specialists to advance new equipment, building, and testing standards.
- Seeking out and evaluating emerging "code-ready" technologies that present such rapid adoption potential that they can become baseline much sooner than most other technologies. Because these efforts impact both groups, they work closely to share data and ideas for achieving maximum internal efficiencies and streamlining the adoption process. Because code-ready technologies vary in their impacts and applicability, there is no linear template that can be used for this process.

Elsewhere, there is significant collaboration between the statewide ETP and the Workforce Education and Training (WE&T) Program. The ETP shares data, identifies barriers, and provides technical information to supplement WE&T outreach and education efforts.

The collaboration between ETP and WE&T also includes helping raise awareness and advance understanding of California's ZNE efforts. As utilities turn to more integrated and whole-building EE solutions, ETP and WE&T will collaborate by examining barriers to and drivers toward adopting integrated solutions. The information gathered will be useful for future education and training programs for homebuilders, commercial architects, facility operators, and trade allies.

External Partners

CEC

The CEC and ETP have partnered on a variety of projects and initiatives. The CEC is a member of the ETCC, along with the major California IOUs. Additionally, the CEC has funded some ETP activities, such as alternative programs aimed at training unemployed workers for jobs emerging in the recovering economy.

Cal TF

The California Technical Forum (Cal TF) is a panel that seeks to review energy savings estimates and technical performance related to California's EE programs. As a new organization, Cal TF hasn't yet collaborated closely with the ETP but future partnership opportunities will be examined as they arise.

Community benefits

Beyond traditional technology evaluations and market interventions, the statewide ETP serves other beneficial purposes. One of these is ETP's work on natural and alternative refrigerants. Older types of refrigerants found in appliances, air conditioners, and industrial equipment are harmful to the ozone layer and act as powerful greenhouse gases. The ETP supports the phase-out of these compounds by working to verify the viability and energy savings potential of new alternatives.

Another critical issue facing California is an ongoing drought that has strained water resources. Recognizing a link between water and energy — the "water-energy nexus" — the ETP is working with utility agriculture stakeholders to find and accelerate adoption of energy-saving technologies that also deliver water savings.

The ETP also works to support the conversion of the transportation sector away from petroleum to electricity- and natural gas-powered vehicles. The ETP has collaborated with the EM&T Program to understand the charging infrastructure for electric vehicles, with the eventual goal of delivering effective energy management options through advanced controls that will facilitate time-of-need charging.

Strategies, Targets, and Milestones

Energy Efficiency Business Plans: Sector Metric Table - Cross-cutting Sector: Emerging Technologies Program								
Problem Statement/ Core Strategy	**Desired Effects**	**Implementation Strategies**	**Milestones**	**Baseline**	**Metric Source**	**Short Term Target (1-3 years)**	**Mid Term Target (4-7 years)**	**Long Term Targets (8-10+ years)**
There is a need to "ensure all high priority areas are addressed"	SW ETP will leverage existing technology roadmapping efforts and create/modify technology roadmaps to align with California policy and ratepayer needs.	Sub-strategy 1: Develop and refine Technology Research Priority Maps Tactics to be provided in Implementation Plan	(under development) 1) Complete TPMs 2) Implement TPMs	n/a	n/a	Identify areas with need for TPMs	Assess and update TPMs	Assess and update TPMs
		Sub-strategy 2: Disseminate Technology Research Priority Maps (TRPMs) to stakeholders. Maps will drive SW ETP projects, from the top-down. Tactics to be provided in Implementation Plan: • ETCC meetings, Biannual ET Summit, IDEEA 365/TRIP solicitations, TRIO, Open Forum				Complete and implement TPMs		
There is a need to support a healthy technology pipeline for measure development	The SW ETP projects will be designed to encourage manufacturers and technology developers to create technologies that can be relied upon to meet California ratepayer needs for energy efficiency.	Sub-strategy 1: Work with new technology vendors, manufacturers, entrepreneurs Implementation Plan tactics: • TRIO, CalSEED • Tech Development Support	(under development) • Phase 1 goal: identify need for new technologies and manufacturers/developers willing to partner with ETP • Phase 2 goal: identify ways to support developers in developing or specifying new technologies • Phase 3 goal: Provide support identified in Phase 2 • Phase 4 goal: Identify next steps (lab testing? Pilot testing?) • Phase 5 goal: Hand off to implementer of next steps identified in Phase 4	n/a	Program Tracking Data	All TPM v1.0 projects are identified, assigned and completed, Phases 1-5	All TPM v2.0 projects are identified, assigned and completed, Phases 1-5	All TPM v3.0 projects are identified, assigned and completed, Phases 1-5
		Sub-strategy 2: Work with universities and colleges Implementation Plan tactic: RocketFund						
		Sub-strategy 3: Meet PA requests to work with specific technologies and technology developers, including C&S requests, WE&T requests, etc.						

Energy Efficiency Business Plans: Sector Metric Table - Cross-cutting Sector: Emerging Technologies Program								
Problem Statement/ Core Strategy	**Desired Effects**	**Implementation Strategies**	**Milestones**	**Baseline**	**Metric Source**	**Short Term Target (1-3 years)**	**Mid Term Target (4-7 years)**	**Long Term Targets (8-10+ years)**
PAs have a need to know which technologies would and would not be suitable for incentive programs.	ETP will vet technologies and solutions that aren't yet ready for inclusion into an EE portfolio. These activities result help program managers create measures that have a more robust level of assured savings.	Sub-strategy 1: Conduct TPM-driven Technology Assessments Implementation Plan tactics: • Field studies • Lab studies • Demonstrations Sub-strategy 2: Test TPM-driven Solutions Implementation Plan tactics: • Scaled Field Placements – Data collection on technology performance and customers • Demonstrations – Data collection on technology performance and customers • Showcase – Visitor Surveys • TRIP, IDEEA365 Sub-strategy 3: Meet PA requests for assessments of specific technologies	(under development) • Phase 1 goal: identify need for new technologies and manufacturers/developers willing to partner with ETP • Phase 2 goal: identify ways to support developers in developing or specifying new technologies • Phase 3 goal: Provide support identified in Phase 2 • Phase 4 goal: Identify next steps (lab testing? Pilot testing?) • Phase 5 goal: Hand off to implementer of next steps identified in Phase 4	n/a	Program Tracking Data	All TPM v1.0 projects are identified, assigned and completed, Phases 1-5	All TPM v2.0 projects are identified, assigned and completed, Phases 1-5	All TPM v3.0 projects are identified, assigned and completed, Phases 1-5

EM&V Considerations

Evaluation Needs Preparedness

The utilities are currently updating the ETP tracking database to include data on both factors under ETP control, such as number of TDS, TA, and TIS projects initiated, as well as factors not under ETP control, such the proportion of technologies filtered out as "not appropriate" vs those as selected as candidates for further ETP assessment, the amount of savings resulting from ETP-vetted measures, length of a project, etc. These updates will meet ETP's needs in the short term. The ETP database will be designed to track information that can be gathered during the course of program implementation.

ETP's evaluation needs in the longer term require significant development of additional infrastructure to track coordination and optimization according to the TRPMs, as well as window-of-opportunity projects that may not be on the TRPM.

Evaluation preparedness at the subprogram level will be discussed in detail in the Implementation Plans.

Considerations for future ETP evaluations

Utility ET efforts are uniquely designed to assume many of the business risks associated with maintaining a highly-effective EE portfolio. ETP is tasked with helping DSM program administrators determine whether a technology would be suitable for incentive programs. ETP will be considered successful if it both identifies potential new measures as well as filters out inappropriate technologies.

As a supply side program, a resource-based impact evaluation can be problematic when applied to ET. Indeed, tying ET to such a model of only counting technologies that are adopted into the measure portfolio discourages the calculated risk-taking upon which the ETP has built a credible, long-term track record. Counting only adopted technologies sets faulty incentives for ETP to only focus on low-risk measures with high likelihood to become IOU program measures. ETP fulfills several functions for the EE portfolio, including identifying and supporting measures with high value-add for the portfolio, but also pursuing some "high risk, high reward" measures. ETP's program metrics need to track both adopted technologies and filtered technologies, to accurately reflect ETP's value in preventing "snake oil", or ineffective technologies, from being offered by program managers.

While the ETP is in favor of tracking the impacts of its work in terms of EE program outcomes, there are additional indicators that should also be considered to accurately gauge its success. Tracking the number of new measures recommended by ETP, as well as their market uptake, is an interesting exercise, yet neither the number of new measures nor their market uptake rate is under ETP's sphere of influence. ETP evaluations should also take into consideration nation-wide trends and challenges, such as the difficulty in finding cost-effective measures for the residential sector, which is not a problem specific to California.

At the sector level, ETP will be considered a success if it meets its four objectives:

- Objective 1: Use Technology Priority Maps to ensure high priority areas are met
- Objective 2: Support a healthy technology pipeline
- Objective 3: Reduce risk to utility programs

Appendix A: Who does ETP serve?

The ETP serves resource acquisition programs as they develop new measures. Additionally, ETP supports C&S, gathering data for CASE studies. ETP operates where emerging technologies and utility programs intersect. This section describes the needs of internal utility customers, the utility measure development process, and some characteristics and trends in the energy-efficient technology landscape to provide a better understanding of the context within which ETP is implemented.

The utility measure development process draws across multiple business functions

Measure development refers to the process by which DSM program administrators decide which technologies to include in the incentive programs. A clear distinction needs to be made between an energy efficient technology and a measure, which has passed through utility review at multiple levels and may encompass more than just a widget.

The measure development process differs at each utility, and requires the coordination and input across multiple business functions. A recent study[154] on utility measure development looked at the measure development processes at the four IOUs, plus LADWP and SMUD. It showed that these processes were highly idiosyncratic to each utility, and involved staff in engineering, product management, program management, analytics and forecasting, strategy, evaluation, marketing and communications, large customer account management, vendor alliance management, and processing operations. Across the utilities in the study, different teams play different roles, at different decision points. For example, the evaluators found that PG&E has six gates in their stage-gate process for measure development, while SDG&E has three.

The ETP is but one contributor to this process, which applies both residential and non-residential measures. Across these teams, each utility must effectively determine the technology's estimated market potential, whether the supply chain is in place, whether a vendor network can support installation and service, which customer segments might have a higher propensity to purchase and install, what level of penetration is required for the measure to become cost effective, what the market barriers might be for each customer segment, and how to design a program to overcome those market barriers. While ETP can and has contributed much of this information in the course of its activities, neither the sole responsibility nor the sole credit for emerging technology adoption belongs to ETP. ETP staff do not make the ultimate decision whether a technology is offered as a measure through a resource program.

Innovation and measure evolution often starts at the local level

The measure development process itself is not a linear process, but in many utilities nationwide, particularly those without a separate emerging technology assessment division, new technologies for the non-residential sectors are first installed through calculated projects at a local site. As more customers include the technology as a measure in incentive projects, the program administrator can use market interest as an indicator that it may be more efficient to deem the savings from the technology, rather than requiring a custom calculation for each project[155]. Technologies can also be deemed as

[154] Evergreen Economics, 2015, available at: http://tinyurl.com/hs8nfgg
[155] Custom measures are not available for single family residential customers.

measures without first going through the proving grounds of calculated projects, but a greater degree of review is needed to determine the level of market risk.

ETP also plays a critical role in custom projects, which are often the first point of entry for a technology into the measure development process. ETP's assessments are regularly shared with utility business account executives who offer custom measure options to large non-residential customers that can deliver deep energy savings due to the high energy usage of those customers.

The phases of measure evolution from calculated to deemed is important because it mirrors the different phases of innovation and technology maturity and drives the overall ETP approach presented in this Business Plan. The (now closed) U. S. Office of Technology Assessment's book "Innovation and Commercialization of Emerging Technology"[156] and shows that in the early stages of a technology's lifecycle, products are diverse, often including custom designs[157]. During the growth phase, one product design emerges as being stable enough to have significant production volume. During the maturity phase, there are multiple product manufacturers and products have become similar enough that parts are standardized and warranties are inherent to its value proposition. Finally, in the introductory phases of a technology, a manufacturer's competitive strength comes from being able to deliver a reliable, functional product.

Overall, as the technology matures, the emphasis shifts from reliability concerns to economizing on production costs to offering the same functionality at a lower cost. Throughout the stages of technology maturity, the overall trend is from customized to standardized product designs, trading off between intensive use of resources at a distributed level to an intensive use of resources at a centralized level, realizing gains from economies of scale.

Similarly, measures also have a lifecycle. Measure evolution also progresses through these phases, and reflect similar characteristics. A new technology can become a measure as soon as a customer proposes and a custom incentive application is approved with calculated savings that meet an energy reduction need. An example of this evolution is LED parking lot lighting that first began as a custom measure and later evolved into a deemed measure. Over time, certain measures will prove to be more popular with customers. At this point, the utility program administrator may consider reducing the costs associated with implementing the measure[158] and begin to explore whether the measure should be deemed instead.[159]

The design of the Statewide ETP program incorporates the natural progress of technologies and measures from customized to standardized (i.e., deemed), from localized to centralized (i.e., statewide mid-stream deem measure offer), and from standalone technologies to integrated solutions. This natural progression not only requires that high levels of emerging technologies expertise be available at the local and statewide program levels, but also that the task of scanning and screening new

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[156] U.S. Congress, Office of Technology Assessment, Innovation and Commercialization of Emerging Technology, OTA-BP-ITC-165 (Washington, DC: U.S. Government Printing Office, September 1995). Available at http://**ota**.fas.org/reports/9539.pdf.

[157] This table is a synthesis of William J. Abernathy and James M Utterback's, "Patterns of Industrial Innovation, " Technology Review, June/July 1978

[158] Note that these costs are not just borne by the utility, as customers must also spend a lot of resources and time developing and receiving approval for custom projects.

[159] As a measure evolves further and gains even greater customer interest, the measure may be considered for code, or for upstream and midstream programs.

technologies and ideas be distributed through as wide a network of emerging technology professionals as possible. The design of the SW ETP leverages the entire network that has been built by ETP subject matter experts throughout ETP's almost two decades of operation.

Workforce Education & Training

Chapter Summary

The Workforce Education & Training (WE&T) program was established to increase energy savings for customers across all sectors through a trained, skilled, and engaged workforce. Since that time, SDG&E's program has offered a suite of energy efficiency education programs that span from energy education and career awareness programs for K-12 students to advanced skills training and certification programs for skilled, incumbent workers.

> **The California Energy Efficiency Strategic Plan's Vision for the Workforce Education and Training Sector**
>
> "By 2020, California's workforce is trained and fully engaged to provide the human capital necessary to achieve California's economic energy efficiency and demand-side management potential."

To support the goals described in the California Energy Efficiency Strategic Plan, several factors are considered when designing WE&T offerings for both the end-use customers who make decisions about participating in EE and purchase equipment as well as the market actors or Trade Professionals who sell, design, install and maintain it. As such, course offerings should be designed taking into account factors such as SDG&E customer demographics and energy consumption along with their awareness, interest and aptitude about EE program offerings. Skills building educational tracks should understand the existing workforce demographics and characteristics coupled with economic forecasts and possible areas of growth.

The WE&T program educational offerings support multiple sectors and end-uses and are provided via a wide range of delivery methods including in-person workshops, webinars, educational series and certification programs. Sample of offerings focuses are:

- Building Design & Construction
- Building Performance
- Codes & Standards
- Home Performance/Whole House
- HVAC
- Lighting
- Marketing/Finance/Sales/Real Estate
- Food Service
- Renewable Energy
- Sustainability
- SDG&E's Rebate & Incentive Programs

Historically, a large majority of the WE&T offerings have been in alignment with SDG&E's primary load and end-uses to program goals and have thus focused on achieving savings in the commercial sector and HVAC and lighting end-uses. These offerings have traditionally been delivered through single classes, workshops, and certifications.

In addition to SDG&E's WE&T program, there are many other educational institutions that prepare and train workers who support the energy industry including community colleges, vocational schools, apprenticeship programs, trade organizations, etc. To date, SDG&E has provided support by offering classes as well as funding special initiatives, and while these efforts have yielded positive results, a more clearly defined relationship to support core energy education would be beneficial to all parties and will be critical to achieve the goals outlined in the Strategic Plan and SB 350. To achieve these goals, SDG&E recognizes that WE&T offerings will need to begin to collaborate with appropriate organizations in a more formalized process and supporting enhancement of curricula.

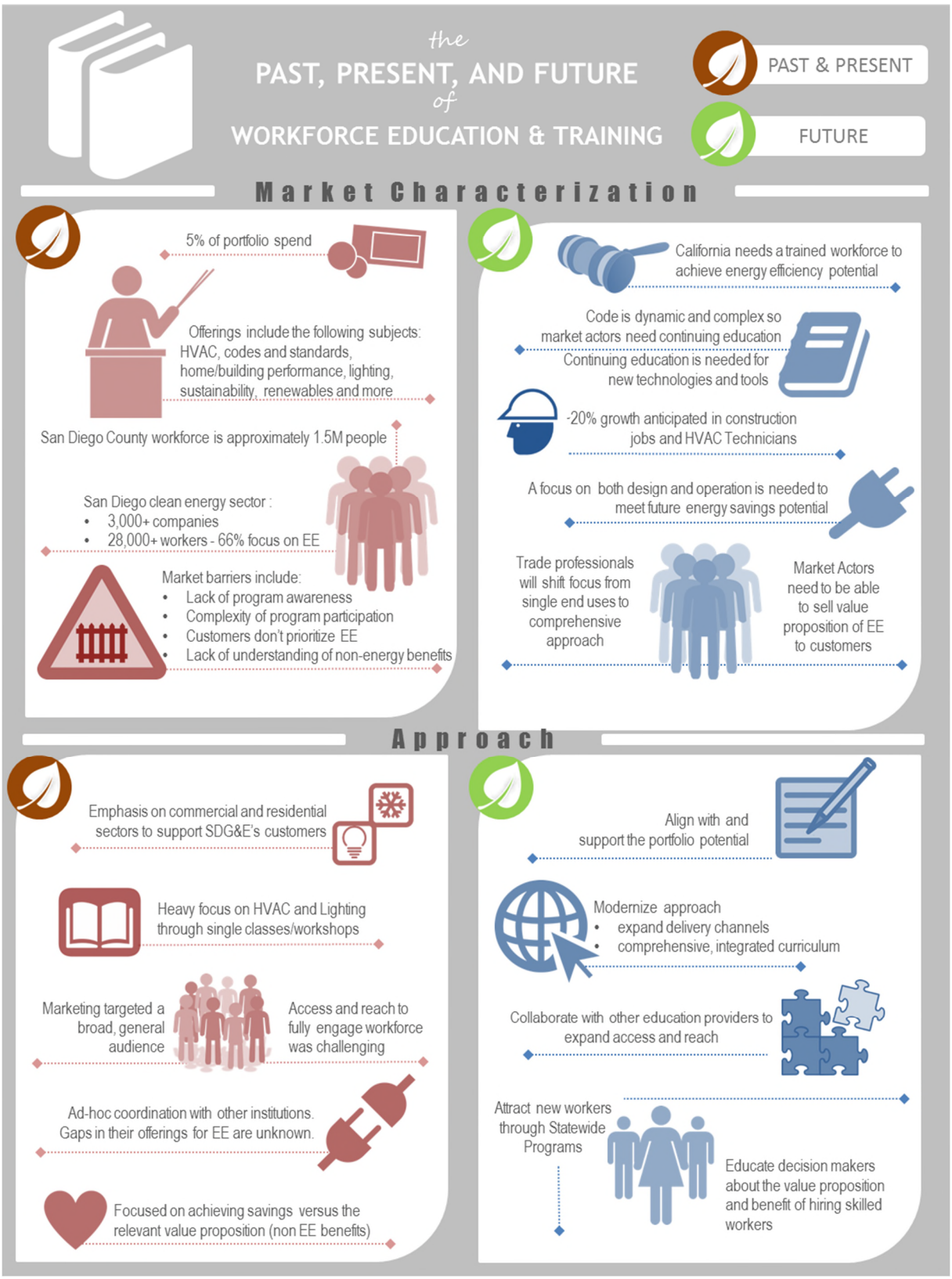
The intent of this business plan is not to make wholesale changes to this mission, but rather to enhance our approach by continuing successful elements, maximize offerings that support SDG&E EE potential and develop new offerings for untapped opportunities. The end result should create demand for EE through engaged and informed decision makers who understand and appreciate the value proposition of EE and the importance of hiring skilled workers who must be trained and qualified to meet this need.

In alignment with the California Energy Efficiency Strategic Plan, SDG&E's mission for the Workforce Education & Training sector is to meet the workforce and market needs of the State, while specifically addressing the needs of the San Diego market and customers. To achieve this mission, collaboration with appropriate organizations will be crucial to ensure that workers have access to education and the increase in reach of education.

To accomplish this mission, SDG&E has established the following Workforce Education & Training sector goals:

- Goal 1: WE&T offerings prepare workforce to meet California's goal of doubling EE savings by 2030, by reaching X number of market actors and achieving Y% of competency demonstration.
- Goal 2: WE&T offerings will increase the participant knowledge gain by X% for SDG&E's targeted audience in the sector plans. See Figure WE&T-14: Goals/Strategies/Tactics Summary
- Goal 3: WE&T supports Statewide Career Connections and Statewide Career & Workforce Readiness Programs. Goal TBD.

These goals are designed to directly address the needs of workers by providing the skills to achieve EE savings and to educate decision makers about the need to hire skilled workers.


the
PAST, PRESENT, AND FUTURE
of
WORKFORCE EDUCATION & TRAINING
PAST & PRESENT
FUTURE
Market Characterization
5% of portfolio spend
Offerings include the following subjects: HVAC, codes and standards, home/building performance, lighting, sustainability, renewables and more
San Diego County workforce is approximately 1.5M people
San Diego clean energy sector :
• 3,000+ companies
• 28,000+ workers - 66% focus on EE
Market barriers include:
• Lack of program awareness
• Complexity of program participation
• Customers don't prioritize EE
• Lack of understanding of non-energy benefits
California needs a trained workforce to achieve energy efficiency potential
Code is dynamic and complex so market actors need continuing education
Continuing education is needed for new technologies and tools
-20% growth anticipated in construction jobs and HVAC Technicians
A focus on both design and operation is needed to meet future energy savings potential
Trade professionals will shift focus from single end uses to comprehensive approach
Market Actors need to be able to sell value proposition of EE to customers
Approach
Emphasis on commercial and residential sectors to support SDG&E's customers
Heavy focus on HVAC and Lighting through single classes/workshops
Marketing targeted a broad, general audience
Access and reach to fully engage workforce was challenging
Ad-hoc coordination with other institutions. Gaps in their offerings for EE are unknown.
Focused on achieving savings versus the relevant value proposition (non EE benefits)
Align with and support the portfolio potential
Modernize approach
• expand delivery channels
• comprehensive, integrated curriculum
Collaborate with other education providers to expand access and reach
Attract new workers through Statewide Programs
Educate decision makers about the value proposition and benefit of hiring skilled workers

Approach to Achieve Workforce Education & Training Sector Goals

Workforce Education & Training is a cross-cutting program that spans the Commercial, Residential, Public, Industrial, and Agricultural sectors. To achieve California's energy efficiency and demand-side management potential, SDG&E and key stakeholders must educate and train market actors and decision makers to facilitate a foundation for an innovative, connected, and sustainable energy future. SDG&E seeks to achieve ZNE and doubling of energy efficiency by provide continuing education and training to market actors, influencing core education's curriculum, and collaborating with other organizations to engage statewide programs.

Performing analysis and identifying problems and barriers that exist in both California's and San Diego's markets has identified a number of consistent barriers to address for this sector. Considering the direction set by the CA LTEESP and other legislation, goals and strategies have been established to achieve a framework that will yield results in support of the mission and vision of the Workforce Education and Training sector.

In summary, the barriers for this sector can be characterized by these statements:

- Without ongoing education on code changes and new technologies, we will not be able to achieve California's energy efficiency potential.[160]
- Many occupations have the ability to influence EE savings, but training for their jobs usually does not focus on energy efficiency.[161]
- Decision Makers do not value energy efficiency
- Customers often make their decisions based on the lowest upfront costs without including other critical aspects of a successful project

In addition to identifying the goals, it is critical to define specific steps that SDG&E and its customers must take to make progress against these goals. This section outlines the three overarching goals that set the direction for SDG&E's Workforce Education and Training sector. SDG&E's WE&T goals are:

- Goal 1: WE&T offerings prepare workforce to meet California's goal of doubling EE savings by 2030, by reaching X number of market actors and achieving Y% of competency demonstration.
- Goal 2: WE&T offerings will increase the participant knowledge gain by X% for SDG&E's targeted audience in the sector plans. See Figure WE&T-14: Goals/Strategies/Tactics Summary.
- Goal 3: WE&T supports Statewide Career Connections and Statewide Career & Workforce Readiness Programs. Goal TBD.

These and the existing core program components will be used to reach savings goals based upon approved budgets. The following table outlines the proposed budget for SDG&E's WE&T sector.

Fig WE&T-1: WE&T Sector Annualized Budget

	Near-Term 2018-2020	Mid-Term 2021-2024	Long-Term 2024-2027
Annual Budget	TBD	TBD	TBD

[160] Source: Don Vial Center, Prop 39 Jobs Training, 2013, p17. http://laborcenter.berkeley.edu/pdf/2013/prop39_jobs_training.pdf

[161] Source: Don Vial Center, Needs Assessment, 2011, p214

It is important to recognize that SDG&E developed the goals, strategies, and tactics described in this business plan to complement, and not replace, the current program level interventions that have been proven successful.

Statewide WE&T Sector Market Characterization and Segmentation

California consumed 279.4 TWh in 2014, with commercial (45%) and residential (32%) consuming the most.[162] To support the long term energy efficiency goals of California, all sectors must have decision makers that utilize energy efficiency projects and a skilled workforce that is trained and will facilitate energy efficiency.

California is recognized for having a large number of market actors that are engaged in energy efficiency, clean energy, and advanced energy occupations. The demand for so many market actors in this area has been the result of California's drive to be energy efficient and provide clean energy. Adoption of energy efficiency in California is a result of a combination of drivers, including legislation, increases in electric rates, and reducing environmental impact. The value proposition of energy efficiency to end-users results in a large, and increasing, demand for a workforce that is capable of quality design, installation, and maintenance. As a result, over 430,000 people are employed at advanced energy jobs (includes energy technologies, manufacturing, and supply and demand) at more than 40,000 firms, with about 70% focused on energy efficiency.[163] These market actors need continuing education and training on changes to codes, training on new skills, training on new technologies, and training on new tools.

There is no specific data set that exclusively tracks employment or the number of jobs in the energy efficiency sector. Occupations and market actors that can influence energy efficiency fall across multiple NAICS codes. An estimated number of certain statewide market actors is below[164] in Figure WE&T-2:

[162] Source: Energy Consumption Data Management Syste, 2014. http://www.ecdms.energy.ca.gov/elecbyutil.aspx
[163] Source: AEE Institute, CA Advanced Energy Employment Survey, 2014, p4. http://info.aee.net/hs-fs/hub/211732/file-2173902479-pdf/PDF/aeei-california-advanced-energy-employment-survey-fnl.pdf
[164] Source: Opinion Dynamics Corporation, Indirect Impact Evaluation of the Statewide Energy Efficiency Education and Training Program, 2006 – 2008. http://www.calmac.org/publications/06-08_Statewide_Education_and_Training_Impact_Eval_Vol_I_FINAL.pdf

Industry Area	Market Actors (Statewide)	Estimated Reach by Centers	Percent Reached (Statewide)
HVAC and Refrigeration	19,700	9,427	44%
Government Agency/Regulatory/Inspector	12,500	3,263	26%
Engineering/Architectural Design	58,200	13,053	22%
Lighting	68,300	8,339	12%
Construction	161,200	9,064	6%
Boilers/Water Heating Sales	56,000	3,263	6%
Other	55,800	2,901	5%
Motors	49,400	2,538	5%
Facility Operations and Maintenance	163,000	3,263	2%
Energy Technology Research/Consulting	N/A	5,801	N/A
Pumping/Hydraulic Equipment	N/A	2,175	N/A
Renewables	N/A	5,076	N/A
Don't Know/Refused	N/A	2,175	N/A

Source: Opinion Dynamics (2010) p. 58.

Fig WE&T -2: Industry Area Market Actors

There are numerous non-Energy Resource Center organizations that are established to provide core education and occupation-specific skills. The California Energy Efficiency Strategic Plan recognizes that, "an effective, comprehensive WE&T program for a new energy efficient economy requires collaborative efforts by many entities. It is not the core mission of utilities to effectuate the level of change needed to create a comprehensive WE&T program, nor can ratepayers fully fund the effort." In addition to the educational institutions themselves, participants in defining and/or providing energy efficiency workforce education and training resources include[165]:

Government Agencies

- California Department of Education
- Department of Labor
- Local, Regional and State Governments

Educational Institutions

- University of California and the California State University
- Community Colleges
- Private Colleges and Universities
- Technical Skills
- K-12 School Districts

[165] CA LTEESP p79

Community Based Organizations

- California Community Services and Development (CSD)
- California Workforce Investment Boards (WIBs)
- Workforce Training Programs

Industry and Labor Organizations

- Trade Unions and Apprenticeship Programs
- Home Rating Organizations
- Trade Associations

A brief overview of California's workforce system at various levels is below in Figure WE&T-3[166]

Focus	Type	# of Sites	Program Tracks	# of Sites in San Diego
Workforce Development	Workforce Investment Boards	49		1
	One-Stop Centers	259		11
	Regional Occupation Programs	_	211	17
Post-Secondary Education	Community Colleges	112	607	7
	Adult Schools	285	285	TBD
	Regional Occupation Centers	74	74	TBD
	CSU/UC	33	212	3
Other Training Resources	Community Based Organizations	_	39	TBD
	Apprenticeship (Joint/Unilateral)	_	265	TBD
	Private Training Organizations	15+	204	20
Certification Organizations (may not be exhaustive list)	• Building Performance Institute (BPI) • LEED • Northern American Technical Excellence (NATE) • Refrigeration Services Engineers Society (RSES) • No. American Board of Certified Energy Professionals (NABCEP)	N/A	N/A	N/A

Fig WE&T -3: Overview of CA Workforce System

These organizations target a specific set of market actors for certain skills, occupations, and career tracks. Offering multiple sources of education provides customers with their choice of how to receive access and the specific education and trainings that they prefer. Also, as every market actor has unique knowledge, they may need different "on-ramps" for education or specific training than someone else may need. However, energy efficiency is not the primary focus of many of these organizations. When it comes to training specifically for energy efficiency or renewable energy occupations, the majority of programs are offered by private organizations and the utilities. In many cases, these are skills upgrade training courses."[167]

[166] Source: Needs Assessment
[167] Source: Don Vial Center, Needs Assessment, 2011, p214

There is a variety of organizations to receive education that may sufficiently meet the needs of contractors; however, confusion of where to go and awareness of trainings is a greater obstacle than the number and availability.[168] Lack of coordination among these organizations and occupations they serve is lacking, organizations may address workforce education and training without the proper comprehensiveness needed to achieve future energy efficiency goals. And because every organization has different mission and goals, organizations have different driving needs. For example, the California Master Plan for Higher Education the higher educational institutions continue to provide a coherent system for post-secondary education, but no such coordination exists for the "middle skills occupations."[169]

It is not just incumbent workers that need training and education, but decision makers and end-users that need education. This is currently achieved through educational offerings targeting them, and to a lesser extent, the market actors selling EE themselves. Decision makers need to be educated about the reduction in energy use as an asset, but also that many non-energy benefits can be achieved, such as improved occupant comfort or lengthening the functioning life of assets. While we have seen customers adopt energy efficiency, there is still a need to increase uptake in energy efficiency projects and hiring skilled market actors to implement the projects.

Local WE&T Sector Market Characterization and Segmentation

The local San Diego market is similar to California as a whole in that consumption in the Commercial (45%) and Residential (37%) sectors represents similar amounts. However, what is quite unique is the more detailed make-up of these sectors is different, and as a result, the needs of our market actors are different from other areas in California to be successful. Analyzing this consumption information and EE potential, it becomes apparent that SDG&E focuses on the Commercial, Residential, and Public sectors and leverages the strengths of other organizations to address other sectors.

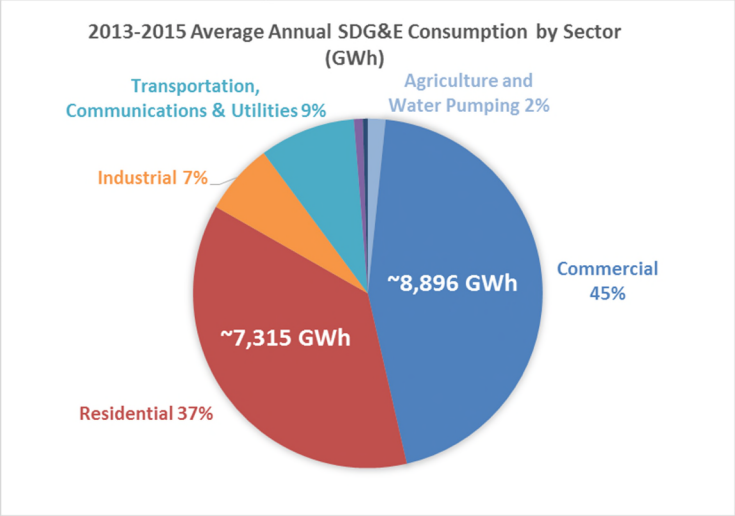


Fig WE&T-4: SDG&E Consumption by Sector

[168] Source: Opinion Dynamics, PY 2013 – 2014 California Statewide Workforce Education and Training Program: http://media.wix.com/ugd/0c9650_8c9c69a0e03345448957d2bb2c8e81a1.pdf
[169] Source: Don Vial Center, Needs Assessment, 2011, p 122, http://laborcenter.berkeley.edu/pdf/2011/WET_Part2.pdf

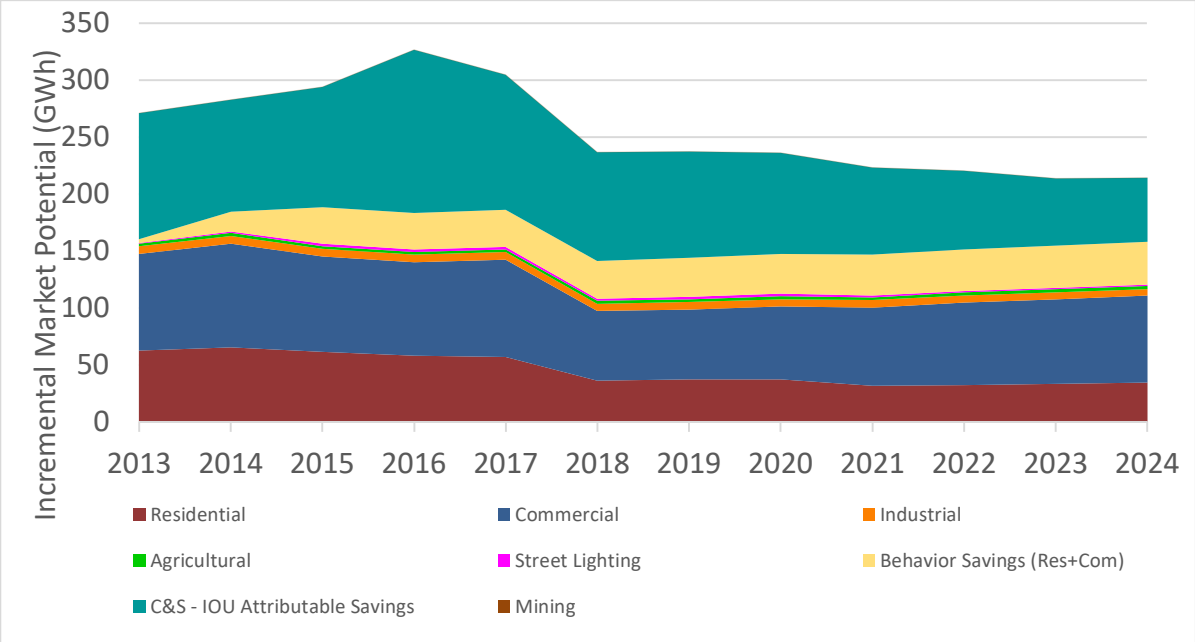
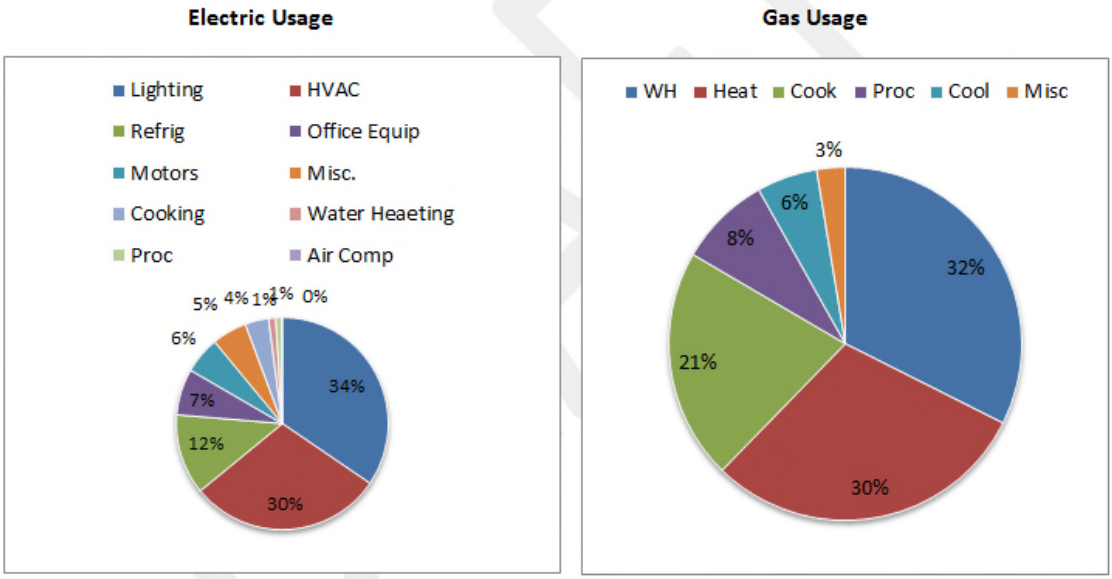


Figure WE&T-5: SDG&E Incremental GWh Market Potential

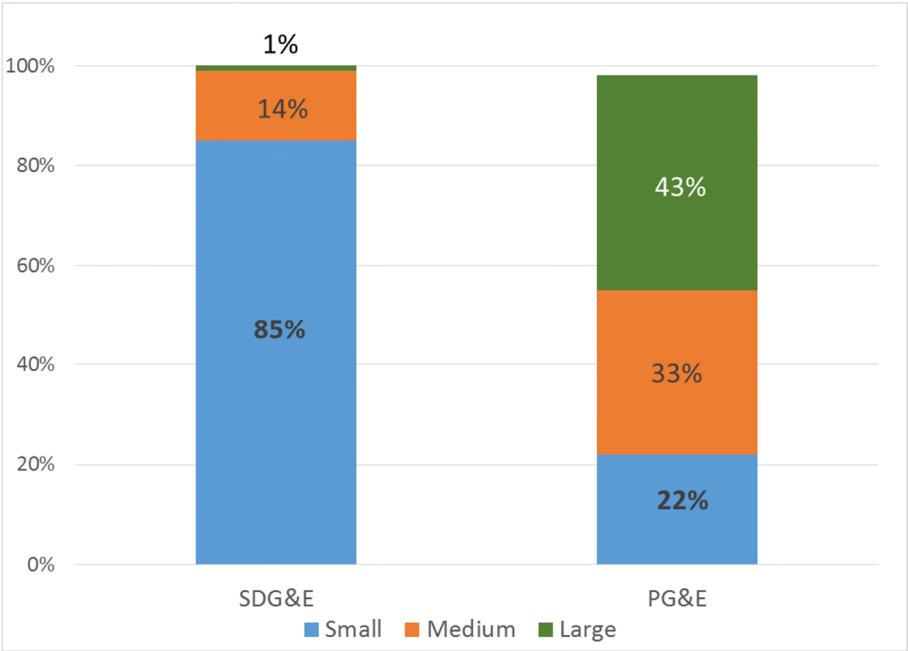
The Commercial sector is an important component to address in SDG&E's energy efficiency portfolio from a presence and impact perspective. Historically, this sector has represented more than 40% of SDG&E customers' total electric energy consumption and 42% of SDG&E's portfolio savings in the 2013-2015 program cycle. As SDG&E's largest sector by energy consumption, for SDG&E to support California in meeting its energy savings goal, this sector must be given attention. When analyzing electrical consumption by end-use, as shown in Figure WE&T-6, 34% is consumed by lighting and 30% is consumed by HVAC.

Figure WE&T-6: Commercial Sector Electric and Gas Consumption by End-Use



However, it can be difficult for market actors to reach these small customers(<20kW) that represent 85% of all SDG&E's commercial customers. Figure WE&T-7 shows this unique situation faced by SDG&E.

Figure WE&T-7: Commercial Customer Size by IOU Specific Definition (Based on Demand)



The Residential sector is also an important component to address for SDG&E's portfolio needs. Historically, this sector has represented more than 37% of SDG&E customers' total electric energy consumption, but only 21% of SDG&E's portfolio savings in the 2013-2015 program cycle. As an important sector, the residential sector must be successful in reducing energy consumption and adopting renewable energy to achieve ZNE by 2020.

Based on the Navigant market potential study, lighting is likely to drop in the coming years, but behavior/operation will contribute a substantial amount of savings going forward. The composition of owners and renters will mean different education and training is needed to accomplish our goals. Of the 1.2 customers, 45% are single family owners, 21% are single family renters, 8% are multifamily owners, and 26% are multifamily renters. To achieve energy savings in the residential sector, homeowner education should focus on the benefits of investing in energy efficiency and how to adjust their behaviors to achieve deeper energy savings. Special education will be needed to address the value of energy efficiency for both tenants and landlords.

The Public sector is an important sector to support as it can improve its own facilities as well as demonstrate leadership in the Commercial and Residential sectors. The public sector can use education about preventative maintenance of equipment, as well as better understanding codes for inspection and permit requirements.

Analyzing these primary sectors, it becomes apparent that certain sectors and end-uses need heightened focus for SDG&E to achieve its portfolio needs. These major areas are:

1) Skill enhancement for incumbent market actors, especially in regards to HVAC (Small Commercial & Residential) and comprehensive approaches
2) Operation & behavior education for residential and non-residential customers
3) Codes & Standards education
4) Complement clean energy training to prioritize energy efficiency training to achieve ZNE

To achieve SDG&E's energy efficiency potential, a skilled workforce is needed to reach these goals. The Clean Energy sector in San Diego County employs 28,597 workers, or about 1.25% of the total 1,511,300 employees.[170]

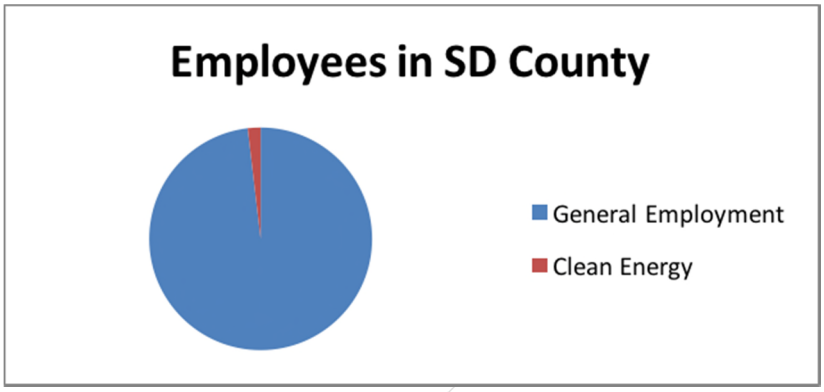


Fig WE&T-8: Clean Tech Employment in San Diego County

As 50% of employers in San Diego's Clean Energy industry are composed of 5 or less employees, market actors need a variety of specialized and cross-skill training, sales and project management to be successful. Workers who can sell rebate programs and discuss and calculate potential energy savings are highly valued because they can often generate more business for the employer.[171] This was valuable as over 80% of energy savings in 2015 were delivered by Trade Pros to commercial customers.[172] However, it is often difficult for contractors to let their people off work to attend several consecutive days of training, although they do realize the importance and value of training.[173]

After 2018, the energy efficiency potential market is set to expand in the Commercial sector. In alignment with the potential, the Clean Energy Industry is expecting employer growth in San Diego County, especially in the areas of HVAC and construction. For SDG&E to achieve energy savings potential as seen above, it will need to support incumbent workers with appropriate technical training on new technologies, as well as support any new workforce with the appropriate entry level skills needed to be successful.

[170] Source: Labor Force and Unemployment Rate for Cities and Census Designated Places. CA Employment Development Department, Sept 2016. http://www.labormarketinfo.edd.ca.gov/data/labor-force-and-unemployment-for-cities-and-census-areas.html
[171] Source: Clean Energy: Labor Market Analysis San Diego County. San Diego Workforce Partnership, Oct 2014. http://workforce.org/sites/default/files/pdfs/reports/industry/clean_energy_2014_0.pdf
[172] Internal SDG&E data
[173] Source: Whole House Retrofit, p15

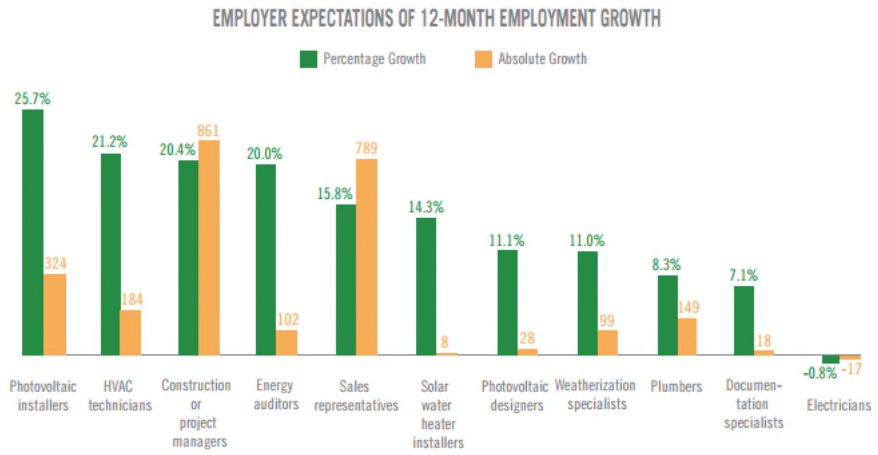


Fig WE&T-9: A Growing Workforce

To ensure that these incumbent and future market actors support the delivery of energy savings, they need to have the proper skills and training, understand how to participate in EE programs, and participate in continuing or advanced education. SDG&E will continue to facilitate a market that doesn't restrict participation for qualified workers, especially if California plans to achieve goals by 2020 (ZNE) and 2030 (ZNE and SB 350) of achieving goals by 2020 and 2030. Mandatory certifications and licenses can set standards of competency and creates value for workers, but can decrease access, including for disadvantaged workers.[174]

SDG&E supports collaboration with the commission, CEC, and stakeholders to fulfill SB 350's goal of a responsible contractor policy.[175] SDG&E will continue to require contractor qualifications and standards when appropriate so that safety and potential energy savings are fully realized. Standards already exist for certain occupations and are overseen by appropriate agencies, such as the Contractors State License Board and local Building Inspectors. Requiring policies that don't guarantee energy savings may hinder the energy efficiency market potential, as requiring certification may create a supply problem of available workers due to cost of certification, cost of renewal, and time needed to receive certification.[176]

The value proposition of energy efficiency should create demand for EE through engaged and informed decision makers who understand and appreciate the value proposition of EE and the importance of hiring skilled workers who must be trained to meet this need.

Energy Efficiency Market Potential

Workforce Education & Training is a non-resource program and thus, energy savings are not attributed directly to the Program. However, Workforce Education and Training Programs were found to offer significant indirect impact between 2006 and 2008. During this time frame, it is estimated that statewide, the Energy Centers combined yearly gross impact of approximately 700 GWh, annual gas savings of approximately 6 million net therms, and 30,000 metric tons of avoided carbon-dioxide. The

[174] Source: Don Vial Center, Needs Assessment, p 276. http://laborcenter.berkeley.edu/pdf/2011/WET_Part2.pdf
[175] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350
[176] Source: CALMAC Lighting Study, p69, http://www.calmac.org/publications/Lighting_Controls_Training_Assessment_Report_2016-04-08b.pdf

net savings of the Energy Centers are estimated to provide an additional 5% to the overall projected energy impact of the portfolio.[177]

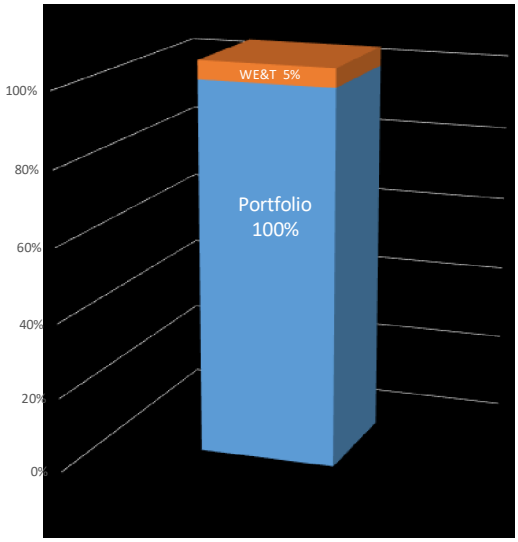


Fig. WE&T-10: Statewide WE&T Savings Impact on Portfolio Energy Savings

Overview of Current Offerings

Historically, WE&T has been structured as three sub-programs: Centergies, Connections, and Strategic Planning. A brief description of the current offerings is below:

Centergies: The Centergies sub-program provides a range of different educational offerings at the seven Energy Centers and other locations throughout the state. The target audience had been primarily incumbent market actors, such as designers, engineers, HVAC technicians, contractors, and building operators. This is achieved independently and with ad-hoc collaboration with other education organizations.

Connections: The Connections sub-program incorporates Energy Efficiency knowledge into K-12 curriculum and raises awareness about careers and jobs in the energy efficiency industry.

Strategic Planning: The Strategic Planning sub-program encompasses activities that were specifically designed to support the CA EESP.

Working collaboratively with the other IOU Energy Centers, the WE&T program has offered a wide breadth and depth of education to various market actors and decision makers. As shown in Figure WE&T-11, statewide, the IOUs have offered education in a number of categories during the 2013-2015 program cycle:

[177] Source: Opinion Dynamics Corporation, Indirect Impact Evaluation of the Statewide Energy Efficiency Education and Training Program, 2006 – 2008. p3. http://www.calmac.org/publications/06-08_Statewide_Education_and_Training_Impact_Eval_Vol_I_FINAL.pdf

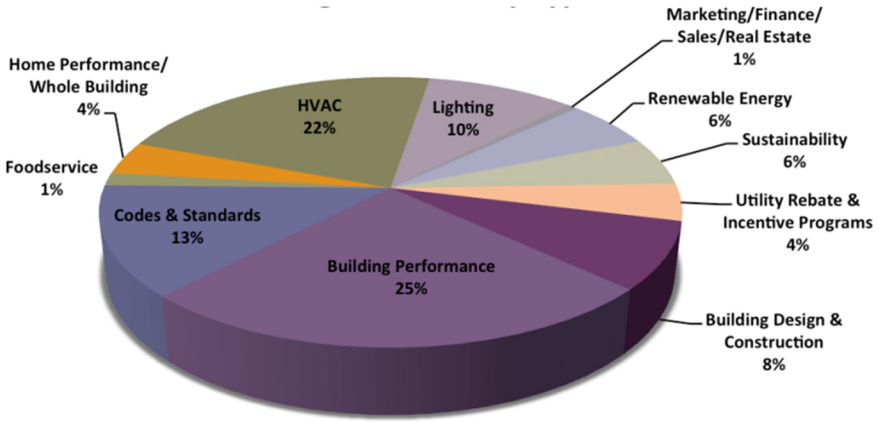


Fig. WE&T-11: Education Categories by IOUs 2013-15

SDG&E has focused in on its specific needs to target its offerings mainly to the commercial sector and residential sector with a major emphasis on IOU Program training, HVAC, and Codes & Standards.

Sector / End-Use	% of Seminars Offered	% of Participants Attended
Codes & Standards	9%	8%
HVAC	11%	20%
Utility Rebate & Incentive Programs Training	16%	11%
General Non-Residential	32%	29%
Lighting	7%	6%
Sustainability & Renewable Energy	12%	13%
Residential (Home Performance & Home Owner)	8%	4%
Residential (Home Owner)	4%	8%

Fig. WE&T-12: Seminars and Attendees by End-Use

Future Trends

There are a number of future trends that the Workforce Education & Training programs seeks to address to ensure that SDG&E's goals are met and barriers are overcome.

First, the Workforce Education & Training program will re-align the sub-programs to better clarify goals and activities. This will clarify how the program supports the needs of California and local markets and clearly define WE&T's role with other educational institutions that provide core energy education See the Future Look table, Figure WE&T-15, for a graphic display of proposed realignment.

Another major trend is to better align program metrics with knowledge and learning outcomes and move away from the current metrics of a focus purely on number of educational offerings given in a year. While we will continue to track this information, a greater emphasis and reporting structure will focus on more appropriate metrics as described below in the Metric Section.

As described in the market characterization above, there are plenty of educational offerings available, so SDG&E will specifically target appropriate audiences and provide more appropriate titles and

descriptions, so that potential attendees are aware of what is available to them, why it is valuable for them to attend, and what some of the desired outcomes of attending will be.

Analyzing current market data as soon as it becomes available in conjunction with continual review of SDG&E's portfolio should allow the program to offer better timed and more appropriate classes as needed. An example is that home performance offerings were few and attendance was minimal, so an decrease in classes offered drove attendance up. Then with knowledge of offerings and demonstrated value, a significant reduction in classes (~50% reduction) resulted in minimal reduction of attendance (~10% reduction).

A major trend that needs to be addressed is education for market actors to "sell the value proposition of energy efficiency" and manage customers' energy efficiency projects. Decision makers will continue to receive attention and education, but is important for market actors to be able to support the demand for projects and their skills, as well as be more valuable for their employers.

Continual education will remain a trend, especially in certain areas such as Codes & Standards, new technologies, and new tools. Code education gets updated every 3 years and market actors, decision makers, and building inspectors need to be educated on the latest code requirements. This is also a great potential for SDG&E to collaborate with appropriate organizations to "train-the-trainers" on code changes, so that they are appropriately infused in the curriculum of other organizations.

Legislative Impacts on Strategy

The table on the next page, Figure WE&T-13, shows a few of the major legislation that impacts WE&T. Other efforts oriented to benchmarking, market transformation among others will likely be adopted in some form impacting how and what WE&T should focus on in the coming years. WE&T will need to be agile and flexible to respond to this dynamic environment and be innovative in the future.

Fig. WE&T-13: Responses to Legislative Policy		
Policy Driver	**Specific Requirement / Guidance**	**Business Plan Response**
SB 350 - Clean Energy and Pollution Reduction Act of 2015	* Achieve a cumulative doubling of savings in electricity and gas retail customers final end uses by 1/1/30. * The CEC shall adopt a responsible contractor policy to ensure that ratepayer-funded EE retrofits meet high-quality performance standards and reduce energy savings lost or foregone due to poor-quality workmanship. * Workforce development and job training for residents in disadvantaged communities, including veterans, at-risk youth, and members of the state and local community conservation corps.	* WE&T offerings will prepare the workforce to achieve a doubling of EE through educational opportunities that provide technical training, continuing education, and certifications as well as reducing confusion for workers considering these educational opportunities. * SDG&E will collaborate with the commission on the adoption, implementation, and enforcement of a responsible contractor policy * Will continue to educate participants from disadvantaged communities, and propose a new SW-Career & Workforce Readiness program
AB 793 - Energy Management Technology Incentive Offering	Must develop programs by 1/1/17 that provide incentives to help residential and small/medium business customers acquire energy management technology and educate them about these programs.	* SDG&E may facilitate the development or enhancement of market actor education on how to properly design, install, or maintain home energy management technology, based on any gaps in the market for this education. • SDG&E may facilitate the development or enhancement of home-owner education on how to properly use energy management technology. Example tactics may include "how-to" videos or manuals.
AB758 - Existing Buildings Energy Efficiency Action Plan	3.3 - Implement WE&T strategies that integrate Knowledge, Skills & Abilities with WE&T curriculum; update training to include best practice building science and code requirements. 3.3.4 - Train contractors and other market actors to sell energy efficiency. 3.3.6 - Include special skills training in core WE&T activities to help meet demand, spur innovation, and increase the body of knowledgeable building professionals.	* Will include special skills training (i.e.. Retrocommissioning, facility management) in core WE&T activities to help meet demand and increase the body of knowledgeable building professionals. * WE&T offerings will train contractors how to sell energy efficiency to customers. * Will provide education and training around dynamic code changes, new technologies, and skills needed to meet legislative needs (such as ZNE Design, Benchmarking and Retrocomissioning)
AB 802 - Benchmarking and Changes to Energy Efficiency Baselines	**Benchmarking** - By 1/1/17, for multi-unit buildings, utilities must provide aggregated energy usage data to its owner, its agent or the building operator. Commission will set requirements for public disclosure of information for benchmarking purposes. **Baselines** - Authorizes utilities to provide incentives to customers for energy efficiency projects based on normalized metered energy consumption as a measure of energy savings.	* Will provide education and training around dynamic code changes, new technologies, and skills needed to meet legislative needs (such as ZNE Design, Benchmarking and Retrocomissioning) • Will educate contractors and building operators how to benchmark energy usage and software in facilities so they understand their energy use • Will educate decision makers about the value of benchmarking and the increase in value of their investments for the purpose of selling or leasing their property

Goals, Strategies, and Tactics for the Workforce Education & Training Sector

SDG&E will continue implementing to coordinate with appropriate organizations that are throughout the state to influence education, but it will continue to focus on specific needs of its local market while addressing statewide needs, such as:

- Data driven approach to optimize the number of basic, intermediate, advance courses and topics
- Identify companies and engage firms that are ideal for cross-skills trainings for a more comprehensive approach to energy projects
- Participation in California Energy Efficiency Rebates & Incentive Programs
- Codes & Standards
- Access and support for future and potential workers through statewide efforts
- Collaboration with appropriate organizations and educational institutions to infuse and expand energy efficiency curriculum into their offerings

The strategies and tactics proposed in this business plan will expand the existing programs, supplement them, and drive participation in them. These are summarized below in Figure WE&T-14 below.

Figure WE&T-14: Goals/Strategies/Tactics Summary

Goal	Strategy	Tactics	New, Existing, Modified	Short, Mid, Long-Term
WE&T offerings prepare workforce to meet California's goal of doubling EE savings by 2030, by reaching X number of market actors and achieving Y% of demonstrating competency.	Deliver technical training, continuing education, and certifications to ensure a trained and skilled workforce can deliver energy savings.	• Provide education and training around dynamic code changes, new technologies, and skills needed to meet legislative • Support certification so that market recognition of acquired skills or competency is available • Provide access to tools and tool-trainings that will allow workers to more efficiently work and achieve better results • Incorporate integrated demand side management approaches into current offerings	Existing	Short
	Collaborate with appropriate organizations of California's education system to expand the reach & access of energy efficiency education.	• Development and/or enhancement of current or new curriculum • Stakeholder Engagement Forum • A gap analysis to see what the current challenges are for core curriculum to achieve legislative mandates, such as ZNE performance.	Modified	Mid

Goal	Strategy	Tactics	New, Existing, Modified	Short, Mid, Long-Term
	Educate decision makers on the value proposition of energy efficiency and hiring skilled workers to implement projects	• Educate decision makers about the return on investment for energy efficiency projects • Educate decision makers about the value of hiring skilled • Educate decision makers about the additional benefits to EE projects outside of energy reduction	Modified	Short
WE&T offerings will increase the participant knowledge gain by X% for SDG&E's targeted audience in the sector plans. See Figure WE&T-14: Goals/Strategies/Tactics Summary.	Commercial Strategy: Transform tenant energy savings into asset value for property owners.	• Educate tenants to include concepts such as benchmarked energy costs when evaluating rental properties as well as how to choose contractors and access financing • Educate landlords/property managers about the need to use building operators & facility managers who are knowledgeable about energy measures to ensure proper maintenance and operation. • Hold benchmarking classes to ensure a market of workers who can benchmark buildings	Modified	Short-Mid
	Residential Strategy: Empower customers to better manage their energy usage	• TBD	TBD	TBD
	Public Strategy: Educate leaders to make informed decisions	• highlight the value of EE, • promote market acceptance by educating both internal public stakeholders and external constituents on how to enable EE projects and improve compliance, and ensure that a skilled and trained workforce properly installs and maintains equipment	New	Short

Goal	Strategy	Tactics	New, Existing, Modified	Short, Mid, Long-Term
	Industrial Strategy: Unlock deeper svings through SEM	Educate and train industrial customers to identify process savings and how to achieve deeper savings through Strategic Energy Management.	New	Short
	Agricultural Strategy: Expand the Use of Third Parties to Develop and Deliver Intervention Strategies	• Work with 3rd Party that can provide specific education and training to agricultural customers, including the Agricultural Strategic Energy Management. Outsource targeted and potentially on-site training	New	Short
WE&T Offerings support Statewide Career Connections and Statewide Career & Workforce Readiness Programs.	Promote Statewide - Career Awareness/Connections and Statewide - Career Readiness to support the availability of workers for the cited talent shortage	• SW - Connections	Modified	Short
		• SW – Career & Workforce Readiness	New	

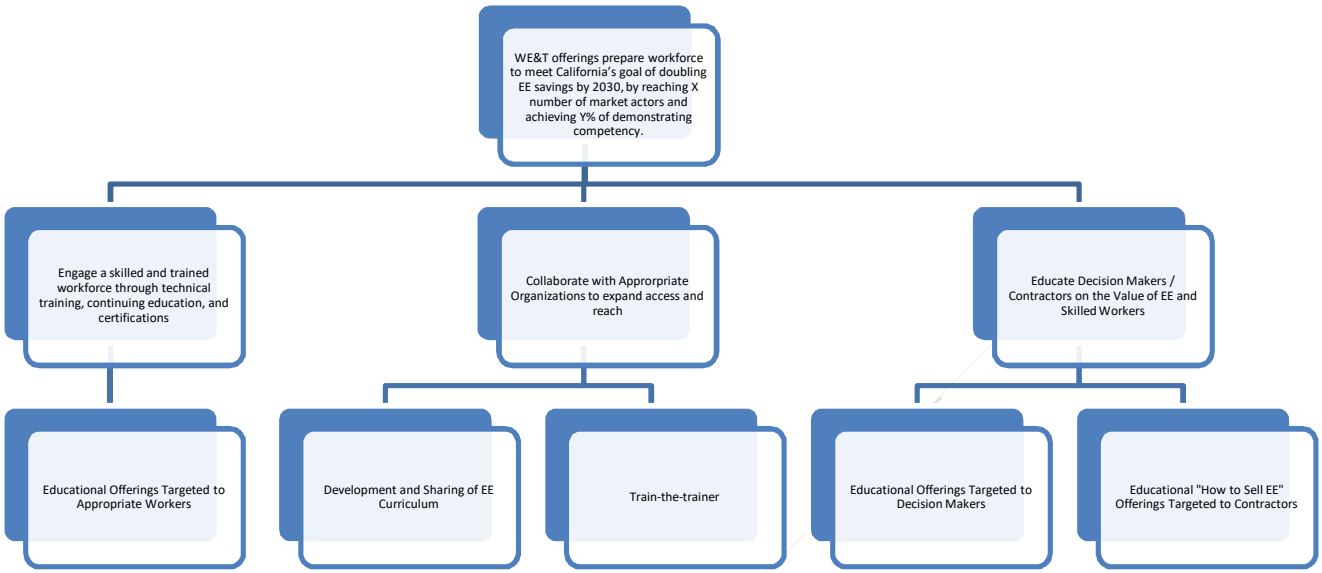
Goal 1: WE&T offerings prepare workforce to meet California's goal of doubling EE savings by 2030, by reaching X number of market actors and achieving Y% of demonstrating competency.

> *"However, in order to achieve the very ambitious energy conservation targets set forth in the Strategic Plan and other policies, increasingly complex energy conservation measures and programs are needed. Energy efficiency jobs in the near future will require additional knowledge, skills, and abilities (KSAs) to complete this more complex work than were required for past EE success."*[178]

To meet California's goal of doubling EE savings, the WE&T program must undertake multiple strategies to ensure that the workforce receives the knowledge, skills, and abilities that will be required to meet future EE success. These strategies will entail ensuring proper educational offerings provide the appropriate skill training, that other education organizations infuse energy efficiency into their core

[178] Source: Don Vial Center, Workforce Issues and Energy Efficiency, p2. http://laborcenter.berkeley.edu/pdf/2014/WET-Plan-Executive-Summary14.pdf,

curriculum, and that decision makers understand the value proposition of energy efficiency and hiring a skilled workforce to implement projects.



Strategy: Deliver technical training, continuing education, and certifications to ensure a trained and skilled workforce can deliver energy savings.

> *"There may be a need for skills upgrade training for incumbent workers for new "beyond-code" technologies. Nevertheless, there can be a lag time for upgrading curriculum as the most cutting-edge energy efficiency and renewable energy skills and technology penetrate the market."*[179]

Continuing education is needed to achieve energy efficiency potential. Codes, technologies, and tools are dynamic, and it is important for incumbent workers to be educated and trained to fully realize energy savings and remain competitive in the marketplace. Educational offerings will have to be delivered through multiple approaches (classroom, hands-on, online), as there are a number of factors that can prevent market actors from taking training, including the economy, size of company, or time of day.[180]

Educational offerings will need to be tailored to multiple audiences, as there is a substantial difference in the needs and issues between sectors, and even size of buildings within sectors, such as small commercial versus large commercial. However, educating contractors across end-uses will become important so that integrated and comprehensive approaches are undertaken. To realize EE savings in the future, more knowledge about whole areas is needed.

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[179] Source: Don Vial Center, Prop 39 Jobs Training, 2013, p17. http://laborcenter.berkeley.edu/pdf/2013/prop39_jobs_training.pdf

[180] Source: Critical Data Gaps Assessment, p11. http://www.calmac.org/publications/2013-2014_WET_PTLM_and_Critical_Data_Gap_Assessment.pdf

Many occupations have the ability to influence EE savings, but the job may not have a traditionally clean energy focus. These occupations will need to receive relevant education to apply their knowledge to help realize energy savings.

Education around proper building operation will be important for commercial and residential customers to realize savings once equipment and systems have been properly designed, installed, and maintained.

In addition to offering educational trainings, it will be crucial that targeting the appropriate audience and getting them to come occurs. This will occur through targeted marketing efforts, better descriptions of classes, and demonstrating the value of what expected learning outcomes will be for the market actor.

Sample Tactics

Two primary tactics are needed to implement the strategy above. The first tactic is educational offerings that provide technical training, continuing education, and market signals of competency such as certifications. Some example tactics this effort will be to:

- Provide education and training around dynamic code changes, new technologies, and skills needed to meet legislative needs (such as ZNE Design, Benchmarking for AB 802 and Retrocomissioning for AB 758)
- Support certification so that market recognition of acquired skills or competency is available
- Provide access to tools and tool-trainings that will allow workers to more efficiently work and achieve better results
- Incorporate integrated demand side management approaches into current offerings
- Allow for third parties to bid on specific trainings that are needed

The second tactic will reduce confusion for workers considering educational offerings and make it easier for potential participants to find training options in their areas. Thisobjective may be accomplished by:

- Targeted marketing to workers to alert them about appropriate classes
- Providing a training roadmap of offerings to help workers understand related courses
- Interactive training calendar available on website to promote and list educational offerings as they become available.
- Classify educational offerings as stand-alone, series, certification or continuing education (CEU), and include level of difficulty (Basic, Intermediate, Advanced)

Strategy: Collaborate with appropriate organizations of California's education system to expand the reach & access of energy efficiency education.

> *"An effective, comprehensive WE&T program for a new energy efficient economy requires collaborative efforts by many entities."*[181]

Workforce education and training organizations do not have a primary focus on the skills and training that is needed to achieve California's economic potential for energy efficiency. It will become important for SDG&E to engage and collaborate with appropriate organizations to expand access for market actors to receive energy efficiency education from their choice of existing training pathways. Additionally, it is critical that market actors receive information that is timely and correct. A gap analysis will be needed to identify and understand where curriculum support is needed for each organization.

[181] Source: CA LTSEEP, p 70

SDG&E will collaborate with individual training providers and non-profits, but also facilitate collaboration amongst a variety of organizations through stakeholder engagement opportunities. Such an environment will allow organizations to share ideas, collaborate, and improve energy efficiency education without additional ratepayer funding. Collaboration will facilitate consistent standards of education and should result in better quality assurance adoption of work performance and become a market norm[182].

Core educational institutions may have different needs, but a common action could benefit multiple organizations. This would be train-the-trainer actions, where educators themselves receive the latest education regarding new technologies or changes in code and learn effective teaching methods.

SDG&E will collaborate with organizations to enhance or develop curriculum offerings with energy efficiency expertise. Whether it is reviewing and refining material for an update or collaboration for development of new materials, SDG&E will collaborate with other organizations to support curriculum enhancement and development.

Increase the dissemination and reduce the cost of educational offerings that are created using EE funds. SDG&E will work to reduce the cost of these offerings as they should become cheaper to administer, with funding mainly support refreshing of materials and potentially train-the-trainers.

WE&T funding could be used to support the development of new or enhanced trainings with "seed funding" to kick start development of new educational offerings. Once caveat is that funding recipients would identify funding sources to sustain funding or sunset. Organizations will be required to submit a plan for self-sufficiency when applying for "seed funding," with a timeline and achievable metrics.

Sample Tactics

Two primary tactics are needed to implement the strategy above. The first tactic supports stakeholder engagement. Some sample tactics of this effort may be:

- Host stakeholder engagement forums that invites organizations to network, share ideas, collaborate and prioritize actions to be taken
- Promote cross-skills training and collaboration between organizations to achieve California's EE goals
- Suvery training providers to identify EE gaps in core curriculum to achieve legislative mandates, such as ZNE performance.

The second series of tactics address specific steps that SDG&E may undertake with organizations that will be specific to their individual needs. Some examples may be:

- Train-the-trainer sessions on new technologies and codes
- Development and/or enhancement of current or new curriculum
- Work with third parties to leverage expertise to address specific training needs

[182] Source: CA HVAC Contractor and Technician Behavior Study Phase II

Strategy: Educate decision makers on the value proposition of energy efficiency and hiring skilled workers to implement projects

> *"There was general agreement, though, that there is not much demand for certified installers among customers or general contractors."*[183]

Decision makers need to understand the value proposition of energy efficiency and the importance of hiring skilled workers to implement projects. An increase in demand for comprehensive energy efficiency projects will have a major impact on the workforce. As more projects are designed, installed and maintained, there will be a need for a trained workforce that can deliver savings.

Educational offerings will inform decision makers that an investment in energy efficiency results in a greater return on their investment, and that the investment includes non-energy benefits like increased comfort and productivity.

Just as decision need to understand the value proposition of EE, Market Actors must understand how to effective position and sell it. This will help realize energy efficiency potential, increase their value, and continue to drive business opportunities for them. This education involves not only selling, but being able to bid and manage work. If contractors can sell EE as an investment, contractors will win customer business.[184]

In addition to market actors selling energy efficiency, market actors must maintain work quality standards so that investments in projects are properly realized. "In very broad terms, work quality can be described as: 'a system that meets customer needs, delivers energy savings, complies with all relevant code, and continues to function as designed over time." Seven major elements go into work quality: Design, Code Compliance, Commissioning, Installation, Functionality, Persistence, and Occupant Satisfaction.[185]

Sample Tactics

Tactics are needed to implement the strategy above. The first series of sample tactics focus on educational offerings directed towards decision makers to demonstrate the value proposition of energy efficiency as an investment and not a cost. Some example tactics of this effort will be:

- Educate decision makers about the return on investment for energy efficiency projects, including available rebate and incentive programs.
- Educate decision makers about the value of hiring skilled workers to ensure that their investment is fully realized and that a project is designed, installed, or maintained properly.
- Educate decision makers about the additional benefits to EE projects outside of energy reduction, such as improved occupancy comfort.

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[183] Source: Lighting Control Training Assessment, http://www.calmac.org/publications/Lighting_Controls_Training_Assessment_Report_2016-04-08b.pdf, p68

[184] Source: Western HVAC Performance Alliance 2016. Recommendations to Operationalize Employer Support for the HVAC Sector Strategy

[185] Source: Lighting Control Training Assessment, 2016. P 72. http://www.calmac.org/publications/Lighting_Controls_Training_Assessment_Report_2016-04-08b.pdf

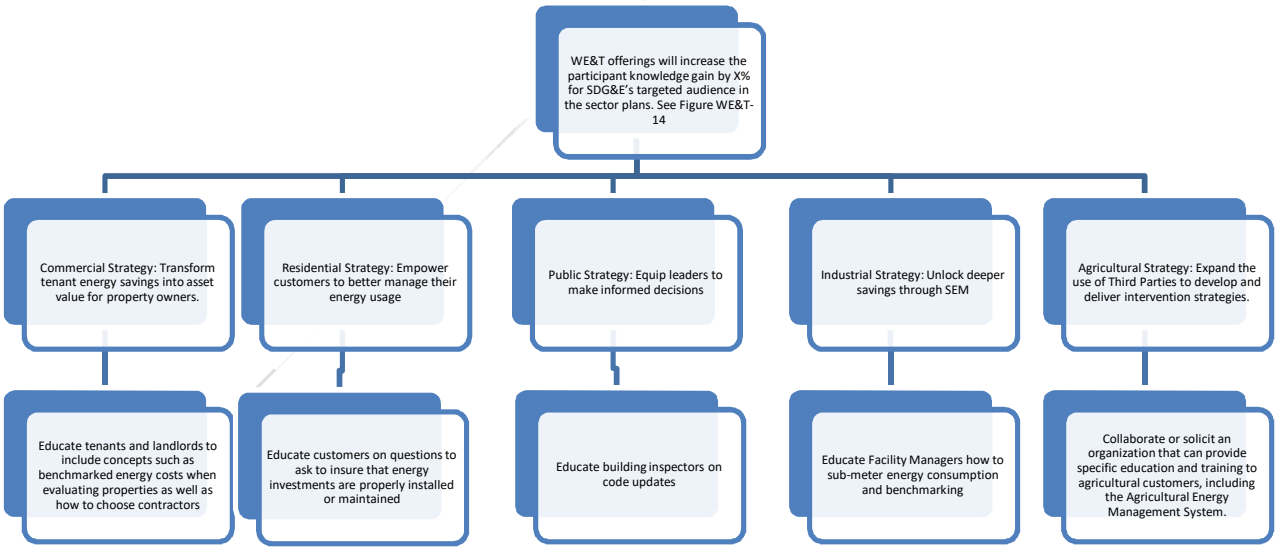
The second tactic supports educating workers on how to "sell Energy Efficiency." This will allow them to "sell" the value of energy efficiency. Some example tactics of this effort include:

- Educate contractors how to "sell Energy Efficiency" and how to bid for and manage customer business.
- Educate contractors how to sell additional benefits of projects and just the reduced energy savings aspect.

Goal 2: WE&T offerings will increase the participant knowledge gain by X% for SDG&E's targeted audience in the sector plans. See Figure WE&T-14: Goals/Strategies/Tactics Summary.

In addition to supporting California's goals, Workforce Education & Training is necessary for SDG&E to accomplish its EE Portfolio goals based on the local needs of its unique market. Local coordination and focus is important based on the customer makeup of San Diego as seen in the Market Characterization.

SDG&E will continue to offer successful education and collaborate with organizations where appropriate. General focus will include major energy end-uses (such as HVAC, lighting) and proper design, installation, and maintenance. This goal is to further address the specific goals and strategies as highlighted in their respective chapters and provide clarification to the new or enhanced strategies SDG&E is taking. The following strategies and tactics are not exhaustive of the approach and offerings that SDG&E will be offering. Because a specific end-use or customer is not addressed, does not imply that offerings will not be available for that area. The graphic below highlights only one major strategy and tactic per sector, but is not exhaustive. Reference other chapters.



Commercial

Commercial Goal: Improve the EE Penetration in the Property Management Market by X%

As described in the Market Characterization section, it is clear that SDG&E's commercial sector is dominated by very small businesses. Because San Diego is a city of small businesses who lease, rather than own, their facilities, property management companies hold the key to reaching the majority of our commercial customers. The CPUC has identified leased space as hard-to-reach because of the split

incentive situation, AB 758 identifies property owners and occupants as targets for a data driven approaches, and SDG&E recognizes that achieving ongoing energy savings in this important market requires a new approach. SDG&E proposes to increase customer uptake in this hard to reach segment by approaching small commercial properties through their property managers.

Commercial Strategy: Transform tenant energy savings into asset value for property owners. Workforce Education & Training can support this commercial sector goal strategy by educating property owners, real estate agents, tenants, market actors, and facility maintenance workers in the value proposition of energy efficiency, how to consider a building as a "whole system, and educate on proper installation and maintenance on end-uses for market actors. Decision makers need to understand the value proposition of energy efficiency and implement projects. They also need to be educated about the value of hiring skilled contractors to ensure that maintenance and operations are properly conducted. As well as educating these customers, workforce training can provide offerings to ensure that market actors are skilled in designing, installing, and maintaining equipment. This will allow customers to have trust that their investment is worthwhile.

Some of these tactics include:

- Educate tenants to include concepts such as benchmarked energy costs when evaluating rental properties as well as how to choose contractors and access financing
- Educate landlords/property managers about the need to use building operators & facility managers who are knowledgeable about energy measures to ensure proper maintenance and operation.
- Facilitate market acceptance through workforce, education and training for trade professionals:
    - Understanding and selling the value proposition of high efficiency equipment.
    - Providing access to tools that showcase the value to customers (sales tools as well as measurement tools from WE&T lending libraries).
    - Educational offerings and certifications that promote quality installation and maintenance.
- Hold benchmarking classes to ensure a market of workers who can benchmark buildings

Residential

Residential Goal: Increase energy efficiency savings in the residential sector by X% through improved customer experience by providing engaging self-service tools and data driven insights.

As mentioned in the market characterization section, the residential sector makes up 1.3M accounts in the SDG&E service territory, 37% of the portfolio's consumption, and only 21% of the savings. Therefore it is important to address some of the trends that affect this sector's growing consumption, and also address why there may be a low uptake in some of the programs developed to help customers save energy.

Energy efficiency typically competes with other customer interests and is not a top focus for many customers. Many energy efficient products have a high cost and low ROI; therefore, it is incumbent upon SDG&E to elevate awareness and participation through an enhanced customer experience.

Residential Strategy: Empower customers to better manage their energy usage

Workforce Education & Training can support this residential goal by providing education to home owners and tenants about home audit tools and how to take action. Customers will be directed to complete an audit/energy efficiency survey that will not only provide energy efficiency recommendations but also provide information on other resources available for a whole home approach. By making customers aware of utility rebates and efficient appliances, customers will have the knowledge and tools to adopt energy efficiency into their lifestyle and utilize home energy management systems.

Some of these sample tactics include:

- Educating customers how to utilize a home energy audit tool.
- Educating customers on questions to ask to insure that energy investments are properly installed or maintained, especially in regards to HVAC and home energy management systems.

Residential Goal: Increase energy efficiency participation in the multifamily sector by X% through an approach targeting both tenants and property owners

Multifamily accounts make up 34% of the 1.3 million accounts within SDG&E's service territories and account for 39% of electric consumption, yet they only account for 25% of electric savings generated through our energy savings programs. Multifamily accounts for 44% of gas consumption and 54% of gas savings generated through energy savings programs.

Residential Strategy: Promote Increased Value of Asset, Generated by Energy Efficiency and ZNE to Property Owners

Workforce Education & Training can support this residential goal by providing education and tools to market actors in design, construction, and facility maintenance. Educate decision makers to value proposition of energy efficiency in their unit.

Some of these sample tactics include:

- Educate building owners about the value of energy efficiency to sell to potential renters

Public

Public Goal: Empower Leaders by equipping them with knowledge and tools to make informed EE decisions

Public sector officials and staff can have significant impacts on communities' and on energy usage in the buildings they affect. Staff training and skills building is important to ensuring that those who can influence energy use decisions are adequately prepared.

Public Strategy: Equip leaders with knowledge and tools to make informed decisions

Workforce Education & Training can support SDG&E's Public Sector by offering public officials skills-based training in environmental and, more specifically, energy leadership. This would include educating leaders on the value of energy efficient projects including energy reduction and other benefits, such as improved occupancy comfort and lengthening the life of equipment.

Industrial

Industrial Goal: Double the Energy Efficiency Participation by the Industrial Sector.

The industrial sector has been historically underrepresented in the energy efficiency arena for a number of reasons. Industrial sector customers tend to have highly specialized, sometimes proprietary systems

which necessitate a customized approach to energy efficiency, but can inhibit cost effectiveness. Also, energy efficiency competes for customer attention and financing.

Industrial Strategy: Add value by bringing external industry expertise that will drive customer participation in programs and encourage customers on continued path towards deeper savings.

Workforce Education & Training can support SDG&E's Industrial sector through collaboration or solicitations with other organizations that have the specific knowledge to address unique aspects of the industrial sector. It may be important for a trusted organization to provide the necessary education around the Industrial Energy Management System so that industrial customers can discuss through their specific questions.

Traditional Workforce Education & Training programs will continue to support Industrial sector customers through traditional end-use support. There are support buildings such as office, warehouse, and delivery space that may need support addressing building envelope, energy efficient lighting, or HVAC support. These support areas will benefit from market actors who are educated in these areas and contracted for this work. This design, installation, and maintenance will be important to reach energy efficiency potential in this sector.

Some of these sample tactics include:

- Educate Facility Managers or other market actors on how to sub-meter energy areas and provide training on benchmarking so that industrial customers can better track where their energy consumption occurs.
- Work with a third party who can provide specific industrial-process education and training to industrial customers, including the Industrial Strategic Energy Management.
- Educate market actors who provide design, installation, and maintenance for industrial customers

Agricultural

Agricultural Goal: Double the Energy Efficiency Participation by the Agricultural Sector.

SDG&E's has historically characterized the agricultural sector as a single segment: growers. Further analysis reveals that this single segment is actually a wide variety of sub-segments such as: livestock and poultry, livestock and poultry products, and miscellaneous products and services that include industries like apiculture, cattle feedlots, and aquaculture. The findings and recommendations from the Evergreen Economics study indicate that the manner in which SDG&E has implemented agricultural programs has not been wildly successful and therefore a complete bottom up assessment has been completed. SDG&E sees this as an opportunity to collaborate with third-party implementers to better serve this market and as such SDG&E intends to issue solicitations for this entire sector with the hopes to attract third parties that are embedded in the agricultural markets, have relationships with distributers and suppliers and can achieve the energy savings goals.

Agricultural Strategy: Expand the Use of Third Parties to Develop and Deliver Intervention Strategies

Workforce Education & Training can support SDG&E's Agricultural sector through collaboration or solicitations with other organizations that have the specific knowledge to address unique aspects of the agricultural sector. It may be important for a trusted organization to provide the necessary education around the Agricultural Energy Management System so that agricultural customers can discuss through their specific questions.

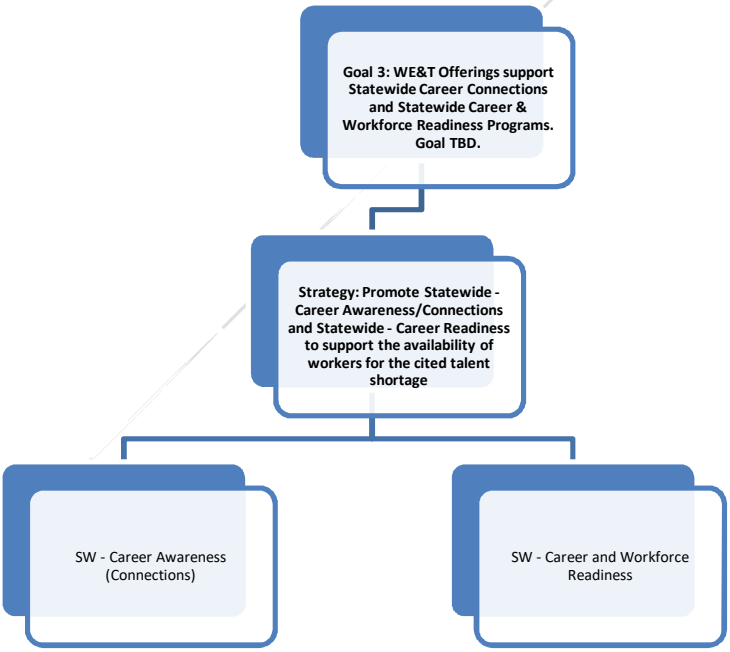
Traditional Workforce Education & Training programs will continue to support Agricultural sector customers through traditional end-use support. There are support buildings such as office, warehouse, and delivery space that may need support addressing building envelope, energy efficient lighting, or HVAC support. These support areas will benefit from market actors who are educated in these areas and contracted for this work. This design, installation, and maintenance will be important to reach energy efficiency potential in this sector.

Some of these example tactics include:

- Collaborate or solicit an organization that can provide specific education and training to agricultural customers, including the Agricultural Strategic Energy Management.
- Educate market actors who provide design, installation, and maintenance for agricultural customers' support buildings, such as office and delivery space.

Goal 3: WE&T Offerings support Statewide Career Connections and Statewide Career & Workforce Readiness Programs. Goal TBD.

"There is a magnitude of talent shortage perceived for the energy workforce with a national expectation that available jobs are expected to double from 1.7 million to 3 million. However, when asked what issues of most concern are, the two most important issues were (1) the aging workforce who is expected to retire and leave the workforce, and (2) a lack of qualified workers who will be able to replace retirees." (Manpower, p13)



Strategy: Promote Statewide - Career Awareness/Connections and Statewide - Career Readiness to support the availability of workers for the cited talent shortage

Per the recent Decision, certain programs will be administered by one program administrator and implemented by one or more third-party implementers on a state-wide basis. The current sub-program,

Connections, and a new proposed sub-program, Career & Workforce Readiness, will be administered by a lead PA.

There is a belief that is an upcoming worker shortage will exist in the energy workforce. To support available supply of market actors, SDG&E will serve as lead administer or as a coordinating PA to support these programs.

An area to address this worker shortage is by engaging students who are in K-12 schools and need to be exposed to jobs and careers in energy efficiency. EE infusion into curriculum and increased awareness of the current and potential jobs will be explored.

Another potential area to address this worker shortage is through disadvantaged communities that face low wages and high unemployment rates. SDG&E will collaborate to infuse energy efficiency into organizations that are funded to support these potential workers.

Sample Tactics

Two primary tactics are needed to implement the strategy above. The first tactic focuses on career awareness and education for students in grades K-12. This program will be Statewide Administered and bid out to 3rd party contractors.

The second tactic focuses on career awareness and readiness for disadvantaged communities. This program will be Statewide Administered and bid out to 3rd party contractors.

Future Look

To accomplish the goals and strategies laid out in this plan, we propose restructuring the WE&T program to create a pathway for participants and define clear roles and responsibilities for how our program works in conjunction with other education providers.

Fig. WE&T-15: Future Look

Program Component	**A. Career Connections:** Job/Career Awareness & Basic Green Energy Ed	**B. Career & Workforce Readiness (CWR):** Job and Career Readiness	**C. Integrated Energy Education & Training (IEET)**	
			Core Energy Education	Technical Upskill
Primary Audience	People unaware of energy jobs and careers: - K-12 students - K-12 instructors - Energy job/career seekers - Energy education seekers	People not prepared to enter a traditional energy job/career higher education path: - Disadvantaged communities - Disadvantaged workers	People on a chosen educational track toward a job/career: - Post-secondary students - Adults - Retraining for those who have identified an energy career energy path	People in a job/career seeking energy-focused upskilling: - Engineering & design professionals - Technical trades / journeymen
Offerings and Purpose	- Career awareness - Green energy and sustainability teaching materials and support (green energy/ sustainability)	- Career prep/job readiness services (via partnerships) - Gain skills that may lead to employment and/or advancement in a job in the energy efficiency field	- Track-specific technical education and training - Support for teaching materials development - Train-the-Trainer - "Kick-Start / early stage" initiatives support - Building performance measurement tools	- High-level and in-depth training - Targeted offerings for specific occupations - Certification program support
Primary Organizations for Strategic Partnerships	- K-12 schools - WIBs, CBOs	- Workforce Investment Boards - Community-based organizations - Job-training organizations	- Community and 4-year Colleges - Job-training organizations - Vocational Schools - Labor/Unions - Trade Associations - Apprenticeship & Pre-apprenticeship - Community-based orgs.	- University Extension Programs - Certification agencies & programs - Professional and Trade Associations and Agencies
Outcomes	Knowledge gain, using gained knowledge and skills on the job, expanding/enhancing other organizations' curricula. Combined outcomes should lead to EE savings and support SDG&E portfolio goals.			

WE&T Sector Metrics

EE Business Plans: Sector Metric Table - Workforce Education & Training										
Problem Statement	Market Barriers	Desired Sector Outcome	Intervention Strategies	Sector Metrics	Baseline	Metric Source	Current, Modified, or New	Short Term Target (1 - 3 years)	Mid Term Target (4 - 7 years)	Long Term Target (8 - 10+)
Market Actors don't have the technical knowledge, skills, or abilities to meet CA's energy efficiency potential	1) Code Changes and Complexity 2) New technologies and "upskill" training is needed to stay competitive 3) Access for market actors is difficult due to taking time off of work	1) Ensure market actors are aware of code requirements 2) Ensure market actors receive the latest education and training on new technologies, tools, etc	1) Provide educational offerings at Energy Centers 2) Collaborate with Appropriate Organizations to expand knowledge and reach	1) % of Participants that report knowledge gain. 2) # of Othanizations that collaborate with SDG&E for curriculum enhancement.	1) Current % of Participants that indicate that there is knowledge gain from class. 2) Current # of Organizations that collaborate with SDG&E.		Modified			
Market Actors don't have the knowledge of how to participate in IOU / PA programs	1) Lack of Awareness of Programs 2) Complexities and Requirements of Program participation	1) Market Actors participate in energy efficiency programs	1) Provide educational offerings at Energy Centers 2) Collaborate with Appropriate Organizations to expand awareness of EE programs	1) % of Contractors that are in business and have successfully submitted a project.	Current % of Trade Professionals who are in business and have submitted a successful EE program.		Modified			
Decision Makers Don't Understand the Value Proposition of Energy Efficiency	1) Lack of Understanding or Awarness of ROI or Programs 2) Unaware of business benefits beyond Utility Cost savings 3) Program Complexities diminish perceived value 4) Contractors don't "sell value" of EE	1) Decision Makers place a priority on energy efficiency projects and participate in programs or change their behavior to reduce energy use	1) Provide educational offerings at Energy Centers 2) Collaborate with Appropriate Organizations to expand knowledge and reach	% of Property Owners and Tenants that Participate in Programs % of Property Owners or Tenants that indicate knowledge gain or use info at work	1) Current % of Participants that indicate that there is knowledge gain from class. 2) Current # of Organizations that collaborate with SDG&E.		Modified			
Homeowners or Renters don't understand the value proposition of Energy Efficiency	1) Lack of Understanding or Awarness of ROI or Programs 2) Unaware of business benefits beyong utility cost savings 3) Competing Priorities (aesthetic remodel) 4) Program Complexities or Cost diminish perceived value	1) Homeowners or renters place a priority on energy efficiency and participate in programs or change their behavior to reduce energy use	1) Provide educational offerings at Energy Centers 2) Collaborate with Appropriate Organizations to expand awareness of EE programs	% of Homeowners, Property Owners, or Renters that Participate in Programs % of Homeowners, Property Owners, or Tenants that indicate knowledge gain or use info at work	1) Current % of Participants that indicate that there is knowledge gain from class. 2) Current # of Organizations that collaborate with SDG&E.		Modified			
Statewide Program Administration & Coordination achieves goals	TBD	TBD	TBD	TBD						

PA/Program Coordination

Goal 1 and Goal 2 will be accomplished as SDG&E creates strong ties with the other PAs, educational organizations and stakeholder groups to develop technical trainings and expand access to energy efficiency education.
Goal 3 will explore opportunities with other agencies that lead to mutual benefits through collaborative efforts.

WE&T EM&V Considerations

SDG&E EM&V is preparing for the evaluation of the WE&T sector and some proposed interventions and indicators are here to gain a complete picture of the sector across time, and at various intervention points.

SDG&E is proposing a short-term, mid-term, and long-term metrics for the Workforce Education & Training sector.

The WE&T sector EM&V effort will begin with the implementation of the business plan and occur at regular and ongoing intervals. There will be **short-term metrics** or leading indicators, which will consist of:

1) Number of organizations that WE&T works with and broken down into:
    a. government agencies, educational Institutions, community based organizations, and industry and labor organizations

2) Post-offering evaluations that measures:
    a. Increase in participant knowledge gain after attending offering
    b. If participant predicts they will use the information at work on daily, weekly, monthly, or annual basis

3) Follow-up evaluation that measures:
    a. Retention in participant knowledge gain
    b. If and how have participants used the information they learned at work

Mid-term metrics will be developed through a Process Evaluation that is based on the information that is collected by the short-term metrics, EM&V support, and stakeholder engagement; however, we expect success to look different even though the metrics are similar. The Metrics will be designed to measure:

1) The depth of how WE&T is improving and supporting curriculum of other organizations

2) Post-Offering Evaluations that measure:
    a. Increase in Participant Knowledge on a more object level
    b. If Participants predict they will use the information learned

3) Follow Up Evaluation that measures:
    a. Retention in Knowledge Gain
    b. If Participants have used the information

Additional analysis will become necessary over time. Eventually the indicators and metrics above will need to be test to determine specifically whether or not a metric is appropriate or successful. This analysis requires significant in-depth analysis and support. Where evaluators identify metrics that are significant and positive, we can further engage our programs to address these metrics.

Long-term metrics will be developed similar to mid-term metrics and will be designed to measure:

1) The organizations and depth of support that WE&T has provided

2) Evaluations of offerings and quantify the energy savings achieved

3) Post-Offering Evaluations that measure:
    a. Increase in Participant Knowledge on a more object level
    b. If Participants predict they will use the information learned

4) Follow Up Evaluation that measures:
    a. Retention in Knowledge Gain
    b. If Participants have used the information

Finance Sector

Chapter Summary

Finance Vision
Customer adoption of deep, comprehensive energy efficient-related solutions for their homes and businesses through innovative and affordable financing options promoted by the contractor community and supported by the financial industry.

In response to California's goal to double energy efficiency levels by 2030, the Finance offering will promote greater levels of adoption for more comprehensive EE solutions for customers. These finance offerings will consist of a variety of financing options for single-family and multi-family residential customers as well as for small business and broader nonresidential customers. These offerings will support all types of demand-side investments, including energy efficiency, demand response, distributed generation, and storage.
EE Finance will be seamlessly integrated with other energy efficiency programs to provide customers with comprehensive EE solutions in a simple approach that will enable greater levels of customer participation throughout the program portfolio. Overall, the EE Finance offerings are designed to:

- Encourage customers to invest in projects that will achieve deeper energy savings;
- Overcome the "first cost" barrier of energy efficiency upgrades;
- Leverage ratepayer funds by bringing in private capital to improve on the overall program portfolio cost effectiveness;
- Increase sales and installation of energy efficient products and services; and
- Reach a broader set of customer groups (e.g., disadvantaged communities, historically low EE adoption rates) and market segments.

The strategies described in this business plan will enable customers to take a holistic approach to projects and act as a catalyst to implement improvements regardless of capital improvement budgets or schedules constraints. The offerings are designed to help customers produce deeper energy savings.
The Energy Efficiency Finance vision and corresponding key objectives set the tone and direction for the next generation of EE finance offerings. It is vitally important that they are clear, concise and connected to California's overall energy efficiency vision. The finance business plan relies, in part, on the current California Long Term Energy Efficiency Plan as a touchstone to help shape its vision. The business plan has a number of other influences including: Commission policies, legislative directives, evaluation studies, industry trends, customer needs, stakeholder input and program experience.
The Energy Efficiency Finance objectives were borne from the energy efficiency business planning efforts and reflect the areas of focus needed to achieve the its vision. The key objectives are provided to set clear and tangible direction. Over time, the vision and/or the corresponding objectives may be reset to adapt to changes in the financing industry, contractor community, regulatory policies, laws and customer response to program offerings.

A. Market Characterization

a. Customer Landscape

As the nation's largest natural gas distribution utility, SoCalGas delivers clean, safe and reliable energy to 21.6 million consumers through 5.9 million meters in more than 500 communities. SoCalGas' service territory encompasses approximately 20,000 square miles in diverse terrain throughout Central and Southern California, from Visalia to the Mexican border. SoCalGas customer profiles include residential, commercial, public, industrial and agricultural customers of all sizes. More detailed discussions for each customer sector is provided in the corresponding sector chapter of this energy efficiency business plan. The following are key characteristics of the energy efficiency financing market:

Nonresidential Customers

- **Public sector customers' adoption of EE financing products varies.** Public sector customers especially in the local government segment, have different legal perspectives on whether EE financing products, such as on-bill financing, are considered an increase in debt for the local government.
- **Customer adoption of on-bill financing continues to grow.** On-bill financing continues to attract participation among all sectors especially the Public sector.

Homeowner

- **EE Finance customer is primarily a single-family homeowner.** Residential single-family is typically defined as buildings that contain no more than four units. There are approximately 8.8 million homes in California under this definition.[186] Multi-family unit buildings are treated as nonresidential properties.
- **Three common types of energy efficiency financing products**. The following are the primary financing products available to homeowners: (1) *home equity loans*, (2) *term loans* (i.e., term loans from financial institutions that can be either secured or unsecured against equipment), and (3) *Property Assessed Clean Energy (PACE) loans*.
- **The PACE program is by far the most popular among potential customers.** PACE represents 90% of that volume, or $196 million, while energy efficiency term loans represent 8%, and energy efficiency home equity loans represent 2%.
- **1 out 6 homeowners consider making EE upgrades.** Among homeowners who did not complete any energy related upgrade in the past two years, one in six homeowners (16%) considered making an energy-related upgrades but did not primarily due to the high upfront costs of the upgrades.
- **About 25% of customers finance home improvements.** About one-third of homeowners completed energy-related upgrades in the last two years, but only a small fraction of them (one-quarter) used any type of financing[187].
- **Significant opportunity for financing to assist "willing" customers.** The opportunity for financing to help fund and grow energy-related projects in the near future is significant. Four in ten homeowners said that they are likely to make an energy-related upgrade in the next two years, and 27% are at least somewhat likely to use financing, which is similar to the portion of

[186] U.S. Census Bureau, October 2011.
[187] PY 2014 Finance Residential Market Baseline Study, Volume I of II, Opinion Dynamics, p. 1.

homeowners who reported using financing for energy-related upgrades in the past two years (25%).

Home Contractor

- **There are approximately 55,000 contractors qualified to work on residential properties.** These contractors hold an active General Contractor (Class B) and/or HVAC (Class C-20) licenses in California and perform work on residential properties. Most of these contractors are aware of EE financing products available to their customers, but few are aware that contractors can promote and offer directly to their customers.
- **Contractor size and marketing capacity indicate support for EE financing products.** Of the contractors who do promote financing to their customers, the vast majority are medium and large sized contractors likely because they have better developed sales and marketing capacities. The large contractors are also three times more likely than small contractors to offer solar PV equipment financing, which may contribute to their higher rates of financing promotion.
- **More contractors promote PACE than any other EE financing product.** One in ten contractors are promoting PACE financing. Amongst the few contractors promoting any type of EE financing, the majority of them are promoting PACE. PACE appears to dominate amongst contractors.
- **Perceived lack of capacity among contractors to promote financing.** Contractors reported that that they had limited capacity to promote financing.
- **Lack of awareness of financing options available.** Some contractors indicate that they are not sufficiently aware of financing options available (38%).
- **Some contractors are not interested in promoting financing.** One in seven contractors indicate that they are not interested in promoting financing to their customers, largely because they do not believe they should be involved in how a customer chooses to fund projects.

b. Trends

Key trends in the financing market within California include:

- **About 25% of customers finance home improvements.** About one-third of homeowners completed energy-related upgrades in the last two years, but only a small fraction of them (one-quarter) used any type of financing[188]. Amongst the 36% of homeowners who purchased an energy-related upgrade in 2012-2013, the vast majority (75%) did not use any form of external financing. Only 25% of customers used external financing at all and even fewer (20%) used conventional financing.
- **PACE loans dominate residential EE loan market.** PACE financing dominates energy efficient financing volume, so far. In 2014, customers borrowed $218 million in energy efficient financing. PACE represents 90% of that volume, or $196 million, while energy efficiency term loans represent 8% and energy efficiency home equity loans represent 2%. However, the homeowner survey results suggest that the conventional financing market for energy-related upgrades is likely four times greater than the 2014 EEFP loan volume1 resulting in an estimated $850M-$1B of energy-related upgrades being support by conventional financing in 2014.
- **Contractors complete EE program applications on behalf of the customer.** Several contractors reported that they offer utility rebates to their customers, and most of these contractors complete the paperwork and submit it on the customer's behalf. If financing program and the

[188] PY 2014 Finance Residential Market Baseline Study, Volume I of II, Opinion Dynamics, p. 1.

rebate programs are coordinated such that participating in the financing program can result in faster rebate processing, this may be a very attractive feature to contractors.

- **Very low customer interest in EE-specific term loans.** The volume of EE-specific term loans is low compared to the volume of PACE lending, accounting for only 8% of EEFP lending volume. Moreover, the vast majority of EE-specific term loans is delivered by credit unions, with banks generally doing very little with this type of product. Customers typically used conventional financing rather than energy efficiency-specific financing. Among survey respondents who used financing for energy-related upgrades to their home, 81% used conventional financing options that have no energy efficiency requirements. These most often included credit cards and bank loans. In comparison, 14% used energy efficient financing options like PACE or energy efficient terms loans.
- **EE home equity loans are rarely used to fund EE improvements.** Home equity loans account for only 2% of EEFP loans. EE equity loans have not gained much traction in the market in comparison to PACE and term loans, despite the large number of financial institutions registered with the FHA to offer PowerSaver and EEM loans. This indicates that the market opportunity for these loans is limited (perhaps due to qualification criteria), the loans lack sufficient marketing support, or the current design characteristics of these loans are not attractive to customers.
- **Growth in EE-related financing products.** Financing EE upgrades is not necessarily new as homeowners have for many years financed home renovations, including EE measures, through conventional term loans and home equity loans, or short term lending through credit cards. However, only in the last five years have we seen financing products developed specifically to encourage homeowners to invest in energy efficiency.

c. Gaps/Barriers

There are several market barriers present within the same market that inhibit the customer from achieving higher levels of energy efficiency. Market barriers are a byproduct of the market sector characteristics and the customer's behavior within that specific market sector. Program strategies are temporary interventions introduced into the market sector to reduce these market barriers to create real, lasting market changes.

The following are perceived market barriers identified during the business planning process. Specific examples related to each market barrier are provided.

Market Barrier: High first cost

- **High costs associated with more comprehensive EE projects.** The combination of financing and rebates appeared to be more effective than either method alone in both the residential and nonresidential sectors.
- **Interest rates are too high.** About two-thirds of the homeowners (62%) felt that the interest rates available to them through the market are too high. This percentage increases for low-income homeowners (72%) and for low-FICO-score customers (69% with FICO below 640). About two-thirds of the homeowners (62%) felt that the interest rates available to them are too high and about 41% feel that it would be difficult to obtain a loan. These barriers are larger among customers with low income or low credit scores.
- **Shorter loan tenors create low participation.** Increases in loan tenors (e.g., 24 to 48 months) can improve an EE project payback thereby creating more demand for EE financing products in the nonresidential sector.

Market Barrier: Hassle factor

- **Financing offering can be complicated and overwhelming to residential customers.** WRCOG sponsored HERO primarily to achieve economic goals. Such goals appear to carry fewer policy requirements than conservation goals, and the absence of ratepayer or significant taxpayer subsidies avoids the need for extensive regulatory oversight on spending or program outcomes. As a result, HERO has been able to offer a simple application process and minimal restrictions on eligible measures, which have been key factors in its growth. (In contrast, when the SCEIP PACE program sought to enforce a policy-driven project loading order, requiring efficiency measures before renewables, participation dropped sharply.)[189]
- **Complicated loan processes reduce participation in the nonresidential sector.** Similar to the residential sector, a need for very simple, streamlined financing processes is necessary to promote greater participation among "willing" customers.

Market Barrier: Asymmetric Information

- **Lack of contractor support at point of sale.** As demonstrated by the three PACE programs administered by third-parties and most active in California (HERO, California FIRST, and Ygrene), the key to driving participation in a financing program is to meet the needs of contractors. All three programs have dedicated significant resources to providing an easy and reliable tool that can help contractors grow their businesses.[190]
- **Lack of consistent definition for "energy efficient upgrades".** The requirements and definitions for what qualifies as "energy efficient upgrades" are not consistent among financing products. Many financing products that specifically fund energy efficiency do not have strict requirements or standards for energy efficiency. Some products may use very liberal definitions of what constitutes energy efficiency and some may have more conservative definitions. How strictly the products define what qualifies as energy efficiency will likely have an impact on the outcomes from various products.
- **Financial institutions are not positioned to promote EE financing.** The point-of-sale-financing origination model has the potential to drive business compared to bank originated financing, regardless of which offer lower interest rates: Financial institutions are not necessarily in a position to sell EE financing successfully, instead it is the contractors who perceive EEFPs as a useful tool to sell home improvement projects that facilitate the lending. In many big-ticket industries (e.g., automobiles) financing is often marketed and originated at the point of sale. Since contractors are selling the energy efficiency upgrades to customers, this channel has great potential to introduce and originate financing if needed.

B. Value

a. Discussion of roles for cross-cutting sector

In response to California's goal to double energy efficiency levels by 2030, the Finance offering will promote greater levels of adoption for more comprehensive EE solutions for customers. The EE Finance offerings will consist of a variety of financing options for single-family and multi-family residential customers as well as for small business and broader nonresidential customers. These financing offerings will support all types of demand-side investments, including energy efficiency, demand response, distributed generation, and storage.

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[189] Id, p. 7.
[190] Id, p. 6.

b. How does it support portfolio

EE Finance will be seamlessly integrated with other energy efficiency programs to provide customers with comprehensive EE solutions in a simple, easy approach that will enable greater levels of customer participation throughout the program portfolio. For example, On-Bill Financing will be jointly offered with the Public Sector's Comprehensive Direct Install (CDI) program. CDI will require customers to pay for a portion of the comprehensive EE retrofit performed by a qualified contractor. This co-pay requirement can be met through the On-Bill Financing program thereby removing the customers' first cost barrier.

Overall, the EE Finance offerings are designed to:

- Encourage customers to invest in projects that will achieve deeper energy savings;
- Overcome the "first cost" barrier of energy efficiency upgrades;
- Leverage ratepayer funds by bringing in private capital to improve on the overall program portfolio cost effectiveness;
- Increase sales and installation of energy efficient products and services; and
- Reach a broader set of customer groups (e.g., disadvantaged communities, historically low EE adoption rates) and market segments.

c. How does it benefit customers

EE Finance offerings are designed to facilitate the adoption of energy efficiency by removing one of the major barriers to participation – up-front costs. Additionally, EE Finance enables customers to take a holistic approach to projects and acts as a catalyst to implement improvements regardless of capital improvement budgets or schedules constraints. The offerings are designed to help customers produce deeper energy savings.

C. Vision

The Energy Efficiency Finance vision and corresponding key objectives set the tone and direction for the next generation of EE finance offerings. It is vitally important that they are clear, concise and connected to California's overall energy efficiency vision. The finance business plan relies, in part, on the current California Long Term Energy Efficiency Plan as a touchstone to help shape its vision. The business plan has a number of other influences including: Commission policies, legislative directives, evaluation studies, industry trends, customer needs, stakeholder input and program experience.

The Energy Efficiency Finance objectives were borne from the energy efficiency business planning efforts and reflect the areas of focus needed to achieve the its vision. The key objectives are provided to set clear and tangible direction. Over time, the vision and/or the corresponding objectives may be reset to adapt to changes in the financing industry, contractor community, regulatory policies, laws and customer response to program offerings.

Finance: Vision

Customer adoption of deep, comprehensive energy efficient-related solutions for their homes and businesses through innovative and affordable financing options promoted by the contractor community and supported by the financial industry.

Key Objectives:

Near-term

- Create program participation processes that are easy for contractors to integrate into their sales process and business operations, achieving the following: port seamlessly into their proposals; offer customers a compelling proposition; accept a broad array of eligible measures; approve the majority of customers; confirm approval quickly while the contractor is "at the kitchen table"; support fast and easy closings; and pay the contractor promptly.
- Create simple, streamline program processes for the nonresidential sectors to promote ease of entry into the program.
- Coordinate EE financing programs with EE incentive programs to support immediate rebates to facilitate the contractor point of sale with customer.
- Integrate EE incentive programs with innovative financing solutions, such as loans that remain with the property through owner-occupant turnover and energy efficient mortgages. This will be essential in allowing builders and owners to leverage the cost-savings inherent in ZNE buildings into investment costs.
- Reduce the interest rates relative to other financing products (e.g., PACE).
- Create education and outreach partnerships with lenders focused on financing whole building, whole solutions and major EE equipment installations.
- Retain and modify on-bill financing (OBF) for public sector customers as well as for small to medium commercial, industrial and agricultural businesses to facilitate a simple customer engagement for more comprehensive energy efficiency solutions delivered by contractors in combination with other EE incentive offerings.
- Launch new finance offerings and convert successful programs into long term programs for customers that don't qualify for OBF.
- Emphasize contractor training and marketing outreach.
- Offer affordable EE lending options for low- and moderate-income and poor creditworthy borrowers.
- Develop construction loan program to cover construction costs for EE projects.

Long-term

- Help contractors to encourage customers to finance EE equipment. Create and support a new database that includes project and financial product performance.
- Create offerings that will appeal to customer groups that have low participation in EE financing programs. For example, customers who: desire loans under $5,000; want to financing non-eligible EE measures; have little to no home equity; and prefer not place a lien on homeowner's property.
- Transition to private lending to support all loans currently funded by EE ratepayers.
- Rely on qualified contractor community to exclusively promote EE financing products during the point of sale with customer.

D. Program Strategies and Delivery

a. On-Bill Financing

On-Bill Financing (OBF) offers interest-free, unsecured, on-the-utility-bill loans that work in conjunction with utility energy efficiency programs. It is designed primarily to facilitate the purchase and installation of qualified energy efficiency measures by non-residential customers who may lack up-front capital to

invest in real and sustainable long-term energy cost reductions. Loan terms range from up to five years for commercial customers and up to ten years for government agency customers. The eligible loan amount is based on the project cost, less incentives or rebates, up to the loan maximum of the OBF product and within the loan term thresholds. Customer loans are repaid through a fixed monthly installment on their utility bills. There is no prepayment penalty and loans are not transferable. Additionally, partial or non-payment of loans could result in shut-off of utility service.

Implementation barriers for natural gas-only OBF continue to be the long payback periods for natural gas equipment. Project payback periods for most gas projects tend to be much longer than the five year maximum required for business projects to qualify. Customers and contractors will be encouraged to seek out deeper retrofits that will meet the program requirements.

b. Financing Pilots

The lack of financing to overcome the first cost barrier continues to be a central challenge to implement energy efficiency improvements. Many existing financial products were not created to encourage energy efficiency improvements and thus not effective or attractive for consumers to invest in energy efficiency.

With the use of ratepayer supported credit enhancements and IOU on-bill repayment, the CPUC has authorized the IOUs to launch new financing pilots in an effort to broaden market eligibility and participation with enhanced financing options for energy efficiency improvements for ratepayers and lenders. The financing pilots are intended to leverage private capital from third party lenders to expand the access of attractive financing through innovative financing programs. Key pilot design elements include:

- On-Bill Repayment (OBR): Allows customers to repay third party energy loans and leases on the utility bill.
- Credit enhancements: Minimize risk of capital losses for lenders, thereby resulting in increased consumer access to enhanced financing terms

In September 2013, the CPUC approved Decision (D.) 13-09-044 to implement statewide residential and non-residential finance pilot programs to address the first cost barrier to support energy efficiency improvement projects. These pilots are intended to serve multiple segments including single family, multifamily, small business, and other non-residential sectors.

As part of the implementation of the financing pilots, D.13-09-044 established the California Hub for Energy Efficiency Financing (CHEEF). The CHEEF's role includes coordinating among various market participants and managing funds and data. In July 2014, the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) received legislative authority to administer the pilots as the CHEEF manager. To assist with program implementation, CAEATFA awarded the Master Servicer (MS) contract to Concord Servicing on April 2015. Each pilot is expected to run for 24-months starting from the time the first loan is enrolled in the program.

Goals and Objectives

Goals of the finance pilots include the following:

- Attract private capital to support energy efficiency investments by leveraging the additional security created through use of the utility bill as well as ratepayer-supported credit enhancements.
- Improve interest rates and other terms under which financial institutions offer energy efficiency financing to customers.
- Enable customers to undertake larger and more in-depth EE projects.
- Expand successful pilots and features as full programs.

Table 1 provides a list of the program types with a brief description. The Residential Energy Efficiency Loan Assistance Program (REEL) launched Q3 2016. The IOUs and CAEATFA will focus on the launch on the remaining pilots including the OBR feature.

Figure Fin-1: Financing Pilots

Program Type	Description
Residential Energy Efficiency Loan (REEL)	Single family residential loan program without on-bill repayment feature.
Energy Efficiency Line Item Charge (EFLIC)	On-bill repayment sub-program of REEL (PG&E only).
Master-metered Multifamily	Available for property owners of affordable housing buildings with 20 or more units with on-bill repayment feature.
Small Business Loan	On-bill loan program for small businesses as defined by the United States Small Business Administration (SBA).
Small Business Lease	On-bill and off-bill lease program for small business as defined by SBA.
Non-residential without Credit Enhancement	On-bill repayment program for all non-residential customers. Distributed generation is allowed.

E. Program/PA Coordination:

A key to successful program administration is having an open, positive collaboration among program implementers and other program administrators. SoCalGas is committed to a coordinated and collaborative, on-going relationship among all implementers and program administrators.

The financing pilots will be implemented the same statewide in the four investor owned utilities service territories. As of 2013, SoCalGas has been the statewide lead assisting with the coordination of efforts with CAEATFA and the IOUs ranging from regulatory compliance to IT data exchange protocols/system integration testing. The pilots are expected to run through Q3 2019.

F. EM&V Considerations:

The EE Finance crosscutting activities support all customer sectors with very unique and divergent ways they use energy. There is a need for a deeper level of research on each of customer sector and segments respond to EE financing solutions.

The IOUs and the CPUC will continue to research the successfulness of current and new finance offerings in the future. The financing pilots will undergo impact and process evaluations at the appropriate time. The list below reflects ongoing, planned, and potential future studies whose results will help shape future programs.

Market Research and Process Evaluation:

- Calculating cost-effectiveness appropriately for financing programs
- Non-Residential finance market study
- Finance market, education, & outreach evaluation

Load Impact:

- On-bill financing impact evaluation
- Financing pilots impact evaluation
- Incremental savings from finance offerings

Codes and Standards

A. Chapter Summary

California's policy goals around energy use are ambitious, and program administrators'' (PAs) vision for Codes and Standards (C&S) is that it will play a central role in meeting SB 350 goals, as well as longer-term greenhouse gas (GHG), Zero Net Energy (ZNE), and other broader state policy objectives. To reach the state's ambitious energy efficiency goals, the state needs to increase savings and change the way it uses resources. C&S activities are a cost-effective way to get an ongoing stream of savings. Past C&S efforts have delivered substantial savings,[191] but PAs' vision is to continue to grow these activities to maximize energy savings and support a diverse range of policy objectives.

Codes and Standards 2.0 (C&S 2.0) strategies contribute to California's energy efficiency success by supporting the adoption of robust building codes and appliance standards at the local, state and federal levels, and pursuing improved compliance with adopted standards. As such, C&S' work is directed at code setting bodies such as the California Energy Commission (Energy Commission), Department of Energy (DOE), and American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), or entities that produce data or ratings referenced by codes and standards, as well as those in compliance-related professions.

The vision for C&S 2.0 efforts is as follows:

- **C&S 2.0 is an <u>expansion</u> of the old C&S effort. C&S efforts will add new components and emphasize increasing primary research to inform code choices.** Expansions include:
    - Increased emphasis on coordinated long-term planning to reach deeper and have a more deliberate approach to meeting policy goals.
    - Increased primary data collection (and coordination with Emerging Technologies (ET)) aimed at strengthening cost effectiveness and feasibility arguments.
    - Targeted compliance efforts and development of electronic compliance infrastructure.
    - Code readiness activities, and "Code-Directed Industry Transformation (CDIT)," to increase the speed by which we adopt codes and standards.[192]
- **C&S will consider multifaceted objectives** California's statewide goals are diverse in scope, including targets over the next 35 years for energy efficiency, demand reduction, renewable energy, onsite generation, grid connectivity, demand response, energy storage capacity, ZNE buildings, water efficiency, and alternative fuels vehicles. To contribute, C&S must be designed and implemented with these multifaceted objectives in mind. Energy efficiency will continue to be the foundational goal of C&S initiatives, but PAs will also engage in other statewide goals (e.g., water management) that have an indirect, but strong, relationship with energy efficiency.
- **C&S efforts will <u>accelerate the transition of measures into code</u> by being <u>pro-active,</u> targeting interventions earlier in the process to advance energy efficiency faster (i.e., promote code adoption at the earliest feasible date).** The increase in coordination, enhanced primary research

[191] NRDC's CA Golden Opportunity, p 15: https://www.nrdc.org/sites/default/files/ca-energy-efficiency-opportunity-report.pdf
[192] Note: Code readiness is applicable to PG&E local C&S efforts.

efforts, and PG&E's code readiness activities are all examples of how the C&S effort will accelerate the transition into code.

- **C&S efforts will be integrated with the other sectors in a <u>multi-sector approach</u>** that applies a systems perspective to the challenge rather than focusing on individual parallel solutions.
- **C&S efforts will advance CDIT[193],** which includes intentional and specific activities executed to realize the outcomes expressed in D.09-09-047, which defined market transformation as "long-lasting, sustainable changes in the structure or functioning of a market achieved by reducing barriers to the adoption of energy efficiency measures to the point where continuation of the same publicly-funded intervention is no longer appropriate in that specific market." The 2014 whitepaper by Prahl and Keating described a preferred approach called "targeted market transformation initiatives" which they defined as "…interventions … designed to induce sustained increases in the adoption and penetration of energy efficient technologies and practices through structural changes in the market and in behaviors of market actors".[194] The objective of applying CDIT to accelerate the adoption of new technologies earlier in the product life cycle is applicable for either definition, but especially fits the white paper's description of initiatives.

Codes and Standards Goals

C&S and the other cross cutting programs are focused on supporting statewide policy objectives, such as the doubling of energy efficiency by 2030 and efforts to work towards ZNE buildings. Each of the cross cutting programs supports statewide goals in its own way. The vision states that **C&S does this by advocating for stronger building codes and appliance standards at the local, state, and federal levels, as well as supporting the compliance of those more efficient codes and standards.**

C&S' specific goals are:

- Save energy (in particular XXX GWh across the state by 2025) and water, and reduce greenhouse gases through the adoption of new codes and standards at all levels (i.e., local reach codes, state, and federal)
    - This includes providing research that enables and supports state agencies responsible for achieving state policy goals
- Provide services that support and align with state policy objectives by:
    - Coordinate with the public sector the following activities in an effort to inform long-term, planning and collaboration for adoption of future codes and standards:
        - Maintaining high compliance margins for whole buildings and appliances; and improving compliance margins for selected, high importance codes and standards
        - Increasing adoption of local reach codes that support the development and adoption of statewide and national code changes
    - Producing high-quality information and data to support CDIT, which aims to transition a measure or system (bundle of measures) into code during the early stages of the diffusion cycle[195]

[193] CDIT is a feature of the "code readiness" strategy and activities, and applicable to PG&E only.
[194] Prahl, Ralph and Keating, Ken. 2014. *Building a Policy Framework to Support Energy Efficiency Market Transformation in California.* http://www.energydataweb.com/cpuc/home.aspx p. 8
[195] PG&E only

B. C&S Proposal Compared to Prior Program Cycles

Some of the key differences between past C&S efforts and proposed future efforts include: longer-term planning, more targeted compliance activities focusing in on high-impact areas and updating antiquated compliance processes, and the inclusion of code readiness activities[196]. Another core change for C&S 2.0 activities includes increased primary data collection and analysis. C&S plans to conduct primary research and analyses to support code and standards objectives and support state policy goals, guided by the CPUC, Energy Commission, and other state agencies goals, and long term tactical plans.[197] Investment in primary research and data collection efforts accelerates the creation of well-supported code change proposals. C&S will collaborate with code setting entities to identify primary research areas that will be of highest value. Well-substantiated proposals submitted to code setting entities are more likely to proceed with success. The research and primary data collection will fill gaps identified through needs assessments, and will work in coordination with other efforts such as ET efforts. Primary research efforts will be tracked to monitor which research efforts lead to code setting action. This increase in primary research can be seen in several of the intervention strategies.

To meet the goals laid out in the vision, C&S has identified five major intervention strategies (*further detailed in Section G: Approach to Achieving Goals*) for C&S:

Long-Term Integrated Planning

Long term integrated planning incorporates an integrated dynamic approach to coordinate and align strategic planning within the energy efficiency portfolio. For PG&E, this strategy will also be used to identify "code readiness" priorities[198] for the building and appliance code advocacy programs specifically. Current work in this area ensures the statewide program syncs with the objectives of other internal and external groups, such as incentive program managers and other organizations involved with code development.

- In the very near future, C&S will create a long-term tactical plan to determine strategies that focus on 2030 and 2050 GHG targets as well as dividing appliance advocacy into targeted efforts at the state and national levels.[199]
- In the near midterm future, C&S will increase its involvement in various California Air Resources Board (CARB), Energy Commission, and CPUC proceedings to ensure that C&S activities and opportunities are well understood amongst various stakeholders including transportation, water use reduction and other prioritized areas that have the most promise for success through use of codes and standards activities to support the long-term tactical plan.
- In the long term, the strategy will use the data collected through the program to continue to guide the subprogram to facilitate greenhouse gas reduction and energy efficiency.

Advocacy to Support Building Codes and Appliance Standards

Advocacy activities develop proposals for building codes and appliance standards. Long-term experience is a significant benefit to this work given the need to anticipate areas of interest by code setting bodies, code complexity, and the necessary information for the rulemakings. For example, a deep

[196] PG&E only

[197] PG&E is broadening the Code Readiness subprogram to include forward-looking research and analysis not included in CASE study development for existing or near-term rulemakings: field surveys that produce population data, tactical field surveys and studies aimed at specific building codes or appliance standards, lab testing, simulation models, tear-down analyses, collection of cost and other web data over time, amenity and human response to physical attributes, equipment operation, etc.

[198] PG&E-specific

[199] Descriptions of these subprograms and proposed activities are included in the Vision section of this document.

understanding of the details in previous code cycles informs the next cycle and reduces the investment in developing new measures.

- In very near term, the statewide Building Code & State Appliance Standard subprograms will be separated from the local National (and possibly International) Standard subprogram. The National Standards program will work on Department of Energy (DOE) appliance standards and test procedure, multiple national (and possibly international, as applicable) agencies or organizations that develop mandatory or voluntary standards, test procedures, labels, and/or protocols that could directly impact California customers and goals.[200]
- In the near term, C&S plans to fund additional research to address current information gaps that limit its capacity to advocate for more efficient and simplified codes and standards.
- In the long term, the program research will be supported by accurate, statistically valid data that will enable well-written standards that enable compliance.

Code Readiness Activities[201]

This new strategy focuses on introducing promising building systems and appliances to actors within various building industry supply chains[202] to determine whether they are ready for codification. PG&E will expand code readiness in collaboration with other programs in the following ways:

- In 2017 and beyond, C&S will conduct primary research and analyses that supports state policy goals, guided by CPUC, Energy Commission, and other state agency goals, and long term tactical plans.[203]
- In the near term, C&S will invest in a deliberate process by transitioning to codes and standards earlier in the product life cycle,[204] or CDIT. This will allow PG&E to invest in portfolio infrastructure to gradually transition away from traditional incentive programs while continuing to move the market towards more efficient technologies and systems. PG&E will measure ongoing progress towards CDIT.[205]

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[200] These includes, but are not limited to, American Society of Heating, Refrigerating, and Air Conditioning Engineers (model building codes, such as ASHRAE 90.1 and 189.1), International Code Council (model building codes, such as the International Energy Conservation Code and the International Green Construction Code), the Environmental Protection Agency (ENERGY STAR labels), the Federal Trade Commission (EnergyGuide labels), Institute of Electrical and Electronics Engineers (e.g., IEEE 802.3 Energy Efficient Ethernet), International Electrotechnical Commission (test procedures), etc.

[201] CPUC approved a new *Code Readiness for* PG&E local C&S subprogram for 2016. https://www.pge.com/nots/rates/tariffs/tm2/pdf/GAS_3656-G.pdf

[202] Here we will leverage the Compliance Improvement subprogram training platform (e.g., Energy Code Ace).

[203] PG&E is broadening the Code Readiness subprogram to include forward-looking research and analysis not included in CASE study development for existing or near-term rulemakings: field surveys that produce population data, tactical field surveys and studies aimed at specific building codes or appliance standards, lab testing, simulation models, tear-down analyses, collection of cost and other web data over time, amenity and human response to physical attributes, equipment operation, etc.

[204] The *Naturally Occurring Market Adoption (NOMAD)* curves from past C&S impact evaluations provide evidence that this is not only feasible but has been the case for many past codes and standards. For example, many adoption points have occurred at less than 10% market share, resulting in quicker savings and quicker market transformation. Code officials can rely on data from targeted projects (e.g., hundreds instead of thousands) as long as the measure or system is demonstrated as *cost-effective* and *feasible*.

[205] For example, conduct an initial survey in 2016-17, execute strategies for several years, and then conduct regular follow-up surveys (e.g., every 5-10 years) to establish portfolio savings and statewide progress. Metrics will expand to include progress towards state policy goals.

- In the midterm, PG&E will conduct primary research and analyses that support the long term tactical plans.[206] Investment in primary research and data collection efforts supports and accelerates the creation of well-supported code change proposals.
- In the long term, the strategy will expand collaboration with voluntary programs to develop specific targeted program offerings based on code readiness projects and future C&S objectives.

Technical Assistance to Local Governments to help them Adopt Reach Codes

This strategy has traditionally included technical support for local governments interested in adopting ordinances that exceed the state building energy codes: Title 24, Part 6. This resulted in the development of cost effectiveness reports that local governments use to adopt ordinances that can be submitted to the Energy Commission for approval, and filed with the Building Standards Commission (BSC). As local governments are increasingly focused on reducing greenhouse gas (GHG) emissions, interest expands beyond the standard performance-based reach codes. The reach codes program will expand to include support for ordinances requiring measures beyond traditional energy efficiency measures including voluntary standards, renewable energy, alternative fuels vehicle infrastructure, energy storage, demand response, and water saving measures.

- In the near term, the strategy will be to educate local elected officials and staff regarding the value of reach codes, and help prepare cost-effectiveness studies that support the CAL Green Voluntary Tier rulemaking process; as well as develop comprehensive ZNE reach codes.
- In the longer-term, the strategy will support the development of tools to support local jurisdictions as they track, quantify and report reach code energy saving and greenhouse gas reductions and align programs with reach measures.

Compliance Improvement Activities

These activities complement advocacy work by ensuring potential savings from codes and standards are realized and persist over time. This strategy targets market actors throughout the entire compliance supply chain, providing technical support, education, outreach, and resources to improve compliance with both building and appliance energy standards.

- In the near term, this strategy will work to help market actors understand codes and standards, and provide role-based trainings to improve compliance particularly for the areas that have the highest potential impacts.
- In the longer-term, this strategy will support the development of an electronic repository to track repeated patterns of non-compliance as well as software tools to ensure accurate monitoring and reporting of compliance.

Key Learnings from Recent EM&V Reports of California's Codes and Standards Programs

Past evaluations have focused on Building Codes, Appliance Standards and Compliance Improvement, with evaluation recommendations restricted to these subprograms. The following summary of

[206] Code Readiness is specific to PG&E. PG&E is broadening the Code Readiness subprogram to include forward-looking research and analysis not included in CASE study development for existing or near-term rulemakings: field surveys that produce population data, tactical field surveys and studies aimed at specific building codes or appliance standards, lab testing, simulation models, tear-down analyses, collection of cost and other web data over time, amenity and human response to physical attributes, equipment operation, etc.

recommendations has been adapted from findings in the *2010-2012 C&S Impact Evaluation*[207], and the *Codes and Standards Compliance Improvement Program Years 2013-14 Process Evaluation Final Report*[208].

Building Codes & Appliances Standards Advocacy

- A major challenge in program evaluation has been the lack of program documentation typical to other energy efficiency programs. A living document that tracks areas for improved evaluation methods and documentation would support ongoing improvement to evaluation practices.
- Building envelopes present IOUs with opportunities for intervention, as they also stood out as a major building component that in the total for all sites was just below 2008 code requirements.
- IOUs should continue their appliances standards work, as appliance standards compliance has been high (typically 80+%).

Compliance Improvement

- IOUs have made noticeable progress with the development and improvement of the Energy Code Ace (ECA) website, which provides code compliance trainings and resources to building industry professionals.
    - While building professionals identified increasing awareness of the tool opportunities exist for improvement as trainings are slowly evolving to become more specific and targeted to user needs.
    - C&S can continue this progress by identifying code areas that are particularly vulnerable to noncompliance and tailoring trainings to continually highlight and target those areas.
- Although in-person trainings have been well-received, building industry professionals are less likely to attend. IOUs can tap into the remote training market by expanding online ECA training.
- IOUs can use external partnerships to make training materials and links available on other industry sites where professionals are known to seek information and support.
- IOUs have an opportunity to increase code compliance by providing education to counter perceptions that code compliance is unmanageably complex.

[207] Cadmus, DNV GL. 2014. *Statewide Codes and Standards Program Impact Evaluation Report for Program Years 2010-2012.* http://calmac.org/publications/CS_Evaluation_Report_FINAL_10052014-2.pdf
[208] DNV GL. 2016. *Codes and Standards Compliance Improvement Program Years 2013-14 Process Evaluation Final Report.* http://calmac.org/publications/ComplianceImprovementImpactEvaluationDraftReport_FINAL-OUT.pdf

C. Sector-Level Budget

Over the 10-year period, C&S is proposing to spend X dollars to achieve savings of x GWh, x MW, and x MM Therms. Potential savings by year are shown in Table 2 and budgets by year are shown in Table 1.

(Table 1 TBD)

D. C&S Annual Net Savings from 2015 Potential Study

TBD

E. C&S Landscape

C&S affect many stakeholders in the building industry supply chain. Appliance standards impact all customers who purchase regulated products. Considering this, the influence of C&S has an effect on virtually all customers. With respect to advocacy engagement, priority stakeholders include those who can affect the success of standards in the rulemaking process and through implementation. See appendix D for a more fulsome list of key C&S customers and stakeholders.

a. Trends

C&S sees several key trends affecting statewide C&S initiatives:

- **Increasing CPUC emphasis on Codes and Standards –** During the last several years, the CPUC has communicated the importance of codes and standards.[209][210][211] Additionally, under the Warren-Alquist Act, the Energy Commission expects IOUs to support building standards.[212] These agencies recognizes the central role that codes and standards must play in achieving state policy goals, and C&S 2.0 takes significant steps towards meeting these expectations. Given the discussion above on California's climate policies, this increasing emphasis on C&S is understandable.
- **Increasing number of state policy drivers –** California has a growing number of energy- and climate-related policy goals, expressed in Executive Orders, legislative bills, and state agency action plans (see **Error! Reference source not found.** below for selected goals).[213] The CPUC has indicated the California's publicly-funded energy efficiency programs are an integral part of the state's fight against climate change and greenhouse gas reductions.[214] California's statewide goals are diverse in scope, including targets over the next 35 years for energy efficiency, demand reduction, renewable energy, onsite generation, grid connectivity, demand response, energy storage capacity, ZNE buildings, water efficiency, and alternative fuels vehicle. To

[209] CPUC D.12-05-015, pg. 246.
[210] CPUC D.12-05-015, pg. 249.
[211] CPUC. "Regulating Energy Efficiency: A Primer on the CPUC's Energy Efficiency Programs." February 2016. http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/Fact_Sheets/English/Regulating%20Energy%20Efficiency%200216.pdf.
[212] Warren Alquist Act section § 25402.7. Utility support for building standards
[213] For a more comprehensive review of state policy goals see:
- Greenblatt, J. 2015. "Modeling California Policy Impacts on Greenhouse Gas Emissions." Energy Policy 78: 158-72. Accessed December 2016. http://eetd.lbl.gov/publications/modeling-california-policy-impacts-on.

California Air Resources Board. "2030 Target Scoping Plan Concept Paper" Appendix A. June 17, 2016.
[214] https://www.arb.ca.gov/cc/scopingplan/document/2030_sp_concept_paper2016.pdf

contribute, C&S must be deployed holistically with these multifaceted objectives in mind.[215] The C&S 2.0 framework prioritizes these goals in all planning and implementation.

	2020	2025	2030	2050
Greenhouse Gases	1990 levels (AB 32)		40% below 1990 levels (SB 32)	80% below 1990 levels (E.O. B-30-15)
Efficiency			2x energy efficiency goals[1]	
Zero Net Energy Buildings	100% of new Res.[2]	100% of new state buildings[2]	100% of new Com., 50% Com. Retrofits[2]	
Renewable Portfolio Standard	33%[3]		50%[1]	
Transportation		1.5 million ZEVs[4]		
Fuels			Displace 30% of petroleum use with alternative fuels[5]	
Water	20% less water per capita in Res. & Com. buildings[6]			
High-GWP Gases	Reduce GHG emissions from HFCs by 10 MMtCO2e[7]			
Energy Storage	1.3 GW Storage Procurement[8]			

1. Senate Bill 350
2. CA's *Long Term Energy Efficiency Strategic Plan*
3. Senate Bill X1-2
4. Governor's ZEV Action Plan
5. Assembly Bill 1007
6. Senate Bill X7-7
7. AB 32 Scoping Plan (CARB)
8. CPUC D.10-03-040

Supporting Agencies

Figure 5 Select California Policy Goals

- **Evolving and variable state and federal activities –** State and national regulatory agencies are subject to funding Energy Commission fluctuations, which will impact their efforts towards greater energy efficiency. Over the next ten years, priorities at the state national level may evolve, requiring flexibility and nimbleness in how California executes its C&S strategies. PAs' consistency in C&S support allows California to achieve its state policy objectives despite evolving state and federal funding priorities.
- **Increasing requirements for rigorous data to support Energy Commission rulemakings –** Statewide C&S initiatives support the Energy Commission in their various rulemakings by providing data that building or manufacturing industries demand to support underlying cost or benefits calculations. The Energy Commission relies on statewide C&S activities to provide useful and accurate data. In addition to energy savings, the Energy Commission increasingly considers pricing information and technology readiness, user amenity and how the measure will be applied in practice in buildings and equipment.[216] Verifiable qualitative analysis is needed to respond to these needs as well.
- **Rising Miscellaneous Electrical Loads (MELs) require evolving processes –** To achieve ZNE in California, special attention must be given to miscellaneous electrical loads (MELs) and plug-in

[215] Pat Eilert, Pacific Gas and Electric Company, Eric Rubin, Alex Chase, Energy Solutions, Yanda Zhang, YDZ Energy, "Codes and Standards Climate Strategy," 2016, ACEEE Summer Study.
[216] For a more in depth discussion, see "Codes and Standards: A Path to Affordable Amenity and Customer Satisfaction." Jon McHugh, Alex Chase, Gary Fernstrom, Mike McGaraghan, Chad Worth, and Pat Eilert. 2016 ACEEE Summer Study on Energy Efficiency in Buildings Proceedings. August 2016.

electric vehicles (PEV). Many types of MELs have a relatively shorter product cycle (e.g., cell phones, tablets, smart watches, etc.), so these MELs cannot be effectively managed by the DOE's existing energy efficiency rulemaking process which can take up to ten years.[217] Furthermore, determining the annual energy consumption, energy usage patterns, and product cycles of these MELs would require sizable resources. We need to explore different paths to transform the market for MELs with a shorter product cycle, in addition to supporting new appliance standards.

- **Increasing focus on existing buildings[218] –** The code for new construction is rapidly approaching ZNE targets for residential buildings, with nonresidential goals following closely behind. As such, existing buildings offer an excellent opportunity for savings. In particular, dramatic increases in the energy efficiency of appliances and system solutions in existing buildings are necessary to achieve Senate Bill (SB) 350 *Clean Energy and Pollution Reduction Act of 2015* goals to double energy efficiency of existing buildings by 2030. However, retrofitting existing buildings have challenges, including a broad variety of project types, design and construction arrangements, and constraints caused by existing conditions. Existing buildings' efficiency may be improved through code enhancement proposals focused on building alterations and inefficient appliances. In addition, compliance improvement efforts are especially important to ensure the intended savings are fully realized.

b. Gaps/Barriers

The trends outlined offer insight into the gaps that exist between the needs of the end customer and what is available to fill them. To overcome these barriers, a range of activities—from policy changes to process improvements—are needed.

- **Lack of consistency across state policies and holistic long-term planning to meet those goals** – Disconnects or variances in goal language between multiple well-intending state policies present barriers to integrated implementation. For example, ZNE goals stated in the CLTEESP do not fully align with the GHG reduction goals of AB 32 in terms of metrics, measurement, and milestones. Energy Commission's building energy standards (Title 24, Part 6) include the scope to accommodate a robust set of integrated requirements for renewable generation, and energy storage/demand response. However, IOU funding for energy efficiency and other distributed energy resources (DER) efforts are authorized in separate proceedings, which can inhibit seamless advocacy efforts across DER.
    - For Southern California IOUs, additional stringent air quality requirements for reduced NOx and particulate matter in non-attainment areas have been difficult to reconcile, as it conflicts at times with efficiency of stationary sources.
    - C&S believes the greatest impacts will come from looking across policy drivers and broad DER areas, as well as across technologies. As an example, achieving ZNE for new and existing buildings while maintaining transmission and distribution (T&D) grid stability benefits from the flexibility brought about by the integration of various systems in buildings and communities, integration of photovoltaic (PV) and battery storage, and expansion of demand response and alternative fuels and electric vehicle (EV)

[217] The Energy Commission's process is a faster, 3-4 years but we need to get the process from research to adoption down to a couple years to achieve the best standards.
[218] http://www.energy.ca.gov/ab758/documents/ab_758_bill_20091011_chaptered.pdf

infrastructures. Moreover, with rapidly approaching ZNE goals and relatively short code cycles, this work must accelerate.[219]

  - C&S' long-term tactical planning efforts will improve coordination across programs, accelerate code readiness activities, and transfer knowledge learned from those activities to targeted industry actors. [220]

- **Data deficits –** C&S has found that most, if not all, rulemakings end in compromise between code setting bodies and industry representatives, and the amount of compromise by DOE or Energy Commission staff depends on the quality of date available to defend a proposed rule. Since code setting bodies such as the Energy Commission and DOE are required to show cost effectiveness and feasibility of proposed standards, successful advocacy efforts are built on defensible, current and rigorous data. However, because many industry representatives consider their data associated with their products to be confidential (cost data, in particular), most useful data is derived from research conducted by either the code setting body or IOUs.
  - Defending a proposed rule requires information that demonstrates the viability of the technology and its role in energy efficient systems, especially as technologies advance to where they are ready to be codified. Beyond this basic viability, though, C&S has found a lack of data that is accurate and useful on the performance of newer technologies as well as a lack of thorough understanding of the impact of widespread adoption on the intended system, both areas that are critical for setting of new codes. This need can be filled by increased population data, technical research, and market analyses that are directly related to a public rulemaking conducted by the Energy Commission or DOE.

- **State resource constraints** – Developing code change proposals, gathering stakeholder input, designing compliance processes and offering resources to support the implementation of California's codes and standards is a resource-intensive process. Code setting entities, such as the Energy Commission, have relied on stakeholders to contribute code change proposals and to participate in the rulemaking process. Insufficient resources exist for state agencies to conduct all the supporting activities necessary to evolve state standards in pursuit of policy goals. Since 2002, the IOUs have submitted many Codes and Standards Enhancement (CASE) reports and developed a supportive Compliance Improvement subprogram to assist with resource shortfalls.

- **Federal preemption –** DOE has a program to develop federal appliance standards. As the scope of DOE's appliance program expands, it becomes increasingly important for California's C&S initiatives to meaningfully participate in the federal rulemaking process due to "federal preemption."[221] California often desires to have higher minimum standards than the federal standards. For example, after commercial clothes washer standards (first adopted by California in Title 20 in 2003) became federally covered products through EPAct 2005, California could no longer update standards beyond federally adopted efficiency criteria for commercial clothes

[219] For a more in depth discussion, see "Putting it All Together: Leveraging Codes and Standards to Accelerate Integration of Demand-Side Resources." Heidi Hauenstein, Aimee Beasley, Christopher Uraine, Chad Worth, Stu Tartaglia, and Mary Anderson. 2016 ACEEE Summer Study on Energy Efficiency in Buildings. August 2016.

[220] Working across teams, especially with those that are investing in program strategies that look at systems rather than system components, will result in broadly applicable results.

[221] Federal preemption is the invalidation of any state law that conflicts with federal law; and for appliance efficiency regulations, the effect of minimum federal standards is to cap state appliance standards. Federal law includes an option for states to petition DOE for a preemption waiver, but no state has successfully done so and PG&E does not consider this a practical option.

washers. Federal law includes an option for states to petition DOE for a preemption waiver, but no state has successfully done so and it is not considered a practical option. As such, as DOE's appliance program expands, fewer appliances are available to the Energy Commission to incorporate into Title 20. Thus, efforts must be both focused on the federal level and on completing California adoption of energy efficient standards quickly with the highest levels of efficiency to transform the market as far as possible to set a high bar before the DOE begins its rulemaking process for those appliances. This is a particularly serious issue. The DOE process is much longer than the Energy Commission's process, stranding cost effective energy savings that could contribute to achieving California's policy goals.

- **Local governments lack awareness about which reach codes can help them achieve their goals, and lack the resources needed to adopt reach codes** – A "reach code" is a locally mandated code or alternative compliance path that is more aggressive than the current California Building Energy Efficiency Standards, resulting in buildings that achieve higher energy savings. In California, the unique authority given to cities and counties to adopt reach codes allows local jurisdictions to aggressively pursue their local Climate Action Plan goals as well as the CPUC's goal of achieving ZNE for all new residential construction by 2020 and for all new nonresidential construction by 2030. Reach codes play an important role in ZNE by providing an opportunity to test advanced energy efficiency building practices with designers, building owners, plan examiners, field inspectors, and other development stakeholders. Further, reach code measures work in tandem with utility energy efficiency program incentives designed to accelerate market acceptance and adoption of ZNE building energy practices.
    - Every local government must determine the type of reach code ordinance best suited for meeting its unique GHG reduction goals.[222] However, local governments may lack the awareness, knowledge and resources needed to develop and adopt these codes. Typically, this includes deciding whether to adopt "performance based"[223] CAL Green Energy Efficiency Tiers such as exceeding base code by 15%, mandate "prescriptive"[224] energy efficiency measures such as cool roofs, and/or require "renewable energy"[225] installation such as solar photovoltaic systems. State law[226] requires that "local governmental agencies wishing to enforce locally adopted energy conservation standards" shall submit a study with supporting analysis to the Energy Commission showing how the local government determined energy savings and cost effectiveness and local governments are often limited in their ability to meet this requirement. Through technical assistance, PG&E supports local governments in their efforts to adopt reach codes.

[222] Cadmus, DNV-GL. 2014. Reach Code Subprogram 2010-2012 Process and Pilot Impact Evaluations. pp. 2-6
[223] CAL Green (Title 24 Part 11) identifies several voluntary Tiers requiring "performance-based" energy code compliance thresholds that exceed the Title 24 building energy efficiency standards by a certain percentage (e.g., 15%). The performance approach allows considerable flexibility in the way that designers and builders can customize the set of energy measures that are best suited to the project's needs and characteristics, provided the building energy performance meets or exceeds the minimum requirements.
[224] Prescriptive-based requires installing specific Title 24 building energy measure(s) such as cool roofs, lighting, hot water distribution systems, water efficiency, and/or commercial kitchen applications.
[225] Mandating installation of renewable energy measures does not necessarily require following California's Preferred Loading Order: energy efficiency, demand response, renewables, and distributed generation.
[226] Section 10-106 of the California Code of Regulations, Title 24, Part 1, Article 1

- **Inadequate or absent compliance infrastructure and burdensome compliance processes–** California's collective investment in a modernized electronic infrastructure to increase the efficiency of the compliance process for Title 24, Part 6 has been slow and, without this modernized infrastructure in place, the perception of the compliance process as a time consuming and paper-heavy endeavor persists.[227] Moving away from the current forms framework and transitioning to a streamlined compliance process, including the potential creation of registries, databases and other electronic infrastructure, will take a significant investment, but C&S believes that improving this infrastructure, and developing easy to use compliance tools and processes, is critical for enabling increased compliance.
    - In addition, compliance software functionality and usability has had new challenges over the past two building code cycles. With the recent rapid increase in complexity, breadth, and stringency of the building codes, the compliance software had challenges keeping pace. This has been in part due to the replacement of the simulation engine from the two-dimensional building modeling DOE 2 program (no longer supported by the DOE) to CBECC-COM, a software engine using a three dimensional user interface that uses and underlying engine based on Energy-Plus. While the EnergyPlus software engine is a more capable tool that can better simulate advanced building technologies, the transition was not entirely smooth and caused delays in the implementation of the standards.
    - Another key concern is the gap in understanding between the compliance software results which are an "asset rating" of a building and the actual operation or performance of a building. This issue has been increasingly problematic as a code compliant ZNE building does not necessarily reflect actual ZNE operation where many consumers and building owners are expecting ZNE code buildings to have a zero energy bill.
    - Achieving the state's goal of ZNE for all newly constructed commercial buildings by 2030 will require significant advancements to the energy code and buildings will need to employ compliance software tools that offer new functionality to allow design projects to analyze these advanced strategies and demonstrate that projects meet the ZNE goals.

C&S strategies seek to overcome these key barriers, as explained in greater detail in *Section F, Approach to Achieving Goals*, below.

[227] Compliance Improvement Advisory Group: http://www.caciag.com/Issues

F. Approach to Achieving C&S Goals

Under C&S efforts, five core intervention strategies exist:[228]

- Long-term Integrated Planning and Collaboration
- Advocacy for Building Codes and Appliance Standards at All Levels
- Technical Assistance for Local Government to Develop and Pass Reach Codes
- Compliance Improvement Activities
- Code Readiness Activities

Intervention 1— Long-term Integrated Planning and Collaboration

Foundational to C&S' efforts are long-term planning and collaboration. Many efforts in California are neither coordinated nor integrated at the level needed to address state policy. Long-term integrated planning is needed to develop and implement an integrated dynamic approach to achieving state policy goals and maximize energy savings. Integrated planning envisions what the future building stock and appliance market would be in a world that achieves the State's energy, water and GHG goals and coordinates a plan that achieves these goals.

The outcome of this effort will be a long-term tactical plan for specific codes and standards activities that support state policy goals. Through this planning, C&S expects to see improved alignment with external stakeholders engaged in codes and standards to improve advocacy. A well-coordinated effort with internal stakeholders would be expected to capture DER synergies and maintain grid reliability.

Table 1. Long-term Integrated Planning and Collaboration

Intervention Strategy	Barriers	Example Tactics	Existing, New, or Modified	Short, Mid, or Long-term
Long-term integrated planning and collaboration 	Lack of consistency across state policies and holistic long-term planning to meet those goals	Deconstruct major policy goals such as, specific code objectives and program activities (e.g., the 2030 ZNE Commercial Building goal: achieve ZNE for warehouses in 2022 T24 code cycle, ZNE low rise office buildings during the 2025 T24 code cycle etc. AB758: billing analysis or building rating required for every entry into MLS database before posted for sale)	N	S
		Develop model to estimate potential impacts of each major portfolio element relative to forthcoming code changes and applicable state policy goals.	N	S

[228] Advocacy strategies are delivered statewide, per D.16-08-019.

Intervention Strategy	Barriers	Example Tactics	Existing, New, or Modified	Short, Mid, or Long-term
		Lead the development of 5-15 year tactical plans, in collaboration with IOU program teams, the CPUC, Energy Commission, HCD, BSC and CARB, which are designed to achieve specific code objectives.	N	S,M
		Explore different paths to transform the market for MELs with a shorter product cycle, in addition to supporting new appliance standards.	N	S,M
Partners:[229] Other internal groups outside of the energy efficiency portfolio: distribution, transmission, distributed generation, electric vehicles, demand response, storage, etc.; Agencies and code-setting entities: CPUC, Energy Commission, CARB, DOE, ASHRAE, ICC; Municipal utilities and organizations: SMUD, LADWP, SCPPA, NCPA; External progressive utilities and other entities: NEEA, National Grid, Arizona Public Service, West Coast Collaborative, etc.				

Intervention 2 –Advocacy for Building Codes and Appliance Standards at All Levels[230]

At the core of C&S activities are advocacy efforts. These efforts reach multiple levels of decision making, across both building codes and appliance standards. Specifically, advocacy efforts include strategies to change:

- **State Building Codes:** A State Building Codes strategy is needed to influence proceedings conducted by the Energy Commission and other State agencies. Since building codes determine the efficiency of new buildings, additions, and changes to existing buildings that trigger a permit, they directly influence building design and construction as they relate to ZNE goals. The scope of Title 24, Part 6 has expanded over time to control plug loads, outdoor lighting and some industrial process equipment. The relatively new Title 24, Part 11 Green Building Standards covers water efficiency including site irrigation, building materials, and provision for electric vehicle charging.
- **State Appliance Standards:** The State Appliance Standards strategy is needed to influence rulemakings conducted by the Energy Commission to improve the efficiency of appliance in California. Since appliance standards cover the sale of appliances within the political boundaries of California and impact efficiencies of equipment in both new and existing buildings, they are a powerful policy tool for saving energy and reducing GHG emissions. Appliance standards are enforced by the Energy Commission though the appliances database and occasional monitoring

[229] C&S engages with many different stakeholders and partners. Thus, the "Partners" section within each subprogram table is non-exhaustive.
[230] Advocacy strategies are implemented statewide, per D.16-08-019

of products sold into the California market. Appliance standards are also referenced by the building standards and enforced by building officials in the 500+ California jurisdictions.

- **National Codes and Standards:** This strategy is needed to influence a broad range of national building codes and appliance standards that impact California regulations. For example, Federal Appliance and Equipment Standards, which are embodied in Title 20, have grown to cover products representing about 90% of home energy use, 60% of commercial building energy use, and 30% of industrial energy use.[231] Hence, federal appliance standards are often the strongest policy tool for reducing energy use in existing buildings and a large part of achieving ZNE in both new and existing buildings. In addition to DOE appliance standards and test procedures, multiple national agencies or organizations exist that develop mandatory or voluntary standards, test procedures, labels, and/or protocols that could directly impact California customers and goals.[232]

Advocacy efforts strive for the adoption of cost effective measures which maximize energy savings and reduce environmental impacts. Advocacy efforts increased energy savings for the state—filling the gap described earlier—in pursuit of ZNE and SB 350 policy goals for residential and nonresidential buildings.

[231] DOE. (Accessed September 10, 2016). http://energy.gov/eere/buildings/appliance-and-equipment-standards-program. Values are national estimates.

[232] These includes, but are not limited to, American Society of Heating, Refrigerating, and Air Conditioning Engineers (model building codes, such as ASHRAE 90.1 and 189.1), International Code Council (model building codes, such as the International Energy Conservation Code and the International Green Construction Code), the Environmental Protection Agency (ENERGY STAR labels), the Federal Trade Commission (EnergyGuide labels), Institute of Electrical and Electronics Engineers (e.g., IEEE 802.3 Energy Efficient Ethernet), International Electrotechnical Commission (test procedures), etc.

Table 2. Advocacy for Building Codes and Appliance Standards

Intervention Strategy	Barriers	Example Tactics	Existing, New, or Modified	Short, Mid, or Long-term
Advocacy for Building Codes and Appliance Standards to maximize energy savings 	State resource constraints Data deficits Federal preemption	Lead the creation of detailed CASE proposals for agreed upon topics of interest to the California Energy Commission and other code setting bodies.	E	S,M,L
		Lead a general review of test procedures used to determine performance of appliances for federal and state standards.	N	S
		Expand research and analyses to improve the quality of data included code change proposals.[233]	M	S,M,L
		Provide research and analysis for measures such as water use, building materials, ventilation, and source pollutants.	M	S,M,L
		Provide market analysis and gather high-quality market data, usage patterns and product performance to inform code change proposals.	M	M
		Proactively engage and foster improved working relationships with a broader range of affected stakeholders and recruit them to directly communicate to the Energy Commission and participate in rulemakings.	N	M
		Proactively enhance regulations to include DR requirements, grid connectivity, etc. and enable the plug and play grid.	N	M
		Improve quality of information supplied to the Energy Commission for their interactions with federal agencies	N	M

[233] Research may include a variety of activities: field surveys to collect population data; collection of internet data to determine costs, availability, performance, and compliance; tactical surveys on specific technologies, industries, markets, behavior, and satisfaction; lab tests, etc. Research will be conducted in multiple subprograms and there will be some overlap. While most data collection and market analysis aimed at long term code objectives will be conducted out of the code readiness subprogram, codes and standards research on specific measures and building types for open or near-term rulemakings will continue be conducted in other subprogram areas: California Building Codes, California Appliance Standards, and National Regulations. Additionally, support for Reach Codes will continue to include research in various areas.

Intervention Strategy	Barriers	Example Tactics	Existing, New, or Modified	Short, Mid, or Long-term
		Actively participate and influence the development and updating of test methods and ratings with industry groups (NEMA, AHRI, etc.), technical committees (ASHRAE, IES, IEEE, etc.) voluntary programs (DLC, CEE, EPA/ENERGY STAR, etc.), and regulatory agencies (DOE, ICC, etc.).	M	S,M
Sectors: Residential, Commercial, Industrial, Public, ET, Other: DR **Partners: Code-setting entities: California Energy Commission (Energy Commission), Building Standards Commission (BSC), Housing and Community Development (HCD), California Air Resources Board (CARB), State Fire Marshall (SFM); Code enforcement community members (CALBO, CSLB); IOU Energy Efficiency Programs; National Building Code Development Entities: ICC, ASHRAE, IAPMO, NFPA; Standards Setting entities: ASHRAE, ICC IES, ASTM, ENERGYSTAR, IAPMO; Manufacturing community representatives; Design and construction community members; Municipal utilities: SMUD, LADWP; Compliance software developers; Simulation software developers (e.g. DOE EnergyPlus developers: DOE, NREL, LBNL); Energy efficiency and Demand Response advocates**				

Intervention 3— Technical Assistance for Local Government to Develop and Pass Reach Codes

The Reach Codes strategy is needed to support local jurisdictions which aspire to exceed state building codes. Reach codes are often part of a local government's climate action plan or other green strategy. IOU support includes development of cost effectiveness studies per Climate Zone, drafting of model ordinance templates for regional consistency, developing compliance support tools (such as a Carbon calculator) and assisting with the reach code application process. These reach codes provide crucial experience for understanding the implementation issues associated with a new code before it is rolled out on a statewide basis when these measures are adopted into Title 24, Part 6 or the mandatory portion of CALGreen.

Recently, local governments have become increasingly focused on reducing greenhouse gas emissions. Many local governments have recently requested technical support from the Reach Code subprogram to provide cost effectiveness studies for non-energy efficiency measures such as photovoltaic systems, alternative fuels and electric vehicle infrastructure, energy storage, demand response, and water saving measures.

Through Reach Codes C&S collaborates with the Energy Commission and Local Government Partnerships (LGPs) to identify and provide technical assistance to local jurisdictions interested in adopting Reach Codes. This includes preparing cost effectiveness studies per climate zone, drafting of model ordinance templates for regional consistency, and assisting with the reach code application process.

The outcomes of this technical assistance will be additional reach codes that are developed and adopted by local governments to help reach higher levels of energy efficiency and GHG reduction, and prepare the building industry for more stringent building codes to advance ZNE.

Table 3. Technical Assistance for Local Government to Develop and Pass Reach Codes

Intervention Strategy	Barriers	Example Tactics	Existing, New, or Modified	Short, Mid, or Long-term
Technical assistance for local governments to develop and pass reach codes 	Local governments lack awareness about which reach codes can help them achieve their goals, and lack the resources needed to adopt reach codes	Lead development of tools in collaboration with local jurisdictions that can track, quantify, and report reach code energy savings and greenhouse gas reduction.	E	M
		Support coordination between Energy Commission, BSC and HCD staff to leverage Title 24 Part 11 CAL Green Voluntary Tiers as a primary source for reach code measures by preparing cost effectiveness studies that support the CAL Green Voluntary Tier rulemaking process.	M	S
		Support local initiatives to improve efficiency in existing residential buildings such as Home Energy Score (HES) upon resale or on a voluntary basis, Green Multiple Listing Service (Green MLS), or mandatory energy disclosure (billing data or HES rating disclosed on MLS).	N	M
		Support collaboration efforts with Energy Commission, regional energy networks, local government partnerships, regional public affairs, and other stakeholders to educate local elected officials and staff regarding the value of Reach Codes, the requirements for adoption of local Reach Codes and best practices, tools and resources available to help local implementation.	M	S
		Develop a comprehensive ZNE reach code that integrates energy efficiency, renewables, alternative fuels and electric vehicle infrastructure, energy storage, demand response, and water saving measures with prescriptive measures for each targeted area.	N	S
		Coordinate with energy efficiency programs such as Savings By Design to align programs with reach code measures.	M	S,M
Sectors: Public, Commercial, Residential **Partners: Code-setting entities: California Energy Commission; IOU Internal Programs: Local Government Partnership Program; State and local governments; Code enforcement community; IOU Statewide C&S Team**				

Intervention 4— Compliance Improvement Activities

Compliance improvement activities help to ensure that potential savings from building codes and appliance standards are realized and persist over time. Activities conducted in support of this strategy target market actors throughout the entire compliance supply chain by providing needs-based tools, training, resources and outreach.

Through compliance improvement activities, critical market actors will better understand their unique role in compliance, and will be equipped with the specific knowledge, skill, and tools that they need to quickly, easily, and effectively perform their compliance job tasks. Ultimately, the outcomes of the compliance improvement activities will be higher compliance rates with building and appliance efficiency standards to help realize the full potential of adopting codes and standards.

Table 4. Compliance Improvement Activities

Intervention Strategy	Barriers	Example Tactics	Existing, New, or Modified	Short, Mid, or Long-term
Compliance improvement activities 	Inadequate or absent compliance infrastructure and burdensome compliance processes	Develop and implement role-based training that teaches market actors how to perform their unique compliance job tasks	E	S
		Develop tools and resources that help market actors understand codes and standards, and reduce burdensome processes	M	S
		Develop training using the appropriate modalities per market actor	M	S
		Conduct outreach to increase awareness of the value of compliance with California's energy standards and publicize the availability of tools, training and resources to support improved compliance	M	S
		Increase clarity and usability of codes by incorporating user-centered design in code development.	M	M
		Develop an electronic repository to track repeated patterns of non-compliance by builders and repeated errors by energy analysts. This data can be used to improve next version of code.	N	M,L
		Electronic repository provides feedback on common errors, which measures are used etc.	N	M,L

Intervention Strategy	Barriers	Example Tactics	Existing, New, or Modified	Short, Mid, or Long-term
		This data can be used to improve next version of code.		
Sectors: Residential, Industrial, Commercial, Public, WE&T, ET, Other: DR Partners: Code-setting entities: California Energy Commission, HCD, BSC; Other state agencies; Investor Owner Utilities: IOU Statewide C&S Team, Programs, WE&T, DR, Local Government Partnerships; Utilities: POUs and water districts; Code enforcement community; Design, construction, energy consultant community members; Manufacturing community representatives; State and local governments; Regional Energy Networks; Research community members; California's higher education institutions; Energy and sustainability non-profits				

Intervention 5 – Code Readiness Activities[234]

The Code Readiness strategy is a PG&E-specific intervention strategy. PG&E believes code readiness is needed to support code driven industry transformation, which aims to transition a measure or system (bundle of measures) into code during the early stages of the diffusion cycle, such as the innovator's stage. These efforts reach back to the earlier stages of a measure than the research conducted under the Advocacy intervention strategy. The measures explored through Code Readiness activities can be disruptive in that they challenge the legacy technologies by having major improvements in efficiency. The success of transitioning a specific measure or system into code is conditional on high quality information that provides compelling evidence of cost-effectiveness and technical feasibility as required by the Warren-Alquist Act. Code readiness includes "high touch" projects using PG&E experts and consultants that have well established reputations in their field for innovative excellence. Detailed code support data are collected (e.g., baseline, measure installation, energy efficiency performance, maintenance, and replacement). In addition, market data is collected such as construction feasibility data, customer satisfaction, impacts on the business models of project owners, designers, builders, and trades sub-contractors.

The Code Readiness activities have three objectives.

- The first objective is to produce high quality information and data (savings are not the initial priority) to support industry transformation. In 2016 this strategy was applied through PG&E's Code Readiness subprogram in three residential projects and one nonresidential project. PG&E's plan is to expand this area of work in 2017 and beyond.
- The second objective is to leverage a vast pool of C&S research (technology and market research, cost effectiveness, impacts on manufacturers, etc.) conducted by DOE, IOUs, Northwest Energy Efficiency Alliance (NEEA), and others, adding information garnered from industry representatives during negotiated rulemakings. This research can be used to accelerate the development of new measures for incentive programs, in particular, when there is a long delay between final rules and the effective dates of standards.
- The third objective is to improve primary data collection through field surveys, online data harvesting, and laboratory tests to increase the quality and effectiveness of advocacy efforts.

[234] Code Readiness activities are PG&E specific

Code readiness work will be closely coordinated with ET, with any C&S code readiness elements comprising a new, complementary source of innovation for the portfolio.

The primary outcome of code readiness activities is high-quality data sets for measures and systems needed to support specific codes and standards objectives and documents summarizing C&S research. Through this investment in robust data, PG&E will decrease the cost of future code enhancement proposals.

Table 5. Code Readiness Activities

Intervention Strategy	Barriers	Example Tactics	Existing, New, or Modified	Short, Mid, or Long-term
Code readiness activities to gather data for future C&S proposals 	Data deficits	Design and implement promising technology packages and systems to collect accurate, code-relevant data: enforceability, feasibility, and cost effectiveness. Support with various other tactics, including collection of costs and compliance from web data	N	S, M
		Conduct industry analyses to identify critical actors with whom to engage in projects and knowledge transfer	M	S
		Build a searchable and organized database from various sources (code readiness projects, program projects, etc.) to be used in future code enhancement proposals.	N	S,M
		Summarize codes and standards research and other information in a format that can be easily extracted to develop work papers.	N	S,M,L
		Conduct field surveys to collect population data, including detailed on-site audits and metering to determine equipment performance, load shapes, etc. Support with lab testing, tactical surveys, etc.	M	S,M,L
Sectors: ET, Other: IOU Test Labs **Partners: Incentive program staff; Equipment Manufacturers; Architects, Engineers, and Building Scientists; Builders and manufacturing partners; Residential and nonresidential building owners; Contractors**				

By sector, the top system and measure based code readiness opportunities as of 2016 are detailed in the tables below. Note that these systems and measures may change over time.

Figure 6. Top System Code Readiness Opportunities by Sector in 2016

Cross-cutting	Residential	Commercial
• **Integrated variable speed devices**: pumps, motors, and controls • **Integrated variable speed fans** • **High and low frequency demand responsive controls**	• **Hot Water:** Heat Pump Water Heating (CO2 | Natural Gas) • **Space Heating and Cooling:** Combined hydronic heating and cooling (Natural Gas condensing | Air to Water Heat Pump) • **Whole House Controls:** Wireless addressable appliance, lighting and plug loads • **Energy Storage:** Thermal | Electric • **Integrated envelope**: thicker wall sections | deeper window flanges| verified low infiltration • **IAQ and Ventilation**: reduced ventilation to dilute toxic off-gassing	• **Dedicated Outdoor Air System (DOAS):** With heat recovery | Generation 2: high efficiency HX, economizer, smart controls, self monitoring, addressable • **Radiant ceiling heating and cooling:** Flat panel grid | suspended acoustic panels | integrated architectural elements • **Building Automation:** Addressable controls of lights and plug loads | Performance tracking • **Energy Storage & Distribution:** Thermal | Electric | Micro Grid • **Integrated lighting**: high quality source + control | easy to use local controls w/good interfaces
Agricultural	**Industrial**	**Public**
• **Irrigation system efficiency** • **DR pumping** • **Title 23 system-level measures**: similar to model landscape ordinance	• **Lab hood sash controls and VAV** • **Compressed air systems**: capacity controls | leakage testing • **Networked FDD steam traps**	• **ZNE Issues Guide for State Buildings** • **TDV Valuation Tool for State Buildings** • **Integrated PV, storage and emergency generation**

Figure 7. Top Measure Code Readiness Opportunities by Sector in 2016

Cross-cutting	Residential	Commercial

• ZNE Guidelines
• Variable speed
  ○ space heating and cooling
  ○ air compressors
  ○ cooling and refrigeration
  ○ boilers
• PV infrastructure with battery storage
• Low GWP refrigerants
• Water Use Efficiency
• Outdoor lighting
• Integrated Demand Flexibility
• Steam Traps
• Drain water heat recovery
• Air to air heat recovery
	• Advanced envelope opportunities – windows, walls, attic
	• Heating and Cooling Delivery
	  ○ radiant
	  ○ ductless
	  ○ ducts in conditioned space
	• Combined water and hydronic water and space heating
	• IAQ and Ventilation Cooling
	• Integrated Demand Flexibility and TOU Rates
	• Home automation with high energy efficiency networking equipment
	• PV with battery storage for peak demand reduction
	• Indoor lighting – LED & lighting quality
	• Outdoor lighting and motion controls
	• Variable speed swimming pool pumps and replacement motors
	• CO2 and Gas Heat Pump Water Heater
	• DHW – compact distribution and drain water heat recovery
		• Generation 2 DOAS with HR, FDD, EMS
		• Indoor lighting LPD and controls
		• IAQ and Cooling Ventilation
		• Heating and cooling only
		  ○ radiant
		  ○ chilled beam
		  ○ VRF heat pumps
		• Optimize WWR, U-factor, SHGC
		• Parking lot lighting
		• Storage (electricity and thermal) to reduce peak demand
		• CO2 supermarket and commercial refrigeration
		• Warehouses – multiple measures
		• Drain Water heat recovery
		• 2023 efficiency level RTU with suite of system requirements

Agricultural	**Industrial**	**Public**

• Irrigation efficiency for emitter types and emitter selection
• Irrigation Pump Systems optimized by site conditions, weather, and crop
	• Large horse power variable speed motor systems
	• Refrigeration evaporator fan speed control
	• FDD networked steam traps
	• Gas fueled hydronic
	  ○ injection molding
	  ○ high vacuum diffusion pumping
		• See sectors above

Within the Approach Section, C&S describes new and innovative strategies and tactics, some of which will lead to initial efforts at the program level. C&S will describe any unique and innovative aspects of

each program, as well as any initial activities contemplated or underway, within program-level implementation plans.

G. Statewide Administration and Transition Timeline

TBD

H. Solicitation Strategies

TBD

I. Metrics and EM&V

C&S and the other cross cutting programs are focused on supporting statewide policy objectives, such as the doubling of energy efficiency by 2030 and efforts to work towards ZNE buildings. Each of the cross cutting programs supports statewide goals in its own way. C&S does this by advocating for stronger building codes and standards at the local, state, and federal levels, as well as supports the compliance of those more efficient codes and standards.

The specific goals of C&S are:

- Save energy (in particular X,XXX GWh across the state by 2025) and water, and reduce greenhouse gases through the adoption of new codes and standards at all levels (i.e., local reach codes, state, and federal)
    - This includes enabling and support state agencies responsible for achieving state policy goals by providing them with research
- Provide services that support and align with state policy objectives by:
    - Producing high-quality information and data to support CDIT, which aims to transition a measure or system (bundle of measures) into code during the early stages of the diffusion cycle[235]
    - Maintaining high compliance margins for whole buildings and appliances; and improving compliance margins for selected, high importance codes and standards
    - Increasing adoption of local reach codes that support the development and adoption of statewide and national code changes

In addition to savings, the primary metric C&S and the other cross-cutting programs at the business plan level is alignment with state policy goals and the portfolio. 'Alignment,' however, is difficult to measure given the changing needs of the state. As such, C&S proposes that on an annual [or bi-annual] basis it will present the long-term integrated plan for C&S. Following the long-term integrated plan, we will also present an annual measurement of accomplishments against the goals set forth in each of the annual C&S plans. Thus, similar to the other cross-cutting areas, C&S proposes an annual planning and reporting process as the metric of success.

The C&S plan will include the timeline set forth by California policy to reach milestones on the pathway to ZNE. The Energy Commission makes the final decision as to what criteria constitutes success, and it is C&S' goal to offer in-depth support to Energy Commission staff and Commissioners in this process.

C&S activities will also be measured by the success in improving compliance and supporting the creation of electronic infrastructure systems, such as databases and repositories that collect information that

[235] CDIT is a feature of the "code readiness" strategy, and applicable to PG&E only.

provides evidence of improved uptake of adopted standards. All of these program level objectives (and related measures of success) will be described in the plan.

Table 6. C&S Metrics

Goals	Intervention Strategies	Metric	Baseline (or Benchmark)	Metric Source	Short Term Target (1-3 years)	Mid Term Target (4-7 years)	Long Term Target (8-10+ years)
Save XX GWh, XX MW, xx MM therms and XX GHG from C&S efforts (supported by ETP)	All C&S Interventions	Electricity	Average of XX GWh/ year across 2011-2015	Impact studies	XX GWh	XX GWh	XX GWh
		Demand	Average of XX MW / year across 2011-2015		XX MW	XX MW	XX MW
		MM Therms	Average of XX MM Therms/year across 2011-2015		XX MM Therms	XX MM Therms	XX MM Therms
		GHG reduction	XX tons GHG		XX tons GHG	XX tons GHG	XX tons GHG
Support State Policy and Portfolio Goals	Integrated Planning in C&S, ETP and WE&T All cross-cutting interventions	Alignment and support for State Policy Goals measured by accomplishments against plans	Initial report will be done in early 2017 (on 2016 programs)	Annual reporting	Track alignment; Demonstrate leadership in coordination with stakeholders		

J. EM&V Preparedness and Research Needs

C&S has identified several overarching data gaps in C&S. The research for this sector will be contingent on the needs of the portfolio as a whole and the annual research budget for this sector. However, C&S believes that the following studies should be considered in the EM&V Research Plan.

Studies to support C&S:

- Program attribution study (forthcoming): Program attribution has been difficult to determine. Studying the potential indicators for program attribution will provide greater clarity on attributing program savings to the IOUs.
- Code compliance study: Anecdotal evidence on code compliance is often discussed but actual measurements of code compliance are minimal, especially with HVAC measures and NR lighting retrofits. Studying code compliance on HVAC measures and NR lighting will provide information on areas for the program to improve code proposals in these two key areas.
- Periodic market studies to determine market effects: Potential study provides a market baseline for specific building systems that will be targeted by the program. Tracking the uptake of efficient systems requires additional data collection and analysis. The baseline study should be updated twice, once by the end of year five and the other by the end of year nine.

As described below, 2015 planned IOU-led studies include those to 1) determine code readiness, 2) explore methods for Title 24 improvement, and 3) conduct a process evaluation of IOU C&S Program trainings, classes, and tools.

a. EM&V within C&S

EM&V activities supporting the C&S Program serve three distinct needs:

1. All of the baseline data collection efforts described next employ C&S, rather than EM&V, dollars since they are integral to program implementation. They are considered part of the program implementation process, rather than the formal EM&V process. Detailed baseline data collection forms the basis for support of federal and State standards development. Standards development, at both the state and federal levels, is grounded in a firm understanding of existing conditions of energy use by appliance, system, and market segment. Without current, appliance/equipment usage information by market segment credible estimates of standard's savings, lifecycle cost, and prospective cost effectiveness it is impossible to present a persuasive case for adoption of a proposed standard. Large, statistically valid samples of customer-specific appliance holdings, building conditions, and consumption patterns are obligatory for establishing the appropriate scope and level of a proposed standard. These efforts demand carefully designed sampling plans, extensive on-site survey efforts, and energy use metering at both the appliance/system and whole building levels. Optimally the sample designs must be sufficiently robust to allow testing of potential efficiency changes to support the standard development process.

   The detailed baseline data collection efforts are also critical in the examination and characterization of compliance issues that have arisen with current standards. This is essential so as to not create similar compliance issues as standards are ratcheted upward.

2. Development and tracking of program implementation metrics to gauge sub-program effectiveness is essential to continued improvement of program implementation efforts. Advocacy efforts are the key driver of readily measurable energy savings for the C&S Program. Rigorous recording and detailing of IOU advocacy efforts is essential in order to determine the relative impact of IOU efforts on passage of new codes and standards. Such information, gathered as part of program implementation efforts, is used in the preparation of Code Change Theory Reports (CCTRs) that form the basis for program attribution determination by CPUC impact consultants.

   The use of program implementation metrics is also important in determining the effectiveness of C&S efforts for which direct energy savings information is not readily available. Compliance Improvement efforts, for example, are not easily measured by changes in program savings due to the cost of obtaining detailed compliance data. In particular, building standards compliance data is notoriously costly to obtain. Hence, program efforts are measured by a variety of non-savings implementation metrics that track the effectiveness of compliance improvement/education efforts.

   Non-resource implementation metrics are also necessary to track the reach code support efforts that comprise the IOUs' Reach Code subprogram. While reach codes do generate direct savings the IOU efforts are aimed at providing tools for local jurisdictions to implement reach codes. It is up to the jurisdictions to use the tools as part of their enforcement efforts.

   Non-resource program implementation metrics will also be needed to track code readiness subprogram efforts. The intent of code readiness efforts is to accelerate the market transformation effects of C&S efforts, rather than directly generating large amounts of near-term savings. Consequently, a set of new program implementation metrics will need to be developed to track code readiness efforts and effectiveness.

3. Preparation of materials to aid Commission staff evaluation of CDIT efforts[236]

   a. CCTRs aide net impact determination by Commission staff consultants and establish program activity and code change attribution documentation. CCTRs provide verification of code change logic models and provide insight into the effectiveness of various code advocacy efforts. They play a historical and on-going role in determining savings attributable to IOU program efforts.

   b. Potential study support to help the Commission appropriately allocate future EE budgets

      i) C&S studies, as funded from EM&V and documented in the EM&V Plan (now Version 6), support program development and provide insight into future opportunities for successful code advocacy.

      ii) Notable 2010 – 2012 IOU-led studies included 1) a Statewide C&S Program Process Evaluation, which investigated implementation and documentation of Title 20 and 24 advocacy and CASE studies, 2) an Incremental Measure Cost analysis to examine the decline of Title 20 Appliance products costs and update forecasting methods, and 3) a policy thought paper to determine the baselines for building alterations.

[236] CDIT is PG&E-specific

iii) Notable 2013 – 2014 IOU-led studies have included 1) an assessment of savings overlaps from interactive effects currently unaccounted for in CASE studies, and 2) analyses of 2008 Title 24 nonresidential compliance audits.

iv) Planned 2015 IOU-led studies include studies to 1) determine code readiness[237], 2) explore methods for Title 24 improvement, and 3) conduct a process evaluation of IOU C&S Program trainings, classes, and tools.

[237] Code readiness is PG&E-specific

K. Reference List

TBD: PG&E will complete this section in the final C&S business plan chapter.

L. Appendices

Appendix A. Stakeholder Feedback

All Issues Identifier Number (Index)	Relevant Committee or Subcommittee	Topic	Source/Issue[238]	Page Number
0084	X-Cut: C&S	Business Plan Topic	Comment that Program Administrators talk about the challenge presented by Codes & Standards. Suggestion that those in charge of running C&S programs should talk about the how they affect implementation and how they can address those challenges.	TBD

[238] As indicated in the Issue Tracking Spreadsheet on the CAEECC website, please note that not all issues depicted here are factually correct or current. Additionally, some are paraphrased and others are more verbatim depending on how issue came into tracking process.

Appendix B. C&S Business Plan Checklist

	Cross Cutting Sector	
BP Page Number	**Business Plan Guidance**	**Notes**
NA	**A. Market Characterization**	Per Commission staff suggestion, PG&E has renamed this section "Sector Overview"
8, 38	**a. Customer landscape (who they are, what are their needs)**	
8-10	b. Trends	
10-13	c. Gaps/Barriers	
33-37	**B. Value**	In drafting the BP cross cutting chapter, PG&E determined this information would fit best woven throughout the chapter. PG&E has moved this specific section to the appendix
33	a. Discussion of roles for cross-cutting sector	
34-35	b. How does it support portfolio	
35-36	c. How does it benefit customers	
36-37	d. External impacts and benefits (community/economic benefits)	
1	**C. Vision**	
1-2, 14-25	a. Discussion of opportunities	
14-25	b. Whether items are near-, mid-, long-term strategic initiatives	
26-27	**D. Metrics**	
27	a. One metric or more as appropriate for each intervention strategy	
14-25	**E. Program/PA Coordination: Description of which and how strategies are coordinated regionally among PAs and/or other demand- side options.**	TBD - PG&E will complete this section in the next draft iterations
28-29	**F. EM&V Considerations: Statement of evaluation needs "preparedness" (i.e., data collection strategies and internal performance analysis)**	

Appendix C.: Codes and Standards Value

Roles for Codes & Standards Program within the Cross-Cutting Sector

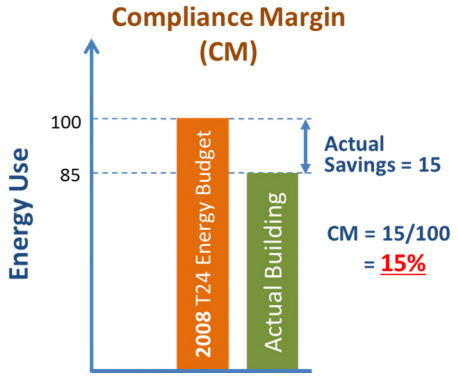
The C&S Program emerged during the late 1990s when California's first attempted to transition away from resource acquisition to market transformation programs. The program objective was to cause permanent reductions in energy use through improvements to Title 24 building codes and Title 20 appliance standards. Circa 2005, advocacy was extended to include federal appliance standards, which are embodied in Title 20 after a DOE final rule.

For measures included in incentive programs, codification of a measure provides an exit strategy to sunset incentive support for technologies that have graduated from emerging to standard practice, completing transformation and liberating funds to be used for new technologies. To ensure the savings from newly adopted codes and standards are realized, the compliance improvement team conducts education and training, and develops tools, to help individuals within compliance supply chain (builders, contractors, manufacturers, etc.) correctly implement state and federal regulations.

Figure 4 shows, based on CPUC evaluations, that compliance margins (percent beyond code) for whole buildings and lighting alterations exceed code baselines, indicating robust compliance with building codes from an energy use perspective.

Figure 8. Compliance Margins from CPUC Evaluations[239]

	Standards	Compliance Adj. Factor (CAF)	Compliance Margin (% above code)
2006 – 08 Evaluation	2005 T24 RNC (whole Building)	**120%** (Electric) **235%** (Gas)	Not available
	2005 T24 NRNC	**61.5%** (8 – 100%)	
2010 – 12 Evaluation	2008 T24 NRNC	**410%** (kWh) **328%** (kW) **118%** (Therm)	**13%** (kWh) **14%** (kW) **1%** (Therm)
	2008 T24 NR Alteration	**304%** (Indoor lighting, kWh) **83%** (Re-roof)	**7%** (Indoor lighting, kWh) Unknown for re-roof*



[239] CPUC 2010 (Cadmus). "CA IOU C&S Program Evaluation for Program Years 2006-08." CPUC 2014 (Cadmus). "Statewide C&S Program Impact Evaluation Report PY 2010-12."

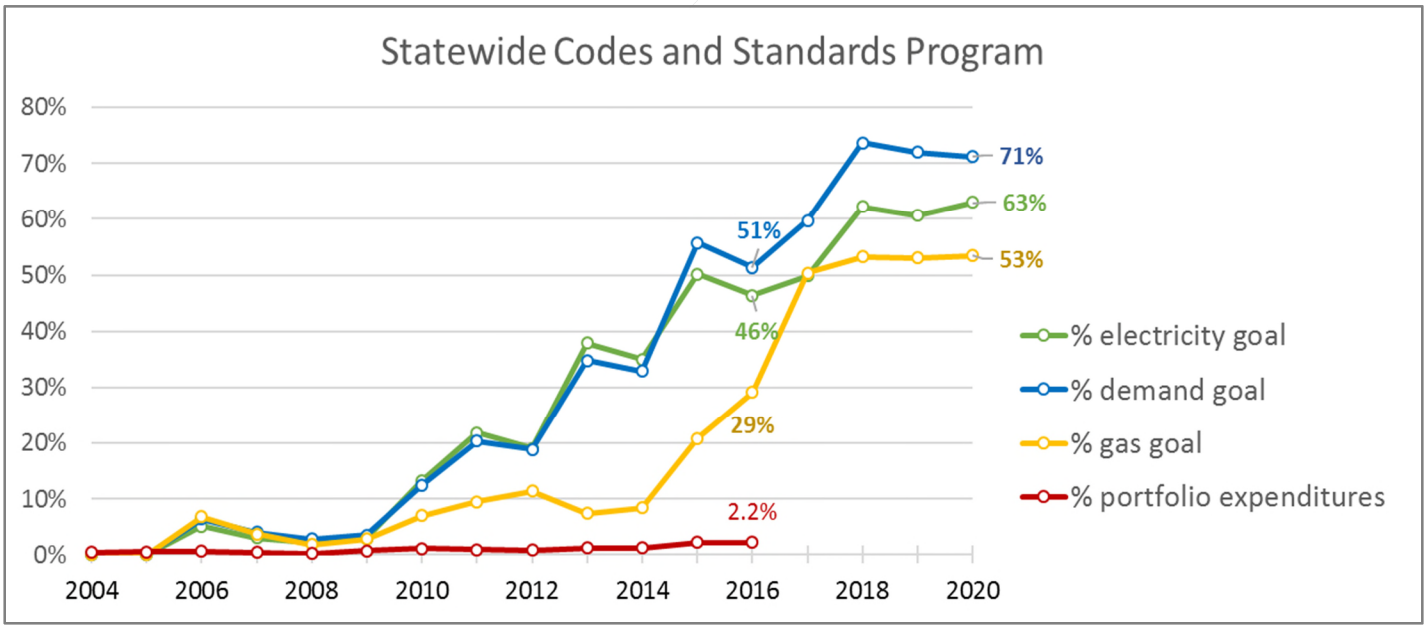
Through reach codes, and planning and coordination activities, the program conducts activities to advance and harmonize codes, standards, and ratings by local governments, ASHRAE and others, such that they support California building codes and appliance standards and other goals. Internal coordination serves to inform programs regarding upcoming changes and gather information to support future code enhancement proposals.

How does it support the portfolio?

The C&S Program is an extremely cost-effective program since savings continue to accrue for many years following the C&S Program advocacy activities. In 2016, with a statewide budget equal to approximately 2.2 percent of the portfolio total, the C&S Program will generate approximately half of the portfolio electric savings (46 percent electricity, 51 percent demand) and almost one-third (29 percent) of gas savings.

Given delays between research and rulemakings, and between adoption and effective dates, several years may lapse between advocacy efforts realized savings. The savings shown in **Error! Reference source not found.**, below, show that measures adopted because of C&S Program efforts conducted through March 2016 will continue to produce savings equal to more than half of the total portfolio savings through 2020. The activities described in this business plan will produce savings from appliance and building standards scheduled for adoption before 2020, and will set the stage for a stream of savings to be realized in future code cycles.

Figure 9: Codes and Standards Program Budget and Savings



Note: the estimated demand, electricity, and gas percentages are calculated by dividing the C&S savings by the total portfolio savings (C&S and incentive programs). The C&S Program savings are based on adopted standards (thru March 2016) for which Statewide IOU team conducted advocacy efforts. The C&S savings are derived from either CPUC Impact Evaluations (for standards that became effective in 2006 thru 2012) or IOU estimates (for standards that become effective in 2013 and beyond). The incentive program savings are estimated based on CPUC evaluation results (for savings from 2004 to 2012), IOU estimates (for savings from 2013-15), and incentive programs goals provided in the CPUC Decision 15-10-028 (2016 and beyond). Per prior CPUC policy, C&S Program savings are *net* and incentive programs savings are *gross*. [Note: The August

2016 CPUC decision D.16-08-019 has now recommended that incentive program goals be measured in *net* goals rather than *gross* goals to address potential free ridership concerns.]

Just as the C&S Program serves a diverse customer landscape, it also plays a cross-cutting role in supporting the other programs and departments within the Energy Efficiency group at PG&E. Accurate data derived from data gathering from code-driven research and market analysis to support the development of effective standards may also be a resource for program developers and implementers serving customers that the standard will eventually impact. This positions the C&S Program to share knowledge through existing relationships.

Benefits to customers

C&S activities benefits California's customers by:

1) Significantly reducing in energy bills for all customers;[240]
2) Providing a solution for the "split incentive" problem faced by a larger percentage of customers who are tenants. (Many landlords purchase appliances based upon first cost, so the improved standards provide the best chance for improved energy efficiency for tenants.); and
3) Supporting building design teams, contractors, customers and government agencies to improve their ability to comply with codes and standards.

C&S activities benefits state agencies by:

1) Achieving progress toward CPUC, Energy Commission, and CARB policy goals;
2) Coordinating with other entities to support the state's ambitious energy policy goals; and
3) Assisting local governments in developing ordinances that exceed statewide minimum requirements.

External Community and Economic Impacts and Benefits

Codes and standards have far-reaching impacts, throughout California and beyond. California frequently leads the nation in setting stringent codes and standards, and many of the benefits realized in California spillover to other states nationwide, and also internationally.

When a code or standard is adopted, it begins permanently changing the market, and the covered technology (or equipment or activity) typically becomes standard practice. Impacts from these market changes provide significant benefits to both IOU and non-IOU customers throughout the state. This benefit affects those who participate in IOU incentive programs as well as those who do not. The Energy Commission estimates that savings from implementation of the 2016 building standards will reduce annual statewide greenhouse gas emissions by 160,000 metric tons of CO_2e[241].

In addition, the economic benefits continue to accrue with each transaction following a code adoption translating to reduced operating costs which directly impact the bottom line for everyone, including:

- Local governments: increase ability to meet local goals through supporting standards implementation;

[240] For example, annual bill reductions per home resulting from the Statewide C&S program advocacy is estimated at $400/y for newly constructed homes and $100/y for existing homes. See slide 4 of the May 4, 2016 Stage 2 Statewide C&S presentation for the EE Coordinating Council. http://media.wix.com/ugd/0c9650_7b6b1a4581114c73b658ca50b37ba625.pdf

[241] 2016 Building Energy Efficiency Standards, June 2015. http://www.energy.ca.gov/2015publications/ENERGY COMMISSION-400-2015-037/ENERGY COMMISSION-400-2015-037-CMF.pdf

- Local businesses: increase profits, reduce prices; and
- Homeowners and residents: lower energy costs, increase in discretionary income.

An increase in discretionary income produces increased spending, at least some of which will be spent at locally-owned businesses, compounding the benefits further through the local multiplier effect, which posits that money spent within the community produces a greater local economic benefit as it recirculates and is re-invested in the community.

Updated codes often spur market innovation to increase customer functionality and energy efficiency. One good example of this is residential clothes washers. In 2006 DOE implemented a clothes washer standard that improved the efficiency to push most top loader washers out of the market. This was a pretty progressive move towards energy efficiency at a time when top loading washers still dominated the market. Front loaders were a premium product in the US even if they dominated the market in Europe. As a result of DOE's regulation manufacturers now produce a low cost front loading washing machine that saves water and energy (while still effectively cleaning clothes). This type of code-driven innovation has encouraged manufacturers to engineer better products while saving energy.

The C&S Program creates jobs through direct employment, indirect employment, and induced employment. The program creates jobs in all three categories with a significant amount created from induced employment which accounts for the expenditure-induced effects in the general economy due to the economic activity and spending of direct and indirect employees. These shared benefits are reinvested in local economies by millions of customers. Wei et al. (2010) estimates that energy efficiency creates 0.17 to 0.59 net job-years per GWH saved.[242] By comparison, they estimate that the coal and natural gas industries create 0.11 net job-years per GWH produced. When utilizing a mid-point for the energy efficiency range (0.38 net job-years per GWH saved), and assuming 80,000 GWH in committed statewide efficiency savings from codes and standards by 2026, the resulting cumulative job creation would be a projected 30,400 jobs.

[242] "Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US?" Max Wei, Shana Patadia, and Daniel M. Kammen. *Energy Policy 38 (2010) 919–931.*

Appendix D. Customer Landscape

C&S affect many stakeholders in the building industry supply chain. Appliance standards impact all customers who purchase regulated products. Considering this, the influence of C&S has an effect on virtually all customers. With respect to advocacy engagement, priority stakeholders include those who can affect the success of standards in the rulemaking process and through implementation. Stakeholders include, but are not limited to:

a. Local, state and federal government agencies
    i. Local jurisdictions
    ii. State agencies
    iii. Federal agencies
b. Utility colleagues
    i. California investor-owned utility (IOU) partner utilities
    ii. Non-California based IOUs operating in California
    iii. California-based municipal utilities
    iv. National utility partners
    v. Third party implementers
    vi. Trade professionals
c. Standards, testing, and ratings organizations
    i. Professional organizations (ASHRAE, IES etc.)
    ii. Industry organizations (AHRI, NEMA, AGA, CTI etc.)
    iii. Voluntary equipment rating programs (ENERGYSTAR, DesignLights Consortium, CEE, WaterSense etc.)
    iv. Building rating programs (LEED, PassiveHouse, EPA PortfolioManager, Living Building Rating etc.)
    v. Building testing organizations (HERS, NatHERS, ATTs, Commissioning Organizations)
    vi. Governmental organizations (DOE, NIST, National Labs, EPA)
d. Enforcement agencies
    i. Building inspectors
    ii. Plans examiners
    iii. Building official advocacy groups (CALBO)
e. Regional partnerships & advocacy groups
f. Construction industry market actors
    i. Design professionals, contractors, engineering firms, energy consultants, HERS raters, and acceptance test technicians
g. Construction industry suppliers
    i. Manufacturers, distributors, and retailers

ii. Industry associations

h. Building owners and operators

i. Building owners (BOMA, California Business Properties Association, etc.)
ii. Occupants (employee unions, retailers etc.)

i. Demand response providers

i. California utilities
ii. Third party implementers
iii. DR Equipment providers

j. Renewable energy providers

i. Solar equipment manufacturers
ii. Solar installation companies

Renewable energy advocacy groups (CalSEIA, Environmental Groups)

Energy Commission

Appendix E.

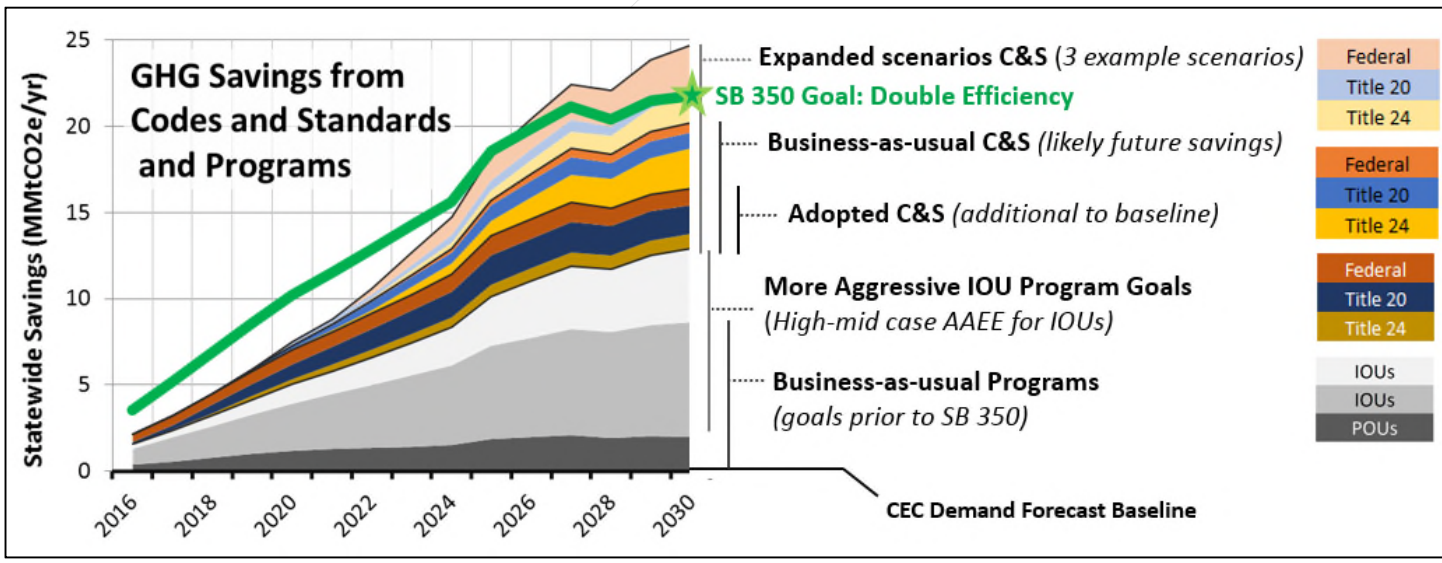
Not applicable to SDG&E. Page purposely left blank.

Appendix F. C&S Opportunities

California has difficult tasks ahead between now and 2050. The first is to achieve existing policy goals, including ZNE for new buildings and to double energy efficiency results by 2030 (see **Error! Reference source not found.**). Then, we will need to "widen" existing policy wedges based on successful implementation and establish new policies to fill the gap between business as usual and policy goals (in red below, **Error! Reference source not found.**).

C&S calculates that business-as-usual savings from programs will achieve roughly 40% of the 2030 SB 350 goal. If IOU programs were expanded from business-as-usual to the savings levels estimated in the high-mid case of Additional Achievable Energy Efficiency (AAEE) specified in Navigant's Potential and Goals Study,[243] programs could achieve 59% of the 2030 SB 350 goal. The additional savings from C&S that have already been adopted but which were not included in the baseline for the SB 350 goal ("Adopted C&S") will increase total savings to 58% of the 2030 milestone. Adding savings from likely future C&S (measures that have not yet been adopted) results in the total savings from" business-as-usual" Programs and C&S: 93% of the 2030 goal. Given three potential assertive expansions to business-as-usual C&S[244], we estimate that California could double efficiency by 2030, reaching 113% of the 2030 goal. **Error! Reference source not found.** summarizes the high-level results of savings potential analysis from 2016-2030, in the context of estimated GHG reductions from achieving the SB 350 doubling efficiency goal.

Figure 10. Deeper Codes and Standards Energy Savings to Double Efficiency by 2030



General sources and assumptions: C&S savings are discounted by subtracting estimates of non-compliance, (NOMAD), and overlap with Program savings. SB 350 doubling efficiency goal - analysis conducted by NRDC, which followed the methodology prescribed in the senate bill language. Annual emissions factors – E3's PATHWAYS

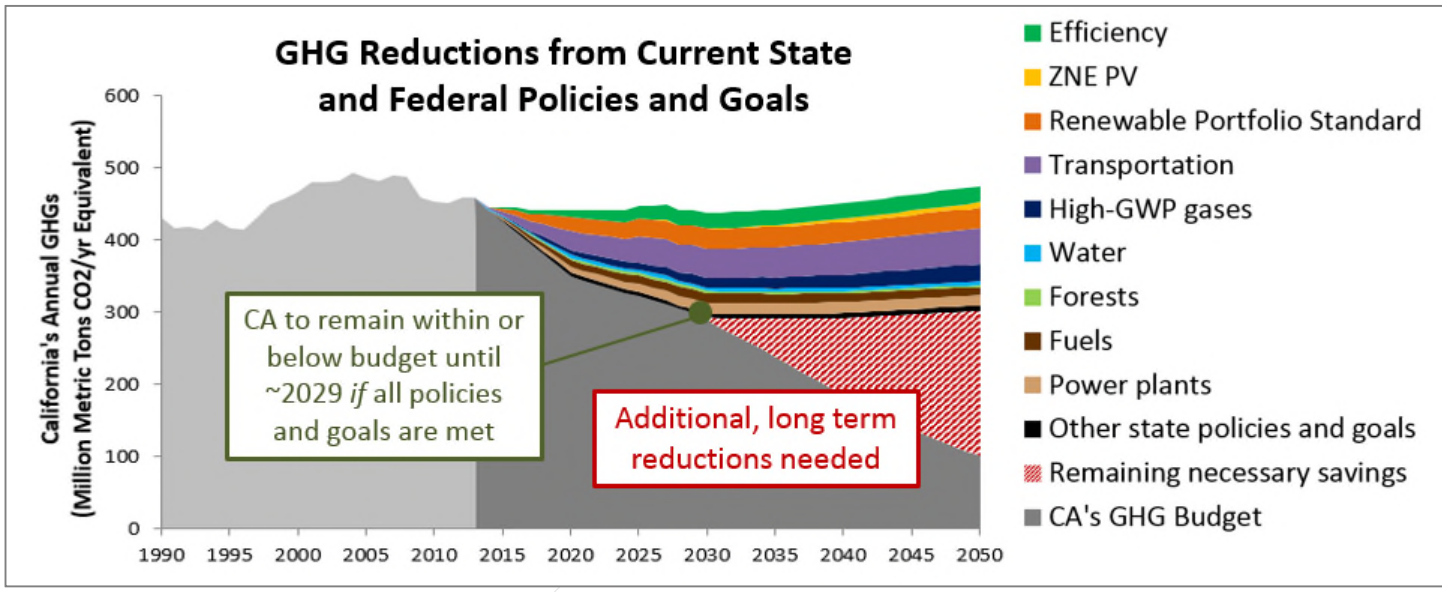
[243] CPUC 2015 (Navigant). "Energy Efficiency Potential and Goals Study for 2015 and Beyond".

[244] At a high level: 1. **Federal:** Enhanced savings for federally covered product categories (through DOE activity or preemption strategies); 2. **Title 20:** Double the rate of Title 20 measure adoption; and 3. **Title 24:** More aggressive efficiency levels and more retrofits affected. For further discussion, see "Codes and Standards Climate Strategy.: Pat Eilert, Eric Rubin, Alex Chase, and Yanda Zhang. 2016 ACEEE Summer Study. Note that the figure has been slightly updated since the ACEEE Summer Study paper was finalized.

model, "Straight Line" scenario. See Eilert et al. *Codes and Standards Climate Strategy* (2016 ACEEE Summer Study) for additional details.

The challenges will continue beyond 2030. **Error! Reference source not found.** below shows California's historical GHG emissions and forthcoming goals established by AB 32, SB 32, E.O. B-30-15, and E.O. S-3-05 (the top of the gray areas represent GHG goals). If California's policy goals are achieved, the State's emissions are expected to decrease at a level that is consistent with GHG reduction goals until about 2029, but additional efforts are needed to reach longer-term goals. C&S can play a role in readying the state for these long-term challenges.

Figure 11. GHG Reductions from State and Federal Policies and Targets



Solid colored wedges indicate GHG reductions if current policy goals are met. Even if current policies are successfully executed, we will need additional strategies to achieve the 2030 goal (40 percent below 1990 levels, established by Executive Order B-30-15) and the 2050 goal (80 percent below 1990 levels, established by Executive Order S-3-05). Source: Eilert et al. Codes and Standards Climate Strategy. 2016 ACEEE Summery Study on Energy Efficiency in Buildings.

Appendix G. Abbreviations and Acronyms

ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ACEEE	American Council for an Energy-Efficient Economy
CALBO	California Association of Building Officials
CARB	California Air Resource Board
CBSC	California Building Standards Commission
CCTR	Code Change Theory Report
CDMT	Code-directed Market Transformation
Energy Commission	California Energy Commission
CPUC	California Public Utilities Commission
DER	Distributed Energy Resources
DOE	United States Department of Energy
DR	Demand Response
ED	Energy Division
EE	Energy Efficiency
EM&V	Evaluation Measurement & Verification
EPAct 2005	Energy Policy Act of 2005
EPCA	Energy Policy and Conservation Act
EPIC	Electric Program Investment Charge
ET	Emerging Technologies
GHG	Greenhouse gases
Green MLS	Green Multiple Listing Service
GWP	Global warming potential
HFC	Hydrofluorocarbons
ICC	International Code Council
IDER	Integrated Distributed Energy Resources
IOU	Investor Owned Utility
NEEA	Northwest Energy Efficiency Alliance
NEEP	Northeast Energy Efficiency Partnerships
NOMAD	Naturally Occurring Market Transformation
NRDC	National Resources Defense Council
PA	Program Administrator

RASS	Residential Appliance Saturation Study
RCx	Retro-commissioning
RPS	Renewable Portfolio Standard
REN	Regional Energy Network
SB	Senate Bill
T&D	Transportation & Distribution
TDV	Time Dependent Value
TRC	Total Resource Cost Test
US DOE	United States Department of Energy – US may not be used
US EPA	United States Environmental Protection Agency – US may not be used
US FTC	United States Federal Trade Commission – US may not be used
ZNE	Zero Net Energy
ZEV	Zero Emission Vehicles

General Appendices

Appendix I: CPUC Business Plan Checklist

Business Plan Element	Coverage in Document
Summary Table for cost effectiveness w/TRC,PAC, RIM, Emissions, Savings	
Historical sector performance and evaluation takeaways	[Pages X through Y → hyperlinks to all references]
Compare/contrast this proposal with past program cycles	[Pages X, Y, Z → hyperlinks to all references]
Analysis of PA and CPUC evaluation reports for this sector within context of this proposal	
How this proposal addresses performance issues within the sector	
Overarching goals, strategies, approaches for sector: How the sector approach advances the goals, strategies and objectives of the Strategic Plans and other Commission policy guidance: • Near-term (year one) strategic initiatives and expected outcomes • Mid-term (years 2-3) strategic initiatives and expected outcomes • Long-term (years 4-5+) strategic initiatives and expected outcomes	
Proposed Programs: Resource, Non-resource, and Pilots	
Resource Program Strategies	N/A (Public Sector covers only non-resource programs.)
Non-Resource Program Strategies	
Pilot Program Strategies	
Proposed Budget Forecast • Near-term (year one) strategic initiatives and expected outcomes • Mid-term (years 2-3) strategic initiatives and expected outcomes • Long-term (years 4-5+) strategic initiatives and expected outcomes	
Projected savings (resource programs) • Near-term (year one) strategic initiatives and expected outcomes • Mid-term (years 2-3) strategic initiatives and expected outcomes • Long-term (years 4-5+) strategic initiatives and expected outcomes	
Performance metrics (non-resource programs)	

• Near-term (year one) strategic initiatives and expected outcomes • Mid-term (years 2-3) strategic initiatives and expected outcomes • Long-term (years 4-5+) strategic initiatives and expected outcomes	
Supporting Functions:	
EM&V Efforts: • Anticipated study needs • Internal performance analysis/feed-through during program deployment	
Marketing and Outreach: Strategies, approaches and outcomes	
Workforce, Education and Training: Strategies, approaches and outcomes	
Coordination with other state agencies and initiatives	
Demand Response	
Residential Rate Reform	
Integrated Demand Side Resources	
Zero-Emission Vehicles (EVs)	
Energy Savings Assistance (Multi-family Focused)	

Appendix II: Policy Drivers

RESIDENTIAL		
CEESP Goal	**CEESP Strategy**	**Business Plan Response**
Section 2 - Goal 1: New construction will reach “zero net energy” (ZNE) performance for all new single and multi-family homes by 2020.	Drive continual advances in technologies	* Single sign-on self-service web portal creates "demand pull" by providing ability to track progress towards ZNE by logging all premise measures installed or projects completed.
Section 2 - Goal 2: Transform home improvement markets to apply whole house energy solutions to existing homes.	Continue to develop, deploy and enhance Whole House Programs, promote effective decision making to create widespread demand research new/advanced cost effective innovations to reduce energy in existing homes, develop partnerships to create and enhance financial products and increase Title 24 compliance.	* Single sign-on self-service web portal that provides more accessible and intuitive offerings.
Section 2 - Goal 3: Develop comprehensive, innovative initiatives to reverse the growth of plug load energy consumption through technological and behavioral solutions.	Drive continual advances and public awareness/demand in plug load usage and energy management systems using market transformation activities while continuously strengthening standards.	* Utilize behavioral interventions to increase engagement. • Provide education through the audit tool capabilities. * Provide customers with near real-time information on their energy-usage.

COMMERCIAL		
CEESP Goal	**CEESP Strategy**	**Business Plan Response**
Section 3 - Goal 2: 50 percent of existing buildings will be equivalent to zero net energy buildings by 2030.	Develop tools and financing strategies to use information, behavioral strategies, commissioning and training to reduce consumption. Improve plug load technologies and 'one-stop' energy management solutions.	* Deploy a redesigned educational effort that is consistent with using energy efficiency to increase the value of the building as an asset. * Will work with third-party implementers to design and deliver a comprehensive offering that maximizes landlord and tenant value while minimizing the impact to both the landlord and tenant businesses
Section 3 - Goal 2: 50 percent of existing buildings will be equivalent to zero net energy buildings by 2030.	Develop business models and supplier infrastructure to deliver integrated and comprehensive “one-stop” energy management solutions	Will create a program specifically targeting property managers that takes an integrated, concierge approach to implementation that includes financing and rebate/incentives.

PUBLIC		
CEESP Goal	**CEESP Strategy**	**Business Plan Response**
Section 12 - Goal 1: Local governments are leaders in adopting and implementing "reach" codes.	Develop broad education program and peer-to-peer support to local govt's to adopt and implement model "reach" codes and/or point of sale policies.	• Empower public customers to improve code compliance by establishing guidance on how to realize improvements and by communicating this information across all major stakeholder groups.
Section 12 - Goal 2: Strong support from local governments for energy code compliance enforcement.	Dramatically improve compliance with and enforcement of Title 24, including HVAC permitting and inspection requirements (including focus on peak load reductions in inland areas)	* Will develop stakeholder engagement plans in order to better understand those customers' needs and establish concrete actions to maintain strong relationships with them.
Section 12 - Goal 3: Local governments lead by example with their own facilities and energy usage practices.	Adopt specific goals for efficiency of local new and existing government buildings; Improve access to favorable financing terms that create positive cash flow from energy efficiency/DSM savings	* Will establish a collaboration platform covering all public sector customers—as well as those across other sectors. * Help each type of public entity stand up its own revolving fund and establish alternative financing mechanisms.
Section 12 - Goal 4: Local governments lead their communities with innovative programs for energy efficiency, sustainability, and climate change.	Local governments commit to clean energy/climate change leadership; Statewide liaison to assist local governments in energy efficiency, sustainability, and climate change programs	* Will continue to provide, and enhance, periodic energy efficiency fact sheets to highlight the energy efficiency progress made within a leader's jurisdiction.
Section 12 - Goal 4: Local Government Energy Efficiency Expertise	Create a menu of products, services, approved technologies and implementation channels to guide local governments; Develop model approaches to assist local governments participating in regional coordinated efforts for energy efficiency,	• Empower public customers to improve code compliance by establishing guidance on how to realize improvements and by communicating this information across all major stakeholder groups.

INDUSTRIAL		
CEESP Goal	**CEESP Strategy**	**Business Plan Response**
Section 4 - Goal 2: Build market value and demand for continuous improvement in industrial efficiency through branding and certification.	Develop and implement workforce training program (integrated with national training effort). Create tracking and scoring systems to measure efficiency, implement ME&O efforts.	* Will address in conjunction with WE&T efforts. * Will expand Strategic Energy Management (to leverage continuous improvement) offering by leveraging the SW downstream model for consistency
Section 4 - Goal 3: Provide centralized technical and public policy guidance for California industrial energy and resource efficiency.	Conduct statewide marketing to create demand and a centralized repository of materials (with partners)	* Will educate and train industrial customers on to identify process savings and how to achieve deeper savings through Strategic Energy Management.
AGRICULTURAL		
CEESP Goal	**Specific Requirement / Guidance**	**Business Plan Response**
Section 5 - Goal 2: California regulations, financing mechanisms, and incentives programs affecting the management of energy, air and water resources, solid waste, and climate change will be coordinated to mutual advantage.	Set objectives and framework for agriculture to attain multi-resource management goals; Coordinate technical assistance, funding, and incentive mechanisms	* SDG&E will solicit for third-party programs that can provide offerings that include Energy Management Systems and emerging technologies, expanded financing options, and Agricultural EE case studies.
Section 5 - Goal 3: Achieve significant increases in the efficiency of electricity and natural gas use and on-site renewable energy utilization, including setting a specific target for irrigation efficiency.	Make information on efficiency solutions readily available to motivate efficiency improvements; Conduct marketing & outreach to stimulate efficiency actions	* will solicit for third-party programs that can offer energy/water management systems, partnerships with water agencies and other solutions that leverage the water-energy nexus.

EMERGING TECHNOLOGIES		
CEESP Goal	**CEESP Strategy**	**Business Plan Response**
Section 11 - Goal 1: Create demand pull and set the research agenda to pursue both incremental and game- changing energy efficiency technology innovations.	Leverage private industry and federally funded technology research and investment; Expand activities to create market pull for energy-efficient technologies	* Will work with new technology vendors, manufacturers, entrepreneurs
Section 11 - Goal 2: Conduct targeted emerging technologies R&D to support the Big, Bold Energy Efficiency Strategies/Programmatic Initiatives and integrated energy solutions goals	Develop general R&D community support for support Big Bold Energy Efficiency Strategies (BBEES)	* identify ways to support developers in developing or specifying new technologies
WORKFORCE, EDUCATION & TRAINING		
CEESP Goal	**CEESP Strategy**	**Business Plan Response**
Section 9 - Goal 1: Establish energy efficiency education and training at all levels of California's educational systems	Incorporate energy efficiency and demand side energy management into traditional contractor and technician training and expand training resources to produce target numbers of trained workers.	* Provide education and training around dynamic code changes, new technologies, and skills needed to meet legislative needs (ZNE Design, Benchmarking and RCx) • Support certification to foster market recognition of acquired skills or competency • Provide access to tools and tool-trainings that will allow workers to work more efficiently
Section 9 - Goal 2: Ensure that minority, low income and disadvantaged communities fully participate in training and education programs at all levels of the DSM and energy efficiency industry	Collaboratively identify appropriate goals and strategies to build California's energy efficiency workforce through 2020, focusing on training that increases participation from within minority, low-income and disadvantaged communities in achieving California's economic energy efficiency potential.	* Will provide career awareness and readiness for disadvantaged communities * Continue to educate participants from disadvantaged communities, and propose a new SW-Career & Workforce Readiness program

CODES & STANDARDS		
CEESP Goal	**CEESP Strategy**	**Business Plan Response**
Section 7 - Goal 1: Continually strengthen and expand building and appliance codes and standards as market experience reveals greater efficiency opportunities and compelling economic benefits.	Develop a phased and accelerated approach to more stringent codes and standards; Improve code research and analysis; Improve coordination of state energy codes and standards with other state and federal regulations; improve coordination of energy codes and standards with utility programs	* Long-term integrated planning and collaboration - such as deconstructing major policy goals such as, specific code objectives and program activities * Expand research and analyses to improve the quality of data included code change proposals * Improve quality of information supplied to the Energy Commission for their interactions with federal agencies
Section 7 - Goal 2: Dramatically improve code compliance and enforcement.	Improve code compliance and enforcement.	* Develop an electronic repository to track repeated patterns of non-compliance by builders and repeated errors by energy analysts. This data can be used to improve next version of code. * Increase clarity and usability of codes by incorporating user-centered design in code development.

FINANCING		
CEESP Goal	**CEESP Strategy**	**Business Plan Response**
Section 2 - Goal 1: Zero Net Energy Homes	Develop innovative financing programs for the construction of energy efficient homes	* Will create program participation processes that are easy for contractors to integrate into their sales process and business operations.
Section 3 - Goal 1: Zero Net Commercial Buildings	Develop innovative financial tools for ZNE and ultra-low energy new buildings	* Will integrate EE incentive programs with innovative financing solutions, such as loans that remain with the property through owner-occupant turnover and energy efficient mortgages.
Section 5 - Goal 2: Coordination of Programs and Funding	Coordinate technical assistance, funding, and incentive mechanisms	* Will coordinate EE financing programs with EE incentive programs to support immediate rebates to facilitate the contractor point of sale with customer.

Appendix III: Residential EM&V Recommendations and Legislative Mandates

Goal	EM&V Recommendations	Strategy	Legislative Mandate
Increase energy efficiency savings in the residential sector by X% through improved customer experience by providing engaging self-service tools and data driven insights	*Assess primary purpose of the program *Develop online marketing to influence customers *Continue with field service *Continue focus on training *Provide information in Spanish *Work in hard to reach areas *Follow-Up after survey *More personalized Recommendations *Additional messaging (Health Based) *Using a wider-range of interventions in DSM programs. *Devote more time to the logic of each program at the planning stage. *Establish a pilot design process for developing and testing pilot programs. *Work with ED and IOUs to align and implement the Ideation Process.	Make Energy Efficiency Products and Services More Accessible Through Methods Such as Mobile Apps & a Self Service Web Portal	AB793, AB758, SB350,
		Empower customers to better manage their energy usage by providing them with granular level information on end-use and personalized recommendations on how to save	SB350, AB758, AB793
		2-3: Increase engagement in the real estate market	SB350, AB758
		2-5 Provide or connect customers to financial assistance	SB350, AB758

Increase energy efficiency participation in the multifamily sector by X% through an approach targeting both tenants and property owners	*Implement a single point of contact *EUC/MFEER/MIDI coordination *Same day enrollment, assessment and installation *Update marketing approach to Multifamily	Promote increase value of asset, generated by Energy Efficiency and ZNE to property owners	SB350, AB758
		Promote increased value of buildings generated by energy efficiency and ZNE to property owners and tenants	SB350, AB758, AB802
Continue to innovate by executing X new approaches to the market	*Encourage more contractor marketing, try to reduce uncertainty around incentive estimates and QA/QC process to get more contractors to embrace program *Monitor QA/QC process so project completion is not delayed *Continue and expand marketing and outreach to inform customers and realtors of the value of WH/HP services. *Build contractor motivation and capacity to market and sell WH/HP services	Identify influential stakeholders that will allow us to expand market opportunities/efficiencies	SB350, AB758

Appendix IV: Residential Key Partners (Committed and/or Potential)

Goal	Key Partners

Increase energy efficiency savings in the residential sector by X% through improved customer experience by providing engaging self-service tools and data driven insights	• Energy Commission
	• Utility (IOU)
	  o Marketing, education and outreach
	  o Program staff
	  o Customer research
	  o Analytics
	  o IT
	• Other IOUs
	• Trade Professional Groups
	  o Contractors
	  o Vendors
	  o Retailers
	  o Manufactures
	  o Social scientists
	  o Evaluators
	• Financial and Investment community
	• Water Agencies

Increase energy efficiency participation in the multifamily sector by X% through an approach targeting both tenants and property owners	• Energy Commission
	• Utility (IOU)
	  o Marketing, education and outreach
	  o Program staff
	  o Analytics
	• Landlords
	  o Property owners
	  o Property managers
	• Tenants
	• Trade Professional Groups
	  o Contractors
	  o Vendors
	  o Facility maintenance operators
	• Financial and Investment community
	• Water agencies

Continue to innovate by executing X new approaches to the market	• Energy Commission
	• Utility (IOU)
	  o Marketing, education and outreach
	  o Program staff
	  o Analytics
	  o IT
	• Trade Professional Groups
	  o Contractors
	  o Technology vendors
	  o Real Estate Agencies

	o Appraisers o Manufactures o Retailers • Financial and investment community

Appendix V: Residential Cross-Cutting Coordination

Sector	Workforce Education and Training	Codes and Standards	Emerging Technologies	Financing
Increase energy efficiency savings in the residential sector by X% through improved customer experience by providing engaging self-service tools and data driven insights	Hold workshops to teach homeowners steps they can take to be more energy efficient, including how to manage home energy use		Work through Ideation process to Incentivize a home management system as part of whole home approach Test out new smart technology for appliances through ideation process and add additional measures (EV Chargers, Battery storage…)	Loans will be available to SDG&E SF customers through REEL and PACE programs
Increase energy efficiency participation in the multifamily sector by X% through an approach targeting both tenants and property owners	Hold seminars that educate landlords about the value of energy efficiency to sell to potential renters. Educate builders about the value of energy efficiency and that they can sell for higher value.			Integrate PACE and launch the statewide MF master-metered loans for affordable housing customers
Continue to innovate by executing X new approaches to the market	Hold seminars that educate Real Estate agents how to sell the value of energy efficiency to prospective home buyers.			Loans will be available to SDG&E SF customers through REEL and PACE programs