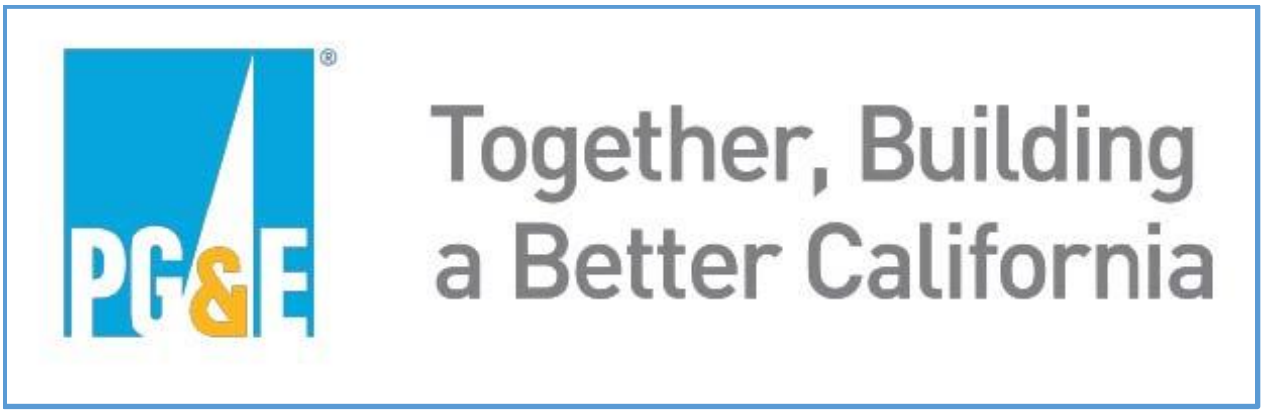

DRAFT

Energy Efficiency Business Plan

Commercial Sector Chapter

Draft – October 18, 2016

PG&E Commercial Sector Business Plan - *Draft*

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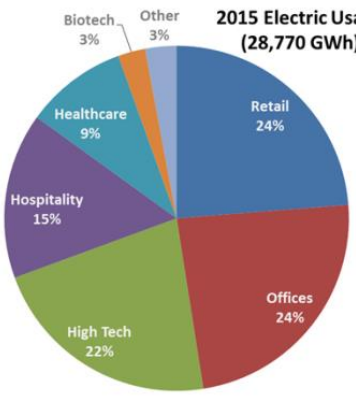
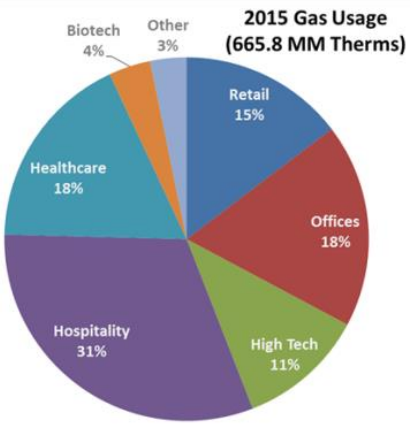
Commercial

Customers by the Numbers[1]

The commercial sector accounts for 38% of electric usage and 25% of gas usage in California[2]





	Commercial Sector		Large Businesses		Small/Medium Businesses	
	2011-2015 Average	2015 Total	2011-2015 Average	2015 Total	2011-2015 Average	2015 Total
Customer Counts (Number of customers)[b]						
Electric	438,930	441,516	91,307	94,970	292,417	338,443
Gas	186,766	186,593	28,081	30,222	133,904	153,082
Total	528,472	530,738	111,979	116,909	350,210	404,119
Annual Sales (GWh, MM Therms)						
Electric	28,601	28,770	19,776	21,142	7,030.8	7,579.2
Gas	683.5	665.8	377.27	393.62	258.8	270.6
Energy Savings (GWh, MW, MM Therms)						
Electric	309.0	250.4	194	165	92.5	82.9
Demand	55.7	46.0	33	28	18.9	17.5
Gas	4.1	4.2	3	3	0.9	1.4
Program Participation (% of total)						
Electric	3.9%	3.2%	5.6%	5.4%	8.1%	6.2%
Demand	3.6%	3.0%	5.0%	11.2%	7.6%	5.9%
Gas	6.5%	6.1%	11.4%	11.2%	13.1%	12.1%
Segment Program Participation (% of segment)[c]						
Electric (GWh) Savings participants						
Retail	8.1%	5.7%	13.3%	8.5%	3.9%	2.6%
Offices	2.5%	1.7%	4.8%	4.4%	4.6%	2.9%
High Tech	1.2%	1.1%	1.2%	1.2%	2.6%	1.2%
Hospitality	7.4%	7.6%	12.0%	14.3%	11.5%	10.5%
Healthcare	2.6%	2.2%	5.0%	5.3%	4.7%	3.4%
Biotech	7.1%	5.3%	15.5%	10.9%	14.5%	10.4%
Gas (Therms) Savings participants						
Retail	10.9%	8.2%	16.8%	12.2%	5.3%	2.1%
Offices	3.3%	2.3%	6.1%	5.6%	6.7%	2.3%
High Tech	7.8%	5.2%	12.5%	9.1%	7.0%	1.2%
Hospitality	8.2%	10.6%	13.9%	20.1%	13.2%	7.3%
Healthcare	4.8%	3.8%	9.1%	8.3%	9.7%	4.2%
Biotech	9.9%	8.9%	13.8%	10.3%	22.4%	11.8%

Notes: [a] Sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively
[b] Customer count by unique combination of Account ID and Premise ID
[c] Showing all segments of Commercial Sector except 'Other'

[1] Source: PG&E program and customer data, does not include schools and other public sector customers.
[2] "California Energy Efficiency Strategic Plan: January 2011 Update," *California Public Utilities Commission and California Energy Commission*, January 2011, p. 28.

A. PG&E's Commercial Sector Vision

PG&E's Commercial Portfolio Vision: PG&E's vision for energy efficiency in the commercial sector centers on empowering both large and small and medium business (SMB) customers to better understand, manage, and eliminate unnecessary energy use. To achieve this vision, PG&E seeks to increase market adoption of energy efficiency and drive deeper, more persistent energy savings through targeted market transformation and integrated solutions that support customers and grid reliability.

PG&E's commercial portfolio will play a leading role in achieving the policy goals of Senate Bill (SB) 350, Assembly Bill (AB) 758, AB 793, AB 802, and the California Energy Efficiency Strategic Plan's (CEESP) 2030 Zero Net Energy (ZNE) commercial building goals. The commercial sector accounts for 38% of electric and 25% of gas usage in California,[3] making PG&E's commercial portfolio a leading contributor to achieving these goals.

PG&E's strategies to address the existing building stock are intertwined with the vision and goals delineated in the AB 758 Existing Buildings Energy Efficiency Action Plan.[4] In particular, PG&E envisions new program models that capture "stranded" potential, new financial solutions to overcome financial barriers, and behavioral, retrocommissioning, and operational (BROS) opportunities to more cost effectively target energy waste in California.[5]

In addition, California's Title 24 building codes and appliance standards are paving the way towards achieving ZNE goals for new and existing commercial buildings by 2030. PG&E will develop a comprehensive suite of assistance, tools, and financial solutions to move the market towards greater adoption of ZNE design and construction.

PG&E uses a variety of delivery channels, from self-service to direct installation, and diverse partners such as local governments, third party implementers, trade professionals, and industry partners, to deliver energy management solutions to SMB and large commercial customers. As trusted energy advisors[6][7], PG&E will use its diverse commercial portfolio in assisting commercial customers make the right energy management decisions to drive deeper, more persistent energy savings.

PG&E's Commercial Customers in Brief

PG&E serves over 500,000 commercial businesses in its service territory, approximately 80% of whom are small and medium businesses (SMB) and 20% of whom are large businesses.

California's economy has been growing and unemployment rates are holding steady. With economic growth comes a growing demand for energy. PG&E's territory is comprised of varying micro-economic climates. San Jose job growth (non-farm employment) is up 5.5% and San Francisco metro area is at 4.6% compared to California's average of 3%. Sacramento (2.8%), Fresno (2.6%) and Stockton (2%) contain more SMB customers than large commercial (see Appendix F for more information).

Commercial customers face many challenges to their businesses, including rising cost of materials, rising health care costs, and increased competition. Managing costs in the face of an uncertain future is important in order to establish economic viability. Energy efficiency is a conduit to decrease energy costs and assists PG&E's commercial customers in overcoming these challenges.

[3] California Energy Efficiency Strategic Plan, January 2011 Update, p. 29.
[4] "California Existing Buildings Energy Efficiency Action Plan," *California Energy Commission*, September 2015, p. 1-4. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN206015_20150904T153548_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf
[5] Bender, Berman, and Skala, 2016. "Perspectives on Doubling Energy Efficiency in California." ACEEE Summer Study 2016. p. 6-5
[6] Utilities are considered the most trusted resource for energy advice (62 percent) by large business customers when asked to pick their top-three resources." [Source: E-Source Large Business Gap and Priority Benchmark 2015, December 2015]
[7] Accenture Research, 2015. The New Energy Consumer: "Unleashing Business Value in a Digital World". p. 16

PG&E's Commercial Sector Goals

PG&E has seven overarching goals for the commercial sector, starting with a primary savings goal:

- Save xx GWh, xx MW, and xx MM therms, with an emphasis on savings from:
    - Targeted business segments
    - SMBs

Secondary goals that we intend to track include:

- Reach an increasing percentage of commercial customers (increasing from 3.9% to xx% over 10-year period) by creating:
    - Targeted value propositions for specific business segments, and
    - Opportunities for SMBs.
- Increase customers' ability to manage energy by increasing the proportion of customers utilizing EMTs from x% to y%
- Integrate energy efficiency with other utility DER options within x% of commercial buildings
- Increase operational efficiency by reducing the ratio of $/kWh and $/therm saved by x% through the use of cost-effective scalable program models such as financing and third-party programs

In addition to these objectives that are directly attributable to our programs, we also seek to influence the market through larger market transformation efforts. Through these efforts, we seek to:

- Assist California in reaching the CEESP's goal of ZNE for 100% of all new commercial construction by 2030 through statewide efforts.
- Increase market share of energy efficiency for key end-uses and/or systems [TBD after mid-and upstream efforts are finalized]

Greater detail on the intervention strategies supporting these goals can be found in *Section G: PG&E's Approach to Achieving Goals*.

B. PG&E's Commercial Sector Proposal Compared to Prior Program Cycles

To meet the goals laid out in its vision, PG&E identified seven intervention strategies (further detailed in *Section G: PG&E's Approach to Achieving Goals*) for the commercial sector, with particular emphasis on where they part from past practice[8]:

- **Data Analytics**: In prior cycles, PG&E applied data analytics to better understand the energy usage profiles of its commercial customers. These efforts culminated in the development of "EE Recommender," PG&E's internal data analytics platform that matches customers with personalized energy efficiency offerings.[9] The platform will continue to be refined to better inform customer outreach strategies.

- **Data Access**: In the past, PG&E developed resources that enabled commercial customers to engage with their energy data. The growth of Advanced Metering Infrastructure (AMI) elevates the importance of data access, since customers can receive detailed energy usage reports that include personalized recommendations for technical assistance and tools to save energy. PG&E will promote data access to ensure all commercial customers have access to their data and can easily share it with third parties.

[8] For more information on PG&E's commercial program in the 2013-2015 program cycle, see the 2013-2014 program implementation plans (PIPs) at http://eestats.cpuc.ca.gov/

[9] Zawadzki, Lin, Dahlquist et al. "Personalized energy efficiency program targeting with association rule mining," *Pacific Gas and Electric Company—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 7.

- **Technical Assistance and Tools:** A key component of PG&E's commercial portfolio in prior cycles was technical assistance and a diverse set of tools to help customers identify opportunities to save energy. Technical offerings included strategic energy planning support, facility audits, and calculation and design assistance, focused on specific technologies, segments, and approaches.[10] PG&E will complement existing offerings with new tools and forms of assistance, including bundling offerings to provide customers with personalized recommendations that maximize energy savings for their investment[11] and developing a comprehensive suite of offerings to promote ZNE adoption.[12]

AB 793—Energy Management Technologies

AB 793 was approved on October 8, 2015 and requires IOUs to incentivize energy management technologies (EMTs) for SMB customers. PG&E is exploring the following long-term SMB solutions:

- **Circuit load monitoring** that determines EE delivered by buildings with circuit sub-metering
- **Mobile app testing** to identify barriers to engagement with energy usage
- **SMB pay-for-performance program**
- **Managed energy services** that combine targeted outreach, integrated building controls, continuous engagement after project completion, and third party financing

- **Financial Solutions**: Financing, rebates, and incentives have always played a major role in PG&E's commercial energy efficiency offerings. In prior cycles, PG&E offered zero-interest project financing, as well as a variety of rebates and incentives to support greater adoption of energy efficiency. This includes providing kickers to encourage hard-to-reach customers to invest in energy efficiency.[13] In the future, PG&E will complement existing offerings with new program models that encourage a greater use of private capital.[14]

- **Assistance for the Design and Building Communities:** In the past, PG&E worked with the design and building communities to advance ZNE demonstrations and the Commercial Whole Building model to move the market towards greater adoption of ZNE. To meet the CEESP's 2030 ZNE goals, PG&E will develop a comprehensive suite of offerings, including new financial solutions, a streamlined application process, and post-occupancy technical assistance and tools to promote savings persistence.

- **Upstream and Midstream Partnerships:** While PG&E has historically established partnerships with commercial manufacturers and distributors of energy efficiency products and services, PG&E will place greater emphasis on cultivating these relationships to prime the market for new energy efficiency offerings and ultimately drive down their cost.

- **Outreach and Education:** Market outreach and education played a key role in prior cycles to increase awareness of the value of energy efficiency. In the future, PG&E will continue to leverage community-wide behavioral energy efficiency campaigns (e.g. Step Up and Power Down) and recognize energy efficiency champions among commercial sector stakeholders.

[10] For more information on PG&E's commercial program in the 2013-2015 program cycle, see the 2013-2014 program implementation plans (PIPs) at http://eestats.cpuc.ca.gov/

[11] "Personalized energy efficiency program targeting with association rule mining," p. 7-8.

[12] "California Energy Efficiency Strategic Plan: January 2011 Update," *California Public Utilities Commission and California Energy Commission*, January 2011, p. 29.

[13] PG&E currently offers kickers for hard to reach customers who meet two of the following criteria: the primarily language spoken is not English, the customer is located outside of the San Francisco Bay Area or Greater Sacramento Area, the business has annual electric demand <20kW or has fewer than 10 employees, and the customer is located in a leased or rented facility.

[14] "California Existing Buildings Energy Efficiency Action Plan: Draft 2016 Action Plan Update," *California Energy Commission*, October 2016, p. 61

These seven intervention strategies will be deployed in stages, over the short-, mid-, and long-term. The individual tactics for each of these strategies are discussed in greater detail in *Section G, PG&E's Approach to Achieving Goals*. Below is a brief summary:

- **In the short-term (1-3 years):** PG&E will optimize portfolio offerings around the new energy savings paradigms such as net savings goals and below-code stranded potential, while exploring new models to scale energy savings cost-effectively. Continued use of data analytics will play a key role in targeting customers and designing and evaluating new program models, such as pay for performance[15].

- **In the mid-term (4-7 years):** PG&E will set the stage for long-term ZNE goals by rolling out a ZNE incentive measure and streamlining resources such as energy modeling, design document templates, and training seamlessly into the application process for new ZNE construction. Commercial customers will also be able to easily engage with their energy usage, facilitating development of strategic energy management plans for large customers as well as bundled tools and assistance for SMBs.

- **In the long-term (8-10 years):** PG&E will continue to support advanced energy management technologies, meter-based savings, pay-for-performance, and other models to advance progress towards doubling energy efficiency by 2030. Customers will view energy use as a key part of cost-management due to the growth of energy management technologies, accessibility of accurate benchmarking data, and programs that use meter based savings. ZNE tactics deployed in the short- and mid-term will be coordinated with codes and standards to facilitate achievement of ZNE goals for existing and new construction by 2030.

To achieve its vision, implementation plans will be strategically deployed within the timeframes listed above to achieve the State of California's energy efficiency goals for the commercial sector. PG&E also anticipates meeting energy savings goals for investment levels, as shown in Sections C and D.

Key Learnings from Recent EM&V Studies of California's Commercial Energy Efficiency Programs

EM&V evaluations from prior cycles also inform the design of PG&E's intervention strategies moving forward. In particular, the following six key learnings from EM&V reports influenced the strategies and tactics proposed in this plan:

- Commercial customers are diverse (sectors, building types, occupancies, lease arrangements) and a range of products and technologies are needed to address their needs.[16]
- Technical assistance for customers has proven valuable. Customers participating in Savings by Design (SBD) routinely request this assistance and it increases persistence of savings. For example, this theme has repeated itself in reviews of SBD process evaluations over the past 15 years.[17]
- Implementing building controls technologies create opportunities for demand and energy savings. Adopting controls technologies empowers customers with energy usage data, automates actions to reduce energy, promotes savings persistence, and overcomes a significant barrier to realize energy savings – time to understand all of the energy efficiency options available and act upon them.[18]

[15] "Powering the Savings: How California Can Tap the Energy Efficiency Potential in Existing Commercial Buildings." *Berkeley Law, Center for Law, Energy & the Environment and the Emmett Institute on Climate Change and the Environment, UCLA*, 2016, p.2.
[16] "PY 2013-2014 Third Party Commercial Program Value and Effectiveness Study Report (Volume 1 of II), *Opinion Dynamics Corporation*, June 15, 2016, p. 18-20.
[17] RLW Associates. (2001) *Final Report 1999-2001 Building Efficiency Assessment (BEA) Study: An Evaluation of the Savings by Design Program*.
[18] Rovito, M., Subramony, G., Laurentia D, et al. "Advanced Thermostats for Small- to Medium-Sized Commercial Buildings," *2014 ACEEE Summer Study Buildings*. Asilomar, CA.

- Lighting, HVAC and refrigeration account for the majority of electric savings in the commercial sector—a trend that is anticipated to continue through 2024.[19]
- Midstream partnerships are effective in increasing the market uptake of energy efficiency. For example, in PG&E's Lighting Innovation Midstream Trial, midstream incentives for LED replacement lamps outpaced sales of LED replacement lamps and/or fixtures through PG&E's other commercial deemed incentive programs. Market actors and end-users noted high levels of satisfaction with the rebate application and payment process.[20]
- Awareness of trainings for nonresidential lighting contractors is a greater obstacle than availability. A recent study determined the wide variety of trainings available for nonresidential lighting programs sufficiently met the training needs of contractors and technicians, but that awareness should be improved.[21]

C. Sector-Level Budget

Over the 10 year period, PG&E 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. Annual Commercial Sector Budgets

Year	Budget	% of Portfolio
2018-2027	TBD	

[19] "*California Commercial End Use Survey*," *Itron*, *March 2006*.
[20] "Pacific Gas and Electric Company's Lighting Innovation Midstream Trial Evaluation," *Evergreen Economics*, October 13, 2015. http://www.calmac.org/publications/PGandE_Commercial_Midstream_LED_Trial_Assessment_Final_Report.pdf
[21] "PY2013-2014 California Statewide Workforce Education and Training Program, Contractor Training Market Characterization." *Opinion Dynamics*. June 2016. http://www.energydataweb.com/cpucFiles/pdaDocs/1631/CPUC%20WET%20Contractor%20Training%20Market%20Characterization_FINAL_V5.docx

D. Annual Net Savings from Potential Study

PG&E aims to achieve net savings goals as reported in the 2015 Navigant Potential and Goals Study ("Potential Study"). These goals are displayed below in Table 2. *Note these are placeholder values. Public goals will need to be split out of these.*

Table 2. Annual Net Savings from Potential Study

Year	Annual Net Goals					
	GWh	% of Portfolio	MW	% of Portfolio	MM Therms	% of Portfolio
2018	149.7		31.5		2.3	
2019	153.6		33.5		2.5	
2020	159.1		35.8		2.8	
2021	168.1		40.5		2.9	
2022	179.1		45.6		3.2	
2023	188.7		49.5		3.4	
2024	202.8		53.7		3.6	
2025	TBD		TBD		TBD	
2026	TBD		TBD		TBD	
2027	TBD		TBD		TBD	
Total						

Source: Navigant Consulting 2015

E. Sector Overview

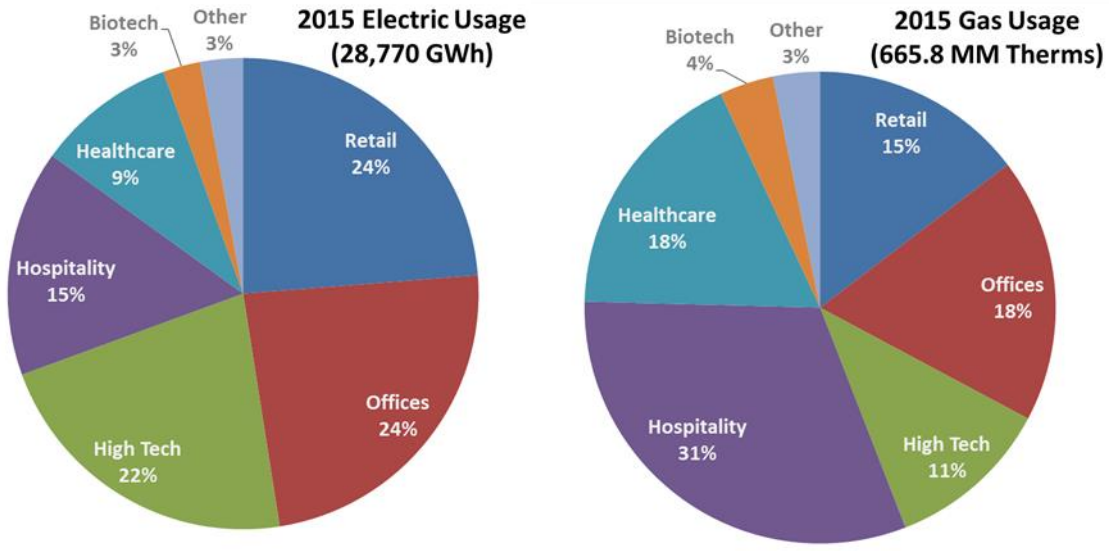
Target Audience

PG&E's commercial customer landscape is diverse, creating unique challenges and opportunities to provide customers with energy efficiency solutions. As a result, PG&E uses data analytics to characterize its commercial customers in terms of segment, size, and geography.

Segment Overview and Energy Usage: PG&E divides the market into segments based on the type of business customers conduct. Segments include biotech, healthcare, high tech, hospitality, offices, retail, and "other."[22] Segmenting its customer base enables PG&E to craft customized solutions for an industry's specific business needs. To date, PG&E's data analytics have identified approximately 10,000 association rules linking customer characteristics with energy efficiency offerings.[23]

The largest consumers of electricity in the commercial sector are offices (24%), retail (24%), high tech (22%), and hospitality (15%).[24] The largest consumers of gas are hospitality (31%), offices (18%), healthcare (18%), and retail (15%).[25] This information is displayed in greater detail in Figure 1 below. For greater detail on program participation, energy usage, and savings for each commercial segment, please see Appendix C: Customer Data.

Figure 1: 2015 Energy Usage by Commercial Customer Segment



Source: PG&E Internal Data

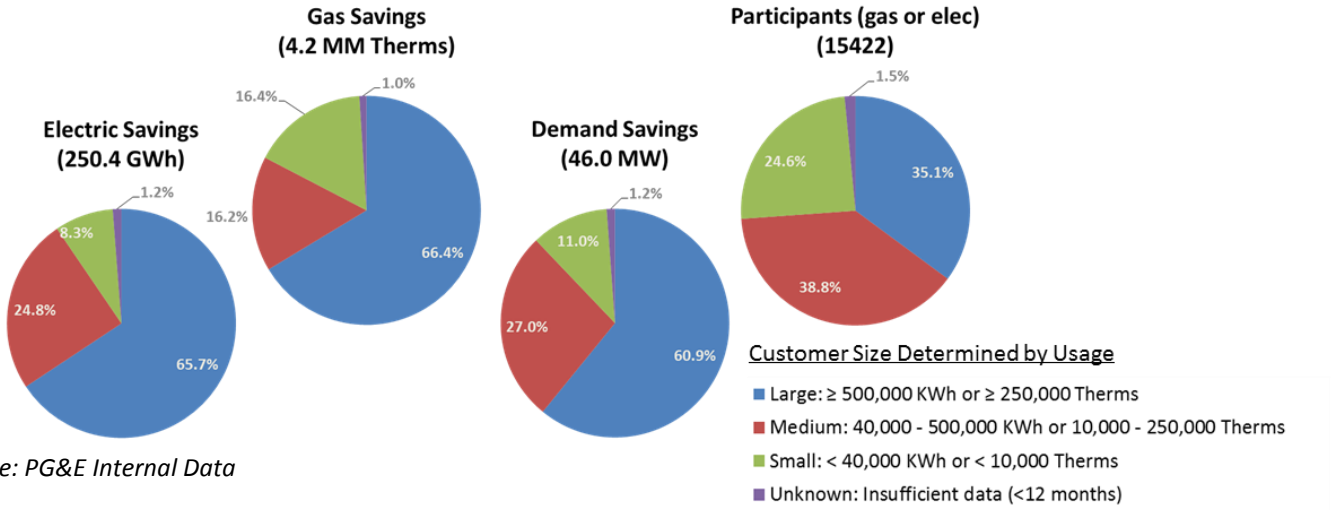
Size and Energy Efficiency Program Participation: PG&E defines customer size based on energy usage. Defining customers based on energy usage enables PG&E to tailor solutions based on a customer's resources and needs.

As Figure 2 shows below, large customers (>500,000 kWh or >250,000 therms) comprised only one-third of commercial energy efficiency program participation in 2015, but accounted for nearly two-thirds of electric and gas

[22] The "other" segment captures all other segments that are not included in biotech, healthcare, high tech, hospitality, offices, and retail.
[23] Zawadzki, Lin, Dahlquist, Bao, et al. "Personalized energy efficiency program targeting with association rule mining," *Pacific Gas and Electric Company—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 8-7
[24] According to the California Commercial End Use Survey, the end uses that consume the most electricity in the commercial sector are interior lighting (29%), cooling (15%), refrigeration (13%), and ventilation (12%). For more, see "California Commercial End-Use Survey," *Itron, Inc.,* March 2006, p. 7.
[25] According to the California Commercial End Use Survey, the end uses that consume the most gas in the commercial sector are space heating (36%) and water heating (32%).

savings. Conversely, although SMBs represent approximately two-thirds of PG&E's commercial energy efficiency participants, they accounted for only one-third of commercial savings in 2015.

Figure 2: 2015 Commercial Energy Efficiency Participation and Savings by Size



Source: PG&E Internal Data

From 2011-2015, the highest participation rates[26] for electric customers were in hospitality (8%), biotech (6%), and retail (5%).[27] The lowest participation rates were in healthcare (2%) and high tech (1%). The fact that high tech customers are responsible for 22% of commercial electricity consumption yet have the lowest participation rate in energy efficiency reveals the need to target this segment to capture savings potential.

In addition, the highest participation rates for gas customers from 2011-2015 were in hospitality (11%), retail (9%), and biotech (11%). The lowest participation rates are in offices (4%) and healthcare (2%).

Figures 3 and 4 below examine commercial electricity and gas customers in 2015 through the lenses of usage, number of customers, and average usage. SMBs comprise more than three-fourths of the customer base for the retail, offices, hospitality, and healthcare segments. A majority of high tech and biotech customers are large energy consumers. On average, high tech and biotech customers used more energy than any other segment on a kWh per customer and therms per customer basis. For example, while average usage across all segments was 65,000 kWh and 3,600 therms per customer, high tech customers used nearly 140,000 kWh and 16,000 therms; biotech customers used more than 730,000 kWh and 2,300 therms per customer.

PG&E will continue to evaluate its data analytics to identify additional segments that may be embedded within the "other" segment, which comprises nearly 15 percent of its commercial customer base. Once identified, these segments can be tracked to inform the design of new offerings.

[26] The participation rate is derived by dividing the number of participants into the number of customers.
[27] For more information on participation rates, see Appendix C: Customer Data.

Figure 3: 2015 Electric Customers: Snapshot of Usage and Average Usage by Size

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total[d]
Electricity Usage (GWh)													
Retail	4,917.6	1,403.0	508.0	6.0	6,834.6	72.0%	20.5%	7.4%	100%	17.1%	4.9%	1.8%	23.7%
Offices	4,631.4	1,604.0	573.4	24.9	6,833.8	67.8%	23.5%	8.4%	100%	16.1%	5.6%	2.0%	23.7%
High Tech	6,098.6	176.5	24.9	1.1	6,301.1	96.8%	2.8%	0.4%	100%	21.2%	0.6%	0.1%	21.9%
Hospitality	2,451.2	1,815.7	196.7	9.1	4,472.7	54.8%	40.6%	4.4%	100%	8.5%	6.3%	0.7%	15.5%
Healthcare	2,196.9	359.2	189.8	0.7	2,746.6	80.0%	13.1%	6.9%	100%	7.6%	1.2%	0.7%	9.5%
Biotech	717.9	19.0	1.3	0.4	738.6	97.2%	2.6%	0.2%	100%	2.5%	0.1%	0.0%	2.6%
Other	127.9	457.4	250.3	7.0	842.6	15.2%	54.3%	29.7%	99%	0.4%	1.6%	0.9%	2.9%
Total	**21,141.5**	**5,834.7**	**1,744.5**	**49.22**	**28,770.0**	**73%**	**20%**	**6%**	**100%**	**73.5%**	**20.3%**	**6.1%**	**99.8%**
Customers (Number of customers)													
Retail	14,363	26,007	56,292	1,763	98,425	14.6%	26.4%	57.2%	98%	3.3%	5.9%	12.7%	21.9%
Offices	24,445	42,015	74,886	1,698	143,044	17.1%	29.4%	52.4%	99%	5.5%	9.5%	17.0%	32.0%
High Tech	37,907	4,268	2,819	83	45,077	84.1%	9.5%	6.3%	100%	8.6%	1.0%	0.6%	10.2%
Hospitality	10,322	27,727	14,550	898	53,497	19.3%	51.8%	27.2%	98%	2.3%	6.3%	3.3%	11.9%
Healthcare	5,437	7,622	19,222	329	32,610	16.7%	23.4%	58.9%	99%	1.2%	1.7%	4.4%	7.3%
Biotech	589	272	138	7	1,006	58.5%	27.0%	13.7%	99%	0.1%	0.1%	0.0%	0.2%
Other	1,907	9,489	53,136	3,325	67,857	2.8%	14.0%	78.3%	95%	0.4%	2.1%	12.0%	14.6%
Total	**94,970**	**117,400**	**221,043**	**8,103**	**441,516**	**22%**	**27%**	**50%**	**98%**	**21.5%**	**26.6%**	**50.1%**	**98.2%**
Average Usage (kWh per customer)													
Retail	342,380	53,948	9,024	3,398	69,439								
Offices	189,462	38,177	7,658	14,680	47,774								
High Tech	160,884	41,344	8,835	13,405	139,785								
Hospitality	237,472	65,484	13,521	10,116	83,606								
Healthcare	404,065	47,132	9,875	1,977	84,226								
Biotech	1,218,872	69,685	9,682	58,329	734,209								
Other	67,069	48,201	4,711	2,119	12,418								
Average	**222,613**	**49,699**	**7,892**	**6,074**	**65,162**								

Notes: [a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
[c] Not evaluating 'Unknown' size customers due to incompleteness of this data
[d] May not sum to 100% due to excluding 'Unknown' size category customers

Source: PG&E Internal Data

Figure 4: 2015 Gas Customers: Snapshot of Usage and Average Usage by Size

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total[d]
Gas Usage (MM Therms)													
Retail	51.0	32.2	14.3	0.2	97.6	52.2%	33.0%	14.6%	100%	7.7%	4.8%	2.1%	14.6%
Offices	66.6	35.6	18.1	0.6	120.8	55.1%	29.4%	15.0%	100%	10.0%	5.3%	2.7%	18.1%
High Tech	70.8	3.9	0.5	0.1	75.2	94.1%	5.1%	0.7%	100%	10.6%	0.6%	0.1%	11.3%
Hospitality	78.4	108.7	20.8	0.5	208.5	37.6%	52.2%	10.0%	100%	11.8%	16.3%	3.1%	31.2%
Healthcare	99.2	13.3	4.9	0.0	117.5	84.4%	11.3%	4.2%	100%	14.9%	2.0%	0.7%	17.7%
Biotech	24.3	0.3	0.1	0.0	24.7	98.3%	1.3%	0.2%	100%	3.7%	0.1%	0.0%	3.7%
Other	3.4	11.0	7.0	0.2	21.5	15.6%	51.2%	32.4%	99%	0.5%	1.6%	1.0%	3.2%
Total	**393.6**	**205.0**	**65.6**	**1.54**	**665.8**	**59%**	**31%**	**10%**	**100%**	**59.1%**	**30.8%**	**9.9%**	**99.8%**
Customers (Number of customers)													
Retail	8,197	10,454	26,546	858	46,055	17.8%	22.7%	57.6%	98%	4.4%	5.6%	14.2%	24.2%
Offices	9,162	15,936	34,413	625	60,136	15.2%	26.5%	57.2%	99%	4.9%	8.5%	18.4%	31.9%
High Tech	2,346	1,122	1,160	40	4,668	50.3%	24.0%	24.9%	99%	1.3%	0.6%	0.6%	2.5%
Hospitality	6,561	17,077	10,495	579	34,712	18.9%	49.2%	30.2%	98%	3.5%	9.2%	5.6%	18.3%
Healthcare	3,296	4,519	13,604	196	21,615	15.2%	20.9%	62.9%	99%	1.8%	2.4%	7.3%	11.5%
Biotech	370	139	94	9	612	60.5%	22.7%	15.4%	99%	0.2%	0.1%	0.1%	0.3%
Other	290	3,429	14,094	982	18,795	1.5%	18.2%	75.0%	95%	0.2%	1.8%	7.6%	9.5%
Total	**30,222**	**52,676**	**100,406**	**3,289**	**186,593**	**16%**	**28%**	**54%**	**98%**	**16.2%**	**28.2%**	**53.8%**	**98.2%**
Average Usage (Therms per customer)													
Retail	6,216	3,078	537	222	2,119								
Offices	7,264	2,231	526	880	2,008								
High Tech	30,161	3,441	473	1,287	16,114								
Hospitality	11,957	6,368	1,978	894	6,006								
Healthcare	30,110	2,952	362	213	5,438								
Biotech	65,706	2,399	598	2,386	40,396								
Other	11,564	3,201	493	175	1,141								
Average	**13,024**	**3,892**	**653**	**470**	**3,568**								

Notes: [a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
[c] Not evaluating 'Unknown' size customers due to incompleteness of this data
[d] May not sum to 100% due to excluding 'Unknown' size category customers

Source: PG&E Internal Data

Geography: PG&E's service territory includes 15 of the 16 climate zones in California.[28] As a result, PG&E segments its commercial customers based on their location in the Central Valley, Coastal, and Mountain regions. Moving forward, this segmentation strategy will play a greater role in informing customer outreach and program design.

Figure 5 below provides greater detail on energy efficiency program participation, energy usage, and savings by region. More than half of PG&E's commercial customers are Coastal, while slightly less than half are in the Central Valley. Only one percent of PG&E's commercial customers are located in the Mountain region. Participation in PG&E's energy efficiency offerings roughly follows these trends, with approximately 60% of participants coming from the Coastal region and less than 40% from the Central Valley.

Figure 5: 2015 Commercial Customers and Participants by Climate Region

2015 Commercial Customers and Participants By Climate Region

	Customer By Climate Region[a]				Percent of Sector			
	Central Valley[b]	Coastal[c]	Mountain[d]	Total	Central Valley	Coastal	Mountain	Total
Customers								
Electric	184,239	251,911	5,365	**441,515**	41.7%	57.1%	1.2%	100%
Gas	90,010	95,678	905	**186,593**	48.2%	51.3%	0.5%	100%
Usage								
Electric (GWh)	9,202.3	19,433.0	134.6	**28,770.0**	32.0%	67.5%	0.5%	100%
Gas (MM Therms)	248.4	415.8	1.591	**665.8**	37.3%	62.5%	0.2%	100%
Participants								
Electric	5,460	8,765	68	**14,293**	38.2%	61.3%	0.5%	100%
Gas	4,341	7,060	55	**11,456**	37.9%	61.6%	0.5%	100%
Savings								
Electric (GWh)	85.5	163.8	1.1	**250.4**	34.1%	65.4%	0.5%	100%
Gas (MM Therms)	1.09	3.14	(0.0002)	**4.2**	25.8%	74.2%	(0.0001)	100%

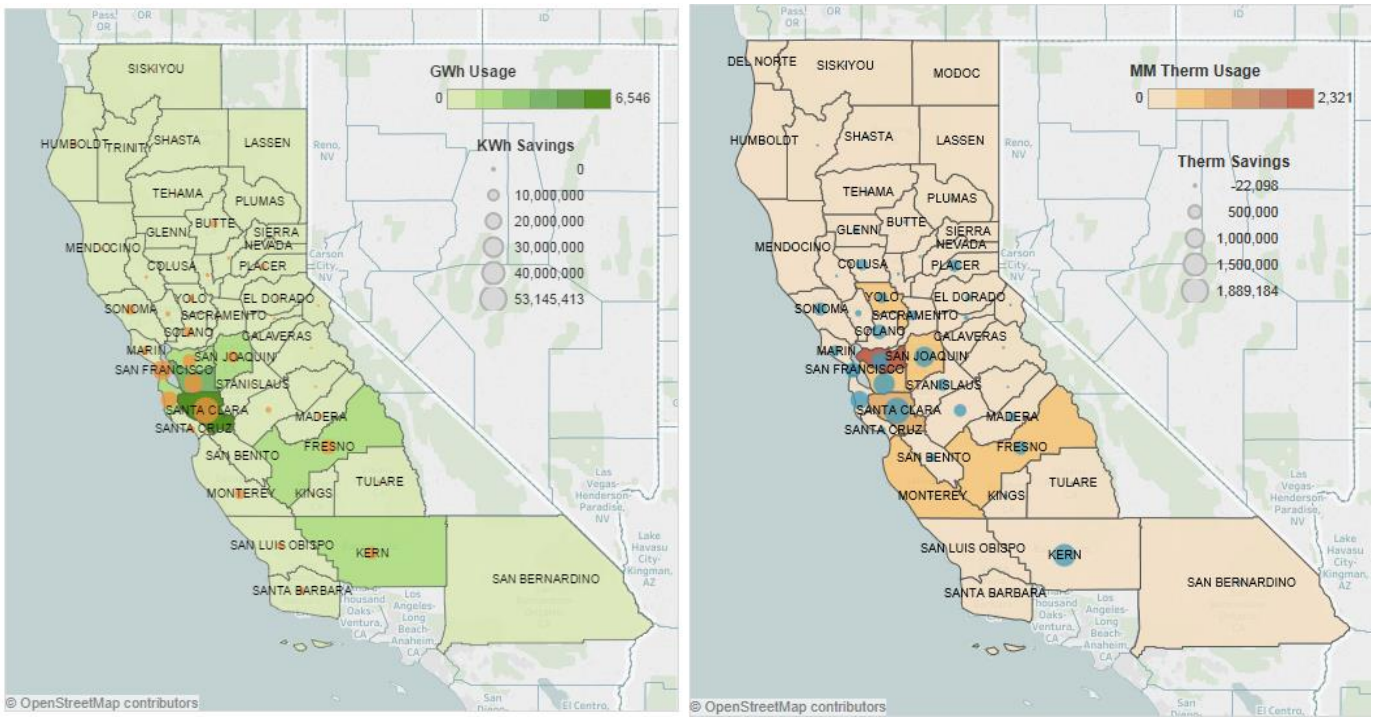
Notes: [a] Climate Regions are aggregates of Climate Zones (Z01-Z16). There are 16 zones but not all are in PG&E's territory.
[b] Central Valley includes: Z11 - Z13
[c] Coastal includes: Z01 - Z09
[d] Mountain includes: Z14 - Z16

Source: PG&E Internal Data

In addition to analyzing residential customers' energy usage at the climate zone level, PG&E also uses data analytics to identify which counties consume and save the most energy. Figure 6 provides an overview of electric and gas usage and savings at the county level. Please see Appendix C: Customer Data for more detailed maps that display usage and savings by segment.

[28] The only climate zone not included is Climate Zone 9, which includes the Los Angeles metropolitan area. For more on Climate Zone 9, see http://www.pge.com/includes/docs/pdfs/about/edusafety/training/pec/toolbox/arch/climate/california_climate_zone_09.pdf

Figure 6: 2015 Commercial Customer Energy Usage and Savings by County



Source: PG&E Internal Data

The counties that used the most electricity in 2015 are largely Coastal, including Santa Clara (6,500 GWh), Alameda (4,100 GWh), San Mateo (2,200 GWh), and Contra Costa (1,800 GWh). Electric savings in 2015 were highest among Santa Clara (53.1 million kWh), San Francisco (28.1 million kWh), Alameda (25.8 million kWh), and San Mateo (20 million kWh) counties.

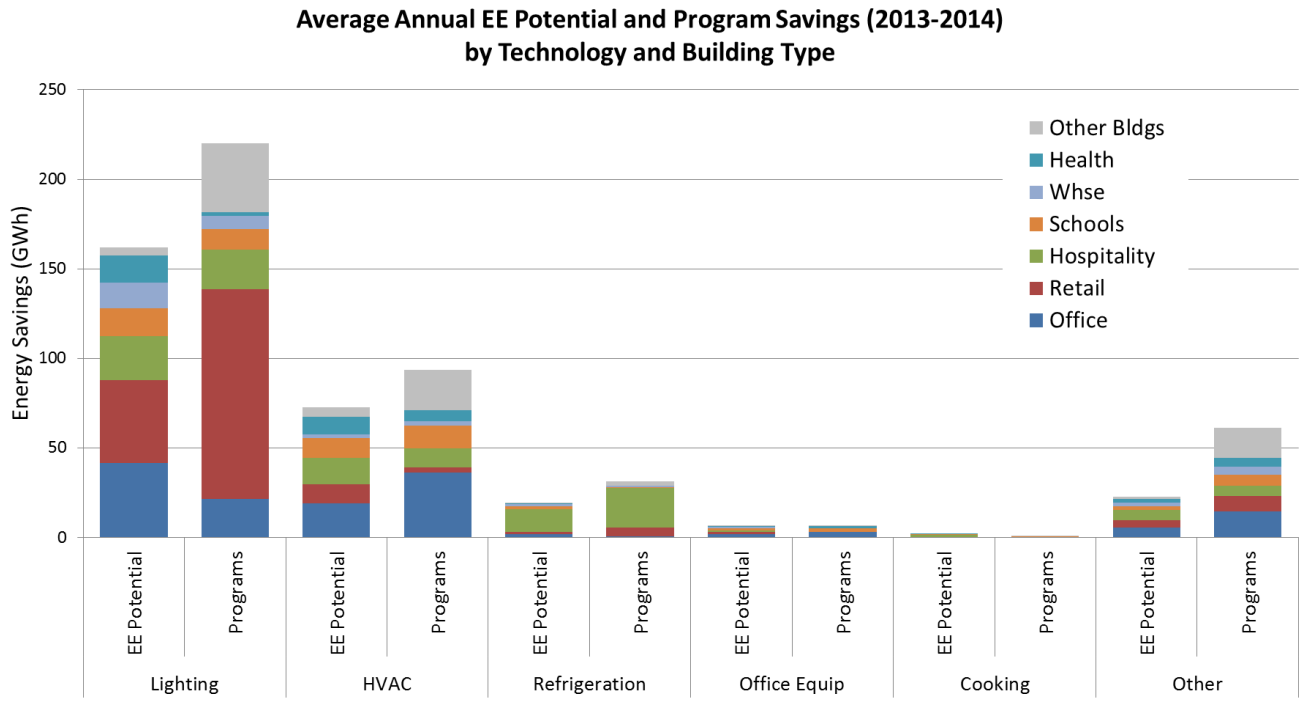
In addition, the counties that used the most gas in 2015 are Contra Costa (2,300 MM therms), Santa Clara (820 MM therms), Alameda (600 MM therms), and Yolo (520 MM therms). Gas savings in 2015 were highest among Santa Clara (1.9 MM therms), Kern (1.4 MM therms), Alameda (1.3 MM therms), and San Joaquin (1.2 MM therms) counties.

Energy Efficiency Potential

The Potential Study[29] provides measure-level forecasts of savings and is used to define utility savings goals. Figure 7 highlights how PG&E program savings compare to the Potential Study. In general, PG&E programs have exceeded energy efficiency potential in each end-use category. This highlights that end-use targeting is an effective tool for both identifying energy savings opportunities and informing program designs that realize these savings. PG&E looks forward to the 2017 update to the Potential Study to inform its future commercial energy efficiency offerings.

[29]" Navigant 2015 Potential and Goals Study," http://www.cpuc.ca.gov/General.aspx?id=2013

Figure 7. 2013-2014 Energy Efficiency Potential and Program Savings



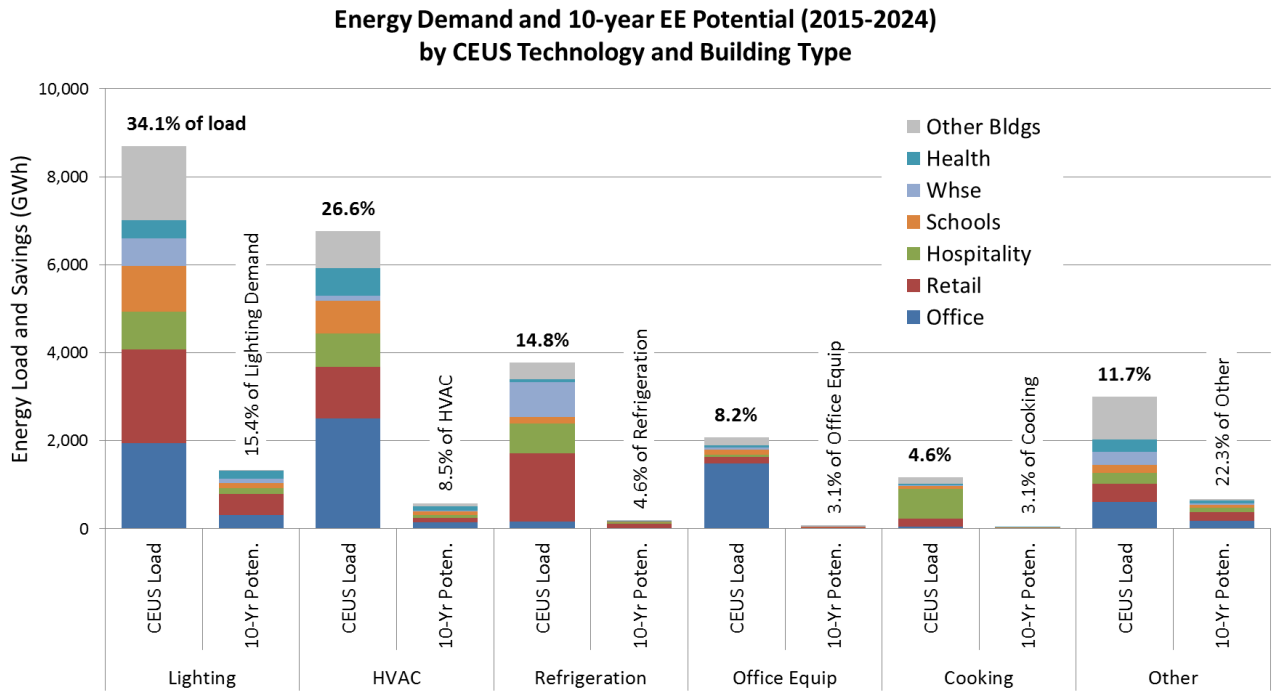
Source: Navigant Consulting 2015 and PG&E Internal Data

The California Commercial End Use Survey (CEUS) provides additional insight into energy load and ten-year savings potential specific to end uses within the commercial sector. The majority of load lies with lighting (34%), HVAC (27%), and refrigeration (15%). Echoing trends from the Potential Study, these end uses also represent the most significant savings opportunities over the next ten years. These data are presented in greater detail below in Figure 8.

The existence of continued savings opportunities within commercial lighting are reinforced by the 2014 Commercial Saturation and Commercial Market Share Tracking Study, which finds that awareness of efficient lighting products is generally higher than adoption. For example, 82% of PG&E customers have heard of compact fluorescent bulbs, two-thirds expressed familiarity with them, and half of customers have actually installed them.[30] In addition, although 95% of PG&E customers have heard of light emitting diodes (LEDs), only 32% expressed familiarity with them, and half have installed them.[31] More than half of PG&E commercial customers also still have incandescent lighting at their facilities.[32]

[30] "Commercial Saturation and Commercial Market Share Tracking Study Telephone Survey Findings," *Itron,* September 4, 2014, p. A-26. http://www.calmac.org/publications/California_CSS_CMST_Phone_Survey_Appendices.pdf
[31] "Commercial Saturation and Commercial Market Share Tracking Study Telephone Survey Findings," *Itron,* September 4, 2014, p. A-28-29. http://www.calmac.org/publications/California_CSS_CMST_Phone_Survey_Appendices.pdf
[32] "Commercial Saturation and Commercial Market Share Tracking Study Telephone Survey Findings," *Itron,* September 4, 2014, p. A-28. http://www.calmac.org/publications/California_CSS_CMST_Phone_Survey_Appendices.pdf

Figure 8. Commercial Energy Load and Energy Efficiency Potential by Segment and End Use



Source: California Commercial End Use Survey, 2006

Figure 8 reveals a gap in available data. The CEUS informs both regulatory policy and energy efficiency program design in California, but relies on data collected in 2005. Over the last decade, California's economy has shifted significantly, energy efficiency technologies have advanced at a rapid pace, and policies such as AB 802 have prompted a reconceptualization of how to account for energy savings. For example, both the Potential Study and CEUS reflect only above code savings. AB 802 now provides an opportunity to capture stranded savings. As a result, updating the CEUS, California Lighting and Appliance Saturation Study, and the Potential Study is critical as PG&E and other program administrators work towards California's energy efficiency goals, such as increasing the efficiency of existing buildings (AB 758), meeting the CEESP's ZNE goals by 2030, and doubling energy efficiency savings by 2030 (SB 350).

F. Commercial Sector Trends and Challenges

PG&E's service territory is large and diverse, which necessitates a multi-pronged approach when addressing the commercial sector. Small, medium, and large customers operate in very different ways. It is important to distinguish between them when evaluating where trends and opportunities exist. PG&E has identified trends that impact its commercial customers through experience and market research analysis.

Trends

- **Energy management has been shown to deliver cost savings and intangible benefits that drive business results**.
    - A 2016 survey of more than 1,000 energy and facility management executives by Johnson Controls reveals 82% cited cost reduction as an extremely or very significant benefit of energy efficiency projects.[33]
    - The Building Owners and Managers Association (BOMA) International's Experience Exchange Report reveals commercial properties reduced total operating expenses from $8.18 to $7.86 per square foot from 2011 to 2012. Two-thirds of these savings are credited to utilities.[34]
    - McGraw Hill Construction's 2011 Green Outlook finds 67% of corporate leaders believe their customers have sustainability needs.[35]
    - A 2015 report by the New Buildings Institute finds "a greater focus on Corporate Responsibility is driving leading CRE (corporate real estate) companies to develop Sustainability and Energy Policies."[36]
    - A 2010 survey of 278 executives by the Economist Intelligence Unit identifies the intangible benefits of energy efficiency as a significant advantage for businesses. Intangible benefits include an enhanced ability to hire and retain talent as well as the ability to increase sales through new energy efficient goods and services.[37]
    - A 2016 presentation by the Institute for Market Transformation finds investing in high-performance buildings lowers operating expenses, provides greater revenue through rental and occupancy premiums, and increases property value due to higher net operating income.[38]
    - Energy efficiency contributes to improved patient care within the healthcare sector. For example, upgrading HVAC systems improves indoor air quality and reduces the frequency of hospital-acquired airborne infections. Lighting upgrades can also decrease the frequency of patient falls.[39]

[33] "2016 Energy Efficiency Indicator Survey," *Johnson Controls*, http://www.johnsoncontrols.com/media-center/news/press-releases/2016/06/23/~/media/b8b0f06132bf41509f22d79db53dfdbb.ashx

[34] "Analysis: Commercial Real Estate Industry Continues to Achieve Utilities Savings," *Building Owners and Managers Association International*, http://www.boma.org/research/newsroom/press-room/2013/Pages/Commercial-Real-Estate-Industry-Continues-to-Achieve-Utilities-Savings.aspx

[35] "Green Outlook 2011: Green Trends Driving Growth," *McGraw Hill Construction, http://aiacc.org/wp-content/uploads/2011/06/greenoutlook2011.pdf*

[36] "Commercial Real Estate (CRE) Market Test Assessment: Understanding Delivery, Partnership Strategies and Program Channels," *Northwest Energy Efficiency Alliance*, March 16, 2015, p. 20.

[37] "Unlocking the benefits of energy efficiency," *The Economist Intelligence Unit*, February 22, 2011, https://www.eiuperspectives.economist.com/energy/unlocking-benefits-energy-efficiency

[38] "Investing in High-Performance Buildings," *Presentation by Leonard Kolstad, Institute for Market Transformation,* April 20, 2016, Slide 4.

[39] "Advanced Energy Retrofit Guide: Practical Ways to Improve Energy Performance—Healthcare Facilities," *U.S. Department of Energy*, p. 13 http://www.nrel.gov/docs/fy13osti/57864.pdf

- **Customers expect innovative energy efficiency technologies and processes entering the market will be accessible through a utility's energy efficiency programs.**
    - More than seven in ten American mayors believe the utility is a city's most important partner in deploying new energy efficiency technologies.[40]
    - A 2015 survey of 200 commercial stakeholders by Ecova finds 82% have installed energy management systems (EMS) at some or all of their facilities.[41] Respondents identified utility-incentive advantages as a motivator for installing an EMS due to the ability to load shift into periods with lower rates. EMS technology will be a key feature of PG&E's AB 793 implementation strategy to promote greater adoption of these technologies.
    - Innovation in energy efficiency technologies is driving demand for energy solutions in the high tech sector. Innovations in more efficient cooling and powering strategies as well as improved power management software have contributed to only a modest increase in energy consumption in enterprise-level data centers. From 2005-2010, energy consumption increased 24% compared with an increase of only 4% between 2010-2014. [42]

- **The size and occupancy of commercial buildings is rapidly changing due to the rise of online shopping, customers' premium on convenience, and rising labor and construction costs**. This trend creates an opportunity for PG&E's energy efficiency programs to intervene in the re-design of these new building types and aligns with AB 758's emphasis on improving energy efficiency in existing buildings. California's AB 758 Existing Building Energy Efficiency Action Plan identifies four trigger points for improvements in commercial buildings: building sale, tenant change, or lease renewal; redesign of a space; maintenance agreement renewal; and mortgage refinance.[43]
    - National retail chains are evolving to supersize for one-stop-shop convenience or downsize into smaller stores for quick grab-and-go trips.[44]
    - Online retailers are racing to secure urban warehouse space to fulfill a higher volume of orders in a shorter amount of time.[45] More office buildings or tenant spaces may be converted to storage spaces, where operating hours and energy needs may not be the same as traditional offices.
    - In response to the Affordable Care Act and evolving patient preferences, health systems are taking a page from the retail handbook as they look for ways to deliver the most convenient and cost-effective care to patients.[46] As a result, health systems are moving primary and urgent care services to shopping centers, backfilling vacancies left behind by big-box retailers that downsized or went out of business during the Great Recession.
    - The rise of labor and construction costs is leading developers to focus on existing commercial buildings as opposed to new ground-up development, particularly in urban areas where vacant land is in low supply.[47] "Adaptive reuse" of existing buildings is appealing not only because of its cost-effectiveness, but also because adapting and reusing buildings is faster to develop than new construction.

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[40] "Energy Efficiency and Technology in America's Cities," *Mayors Climate Protection Center*, January 2014, p. 6 http://usmayors.org/pressreleases/uploads/2014/0122-report-energyefficiency.pdf

[41] "Energy Management System Survey Analysis," *Ecova, Inc.*, June 2015, p. 6, 9 http://s3.amazonaws.com/uploads.ecova.com/2016/04/27220809/ems-survey-analysis-findings-from-industry-professionals.pdf

[42] "Data Centers Continue to Proliferate While Their Energy Use Plateaus," *Lawrence Berkeley National Laboratory*, June 27, 2016, http://newscenter.lbl.gov/2016/06/27/data-centers-continue-proliferate-energy-use-plateaus/

[43] "California Existing Buildings Energy Efficiency Action Plan," *California Energy Commission*, September 2015, p. 19. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN206015_20150904T153548_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf

[44] (http://www.nielsen.com/us/en/insights/reports/2012/retail-usa-whats-in-store-2016.html)

[45] Emily Johnson and Taylor Johnson, "Experts predict commercial real estate trends for 2016," *Building Design and Construction Network*, December 21, 2015 http://www.bdcnetwork.com/TaylorJohnson

[46] Ibid.

[47] Ibid.

- **SMBs continue to comprise a majority of commercial buildings.**
    - More than 50 percent of commercial buildings are 5,000 square feet or less and nearly three-fourths are 10,000 square feet or less.[48] California's AB 758 Existing Building Energy Efficiency Action Plan identifies the importance of addressing energy efficiency opportunities in SMBs, particularly buildings with a single tenant instead of larger buildings with multiple tenants.[49]

Driven largely by these four trends, commercial customers face seven key barriers to participation in commercial energy efficiency programs. PG&E's seven intervention strategies seek to overcome these barriers, as shown in Table 3 below, and explained in greater detail in *Section G. PG&E's Approach to Achieving Goals*.

Challenges

Table 3: Commercial Market Trends and Barriers to Energy Efficiency Program Participation

Key Barriers for the Commercial Sector	Commercial Sector Interventions
• Imperfect information on the performance of equipment, technologies, and buildings impedes effective customer outreach and program design[50]	• Data analytics
• Customers have limited capacity and understanding of energy efficiency[51]	• Data access and awareness
• Customers have competing priorities based on operations, building type, size, and vintage[52]	• Technical assistance and tools
• Customers face high upfront capital costs, a lack of access to credit (for SMBs), and management priorities that can impede energy efficiency[53]	• Financial solutions
• The ZNE market is still in the "proof-of-concept" stage[54]	• Assistance to the Design and Building Communities
• Limited availability of cost effective energy efficient options in the marketplace[55]	• Upstream and midstream partnerships
• Lack of understanding the value of energy efficiency to take action[56]	• Outreach and education

[48] "A Look at the U.S. Commercial Building Stock: Results from EIA's 2012 Commercial Buildings Energy Consumption Survey (CBECS)," *U.S. Energy Information Agency*, http://www.eia.gov/consumption/commercial/reports/2012/buildstock/index.cfm
[49] "California Existing Buildings Energy Efficiency Action Plan," *California Energy Commission*, September 2015, p. 18. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN206015_20150904T153548_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf
[50] Vaidyanathan, Nadel, Amann et al. "Overcoming Market Barriers and Using Market Forces to Advance Energy Efficiency," *American Council for an Energy-Efficient Economy*, March 2013, p. vi. http://aceee.org/sites/default/files/publications/researchreports/e136.pdf
[51] "Commercial Real Estate (CRE) Market Test Assessment," p. 21.
[52] "California Existing Building Energy Efficiency Action Plan," p. 19.
[53] "California Existing Buildings Energy Efficiency Action Plan," p. 18.
[54] "The Road to ZNE: Mapping Pathways to ZNE Buildings in California," *Heschong Mahone Group, Inc.* December 20, 2012, p. 10, http://www.trcsolutions.com/writable/images/The-Road-to-Zero-Net-Energy.pdf
[55] "Commercial Real Estate (CRE) Market Test Assessment," p. 14-15.
[56] "Commercial Real Estate (CRE) Market Test Assessment," p. 14-15.

G. PG&E's Approach to Achieving Goals

Strategic Interventions Overview

PG&E has a long and successful history of providing a diverse range of energy efficiency offerings to its commercial customers. As California's commercial sector changes and the energy efficiency technological and policy landscape evolves, PG&E has identified seven strategic interventions building on past strategies. These interventions are:

- **Data Analytics** overcome the barrier of imperfect information by enabling PG&E to strategically target high-opportunity projects and provide targeted value propositions through its EE Recommender platform. PG&E will continue to analyze AMI data to better understand SMB customer characteristics, paving the way for SMB targeting in the future.
- **Data Access** enables customers to better understand how they use energy so they can make informed decisions about energy management.
- **Technical Assistance and Tools** empower customers with tailored solutions they need to realize their energy savings potential. Connecting customers with bundled solutions that make economic sense for their segment, helping them navigate the complexity of regulations, and integrating energy efficiency offerings into day-to-day operations are all important components of this intervention strategy.
- **Financial Solutions** provide financial impetus to get energy efficiency measures off the ground. New financing options, as well as the loans, rebates, and incentives PG&E currently offers, will play a critical role in supporting the launch of new program models that promote energy management technologies, capture stranded potential, and drive ZNE adoption.
- **Assistance for the Design and Building Communities** is required to overcome the cost barriers of ZNE and meet the CEESP's goals of establishing 50% of existing commercial buildings and 100% of new commercial buildings as ZNE by 2030.
- **Upstream and Midstream Partnerships** increase adoption of energy efficiency within the commercial sector by collaborating with stakeholders who also interact with customers. These partnerships aim to increase market awareness of new energy efficient products and equipment while driving down their cost in the long-term.
- **Outreach and Education** increase participation in commercial energy efficiency programs by promoting greater awareness of opportunities to save energy. This includes community-wide behavioral energy efficiency campaigns such as "Step Up and Power Down" and recognizing champions within the industry for advancing ZNE practices.

The next section provides further detail on the selected intervention strategies and exploratory tactics. Before proceeding with implementation, PG&E will expose each tactic described to a rigorous internal development process to assess its relative viability and cost effectiveness.

Intervention 1 – Data Analytics

According to a 2013 report by the American Council for an Energy-Efficient Economy, "imperfect information may be the most widespread barrier to energy efficiency."[57] Since energy efficiency cannot be seen, it is difficult to understand how different equipment, technologies, and buildings are performing and where savings opportunities exist.[58] These obstacles are particularly acute for PG&E's commercial portfolio due to the diversity of its customer base.

The growth of AMI enables PG&E to mitigate imperfect information by leveraging real-time monitoring and analysis for improved customer targeting.[59] Specifically, PG&E developed its EE Recommender platform, which uses "association rule learning" to provide a targeted value proposition for customers with untapped savings potential, such as high HVAC users in the Central Valley or constrained substations as part of targeted demand side management (TDSM).[60] Association rule learning links energy efficiency offerings with unique customer characteristics, enabling PG&E to provide tailored energy management solutions to its commercial customers.[61]

This intervention strategy aims to achieve two primary outcomes. First, EE Recommender will continue to identify medium to large-sized customers within the highest using customer segments (e.g. retail, offices, high tech, and hospitality) that can contribute significant energy savings through participation in energy efficiency programs.

Second, data analytics will be used to better understand and target SMB customers. According to a 2016 PG&E study, "the SMB segment is so diverse that it has been difficult for the utility and its Energy Solutions and Services (ES&S) account reps to develop a comprehensive understanding of SMB customers."[62] Despite this challenge, a 2016 analysis by Opinion Dynamics and PSEG Long Island points out that the maturity of energy efficiency programs makes smaller businesses an increasingly attractive target for future energy efficiency strategies.[63]

As a result, data analytics play a key role in revealing energy efficiency opportunities for SMBs who are typically not targeted due to their lower potential energy savings and lack of resources dedicated to optimizing business performance.[64] Continued efforts to understand SMB customers will be integrated with "targeted, data and research driven ME&O" to provide clear, directed messaging that drives SMB customers to the right solution(s) based on their resources and needs.[65]

Ultimately, data analytics will play a critical role in doubling energy efficiency by 2030 because they enable PG&E to more accurately deploy resources for the largest impacts. In this way, insights into customer trends not only enhance targeting efforts, but also inform strategies to promote data access and the design of technical assistance, tools, and financial incentives to get energy efficiency measures off the ground.

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[57] Vaidyanathan, Nadel, Amann, et al. "Overcoming Market Barriers and Using Market Forces to Advance Energy Efficiency," *American Council for an Energy-Efficient Economy*, p. vi.
[58] Vaidyanathan, Nadel, Amann, et al. "Overcoming Market Barriers and Using Market Forces to Advance Energy Efficiency," *American Council for an Energy-Efficient Economy*, p. vi.
[59] OP 1 of Decision 06-07-027, issued on July 20, 2006, authorizes PG&E to deploy AMI.
[60] Zawadzki, Lin, Dahlquist, Bao, et al. "Personalized energy efficiency program targeting with association rule mining," *Pacific Gas and Electric Company—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 7.
[61] Zawadzki, Lin, Dahlquist, Bao, et al. "Personalized energy efficiency program targeting with association rule mining," *Pacific Gas and Electric Company—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 7.
[62] Laurain, Bao, Zawadzi, et al. "Better Understanding Customers: Developing SMB DNA to Improve Customer Interactions and Catalyze Positive Behavior Changes," *Pacific Gas and Electric Company—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 8-2.
[63] Avseikova, Burke, Zhou et al. "Targeting Small Businesses—The Search for 80/20 in the 20/80 World," *Opinion Dynamics and PSEG Long Island—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 4-1.
[64] Tonielli, Rick "Use of Data Analytics and Innovative Partnerships in Utility Recro-Commissioning Program Expansion," *ComEd—2016 ACEEE Summer Study on Energy Efficiency in Buildings,"* p. 4-2.
[65] "California Existing Buildings Energy Efficiency Action Plan," p. 83.

Table 4. Intervention 1: Data Analytics

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, Long-term
Data analytics for enhanced customer targeting	**Imperfect information on the performance of equipment, technologies, and buildings impedes effective customer outreach and program design** • Information on energy efficiency is not property targeted to commercial customers and their business cases[66]	Use the EE Recommender platform to match customers with personalized offerings[67]	Large	E	S
		Continue to use data analytics to better understand the characteristics of SMB customers[68]	SMB	E	S
		Refine the EE Recommender algorithm to include past program participation, customer eligibility, and other inputs to improve targeting capabilities	Large	M	M
		Build out the EE Recommender algorithm as a feedback loop that intelligently incorporates customers' propensity to take action into its recommendations	Large	M	L
		Develop a platform that enables PG&E to target SMB customers based on load and demographic characteristics[69]	SMB	N	M
Partners: Third party energy management providers; data service providers; customers; implementers; contractors; online vendors; and trainers.					

PG&E recognizes the importance of targeting, educating, and empowering SMBs to adopt energy solutions that are best suited for their needs. The 2014 Commercial Saturation and Market Share Tracking Study supports a sustained effort to increase targeted outreach for small businesses. In particular, the report finds, "the relatively low incidence of EE program participation among smaller sites (11% participation for very small sites versus 56% for large sites) and their self-reported lack of knowledge of programs available may indicate that hard to reach goals are needed to reach these customers."[70] This finding supports PG&E's creation of savings and participation

[66] "Commercial Real Estate (CRE) Market Test Assessment," p. 4.
[67] Zawadzki, Lin, Dahlquist, et al. "Personalized energy efficiency program targeting with association rule mining," p. 7.
[68] Laurain, Bao, Zawadzki, et al. "Better Understanding Customers: Developing SMB DNA to Improve Customer Interactions and Catalyze Positive Behavior Changes," p. 11.
[69] Laurain, Bao, Zawadzki, et al. "Better Understanding Customers: Developing SMB DNA to Improve Customer Interactions and Catalyze Positive Behavior Changes," p. 11.
[70] "Commercial Saturation and Commercial Market Share Tracking Study Telephone Survey Findings," *Itron*, September 22, 2014, p. ES-11 http://www.calmac.org/publications/California_CSS_CMST_Phone_Survey_Report_updatedES.pdf

goals to measure the impact of concentrated efforts to target and equip SMBs with the tools they need to participate in energy efficiency programs.

Intervention 2 – Data Access and Awareness

A lack of actionable data and awareness of savings opportunities are two of the primary barriers to greater efficiency in commercial buildings.[71] Successfully overcoming these barriers requires ensuring customers and designated third parties can access actionable insights from energy usage in an accessible and timely fashion.[72] In the short-term, PG&E will continue to leverage its marketing, education, and outreach (ME&O) resources and third party implementers to drive customers to existing data sharing platforms, such as MyAccount and Share My Data.

Whole Building Usage Data

Building owners often struggle to access usage data for their entire buildings when its tenants are separately metered and pay their utility bills directly.

AB 802's aggregation provision overcomes this barrier by empowering commercial building owners with the necessary information to identify energy efficiency opportunities and measure their progress over time.

AB 802 also presents a prime opportunity to improve the quality and accuracy of data that PG&E provides to its commercial customers. Specifically, AB 802 requires PG&E to maintain usage records for all buildings to which it provides service, aggregate usage for buildings with three or more accounts (see right),[73] and deliver usage data to building owners, their agents, or operators upon request.[74] According to the Natural Resources Defense Council (NRDC), "increasing the transparency of buildings' energy usage…can drive more retrofits and help owners better manage how their buildings use energy."[75] It also benefits market actors such as investors, who can use data "to gauge the risk of their prospective stake in a company delivering these services, or directly in a portfolio of energy efficiency projects."[76]

Deploying supporting tactics in the short-term aligns with the AB 758 Existing Buildings Energy Efficiency Action Plan's goal of data-driven decision making to "ensure that Californians have access to appropriate data sources to make informed decisions related to energy efficiency."[77]

[71] "California Existing Buildings Energy Efficiency Action Plan," *California Energy Commission*, September 2015, p. 17. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-
[72] Ibid, p. 58
[73] For more resources on the importance of access to energy usage data for commercial customers, see the Data Access and Transparency Alliance (DATA) at http://www.energydataalliance.org. DATA is a collaborative initiative between the Institute for Market Transformation, the Building Owners and Managers Association (BOMA) International, the Real Estate Roundtable, and the U.S. Green Building Council.
[74] "Assembly Bill No. 802," *California Legislative Information*, October 8, 2015, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB802
[75] Stamas, Maria "How California's Unprecedented Public Benchmarking law Can Yield Even More Benefits for Customers," *Natural Resources Defense Council*, February 3, 2016, https://www.nrdc.org/experts/maria-stamas/how-californias-unprecedented-public-benchmarking-law-can-yield-even-more
[76] "California Existing Buildings Energy Efficiency Action Plan," p. 58.
[77] "California Existing Buildings Energy Efficiency Action Plan," p. 60.

Table 6. Intervention 2: Data Access and Awareness

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, Long-term
Data-access to facilitate customer awareness of their energy use	**Customers have competing priorities based on operations, building type, size, and vintage** • Customers have limited technical expertise on the benefits of energy efficiency[78]	Increase customer adoption of the MyAccount platform where customers can engage with personalized energy usage data and tools[79]	SMB	E	S
		Provide third party implementers with energy management applications such as Share My Data to facilitate data-driven solutions[80]	SMB	M	S
		Empower customers with energy usage data after project implementation to promote savings persistence[81]	SMB and Large	M	M
		Streamline disclosure processes for access to commercial building performance data, per AB 802[82]	SMB and Large	M	S
Partners: Third party energy management providers, data service providers, customers; implementers, contractors, online vendors, and trainers.					

The link between data access and the identification of opportunities for energy efficiency is supported by a 2013 process evaluation of commercial customers who used the ENERGY STAR Portfolio Manager tool for benchmarking. Although Portfolio Manager "is not designed to identify specific energy-saving opportunities within buildings," 84% of those surveyed reported leveraging improved awareness of their energy usage to identify energy efficiency opportunities, 67% used data access to identify which buildings needed the most

[78] "Commercial Real Estate (CRE) Market Test Assessment," p. 4
[79] Laurain, Bao, Zawadzki, et al. "Better Understanding Customers: Developing SMB DNA to Improve Customer Interactions and Catalyze Positive Behavior Changes," p. 5.
[80] Laurain, Bao, Zawadzki, et al. "Better Understanding Customers: Developing SMB DNA to Improve Customer Interactions and Catalyze Positive Behavior Changes," p. 5.
[81] "Utility Best Practices Guidance for Providing Business Customers with Energy Use and Cost Data," *U.S. Environmental Protection Agency*, Section 3: The Case for Increasing Customer Access to Energy Use and Cost Data, https://www.epa.gov/sites/production/files/2015-08/documents/utility_data_guidance.pdf
[82] For more information, please see "Assembly Bill No. 802" at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB802

improvement, and 63% used the information to set goals for facility performance.[83] These findings demonstrate commercial customers desire access to actionable insights on their energy usage.

Intervention 3 — Technical Assistance and Tools

Commercial customers face competing priorities depending on their operations, building type, size, and vintage.[84] For example, whereas SMBs may lack the resources to identify the appropriate energy saving measures,[85] large tech companies have significant resources and must deploy energy solutions on an expedited timeframe (e.g. to optimize the capacity of a data center).[86] While data access and awareness enables customers to be more cognizant of their usage patterns, technical assistance and tools enable commercial customers to take action. In addition, this intervention will be successful if commercial customers, and SMBs in particular, know that energy management technologies are available to them and use them more frequently, as needed. In light of the market trend that customers who adopt energy efficiency measures realize financial and intangible benefits, this intervention strategy will play a leading role in ensuring that PG&E can play the role of a trusted energy advisor to guide customers towards bundled solutions that are best suited for their needs.

To better reach customers, PG&E will use its ME&O resources to engage customers at the appropriate point of their business cycles, using financial metrics (e.g. return on investment) and communication preferences best suited to their needs. According to a 2015 market assessment of commercial real estate executives by the New Buildings Institute, "Information on technologies and strategies that does not include cost information and return on investment is quickly dismissed."[87] This highlights the need to understand the audience, ranging from C-suite leaders to individual contributors, and formulate the message concisely and with the right information.

[83] "Statewide Benchmarking Process Evaluation Volume 1: REPORT," *NMR Group, Inc*, April 2012, p. 82.
[84] "California Existing Building Energy Efficiency Action Plan," p. 19.
[85] "California Existing Buildings Energy Efficiency Action Plan," p. 17.
[86] Johnson, Priscilla, Geoff Wickes, and Michelle Lichtenfels, "Baking from Scratch: How a Tiny EM&V Study Disrupted the Status Quo in Utility Program Design," *Pacific Gas and Electric Company—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 4-2.
[87] "Commercial Real Estate (CRE) Market Test Assessment," p. 24.

Table 7. Customer Intervention 3: Technical Assistance and Tools

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, Long-term
Technical assistance and tools to make energy efficiency programs and services, easy, accessible, and relevant	**Customers have competing priorities based on operations, building type, size, and vintage** • Small and medium customers lack resources to effectively implement energy savings[88] • Customers that prioritize energy efficiency are not sure which emerging technologies constitute best practice[89] • Tech companies are constrained by a lack of predictability and need to be agile[90]	Promote audits to identify energy savings opportunities; remarket solutions where projects are not initiated[91]	SMB	E	S
		Improve existing technical and project-management support to enable project identification and completion. Continue to offer on-site consultative engineering assistance through both statewide and targeted (third-party) offerings to guide customers toward efficient options, evaluate vendor proposals, and facilitate incentive submissions.	SMB and Large	E	S
		Continue to deliver multi-touch on-boarding communications to SMBs to drive awareness and engagement with PG&E's energy efficiency offerings	SMB	E	S
		Develop strategic energy management (SEM) plans for large customers (e.g. national chain accounts)	Large	M	M
		Use personalized product or program recommendations to bundle solutions that are most relevant to specific customers[92]	SMB and Large	M	S
		Develop a comprehensive online solution to encourage self-service (e.g. identify qualified	SMB	N	M

[88] "California Existing Building Energy Efficiency Action Plan," p. 19.
[89] "Commercial Real Estate (CRE) Market Test Assessment," p. 21
[90] "Baking from Scratch: How a Tiny EM&V Study Disrupted the Status Quo in Utility Program Design," p. 4-2.
[91] "A Guide to Energy Audits," *U.S. Department of Energy*, http://www.pnnl.gov/main/publications/external/technical_reports/pnnl-20956.pdf
[92] "Commercial Real Estate (CRE) Market Test Assessment," p. 21

		products and rebates, find a trade professional, submit application)			
		Create a delivery model to fast-track pre-install review for complex projects from biotech/high tech companies	Large	N	M
		Create a delivery model to fast-track pre-install review for complex projects with basic underlying savings and cost calculations above a threshold of x dollars spent and/or x energy saved. The relative rigor of the review should align with the project scope (e.g., savings potential and proposed incentive amounts).	SMB and Large	N	M
		Develop new calculation and measure-selection tools to fast-track custom project development and optimize cost effectiveness, much like the Modified Lighting Calculator.	SMB and Large	N	M
		Develop benchmarking based on existing conditions baseline and communicate optimal building performance to customers	SMB and Large	N	S
		Provide customers with energy management technologies such as bill forecasts and energy alerts	SMB	N	S
Partners: Third party energy management providers; data service providers; customers; implementers; contractors; distributors; retailers; trainers; Government Community partnerships; state and local governments.					

The PY 2013-2014 Third Party Commercial Program Value and Effectiveness Study Report reinforces the idea that comprehensive energy solutions are more effective than programs with a single offering. Specifically, it finds more third party programs "with single rather than multiple end-uses closed during 2013-2014, indicating that programs with a more-comprehensive measure mix might have more flexibility to find ways to save energy despite market or policy changes."[93] Moving forward, PG&E will prioritize bundled solutions for its commercial customers. This includes complementing energy audits with project development assistance and partnering with large customers to develop long-term strategic energy management plans.

[93] "PY 2013-2014 Third Party Commercial Program Value and Effectiveness Study Report," *California Public Utilities Commission Energy Division*, p. 34, 95.

Intervention Strategy 4 – Financial Solutions

Commercial customers face barriers such as high upfront capital costs, a lack of access to credit (for SMBs), and management priorities on financial decision making that can impede adoption of energy efficiency measures.[94] PG&E will use financial solutions such as financing, rebates, and incentives so that more commercial customers take EE actions, and the percentage of commercial participants using loans or other scalable models increases. In the short-term, PG&E will continue to offer its existing suite of financing, rebates, and incentives to address the unique financial barriers for commercial market segments (e.g. offices, retail, hospitality, etc.). This includes targeting kickers for hard-to-reach segments, which advances the AB 758 Existing Buildings Energy Efficiency Action Plan's goal of promoting "affordable and accessible energy efficiency solutions."[95]

PG&E will also use financial solutions to explore a meter-based savings program model in accordance with AB 802. This includes a pilot that quantifies stranded below-code savings. These new program designs align with the AB 758 Existing Buildings Energy Efficiency Action Plan's goal of "increased building industry innovation and performance" through "innovative business approaches" and the "pervasive use of analytics to drive targeted improvements."[96]

PG&E will also collect proof of permit closure before paying rebates or incentives for all downstream central air conditioning or heat pumps and their related fans, in accordance with SB 1414.[97]

In the mid-term, PG&E will offer a combined refrigeration and O&M program to target one of the highest end uses in the portfolio. In addition, PG&E will test new financing models to improve customer access to capital.

Ultimately, this intervention strategy plays a critical role in spurring customers to take action. To recap, data analytics target customers, data access and awareness help customers identify energy saving opportunities, technical assistance and tools provide the means to realize savings, and financial solutions serve as added motivation to get energy efficiency measures off the ground. In this way, PG&E's customer intervention strategies can be thought of sequentially and are mutually reinforcing. Moving forward, all four strategies must be implemented in sync to reach stranded potential, maximize savings in existing buildings, and double energy efficiency savings by 2030.

[94] "California Existing Buildings Energy Efficiency Action Plan," p. 18.
[95] "California Existing Buildings Energy Efficiency Action Plan," p. 3.
[96] Ibid.
[97] For more information, see "Senate Bill No. 1414," *California Legislative Information*, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1414

Table 8. Customer Intervention Strategy 4: Financial Solutions

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, Long-term
Financial solutions to get energy efficiency measures off the ground	**Customers face high upfront capital costs, a lack of access to credit (for SMBs), and management priorities that can impede energy efficiency** • Split incentives impede installation of energy efficiency measures[98]	Continue existing energy efficiency program offerings and measures, such as downstream calculated incentives, while also seeking nuanced, innovative means to incentivize efficiency-driven market transformation	SMB and Large	E	S
		Continue offering kickers to hard-to-reach customers[99]	SMB	E	S
		Launch programs that integrate EE and demand response offerings (e.g. energy management systems combined with demand response participation)[100]	SMB	N	S
		Launch programs that measure energy savings at the meter (e.g., Pay for Performance)[101]	SMB and Large	N	S
		Conduct a to code pilot to better understand the extent to which there is below-code equipment that is not replaced through turnover or existing programs	SMB	N	S
		Offer a combined refrigeration and O&M program to target one of the highest end uses in the commercial portfolio	SMB and Large	N	M
		Offer alternative contract models (e.g, green leases)[102] and financing models (e.g. metered energy efficiency transaction structure)	SMB	N	M

[98] "California Existing Buildings Energy Efficiency Action Plan," p. 17.
[99] "Draft Report—A Study of Barriers and Solutions to Energy Efficiency, Renewables and Contracting Opportunities Among Low-Income Customer and Disadvantaged Communities," *California Energy Commission*, p. 17-18.
[100] "California Existing Buildings Energy Efficiency Action Plan." p.iii.
[101] "Powering the Savings: How California Can Tap the Energy Efficiency Potential in Existing Commercial Buildings." *Berkeley Law, Center for Law, Energy & the Environment and the Emmett Institute on Climate Change and the Environment, UCLA,* 2016. p.2
[102] "California Existing Buildings Energy Efficiency Action Plan." p. 82

Partners: Capital providers, developers, customers, solutions providers, contractors, implementers, trade professionals, Local Government Partnerships					

The split incentive barrier occurs when either the tenant or landlord pays the energy bill and there may not be a desire or incentive for either the landlord or tenant to reduce their energy consumption because they are not the responsible party paying the bill.[103] Alternative contract models such as green leases include provisions that overcome this barrier by aligning incentives between landlords and tenants.

NRDC notes green leases benefit landlords by "tying capital cost recovery to associated savings, imposing controls on rising tenant demand for electric service, separating energy expenses from other operating costs for better tracking and expense recovery, and attributing energy consumption to tenants more accurately."[104] Green leases also benefit tenants by instituting "greater assurance of efficiency operations and control over operating costs, the ability to measure energy consumption, and better measurement of base building energy use for accurate allocation of operating expenditures."[105] PG&E will explore green leases and other alternative contract and financing structures to overcome the split incentive barrier and provide customers with the most flexibility to get energy efficiency measures off the ground.

[103] "California Existing Buildings Energy Efficiency Action Plan," p. 17.
[104] "Energy Efficiency Lease Guidance," *National Resource Defense Council*, November 2011, p. 1.
[105] Ibid.

Intervention 5 – Assistance for the Design and Building Communities

According to a report from the 2016 ACEEE Summer Study on Efficient Buildings, builders face obstacles when pursuing ZNE projects because "…they have established, vetted home designs; they have established contractor and supply chain relationships; and there is significant concern about cost and performance issues when trying new designs and equipment at a large scale."[106] In light of the CEESP's ZNE goals for 100% of new commercial construction and 50% of existing construction by 2030 (see right),[107] PG&E is adopting a comprehensive approach to assist, test, and continue to support innovation that results in a larger percentage of the design community and builders consistently building to ZNE specifications.

A Vision for Commercial ZNE

"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."

In the short-term, PG&E will continue to develop its Commercial Whole Building model. This model addresses a recommendation from a 2012 study on the feasibility of ZNE, which recommends to "accelerate whole building incentives, focusing where possible on ZNE and near ZNE projects."[108] In addition, PG&E will continue to provide technical assistance and tools, financial solutions, and workforce education & training (WE&T) in support of its commercial ZNE demonstration projects. These demonstrations provide critical insight into the barriers and opportunities to achieve California's ZNE goals. For example, PG&E has learned products to facilitate ZNE design and building are not readily available on the market and that bidding and construction processes may make it more difficult for ZNE to penetrate low-income communities.[109] In addition, PG&E has identified the importance of supporting ZNE "prototypes" that can have a broad influence on other buildings built in the future, potentially at a larger scale.[110]

Also, PG&E will develop financial solutions that overcome the cost barriers, especially in cases where split incentives may exist. This approach aligns with the CEESP's tactic to "expand implementation of innovative financing mechanisms" and build upon the most useful mechanisms for ZNE buildings.[111]

PG&E will also provide ongoing technical assistance and tools after implementation of ZNE projects to ensure buildings continue to operate as designed. Given the nascent state of ZNE, post-occupancy assistance will be particularly useful for projects that are well-suited for ZNE but lack guidance about ZNE practices.

In the mid-term, PG&E will explore opportunities to streamline the application for ZNE projects to ensure that ZNE is not perceived as onerous, and participants can easily make a business case for energy efficiency to a decision-maker.[112]

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[106] Pigman, Larue, Brown, et al. "Lessons Learned from a Zero Net Energy Production Builder Demonstration," *Resource Refocus LLC, PG&E, BIRAenergy, Design AVEnues LLC, and David Energy Group—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 2.
[107] "California Energy Efficiency Strategic Plan: January 2011 Update," *California Public Utilities Commission and California Energy Commission*, January 2011, p. 28.
[108] "The Technical Feasibility of Zero Net Energy Buildings in California," *ARUP*, December 31, 2012, p. 55.
[109] Pigman, Larue, Brown, et al. "Lessons Learned from a Zero Net Energy Production Builder Demonstration," *Resource Refocus LLC, PG&E, BIRAenergy, Design AVEnues LLC, and David Energy Group—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 5-6.
[110] Pigman, Larue, Brown, et al. "Lessons Learned from a Zero Net Energy Production Builder Demonstration," *Resource Refocus LLC, PG&E, BIRAenergy, Design AVEnues LLC, and David Energy Group—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 2.
[111] "California Energy Efficiency Strategic Plan: January 2011 Update," *California Public Utilities Commission and California Energy Commission*, January 2011, p. 32.
[112] "California Energy Efficiency Strategic Plan: January 2011 Update," *California Public Utilities Commission and California Energy Commission*, p. 29.

Table 9. Intervention 5: Assistance for the Design and Building Communities

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, or Long-term
Assistance for the Design and Building Communities to Meet the CEESP's ZNE Goals	**The ZNE market is still in the "proof-of-concept" stage** • Significant uncertainties remain regarding ZNE impacts on the grid and the costs of achieving ZNE goals[113] • Builders have established designs and subcontractor and supply chain relationships[114]	Continue to develop the Commercial Whole Building model to deliver deep savings and promote ZNE design and construction[115]	SMB and Large	E	S
		Continue ZNE demonstrations to equip designers and builders with the assistance and tools to meet ZNE goals[116]	SMB and Large	E	S
		Incentivize design communities to achieve ZNE design for all new construction[117]	SMB and Large	N	S
		Investigate new financial solutions to reach ZNE[118]	SMB and Large	N	S
		Promote ZNE by streamlining processes for energy modeling, design document templates, and training during the application process[119]	SMB and Large	N	M

[113] "The Road to ZNE: Mapping Pathways to ZNE Buildings in California," *Heschong Mahone Group, Inc*, December 20, 2012, p. 10, http://www.trcsolutions.com/writable/images/The-Road-to-Zero-Net-Energy.pdf
[114] Pigman, Larue, Brown, et al. "Lessons Learned from a Zero Net Energy Production Builder Demonstration," *Resource Refocus LLC, PG&E, BIRAenergy, Design AVEnues LLC, and David Energy Group—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 2.
[115] "The Technical Feasibility of Zero Net Energy Buildings in California," *ARUP*, December 31, 2012, p. 55.
[116] "Fact Sheet: Energy Efficiency Zero Net Energy Program," *California Public Utilities Commission*.
[117] "The Technical Feasibility of Zero Net Energy Buildings in California," *ARUP*, December 31, 2012, p. 7-8.
[118] "California Energy Efficiency Strategic Plan: January 2011 Update," *California Public Utilities Commission and California Energy Commission*, p. 29.
[119] "California Energy Efficiency Strategic Plan: January 2011 Update," *California Public Utilities Commission and California Energy Commission*, p. 35.

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, or Long-term
		Develop post-occupancy ZNE technical assistance to drive savings persistence[120]	Large	N	S
	Partners: AIA, ASHRAE, USGBC, ASE, CEC, CPUC				

The 2012 Technical Feasibility of Zero Net Energy Buildings in California study finds it is technically feasible for California to meet its ZNE goals. Despite this feasibility, the report identifies "the 'best' answer to reach any ZNE metric will differ for each specific building, owner, and site."[121] This finding is particularly relevant for the commercial market, where the diversity of the customer base makes a product-by-product approach untenable for scaling ZNE design and construction. In this way, the study underscores the importance of "integrated design," which "involves engaging all of the stakeholders and communicating the energy goals and expectations early on in the design process."[122] PG&E will continue this approach to greater ZNE adoption through further development of its commercial whole building model and demonstration projects that aim "to achieve an integrated, whole building approach to achieving ZNE."[123]

[120] "California Energy Efficiency Strategic Plan: January 2011 Update," *California Public Utilities Commission and California Energy Commission*, p. 31.
[121] "The Technical Feasibility of Zero Net Energy Buildings in California," *ARUP*, December 31, 2012, p. 7.
[122] "The Technical Feasibility of Zero Net Energy Buildings in California," *ARUP*, December 31, 2012, p. 65.
[123] Pigman, Larue, Brown, et al. "Lessons Learned from a Zero Net Energy Production Builder Demonstration," *Resource Refocus LLC, PG&E, BIRAenergy, Design AVEnues LLC, and David Energy Group—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 2.

Intervention 6 – Upstream and Midstream Partnerships

The CEESP identifies the need to improve Title 20 compliance by "working directly with manufacturers and distributors to improve appliance and equipment."[124] Through partnerships with manufacturers, distributors, retailers, and other market actors in the supply chain, this intervention strategy will enable PG&E to increase the availability of energy efficient measures and decrease the cost of these measures to commercial customers.

The development of upstream and midstream partnerships is supported Environmental Protection Agency's (EPA) finding that upstream and midstream incentives "can affect larger markets than direct incentives targeted to individual customers, because upstream and midstream players are able to offer the desire products or service to all the customers they serve, not just those who learn about direct customers rebates."[125]

In the short-term, PG&E will continue to partner with upstream and midstream actors to increase the availability and awareness of offerings that aid commercial customers in effectively reducing their energy usage (e.g. EMTs). In addition, PG&E will conduct a "bottoms-up" review of its current partnerships to promote their continued success and cost-effectiveness.[126] Ultimately, upstream and midstream partnerships will enable PG&E to ensure supply chain actors are creating, distributing, and stocking the most effective energy solutions for customers.

Table 10. Intervention 6: Upstream and Midstream Partnerships

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, Long-term
Upstream and midstream partnerships to promote the most efficient products, components and system	**Limited availability of cost effective energy efficient options in the marketplace**	Continue to partner with manufacturers and distributors to make purchasing energy efficiency equipment easy and affordable	SMB and Large	E	S
		Continue to partner with community based organizations (CBOs), local governments, local chambers of commerce, the Small Business Administration, third party implementers, and contractors from PG&E's Trade Professional Alliance to promote and/or assist customers with installation of energy efficiency measures	SMB and Large	E	S
		Partner with financial institutions to drive customers or property management companies seeking loans to implement EE retrofit or	SMB and Large	E	S

[124] "California Energy Efficiency Strategic Plan: January 2011 Update," p. 66.
[125] "Customer Incentives for Energy Efficiency Through Program Offerings," p. 6,
[126] For more information, see Fogel, Cathy "Overarching Comments Program Administrator Business Plans Focus on Market Transformation Strategies," September 27, 2016, or D.16-08-019, p. 60.

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, Long-term
		new construction projects.			
		Perform a bottom-up review of upstream and midstream activities to rationalize and optimize them into the most cost-effective configurations[127]	SMB and Large	N	S
Partners: Manufacturers, distributors, contractors, design community					

A 2013 assessment of PG&E's Lighting Innovation Midstream Trial by Evergreen Economics finds upstream and midstream partnerships are effective in increasing the market uptake of energy efficiency and eventually achieving market transformation.[128] PG&E first offered LEDs through its Lighting Innovation Midstream Trial, where incentives were given to distributor-level suppliers for the sale of LED replacement lamps to commercial customers. The evaluators analyzed trial sales data, compared the sales data with PG&E program sales data through the Local Government Partnership/Third Party Direct Install Programs and downstream program (including sales via the Trade Professional Alliance), conducted in-depth interviews with LED market actors, conducted commercial end-user telephone surveys with Trial LED lamp recipients, and developed recommendations for likely market indicators.[129]

The overall findings indicate the midstream incentives were effective, pointing to sales of midstream incentivized LED replacement lamps outpacing sales of LED replacement lamps and/or fixtures through PG&E's other commercial deemed incentive programs during the study period, as well as high levels of satisfaction with the rebate application and payment process from market actors and end-users.[130]

In addition, in close collaboration with other program administrators, PG&E plans to assess the most cost-effective and transformative configurations of upstream and midstream activities. PG&E plans to identify and assess the market transformation objectives, or "targeted market transformation initiatives" (TMTI), of an industrial upstream initiative, prior to implementation.[131] As recommended in "Guidance on Designing and Implementing Energy Efficiency Market Transformation Initiatives," PG&E will coordinate with Commission staff, CEC staff, CAEECC stakeholders, and other stakeholders to act as a "sounding board" through the implementation plan (IP) development process.[132] See Appendix D for more information on the phases PG&E suggests to develop, vet, and launch this TMTI, along with the associated administrative structure.[133]

[127] Fogel, Cathy September 27, 2016. "Overarching Comments Program Administrator Business Plans Focus on Market Transformation Strategies."
[128] "Pacific Gas and Electric Company's Lighting Innovation Midstream Trial Evaluation," *Evergreen Economics*, October 13, 2015, p. vii, http://www.calmac.org/publications/PGandE_Commercial_Midstream_LED_Trial_Assessment_Final_ReportES.pdf
[129] Ibid.
[130] Ibid.
[131] Cathy Fogel, 2016. "Overarching Comments on Program Administrator Business Plans Focus on Market Transformation Strategies." p. 2
[132] Keating, 2014. "Guidance on Designing and Implementing Energy Efficiency Market Transformation Initiatives" p.15
[133] As recommended by Cathy Fogel, Energy Division staff in "Overarching Comments on Program Administrator Business Plans Focus on Market Transformation Strategies." p. 3.

Further, PG&E will work with Commission staff, program administrators and stakeholders to assess technologies and appropriate delivery channel to meet necessary to meet California's market transformation goals, in particular commercial ZNE goals. For example, PG&E will evaluate the connections between up/mid-stream initiatives and long-term SW C&S initiatives to advance C&S initiatives. See Appendix E for examples of possible integration strategies. PG&E will work Commission staff, program administrators and stakeholders to refine and more fully develop this strategy.

Intervention 7 – Outreach and Education

Whereas data access and awareness targets specific customers, outreach and education is a market intervention that will broaden the knowledge and engagement of commercial customers in energy efficiency. For example, Step Up and Power Down is a community-based outreach initiative that partners with cities to spur community-wide adoption of energy saving behaviors. In the short-term, PG&E will continue to provide SMBs with educational on-boarding materials on energy efficiency and promote campaigns within the industry that recognize energy efficiency champions.

Architecture at Zero

PG&E and the American Institute of Architects launched the Architecture at Zero competition in 2011 to encourage new, innovative ideas for ZNE construction to help achieve the CEESP's ZNE goals.

In 2016, the competition will award $25,000 to the team that can provide the best ZNE design for a student housing project at San Francisco State University.

In the mid-term, PG&E will offer HVAC and refrigeration quality maintenance training to improve the knowledge base of contractors within two of the commercial sector's highest end uses. This strategy aligns with the AB 758 Existing Buildings Energy Efficiency Action Plan's goal to "educate, motivate, and encourage consumers to take action on energy efficiency with a comprehensive suite of targeted marketing, education, and outreach materials."[134]

Table 11. Intervention 7: Outreach and Education

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, Long-term
Outreach and education to increase participation and improve knowledge-base of workforce and customers	**Lack of understanding the value of energy efficiency to take action**	Continue to provide training to trade professionals, and other contractors on energy efficiency program requirements	SMB and Large	E	S
		Develop community-level initiatives such as Step Up and Power Down to increase awareness of energy efficiency and reduce energy waste.	SMB	E	S
		Empower customers to be champions of energy efficiency within their industry networks to drive market uptake by providing a platform for PG&E to share best practices. (e.g. ZNE design contests – Architecture at Zero, behavioral best practices program).	SMB and Large	E	S
		Provide quality maintenance training for HVAC and refrigeration contractors to help transform the contractor market towards proper maintenance of systems.	SMB and Large	M	S

[134] "California Existing Buildings Energy Efficiency Action Plan," p. 3.

Intervention Strategy	Barriers	Example Tactics	SMB or Large	Existing, New or Modified	Short, Mid, Long-term
Partners: Local Government Partnerships, Community Based Organizations (CBOs) e.g. Affinity Partners, local governments, local chambers of commerce, the Small Business Administration, local lending institutions and other indutry partners such as trade professionals.					

PG&E's proposed tactic of empowering customers to be energy efficiency champions is supported by the 2006 Evaluation, Measurement, and Verification of the California Local Energy Efficiency Program, which highlights the impact that a champion or change agent can have on influencing the behavior of a larger group. In particular, the study reports "…a few people in a group will typically adopt innovative ideas and behaviors first, and spread them throughout the group."[135] Spotlighting innovative customers as champions within their peer networks will encourage greater adoption of behaviors that align with California's long-term policy goals such as doubling energy efficiency, achieving 50% ZNE for existing construction, and reaching 100% ZNE for all new construction by 2030.

In addition, improving the knowledge base of the commercial workforce and its customers requires improving access to WE&T resources. The PY 2013-2014 California Statewide Workforce Education and Training Program Contractor Training Market Characterization determined that "of available trainings and certifications in California for the three programs under study found that the wide variety of trainings available in the state sufficiently meets the training needs of contractors and technicians. In fact, many experts we interviewed believe that the awareness of trainings is a greater obstacle than the number and availability."[136] Further, the move to more pay for performance models and increased use of normalized metering technologies could require specific training for contractors based on new program requirements.[137] Improving access to WE&T resources for commercial stakeholders will involve a coordinated effort between the WE&T, commercial, and ME&O teams to ensure the value of these opportunities is communicated through the appropriate channels for maximum impact.

[135] "Evaluation, Measurement, and Verification of the California Local Energy Efficiency Program," *Ridge & Associated, Vanward Consulting, and Brown, Vence & Associates, Inc.,* October 16, 2006, p. 3-10. http://www.calmac.org/publications/CALEEP_Final_Report.pdf

[136] "PY 2013-2014 California Statewide Workforce Education and Training Program," *Opinion Dynamics*, June 2016, p. 7.

[137] "Powering the Savings: How California Can Tap the Energy Efficiency Potential in Existing Commercial Buildings," *Berkeley Law, Center for Law, Energy & the Environment and the Emmett Institute on Climate Change and the Environment, UCLA*, 2016, p.4

PG&E Commercial Programs/Incentives Targeted by Intervention Strategies

PG&E's seven intervention strategies will translate into a set of existing, modified, and new programs, as illustrated below in Table 12. This table is illustrative, and does not represent the full suite of program offerings.

Table 12. Commercial Programs/Incentives Targeted by Intervention Strategies

Intervention Strategy	Data Analytics	Data Access and Awareness	Technical Assistance and Tools	Financial Solutions	Assistance for the Design and Building Communities	Upstream and Midstream Partnerships	Outreach and Education
Strategic Energy Management (SEM)	x	x	x	x			x
New Construction (SBD)	x	x	x	x	x		x
Deemed Rebates				x		x	x
Calculated Incentives			x	x			x
Commercial Whole Building (metered-based	x	x	x	x	x		x
Regional Direct Install	X	x	x	x			x
Retail Program	x	x	x	x			x
Hospitality Program	x	x	x	x			x
Office Program	x	x	x	x			x
High Tech Program	x	x	x	x			x
Healthcare Program	x	x	x	x			x
Commercial HVAC	x	x	x	x			x
Other New Programs		x	x	x	x		x

Within *Section G: PG&E's Approach to Achieving Goals*, PG&E describes new and innovative strategies and tactics, some of which will lead to pilot efforts at the program level. PG&E will describe any unique and innovative aspects of each program, as well as any pilots contemplated or underway, within its program-level implementation plans.

Additionally, PG&E will consider the appropriate workforce standard requirements, such as any required certifications, minimum performance standards, or pre-qualification process for specific programs in support of its energy efficiency portfolio. As applicable, PG&E will detail workforce standard requirements in each Implementation Plan (IPs).

H. Leveraging Cross-cutting Resources

- **Finance:** Finance offerings play a leading role in *Intervention Strategy 4: Financial Solutions* and will enable commercial energy efficiency measures to get off the ground through a diverse array of loans, rebates, and incentives. PG&E will continue to offer low-risk financing such as On-Bill Financing (OBF) and OBF Alternative Pathway, and facilitate On-Bill Repayment (OBR)[138] while exploring opportunities to lower the minimum OBF threshold to support access to financing for SMBs.

- In the future, OBR will allow third-party lenders to lend to PG&E and have those repayments collected through their utility bill to finance distributed energy resources (DER) measures. PG&E will also pilot new financing structure that can help overcome transaction barriers for customers, for example, customers who are unable to take out new debt finance. These new financing structure will be developed to support DER investments.

- **Emerging Technologies (ET)**: The statewide ET team primarily supports *Intervention Strategy 3: Technical Assistance and Tools* by identifying technologies with verifiable energy savings and testing new technologies on a limited scale before greater deployment. In the short-term, ET is leading tests of energy management technologies (EMTs) in accordance with AB 793 and supporting further development of the commercial whole building model to unlock deep savings in existing buildings and pave the way for greater ZNE adoption. ET also supports the development of a pay for performance model that is based on normalized metered energy consumption (AB 802).

- **Workforce Education & Training (WE&T):** PG&E will continue to use WE&T resources to improve the skills and knowledge-base of its contractors and trade professionals, as described in *Intervention Strategy 6: Outreach and Education*. WE&T currently offers over 250 courses that are relevant for the commercial workforce, including the basics of conducting an energy audit, specific courses on lighting, HVAC, and refrigeration, and the zero net future. In the future, WE&T will continue to build the capacity of the workforce to ensure buildings operate as designed.

- **Marketing, Education, and Outreach (ME&O)**: ME&O will play a central role in *Intervention Strategies 1-4* due to the importance of engaging customers at the appropriate time, through the proper communication channel, and with the most effective messaging. For example, retail customers rarely implement energy efficiency projects during holiday seasons, healthcare customers require multiple years of lead time before implementing a project, and high tech customers desire solutions with a fast turnaround time. ME&O will also continue to work closely with PG&E's data analytics team to conduct targeted outreach to customers based on insights from EE Recommender.
    - In addition, ME&O will play a leading role in *Intervention Strategy 6: Outreach and Education*. This includes engaging specific communities as part of Step Up and Power Down, recognizing energy efficiency champions within industry networks, and collaborating with WE&T to promote awareness of education and training opportunities.
- **Codes and Standards (C&S):** C&S plays a key role in achieving the CEESP's ZNE goals for commercial buildings. Specifically, the C&S Code Readiness initiative leads primary data collection efforts to support market transformation for measures that are critical to achieving ZNE goals. In this way, C&S research will inform the design of technical assistance and tools as well as financial solutions related to ZNE, see *Intervention Strategy 5: Assistance for the Design and Building Communities*.

[138] A 2014 Measure, Application, Segment, and Industry (MASI) study for chain operations finds 91% of participants surveyed identified repaying a loan through a utility bill was valuable. For more information, see Navigant's "Energy Efficiency Retrofits for Commercial and Public Buildings HVAC, Lighting, Building Controls, Water Efficiency, Water Heating, Building Envelope, Energy Production, Commissioning, Installation, and ESCOs: Global Market Analysis and Forecasts."

- While the ET program takes a product-based approach to understand how an individual technology functions within a broader system, code readiness adopts a “systems based” approach to understanding how a particular piece of equipment impacts overall building performance and its relationship with the grid as a whole. These insights are critical not only in informing the design of future code cycles, but also in understanding how commercial customers can successfully implement integrated demand side management solutions while maintaining grid stability.

I. Integrated Demand Side Management (IDSM)

Integrated demand side management is a company-wide effort that integrates energy efficiency, distributed generation, storage and demand response with new business applications and distribution planning to support cost effective distribution and transmission system reliability.[139] PG&E will expand this locational effort by utilizing the existing framework of offerings and explore third party opportunities to support PG&E in this important initiative. IDSM leverages the commercial portfolio's segments and identifies the dominant segment within the target location (constrained substation).[140] This platform delivers a strategy and implementation plan that enhances the marketing, outreach, and locational EE participation that feeds energy from the identified substation.

Commercial Market and TDSM

As constrained substations are identified, the customer mix is analyzed and dissected to determine the best intervention strategy to decrease demand and energy use in the targeted substation. Generally, TDSM goals require a load reduction in less than two years. Due to this short time frame, fast-acting projects are required to effectively meet load reduction needs. To meet these needs, PG&E has offered customers an additional $100/kW kicker to incentivize participation in these efforts. This targeted value proposition has been particularly effective in enlisting the support of SMB customers.

Commercial and Distributed Energy Resources (DER)

The IDSM effort is a conduit to better integrating controls and data analytics into the operations of PG&E's customers. PG&E leverages the following programs:

Demand Response (DR) programs can take advantage of new controls to better integrate commercial customers into DR programs, building a more robust response to potential grid events and leveraging control over localized commercial activities. Understanding the commercial customer mix is important in offering the right DR program for a customer's business needs.

Distributed Generation (DG) participation has been on the rise in the commercial segment, specifically for solar projects. PG&E will continue to support the interconnection of solar systems in the commercial market. As solar adoption increases, storage will be an increasingly important element to maintain transmission reliability.

PG&E is preparing for storage growth in the coming years. As peak demand hours shift past sunny times of the day, storage will help keep transmission lines less constrained so customers can pull from on-site energy storage directly. PG&E anticipates that the commercial segment will be active in this emerging technology.

Time-of-Use (TOU) Rate Changes

PG&E may be moving the peak period rates for non-residential customers from mid-day to later in the evening beginning in 2019 based on the 2017 General Rate Case (GRC) 2 proposal. The proposed mandatory TOU change would move peak rates from 12-5 PM to 6-10 PM. For the most part, the proposed change is not expected to negatively impact commercial customers because they tend to reduce their energy usage after 5 PM. In this way, it may even generate reductions in energy costs for some customers that use less energy between 6-10 PM compared to 12-5 PM.

[139] Russell, Baatz, Cluett, et al. "Recognizing the Value of Energy Efficiency's Multiple Benefits," *American Council for an Energy-Efficient Economy*, December 2015, pp. 28-29.

[140] Zawadzki, Lin, Dahlquist, Bao, et al. "Personalized energy efficiency program targeting with association rule mining," *Pacific Gas and Electric Company—2016 ACEEE Summer Study on Energy Efficiency in Buildings*, p. 8-9.

If the change is implemented, PG&E will work with its account representatives to ensure commercial customers understand the implications of the change for their business operations. This conversation will also create an entry point to discuss available energy efficiency offerings. If a customer experiences an increase in energy costs due to the change, energy efficiency can be pitched as an opportunity to mitigate the negative cost impact. In contrast, if a customer experiences a decrease in energy costs due to the change, energy efficiency can be positioned as an opportunity to achieve even greater savings.

J. PG&E Helping to Meet State Policy Goals

Table 13. Summary of Relevant Energy Efficiency Policies, Guidance, and PG&E Support

Policy Drivers	Guidance Given	PG&E's Support for Policy
SB350	• Doubling energy efficiency savings by 2030	• Leverage data analytics and customer segmentation to target customers based on high savings potential and market transformation needs • Develop strategic energy management (SEM) plans for large customers (e.g. chain accounts) • Offer a combined refrigeration and O&M program to target one of the highest end uses in the commercial portfolio • Continue to partner with manufacturers and distributors to make purchasing energy efficiency equipment easy and affordable • Develop community-level initiatives such as Step Up and Power Down to increase awareness of energy efficiency and reduce energy waste
AB 758	• Access to data, partnering to increase awareness • Increase plug load efficiency • EE procurement model • Affordable and accessible energy efficiency solutions	• Promote audits to identify comprehensive solutions; remarket solutions where projects aren't initiated • Provide project development assistance to scope and design projects to maximize energy savings opportunities • Create a delivery model to fast-track pre-install review for complex projects (e.g from biotech/high tech companies) • Provide quality maintenance training for HVAC and refrigeration contractors to help transform the contractor market towards proper maintenance of systems. • PG&E is expanding finance offerings to include leveraging more third party capital. Additionally, PG&E plans to reassess the role of traditional incentive models as financing becomes widely available.[141]

[141] "California Existing Buildings Energy Efficiency Action Plan," p. 92

Policy Drivers	Guidance Given	PG&E's Support for Policy
AB 793	• Provide education on energy management technologies • Provide incentives for energy management technology	• Provide customers with energy management tools such as bill forecasts and energy alerts • Launch programs that integrate energy efficiency and demand response offerings (e.g. energy management systems combined with demand response participation)
AB 802	• Disclosure of aggregated whole building energy data • Benchmarking • Provide financial incentives and assistance for High Opportunity Projects and Programs	• Streamline disclosure processes for access to commercial building performance data • Develop benchmarking based on existing conditions baseline and communicate optimal building performance to customers • Conduct a to code pilot to better understand the extent to which there is below-code equipment that is not replaced through turnover or existing programs • Launch programs that measure energy savings at the meter (e.g. Pay for Performance)
SB 1414	• Proof of permit closure for all downstream central air conditioning or heat pumps	• PG&E will collect proof of permit closure before paying rebates or incentives for all downstream central air conditioning or heat pumps and their related fans, in accordance with SB 1414
California Energy Efficiency Strategic Plan (CEESP)	• All new construction will be ZNE in 2030. • 50% of existing buildings will be ZNE by 2030	• Continue to develop the commercial whole building model to deliver deep savings and promote ZNE retrofits • Promote ZNE for new construction by streamlining processes for energy modeling, design document templates, and training during the application process • Investigate new financial solutions to reach ZNE • Develop post-occupancy ZNE technical assistance to drive savings persistence in new construction

K. PG&E's Partners and Commitment to Coordination

PG&E's success in the commercial sector will rely on a broad range of program administrators, regulators, government agencies, universities and other educational entities, market actors, and stakeholders.

Program Administrators

PG&E will continue to work with program administrators and utilities across the state and country to collaborate and implement best practices. Increased collaboration will allow customers operating throughout multiple service territories in California to experience cohesive program offerings.

California Public Utilities Commission (CPUC)

PG&E will work with the CPUC and staff to assess business plan performance, and identify opportunities for continuous improvement. Additionally, PG&E will coordinate with Commission staff to identify and perform market research studies and other studies to ensure the business plans metrics are effectively evaluated. As PG&E modifies existing commercial programs, and/or develops new programs, PG&E will work in close concert with Commission staff to ensure these programs are "EM&V-ready" and meet CEESP and other state policy directives.

Bay Area Regional Energy Network (BayREN)

Both BayREN and PG&E work closely with local governments to deliver energy efficiency programs. While PG&E provides funding to BayREN, PG&E does not have oversight over BayREN's activities, and it will be important to ensure cooperation between the two PAs to create a positive experience for the customer and maximize energy savings for both parties. PG&E will continue to support collaboration as BayREN continues to grow and develop its services.

Marin Clean Energy (MCE)

MCE is a Community Choice Aggregator (CCA) that implements energy efficiency programs for SMBs in PG&E's service territory. The collaboration between PG&E and MCE has been critical in ensuring that customers continue to receive the best possible service.

Local Government Partnerships (LGPs)

Local Government Partnerships (LGPs) foster deep collaboration and coordination between PG&E and local partners resulting in community-based programs that effectively serve small and medium businesses, local governments, K-12 Public schools, and lower income residential customers. Over the past 10 years, PG&E and local partners have established 22 LGPs covering all of PG&E's service territory, including 242 cities and 48 counties. This roster of local partners is uniquely positioned to understand and identify customers within their communities and effectively partner with program implementers to overcome barriers to EE adoption. In 2015, LGPs became the primary provider of SMB downstream energy savings for PG&E's EE Portfolio.

Government Agencies

PG&E will maintain and/or develop new partnerships with government agencies to advance collective interests in the commercial sector. PG&E will work closely with these agencies to develop, refine, and implement, where applicable, key intervention strategies and programmatic activities. Agencies include but are not limited to Local Government Partnerships and chambers of commerce.

Third Party Implementers and Market Actors

Third party program implementers have been, and will continue to be, an important delivery channel for PG&E. PG&E plans to expand current contracts with implementers who possess commercial segment-specific knowledge and experience in order for PG&E to provide holistic, integrated and targeted value propositions to the commercial customer. PG&E will continue to leverage the partnerships established between manufacturers and distributers to ensure cost effective and reliable energy efficient equipment is available for consumers. It is important that PG&E leverage existing relationships and harvest new networks with emerging technologies to help identify innovative energy efficiency products and services to the commercial market.

Community Based Organizations

PG&E will maintain partnerships with community based organizations (CBOs) to educate small business customers on their PG&E accounts, PG&E online resources, and energy efficiency offerings. The CBOs have been instrumental in outreach efforts to PG&E's business customers located in hard to reach communities.

L. Statewide Administration and Transition Timeline

TBD

M. Solicitation Strategies

TBD

N. Metrics and EM&V Considerations

PG&E and the other PAs understand the importance of ensuring that all metrics provide value to the CPUC, program administrators, or other stakeholders. We also recognize that listed metrics can have powerful and unintended effects.[142]

Below we propose draft metrics as of October 2016. We expect that these metrics will change before the final draft as we attempt to compute and thoroughly document the baseline values. Where the metrics may not make sense, we intend to revise to better capture what will be valuable to the CPUC, program administrators, or other stakeholders.

Ultimately, all of the metrics that we propose for the final BP draft will be consistent with the agreed-upon statewide guiding principles for the metrics that was shared with the Energy Division on Aug 16, 2016 (see Table 14 below).

Table 14. Guiding Principles for Metrics

Metrics should…
Be used and useful by PAs to manage portfolio
Inform on the progress to achieving desired market effect(s) and strategy effectiveness
Rely on data collected during program implementation and/or data reporting to CPUC
Simple to understand and clear of any subjectivity
Outcome metrics preferred, but output metrics have high benefit to cost ratio
Not all metrics have a readily interpretable meaning, context is needed
Not a replacement for EM&V

The primary metrics that we are proposing are our energy savings metrics. We are also proposing additional secondary metrics, such as participation, to meet the expectations (and requests) of the CPUC; however, we note that there are times when participation may actually need to decrease in order to focus resources to reach savings goals. As such, more participation does not always track to more savings. Moreover, although we anticipate that participation will increase in the long-term as we bring in new scalable models, it will not be possible to track participation at the customer level as programs start to move to mid- or upstream program models.

The draft metrics proposed are aligned with the overall program goals. Specifically, within the next-10-year period, PG&E's primary goal for the commercial sector is to:

- Save xx GWh, xx MW, and xx MM therms, with an emphasis on savings from:
    - targeted business segments
    - SMBs

Secondary goals that we intend to track include:

- Reach an increasing percentage of commercial customers (increasing from 3.9% to xx% over 10-year period) by creating:
    - targeted value propositions for specific business segments, and
    - opportunities for SMBs.

[142] Perrin, in an article in the American Journal of Evaluation, discussed certain known limitations of performance metrics. Among these limitations, he descripted varying interpretation of the "same" term and concepts, goal displacement, use of meaningless and irrelevant measures, and cost-savings vs. cost-shifting. (Perrin, Burt. 1998. *Effective Use and Misuse of Performance Measurement. American Journal of Evaluation 1998:19;367.)*

- Increase customers' ability to manage energy by increasing the proportion of customers utilizing EMTs from x% to y%
- Integrate energy efficiency with other utility DER options within x% of commercial buildings
- Increase operational efficiency by reducing the ratio of $/kWh and $/therm saved by x% through the use of cost-effective scalable program models such as financing and third-party programs

In addition to these objectives that are directly attributable to our programs, we also seek to influence the market through larger market transformation efforts. Through these efforts, we seek to:

- Assist California in reaching the CEESP's goal of ZNE for 100% of all new commercial construction by 2030 through statewide efforts.
- Increase market share of energy efficiency for key end-uses and/or systems [TBD after mid-and upstream efforts are finalized]

Direct Effects from PG&E Efforts

PG&E's proposed sector-level metrics that can be tracked and monitored with some frequency (i.e., monthly, quarterly, or annually) are shown in Table 14.

Table 15: PG&E-Specific Commercial Sector Metrics

PG&E Goals	Intervention Strategies	Metrics	Baseline (or Benchmark)	Metric Source	Short-Term Targets (1-3 years)	Mid-Term Targets (4-7 years)	Long-Term Targets (8-10+ years)
Save xx GWh, xx MW, and xx MM Therms	All	Electricity saved	Average of approximately 309 GWh/ year across 2011-2015	Annual Ex ante Net Savings from program tracking	XX GWh	XX GWh	XX GWh
		Demand saved	Average of 55.7 MW / year across 2011-2015		XX MW	XX MW	XX MW
		MM Therms saved	Average of 4.1 MM Therms/year across 2011-2015		XX MM Therms	XX MM Therms	XX MM Therms
Reach an increasing percentage of commercial customers (increasing from 3.9% to xx% over 10-year period)	Data Analytics Technical Assistance and Tools Financial Solutions	Annual proportion of all customers participating in energy efficiency programs with tracking by business segment and size	3.9% per year average across 2011-2015 (electric participants only)	Program tracking databases	X% / year	X%/year	X%/year
		Cumulative participating in energy efficiency programs with tracking by business segment and size (unique customers)	XX%	Program tracking databases	XX% cumulative over time frame	XX% cumulative over time frame	XX% cumulative over time frame
		Notes on this metric: Participation may go up or down based on the type of program design. Over time, we expect to touch a larger percentage of customers with our programs, but these will not be able to be tracked if most programs move to mid- and upstream program models. We will revisit this metric and revise based on the final program models. We expect that the denominator for the population will need to stay constant over some period of time.					
Increase customers' ability to manage energy	Data Access Technical Assistance and Tools	Proportion of customers utilizing EMTs	XX% in 2015	Web analytics and tracking databases for programs with EMTs	XX% per year	XX% per year	XX% per year
		Notes on this metric: EMTs will need to be defined during the baseline period, but "may include a product, service, or software that allows a customer to better understand and manage electricity or gas use in the customer's home or					

PG&E Goals	Intervention Strategies	Metrics	Baseline (or Benchmark)	Metric Source	Short-Term Targets (1-3 years)	Mid-Term Targets (4-7 years)	Long-Term Targets (8-10+ years)
		place of business."					
Integrate energy efficiency with other utility DER options within x% of commercial buildings	Technical Assistance and Tools Financial Solutions	Proportion of commercial buildings with energy efficiency and at least one other utility DER (such as DR participation, DG, or storage)	Need baseline (tentative number from IDSM report)	Tracking databases for EE, DR, DG or other DER efforts	XX% buildings over time frame	XX% buildings over time frame	XX% buildings over time frame
		Note on this metric: We are not currently considering savings from DER since DER enabled does not always lead directly to savings (e.g., if DR events are not called).					
Increase operational efficiency by reducing the ratio of $/kWh saved and $/therm saved	All	Annual levelized cost of energy (kWh)[a]	XX $/kWh	Monthly tracking spreadsheets for net reported savings and costs and EUL from program tracking database	XX $/kWh	XX $/kWh	XX $/kWh
		Annual levelized cost of energy (therm)[a]	XX $/therm	Monthly tracking spreadsheets for net reported savings and costs and EUL from program tracking database	XX $/therm	XX $/therm	XX $/therm
		Notes on this metric: PG&E is considering whether this metric should be levelized cost of energy saving or some other metric. If levelized costs, it will be calculated by dividing the program costs by the sector level lifetime ex ante net savings of measures installed in one year.					
Assist in reaching the CEESP goal of ZNE for 100% of all new commercial construction by 2030	Technical Assistance Financial Solutions Assistance for the Design and Building	# of ZNE Commercial New Construction buildings receiving program design assistance	XX from 2015 SBD participation	EE program tracking database for any activities associated with Commercial New Construction (e.g., SBD or similar programs)	XX projects per year	XX projects per year	XX projects per year
		Notes for draft: We will consider whether these should be simply designated ZNE buildings or verified ZNE (which would be a longer-term study rather than a tracking metric).					

PG&E Goals	Intervention Strategies	Metrics	Baseline (or Benchmark)	Metric Source	Short-Term Targets (1-3 years)	Mid-Term Targets (4-7 years)	Long-Term Targets (8-10+ years)
	Communities	See also "market effects" table for related outcome metric					

Overall Statewide Market Effects within the Sector

The tables above document outputs that can be tracked by PG&E; however, we also anticipate that broader market studies should see changes in the overall markets over time based on PG&E's program investment (as well as other factors). In the tables below, we document market level indicators. Note that these need to be tracked through longer-term EM&V studies, and thus are not considered PG&E metrics, but rather broader statewide market indicators that our efforts are leading to the changes that the state desires.

As part of a statewide effort, PG&E recommends tracking the following at the market level.

Table 16: Market Level Indicators for the Commercial Sector

Market Level Goals	Intervention Strategies	Indicators	Baseline	Metric Source	Notes
Assist in reaching the CEESP goal of ZNE for 100% of all new commercial construction by 2030	Technical Assistance and Tools Financial Solutions	Proportion of commercial new construction square foot that is ZNE	<1% in 2015 (17 buildings)	Tracking Study	We will work with the CPUC to determine the type and timing of a future study, and what should be tracked.
Assist in reaching the CEESP goal of 50% of existing commercial buildings being ZNE by 2030	Technical Assistance and Tools Financial Solutions	Square foot of existing commercial sector buildings that are ZNE	X% in 2015	Tracking Study	We will work with the CPUC to determine the type and timing of a future study, and what should be tracked.
Increase market share of energy efficiency for key end-uses and/or systems	Upstream and Midstream Activities to Support EE Equipment	TBD after mid-and upstream efforts are finalized	TBD	Commercial Market Saturation Study	TBD after mid-and upstream efforts are finalized

O. EM&V Preparedness and Research Needs

EM&V Needs

PG&E recognizes the importance of EM&V 'preparedness,' identifying specific data collection strategies early on to support internal performance analysis and program evaluations. As sector-specific programs and energy efficiency measures are developed to support PG&E's commercial business plan, PG&E will collaborate with CPUC staff and their evaluation consultants to ensure that appropriate data collection and reporting capabilities are in place to facilitate accurate evaluation. Details on data collection and reporting will be provided in as much detail as possible in PG&E's Implementation Plans (IPs). EM&V 2.0 strategies will be used wherever PG&E and CPUC evaluation teams believe these offer more accurate and cost-effective data collection and impact evaluation capabilities. More traditional tracking data (e.g., contact information, project development and technical descriptions, savings calculations) will also be available to support evaluation efforts.

PG&E will regularly track and report the following commercial sector data to apprise the CPUC and stakeholders of its progress, starting with monitoring efforts:

- **Monitoring and embedded evaluation efforts:** These efforts will focus on sector-level spending, sector-level savings, participation among large and small/medium customers, participation of three targeted segments, participation in constrained areas, average energy use among participants (not adjusted)

Market Research Requirements

Evaluation, Measurement and Verification (EM&V) conducts research studies designed to increase the proliferation of energy efficiency adoption in the state of California with the guidance of the CPUC Framework.[143] Collaboration between the CPUC and IOUs resulted in the first draft of these studies where public stakeholder input is invited, discussed and incorporated at various stages throughout the EM&V Plan development process. Ultimately, the research for this sector will be contingent upon the needs of the portfolio as a whole and the annual research budget for this sector.[144]

Several types of studies exist that provide information to allow program designers and evaluators to assess the viability of programs, understand the market and how participants interact, key metrics on savings estimation and the overall potential for market adoption of certain energy efficiency interventions. The proposed EM&V methodology to address each research topic ranges from data mining and analytics, secondary research, focus groups, and qualitative interviews with industry experts. Each section below describes the type of study and list future studies planned starting in 2017.

PG&E has identified several overarching data gaps across the commercial sector. These merit additional market research to inform PG&E's delivery of appropriate and timely solutions to customers on their energy efficiency journey. While IOUs can conduct some either individually or collaboratively, other major longitudinal studies must be conducted by the CPUC or CEC.

[143] California Public Utilities Commission. California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals. April 2006.

[144] While PG&E provides several studies in this section, the current budgets are relatively small. The 2016 budgets in the most recent EM&V plan show approximately $4 million for Energy Division-led impact studies and $250,000 to $300,000 for IOU-led process studies. These budgets cover the large commercial and industrial programs, as well as agricultural programs. The CPUC, PAs, and other stakeholders will need to discuss EM&V priorities and determine the relative availability of budget to cover any of the studies.

PG&E believes that the following studies should be conducted to support both market metrics and PG&E program metrics:

- **California Commercial End-Use Survey (CEUS) – *led by the CEC***
- **Updated Goals and Potential Study – *led by the CPUC***

CEUS is of major importance to providing visibility into the end uses of various commercial products including lighting, HVAC, boilers, process equipment, and computers. Last updated in March of 2006, CEUS is an essential compendium that captures detailed building systems data, building geometry, electricity and gas usage, thermal shell characteristics, equipment inventories, operating schedules, and other commercial building characteristics.[145] The IOUs have requested that an updated CEUS be conducted to inform future commercial program design.

Per D.04-09-060, the Potential Study includes economic potential, stretch (i.e. aggressive) and cumulative kW, kWh, and therms savings goals as well as economic potential for statewide energy efficiency programs. Economic potential is the magnitude of savings that could be achieved by programs at a cost equal to or less than the projected cost of supply alternatives. The stretch and cumulative savings goals for electric and gas are to be used for resource procurement and program planning purposes by the Investor Owned Utilities (IOUs). PG&E looks forward to the updated Potential Study in 2017 to inform the design of future commercial offerings.

Future EM&V Studies

Studies referenced throughout this business plan have made recommendations and provided key topics of interests that are not listed in the above tables. Future studies should be conducted with a participatory evaluation model framework that features actionable data to inform program design as its primary output. Past study models have not produced actionable data as readily to inform program design. A participatory approach that features narrower research scopes and increased participation with program designers upfront in the study process is therefore advocated. Study points and questions include the following along with their suggested timeframes for study implementation.

Short term

- What are the baseload energy usages by segment?
- What are the best practices for using occupancy sensors and timers?
- How has direct install helped increase energy savings and can these best practices be implemented in other programs?
- How can customer access and engagement with energy data to reduce consumption and/demand be improved?

Mid-term

- How does behavior of occupants and facility managers affect commercial building operations and energy usage?
- How can high tech participation in EE programs be increased?
- How can LED adoption be increased given that awareness regarding this technology is already high?
- How do Small/Medium Businesses (SMBs) use energy data?

[145] California Energy Commission. California Commercial End-Use Survey. March 2006. CEC-400-2006-005http://www.energy.ca.gov/2006publications/CEC-400-2006-005/CEC-400-2006-005.PDF

- What happens after lighting controls technologies are installed? Do the savings and maintenance persist? What are future uses of these technologies 5+ years down the road?
- Continue to track LED prices in 2017 or 2018 and beyond

Long-term

- How does feedback of real-time EM&V of desk tops, laptops and other plugload devices affect energy consumption?
- How can PG&E better understand the diverse commercial base through segmentation and better targeting?
- What are the dynamics behind energy efficiency competing with self-generation?

Future studies to be conducted in collaboration with other Independently Owned Utilities (IOUs) and the CPUC are presented in the "Energy Division-Investor Owned Utility Energy Efficiency Evaluation, Measurement and Verification Plan," ("EM&V Plan") updated on an annual basis and available on the CPUC's website.

EM&V Preparedness

What is embedded evaluation? The bulk of evaluation activities for most utility energy efficiency programs do not begin until a program cycle nears its conclusion. Typically, third-party evaluators lead the effort to estimate energy savings (impacts), assess attribution, and recommend changes to improve program design and the efficiency of program operations. By contrast, embedded evaluation involves internal, utility evaluation specialists as part of the program team, beginning in the program design and planning stages and continuing throughout implementation. By including the research perspective from an early point, embedded evaluation seeks to inform new or enhanced program designs, improve program implementation and documentation, identify and measure key performance indicators to provide program teams with ongoing feedback so that modifications can be made on an ongoing basis, and position programs for successful third-party evaluation (that is, improving their "evaluability"). The use of embedded evaluation is not a substitute for third-party evaluation. Rather, the practices of embedded evaluation complements other evaluation activities and positions pilots and programs for evaluation success.

How is embedded evaluation being undertaken at PG&E? PG&E's team of evaluation specialists are assigned to specific customer segment-specific program teams. They serve as internal consultants to program managers to improve program design and implementation activities and position programs for evaluability and evaluation success. Specific examples of the activities and focus of these embedded evaluators are provided within each chapter of the business plan.

EM&V Key Learnings

- Commercial customers are diverse (sectors, building types, occupancies, lease arrangements) and a range of products and technologies are needed to address their needs.[146]
- Technical assistance for customers has proven valuable. Customers participating in Savings by Design (SBD) routinely request this assistance and it increases persistence of savings. For example, in a review of SBD process evaluations over the past 15 years, this theme has repeated itself.[147]

[146] "PY 2013-2014 Third Party Commercial Program Value and Effectiveness Study Report (Volume 1 of II), *Opinion Dynamics Corporation*, June 15, 2016, p. 18-20.

- Implementing building controls technologies create opportunities for demand and energy savings. Whether it is a lighting or a building management system (BMS), adopting controls technologies within a building empowers customers with energy usage data, automates actions to reduce energy, promotes savings persistence and overcomes a significant barrier to realize energy savings – time to understand all of the energy efficiency options available and act upon them.[148]
- Lighting, HVAC and Refrigeration accounted for the majority of electric savings in the Commercial sector a trend that is anticipated to continue through 2024.[149]
- Midstream partnerships are effective in increasing the market uptake of energy efficiency. Via PG&E's Lighting Innovation Midstream Trial, midstream incentives for LED replacement lamps outpaced sales of LED replacement lamps and/or fixtures through PG&E's other commercial deemed incentive programs during the same period. Market actors and end-users noted high levels of satisfaction with the rebate application and payment process.[150]
- Awareness of trainings for nonresidential lighting contractors is a greater obstacle than the availability. A recent study determined that the wide variety of trainings available in the state of California for programs including nonresidential lighting sufficiently meet the training needs of contractors and technicians, but awareness should be improved.[151]

[147] "Final Report 1999-2001 Building Efficiency Assessment (BEA) Study: An Evaluation of the Savings by Design Program," *RLW Associates,* 2001.
[148] Rovito, M., Subramony, G., Laurentia D., et al. "Advanced Thermostats for Small- to Medium-Sized Commercial Buildings." *2014 ACEEE Summer Study Buildings*.
[149] "California Commercial End Use Survey," *Itron*. 2006.
[150] "Pacific Gas and Electric Company's Lighting Innovation Midstream Trial Evaluation." *Evergreen Economics*. October 13, 2015. http://www.calmac.org/publications/PGandE_Commercial_Midstream_LED_Trial_Assessment_Final_Report.pdf
[151] "*PY 2013-2014 California Statewide Workforce Education and Training Program, Contractor Training Market Characterization*." *Opinion Dynamics*. June 2016. http://www.energydataweb.com/cpucFiles/pdaDocs/1631/CPUC%20WET%20Contractor%20Training%20Market%20Characterization_FINAL_V5.docx

P. Reference List

This reference list is incomplete and will be updated to reflect all sources cited in future iterations.

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http://www.energydataweb.com/cpucFiles/pdaDocs/1572/PY%202013-2014%20Third%20Party%20Commercial%20Program%20Value%20and%20Effectiveness%20Study%20(volume%20II).pdf

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SMB Group (2015) - 2015 Small and Medium Business Routes to Market Study, http://www.smb-gr.com/wp-content/uploads/2015/03/2015_SMB_Routes_To_Market_brochure.pdf

Q. Appendices

Appendix A: Stakeholder Feedback

Relevant Committee or Subcommittee	Topic	Issue *Please note that not all issues shown below are factually correct or current.* *Additionally, some are paraphrased and others are verbatim depending on how issue came into tracking process.*	Page #
Commercial	Market Assessments & Gaps Analysis Issue	Index #0036—suggestion to include information about climate zones and locational benefits	"Geography," pp. 11-13
Commercial	Intervention Strategies & Metrics	Index #0103—national account customers have constraints on their planning horizons. Utilities should work closely with these customers early on in planning process through a strategic energy management approach	Intervention Strategy 2, page 25
Commercial	Business Plan Topic	Index #0149—will code readiness be addressed more fully in each chapter?	Section H, pp. 40-41
Commercial	Market Assessment & Gaps Analysis Issue	Index #0156—the Navigant Potential and Goals Study uses market potential values and does not consider much larger economic potential	Section O, p. 54.
Commercial	Intervention Strategies & Metrics	Index #0158—need to work on simplifying offerings from customer perspective	Intervention Strategy 1-3, pp. 21-27.
Commercial	CA Regulator or Policy barrier	Index #0189—ensure that solutions are not solely for urban affluent areas, but have broader applicability throughout the state	Intervention Strategy #1, pp. 20-22
Commercial	Business Plan Topic	Index #0221—There are a host of laws that PA's are expected to connect to their BPs (e.g. AB 758, SB 350, AB 802, AB 793)	See Section J, pp. 44-45

Commercial	Business Plan Topic	Index #0222—(1) include discussion of economic potential, (2) "competing priorities" as a barrier is too general, (3) financial/funding barriers need to be unpacked	(1) Section O, p. 54 (2) See Table 3, p. 18 (3) See Intervention Strategy 4, p. 28
Commercial	Chapter Drafts (Voluntary)	Index #0307—provide more complete citations throughout the BP	Incorporated throughout the draft
Commercial	Chapter Drafts (Voluntary)	Index #0310—include a high level summary of key learnings from EM&V	Section B, pp. 6-7 Section O, pp. 55-56
Commercial	Chapter Drafts (Voluntary)	Index #0311—consider workforce requirements prior to being able to contract with a PA	See Section G, pp. 39
Commercial	Business Plan Topic	Index #0468—include more recent commercial saturation and market share tracking studies	See Section E, pp. 14

Appendix B: Compliance Checklist

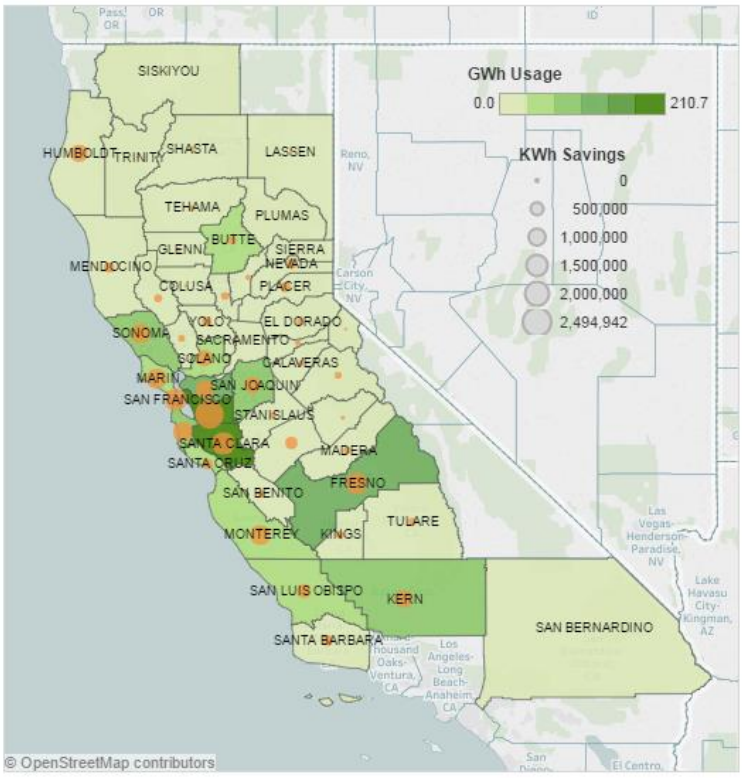
	PG&E Commercial Sector	
BP Page #	**Business Plan Guidance (Market Sector)**	**PG&E Notes**
TBD	A. **Summary Table for cost effectiveness w/TRC,PAC, Emissions, Savings as well as budget and metrics/Portfolio and sector level metrics for regulatory oversight (GWh, MW, Therms, cost effectiveness, and other parameters where applicable),** including performance metrics for non-resource programs.(also p.47 D.15-10-028)/ Portfolio and sector-level budgets that meet portfolio savings and cost effectiveness requirements (p.48 D.15-10-028)	TBD - will be provided as cost-effectiveness analysis is developed
Section B, pp. 4-5	**B. Compare/contrast this proposal with past program cycles**	
Section B, pp. 4-5	C. **How this proposal addresses performance issues within the sector/** Narrative description of changes from existing portfolio, including (1) budget changes; (2) program/intervention strategy changes; (3) justifications for the above. (from D.15-10-028, Appendix 3; included here to be consistent with 7/5/16 discussion with ED, but is not in the sector description of the Appendix)	Budget changes and justifications to be included in future drafts
Section E, pp. 8-15	**D. Market Characterization (Overview and market/gap & other analysis)**	
Section E, pp.	1. Electricity/natural gas consumption, GHG emissions, costs, etc.	GHG emissions to be included in future drafts
Section J, pp. 44-45	2. State goals, strategies and objectives e.g. strategic plan, SB350, AB758, etc. and other Commission policy guidance a. Descriptions of overarching goals, strategies, and approaches for each sector, as well as near-, mid-, and long-term strategic initiatives and sector-specific intervention strategies.	Goals and strategies also included in Sections A, G, and L
Section O pp. 53-56	4. Include any EMV recommendations and how they are being addressed/Historical sector performance and evaluation takeaways/ Analysis of PA and CPUC evaluation reports for this sector within context of this proposal	EM&V recommendations included throughout document; see footnotes and reference lists
Section E, pp. 8-15	5. Customer landscape	
Section F pp. 16-18	6. Major future trends in the above that are key for the PA and its customers	
Section F p. 18	7. Barriers to EE and other challenges to heightened EE (i.e. regulatory, market, data)	Barriers also included in Section G
Section G pp. 19-39	**E. PA's approach to achieve goals in this sector**	
Section G pp. 19-39	1. Products and services, and customer service activities/Resource Program Strategies; Non-Resource Program Strategies; Pilot Program Strategies/develop new strategies to achieve the state's energy efficiency goals in the future/	PG&E has structured its business plans around intervention strategies, and has provided examples of programs in each intervention strategy.

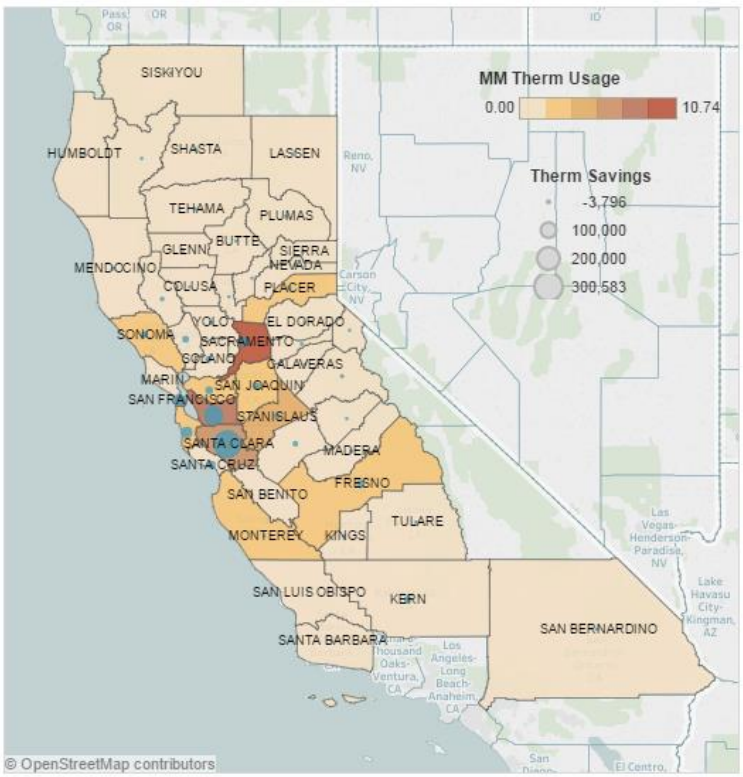
Section G pp 19-39. ; Section L p. 47	a. How does it advance goals discussed above	
Section N pp. 48-52	b. One metric or more as appropriate for each intervention strategy/PAs will still need to set more granular metrics than just sector-level metrics, but they will do so in implementation plans, not business plans. (p.53 D.15-10-028) 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/ Commission clearly states that program administrators "must establish up-front expectations for their activities" and that "business plans shall contain sector-level metrics".	PG&E has developed metrics that track to each of its goals.
Section D p. 8	c. 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	
Section H p. 40	2. Description of PA's local marketing and integration with SWMEO if applicable/ Marketing and Outreach: Strategies, approaches and outcomes	
Section G pp. 19-39	3. Whether items are near-, mid-, long-term strategic initiatives/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	Timeframes can be found in each of the intervention charts.
Section J pp. 44-45	4. Description of how each sector approach advances the goals, strategies and objectives of the strategic plan (p.46 D.15-10-028)	
Section H p. 40	5. Workforce Development, Education and Training: Strategies, approaches and outcomes 6. A description of any pilots contemplated or underway for each sector./ A description of any pilots contemplated or underway for the sector (p.46 D15-10-028)/ Describe any unique or innovative aspects of program not previously discussed, and describe any pilots contemplated or underway for the sector. (Appendix 3, D.15-10-028)	WE&T tactics can be found throughout the intervention strategies.
Section K pp. 46-47	**F. Key partners (committed and/or potential)**	
Section K p. 46-47	**G. Program/PA Coordination:** Description of which and how strategies are coordinated regionally among PAs and/or other demand- side options. (IOU/REN programs; statewide programs; coordination with other state/local government activities.)/ Coordination with other state agencies and initiatives/Description of which and how strategies are coordinated statewide and regionally among PAs and/or with other demand-side options; (p.46 and Appendix 3 D.15-10-028)	
Section H pp. 40-41	**H. Cross-Cutting Coordination:** Description of how cross cutting activities are addressed in customer sector strategies/ Statewide Coordination and cross-cutting efforts/Description of how cross-cutting "sectors" are addressed. (p.46 D.15-10-028)/Cross-Sector Coordination: Description of how cross cutting activities are addressed in customer sectors strategies. Include as applicable: i) Emerging Technologies program ii) Codes and Standards program iii) WE&T efforts iv) Program-specific marketing and outreach efforts (provide budget) – Appendix 3, D.15-10-028	Cross-cutting strategies and tactics can be found throughout the intervention strategies.

Section O pp. 53-56	**I. EM&V Considerations**: Statement of evaluation needs "preparedness" (i.e., data collection strategies and internal performance analysis)/Anticipated study needs/Internal performance analysis/feed-through during program deployment/(p.47-48 and Appendix 3 of D.15-10-028) J. Demand Response	
N/A	**K. Residential Rate Reform**	N/A
Section H p.	**L. Integrated Demand Side Resources**	
N/A	**M. Zero-Emission Vehicles (EVs)**	N/A
N/A	**N. Energy Savings Assistance (Multi-family Focused)**	N/A

Appendix C: Customer Data

Small Customer Data





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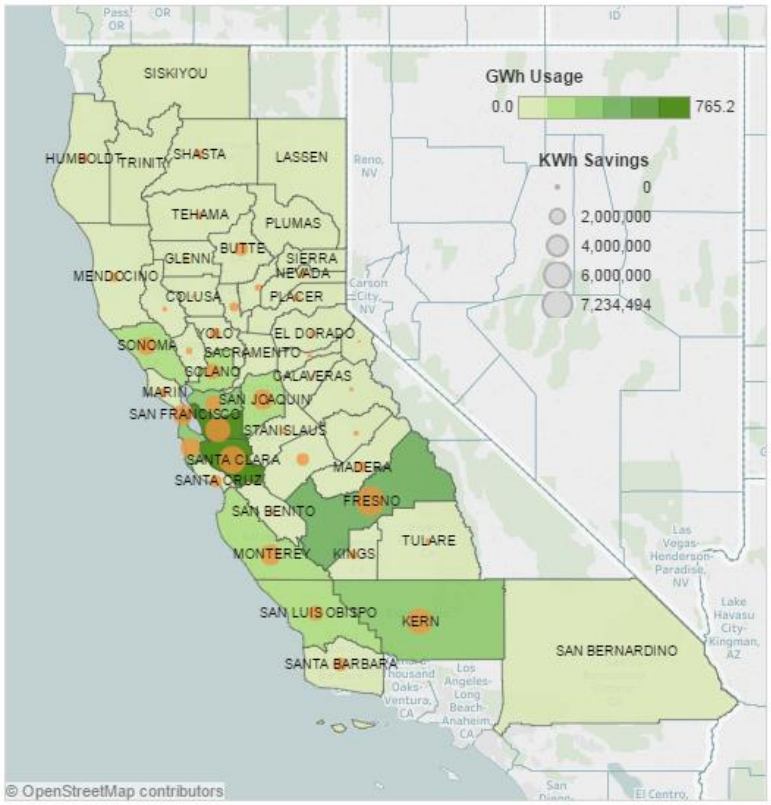
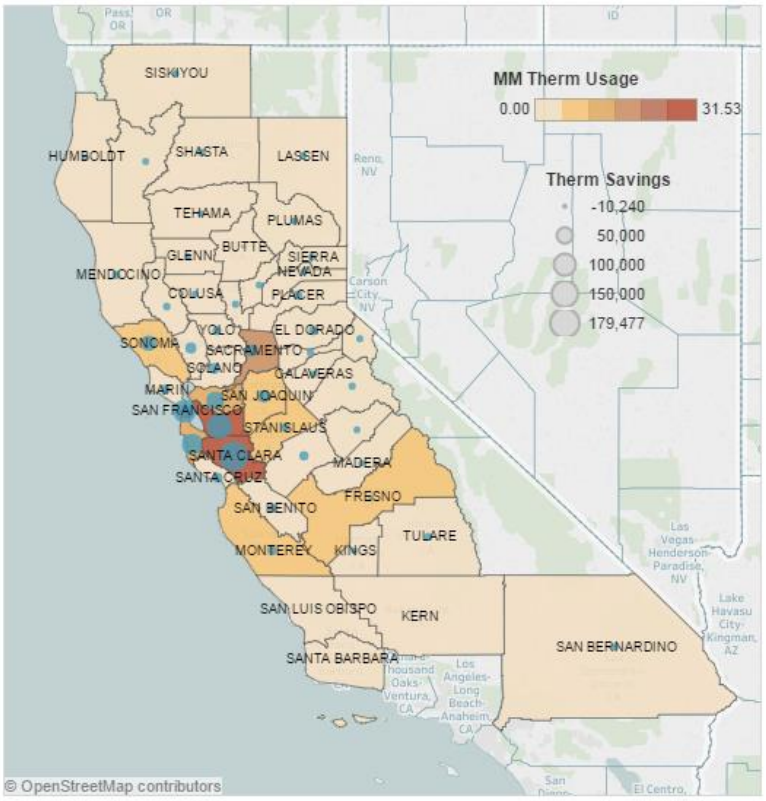
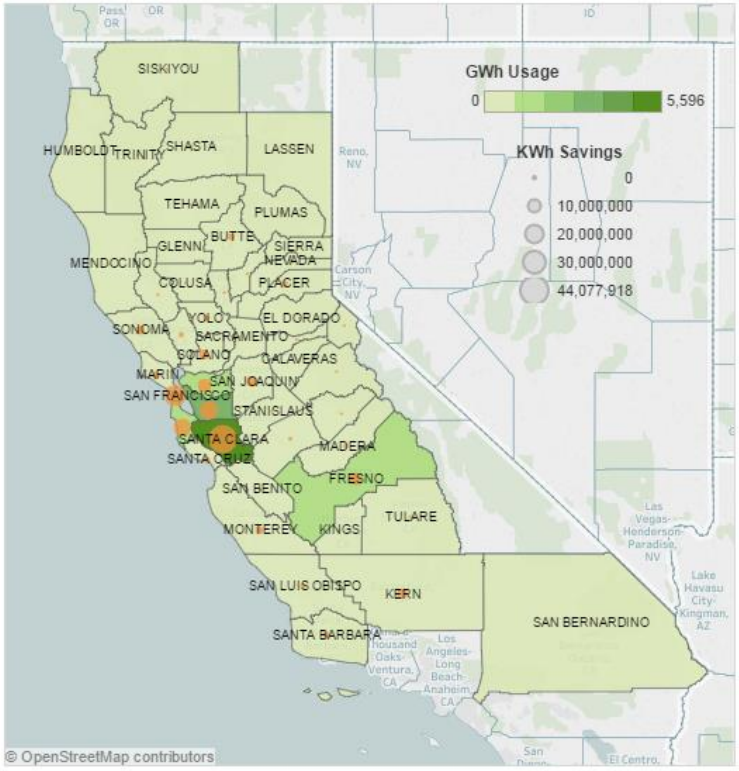
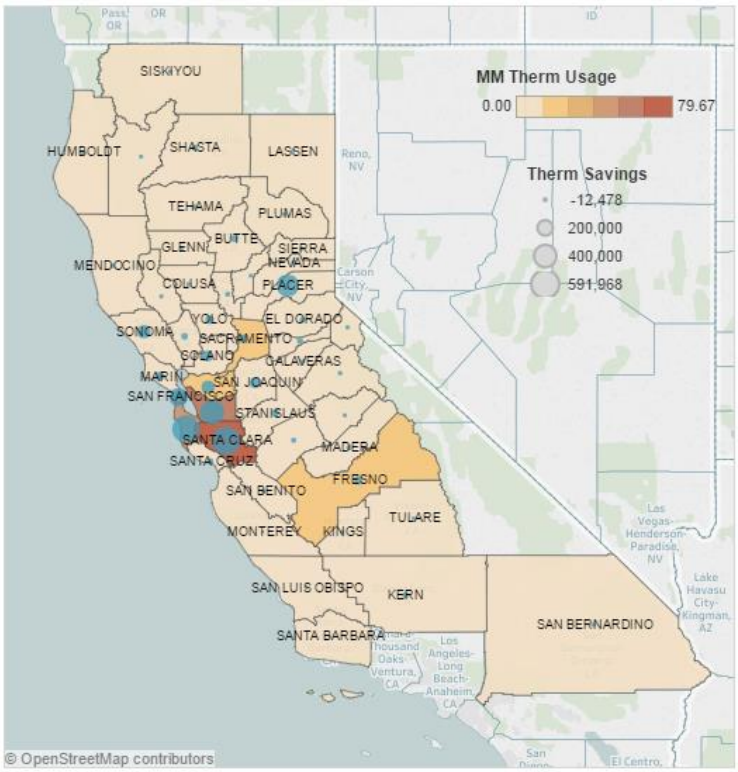




Large Customer Data





Retail Customer Data

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Retail													
Electricity Usage (GWh)	4,917.6	1,403.0	508.0	6.0	6,834.6	72.0%	20.5%	7.4%	100%	17.1%	4.9%	1.8%	24%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	14,363	26,007	56,292	1,763	98,425	14.6%	26.4%	57.2%	98%	3.3%	5.9%	12.7%	22%
Customer trends (2011-2015)													
Average Usage (kWh per customer)	342,380	53,948	9,024	3,398	69,439								
Usage Rate Trends (2011-2015)													
Electricity Savings (MWh)	45,658	27,045	10,455	607	83,765.1	54.5%	32.3%	12.5%	99%	18.2%	10.8%	4.2%	33%
Savings Trends (2011-2015)													
Participants (Number of Participants)	1,567	1,956	1,626	63	5,212	30.1%	37.5%	31.2%	99%	11.0%	13.7%	11.4%	36%
Participant (2011-2015)													
Average Savings (kWh per Participant)	29,137	13,827	6,430	9,637	16,072								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	10.9%	7.5%	2.9%	3.6%	5.3%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
[c] Not evaluating 'Unknown' size customers due to incompleteness of this data
[d] May not sum to 100% due to excluding 'Unknown' size category customers
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Retail													
Gas Usage (MM Therms)	51.0	32.2	14.3	0.2	97.6	52.2%	33.0%	14.6%	100%	7.7%	4.8%	2.1%	14.6%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	8,197	10,454	26,546	858	46,055	17.8%	22.7%	57.6%	98%	4.4%	5.6%	14.2%	24.2%
Customer trends (2011-2015)													
Average Usage (Therms per customer)	6,216	3,078	537	222	2,119								
Usage Rate Trends (2011-2015)													
Gas Savings (Therms)	303,182	117,937	476,617	1,748	899,484.4	33.7%	13.1%	53.0%	100%	7.2%	2.8%	11.3%	21.2%
Savings Trends (2011-2015)													
Participants (Number of Participants)	848	1,626	1,569	43	4,086	20.8%	39.8%	38.4%	99%	7.4%	14.2%	13.7%	35.3%
Participant (2011-2015)													
Average Savings (Therms per Participant)	358	73	304	41	220								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	10.3%	15.6%	5.9%	5.0%	8.9%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
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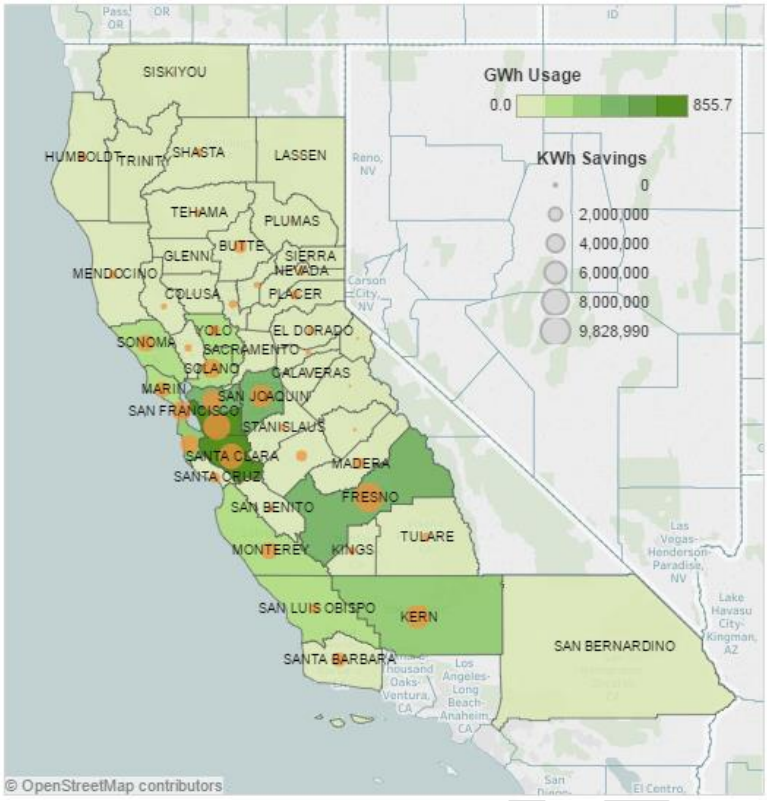
[d] May not sum to 100% due to excluding 'Unknown' size category customers
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively


GWh Usage
0.0
855.7
KWh Savings
0
2,000,000
4,000,000
6,000,000
8,000,000
9,828,990
SISKIYOU
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA NEVADA
MENDOCINO
COLUSA
PLACER
YOLO
EL DORADO
SONOMA
SACRAMENTO
SOLANO
CALAVERAS
MARIN
SAN JOAQUIN
SAN FRANCISCO
STANISLAUS
SANTA CLARA
MADERA
SANTA CRUZ
FRESNO
SAN BENITO
TULARE
MONTEREY
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
Reno, NV
Carson City, NV
Las Vegas-Henderson-Paradise, NV
Lake Havasu City-Kingman, AZ
Los Angeles-Long Beach-Anaheim, CA
Thousand Oaks-Ventura, CA
El Centro
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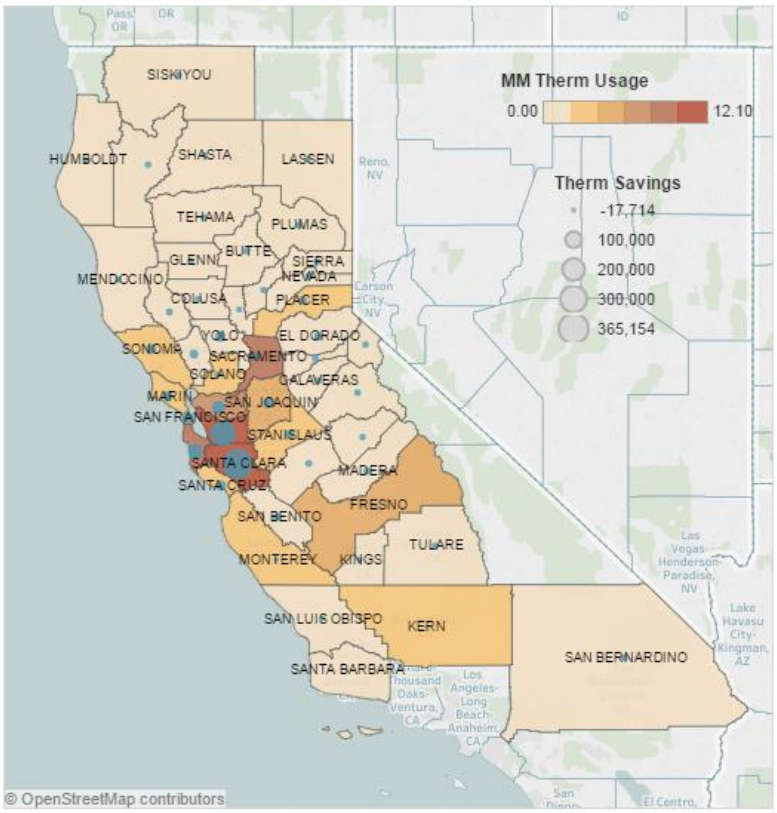
MM Therm Usage
0.00
12.10
Therm Savings
-17,714
100,000
200,000
300,000
365,154
SISKIYOU
HUMBOLDT
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA NEVADA
MENDOCINO
COLUSA
PLACER
YOLO
EL DORADO
SONOMA
SACRAMENTO
SOLANO
CALAVERAS
MARIN
SAN JOAQUIN
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STANISLAUS
SANTA CLARA
MADERA
SANTA CRUZ
FRESNO
SAN BENITO
TULARE
MONTEREY
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
Reno, NV
Carson City, NV
Las Vegas-Henderson-Paradise, NV
Lake Havasu City-Kingman, AZ
Los Angeles-Long Beach-Anaheim, CA
Thousand Oaks-Ventura, CA
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Offices Customer Data

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Offices													
Electricity Usage (GWh)	4,631.4	1,604.0	573.4	24.9	6,833.8	67.8%	23.5%	8.4%	100%	16.1%	5.6%	2.0%	24%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	24,445	42,015	74,886	1,698	143,044	17.1%	29.4%	52.4%	99%	5.5%	9.5%	17.0%	32%
Customer trends (2011-2015)													
Average Usage (kWh per customer)	189,462	38,177	7,658	14,680	47,774								
Usage Rate Trends (2011-2015)													
Electricity Savings (MWh)	32,355	11,938	4,775	507	49,575.8	65.3%	24.1%	9.6%	99%	12.9%	4.8%	1.9%	20%
Savings Trends (2011-2015)													
Participants (Number of Participants)	1,296	947	887	50	3,180	40.8%	29.8%	27.9%	98%	9.1%	6.6%	6.2%	22%
Participant (2011-2015)													
Average Savings (kWh per Participant)	24,966	12,606	5,383	10,140	15,590								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	5.3%	2.3%	1.2%	2.9%	2.2%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
[c] Not evaluating 'Unknown' size customers due to incompleteness of this data
[d] May not sum to 100% due to excluding 'Unknown' size category customers
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Offices													
Gas Usage (MM Therms)	66.6	35.6	18.1	0.6	120.8	55.1%	29.4%	15.0%	100%	10.0%	5.3%	2.7%	18.1%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	9,162	15,936	34,413	625	60,136	15.2%	26.5%	57.2%	99%	4.9%	8.5%	18.4%	31.9%
Customer trends (2011-2015)													
Average Usage (Therms per customer)	7,264	2,231	526	880	2,008								
Usage Rate Trends (2011-2015)													
Gas Savings (Therms)	287,768	166,397	93,416	23,859	571,440.2	50.4%	29.1%	16.3%	96%	6.8%	3.9%	2.2%	12.9%
Savings Trends (2011-2015)													
Participants (Number of Participants)	756	782	731	44	2,313	32.7%	33.8%	31.6%	98%	6.6%	6.8%	6.4%	19.8%
Participant (2011-2015)													
Average Savings (Therms per Participant)	381	213	128	542	247								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	8.3%	4.9%	2.1%	7.0%	3.8%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
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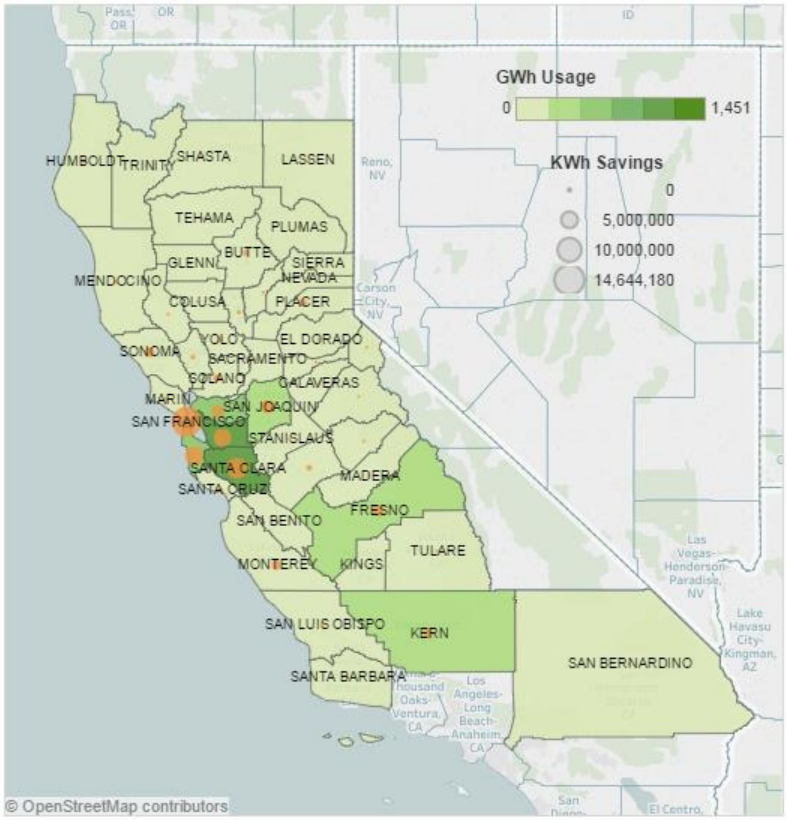
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively


GWh Usage
0
1,451
KWh Savings
0
5,000,000
10,000,000
14,644,180
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA
NEVADA
MENDOCINO
COLUSA
PLACER
YOLO
EL DORADO
SONOMA
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SAN JOAQUIN
SAN FRANCISCO
STANISLAUS
SANTA CLARA
MADERA
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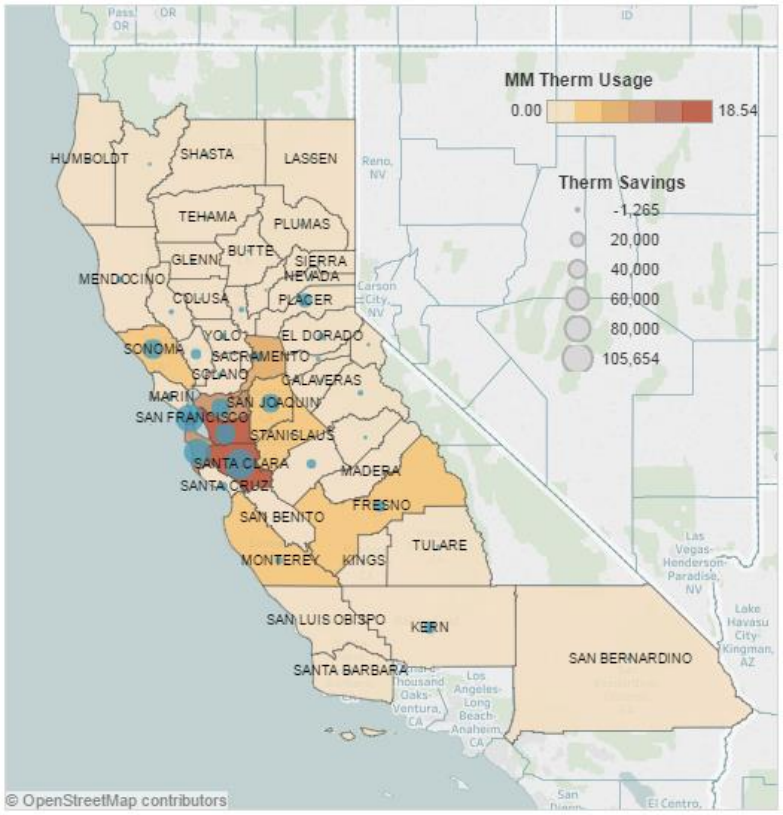
MM Therm Usage
0.00
18.54
Therm Savings
-1,265
20,000
40,000
60,000
80,000
105,654
HUMBOLDT
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA
NEVADA
MENDOCINO
COLUSA
PLACER
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High Tech Customer Data

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
High Tech													
Electricity Usage (GWh)	6,098.6	176.5	24.9	1.1	6,301.1	96.8%	2.8%	0.4%	100%	21.2%	0.6%	0.1%	22%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	37,907	4,268	2,819	83	45,077	84.1%	9.5%	6.3%	100%	8.6%	1.0%	0.6%	10%
Customer trends (2011-2015)													
Average Usage (kWh per customer)	160,884	41,344	8,835	13,405	139,785								
Usage Rate Trends (2011-2015)													
Electricity Savings (MWh)	41,727	699	40	793	43,258.7	96.5%	1.6%	0.1%	98%	16.7%	0.3%	0.0%	17%
Savings Trends (2011-2015)													
Participants (Number of Participants)	457	41	8	1	507	90.1%	8.1%	1.6%	100%	3.2%	0.3%	0.1%	4%
Participant (2011-2015)													
Average Savings (kWh per Participant)	91,306	17,051	4,953	792,942	85,323								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	1.2%	1.0%	0.3%	1.2%	1.1%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
[c] Not evaluating 'Unknown' size customers due to incompleteness of this data
[d] May not sum to 100% due to excluding 'Unknown' size category customers
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
High Tech													
Gas Usage (MM Therms)	70.8	3.9	0.5	0.1	75.2	94.1%	5.1%	0.7%	100%	10.6%	0.6%	0.1%	11.3%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	2,346	1,122	1,160	40	4,668	50.3%	24.0%	24.9%	99%	1.3%	0.6%	0.6%	2.5%
Customer trends (2011-2015)													
Average Usage (Therms per customer)	30,161	3,441	473	1,287	16,114								
Usage Rate Trends (2011-2015)													
Gas Savings (Therms)	608,521	10,712	(147)	651	619,737.7	98.2%	1.7%	0.0%	100%	14.4%	0.3%	0.0%	14.6%
Savings Trends (2011-2015)													
Participants (Number of Participants)	214	23	7	1	245	87.3%	9.4%	2.9%	100%	1.9%	0.2%	0.1%	2.1%
Participant (2011-2015)													
Average Savings (Therms per Participant)	2,844	466	(21)	651	2,530								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	9.1%	2.0%	0.6%	2.5%	5.2%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
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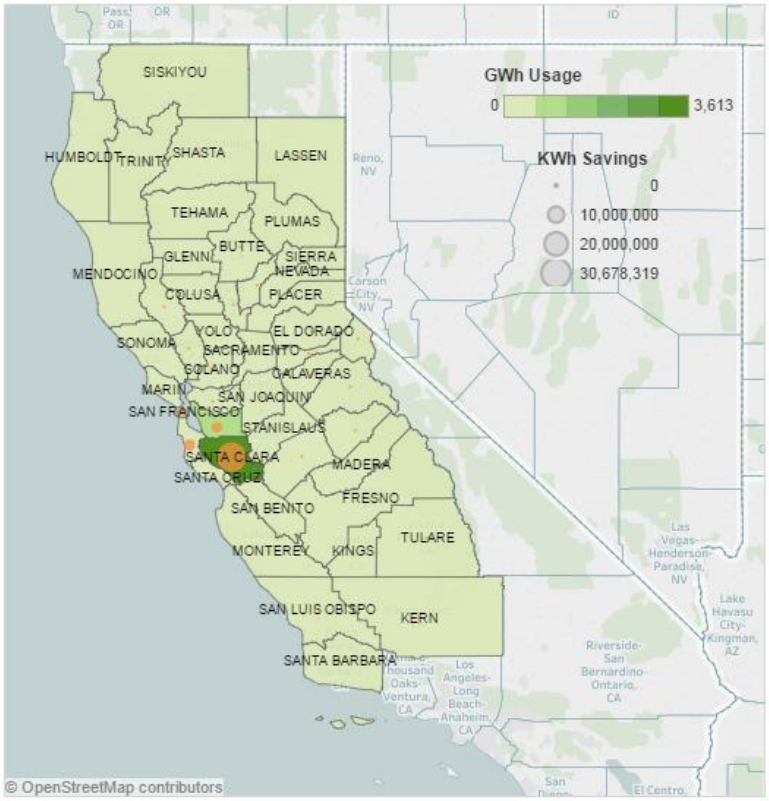
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively


GWh Usage
0
3,613
KWh Savings
0
10,000,000
20,000,000
30,678,319
SISKIYOU
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA NEVADA
MENDOCINO
COLUSA
PLACER
YOLO
EL DORADO
SONOMA
SACRAMENTO
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SAN FRANCISCO
STANISLAUS
SANTA CLARA
MADERA
SANTA CRUZ
FRESNO
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Reno, NV
Carson City, NV
Las Vegas-Henderson-Paradise, NV
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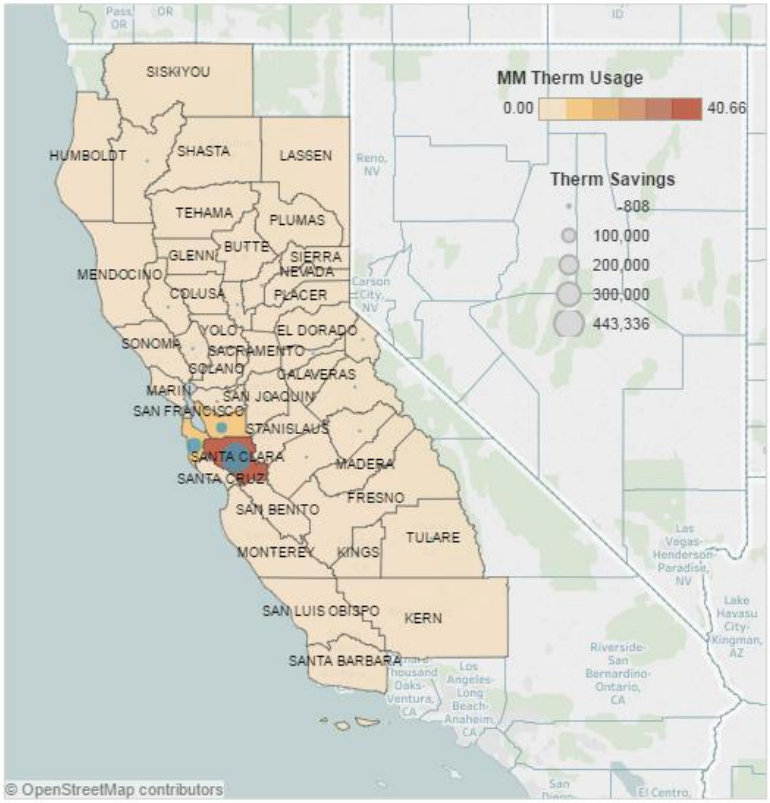
MM Therm Usage
0.00
40.66
Therm Savings
808
100,000
200,000
300,000
443,336
SISKIYOU
HUMBOLDT
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA NEVADA
MENDOCINO
COLUSA
PLACER
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Hospitality Customer Data

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Hospitality													
Electricity Usage (GWh)	2,451.2	1,815.7	196.7	9.1	4,472.7	54.8%	40.6%	4.4%	100%	8.5%	6.3%	0.7%	16%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	10,322	27,727	14,550	898	53,497	19.3%	51.8%	27.2%	98%	2.3%	6.3%	3.3%	12%
Customer trends (2011-2015)													
Average Usage (kWh per customer)	237,472	65,484	13,521	10,116	83,606								
Usage Rate Trends (2011-2015)													
Electricity Savings (MWh)	26,854	19,311	2,753	778	49,695.8	54.0%	38.9%	5.5%	98%	10.7%	7.7%	1.1%	20%
Savings Trends (2011-2015)													
Participants (Number of Participants)	1,477	2,074	446	48	4,045	36.5%	51.3%	11.0%	99%	10.3%	14.5%	3.1%	28%
Participant (2011-2015)													
Average Savings (kWh per Participant)	18,182	9,311	6,172	16,202	12,286								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	14.3%	7.5%	3.1%	5.3%	7.6%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
[c] Not evaluating 'Unknown' size customers due to incompleteness of this data
[d] May not sum to 100% due to excluding 'Unknown' size category customers
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Hospitality													
Gas Usage (MM Therms)	78.4	108.7	20.8	0.5	208.5	37.6%	52.2%	10.0%	100%	11.8%	16.3%	3.1%	31.2%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	6,561	17,077	10,495	579	34,712	18.9%	49.2%	30.2%	98%	3.5%	9.2%	5.6%	18.3%
Customer trends (2011-2015)													
Average Usage (Therms per customer)	11,957	6,368	1,978	894	6,006								
Usage Rate Trends (2011-2015)													
Gas Savings (Therms)	347,520	325,835	84,437	10,355	768,146.2	45.2%	42.4%	11.0%	99%	8.2%	7.7%	2.0%	17.9%
Savings Trends (2011-2015)													
Participants (Number of Participants)	1,316	1,931	385	41	3,673	35.8%	52.6%	10.5%	99%	11.5%	16.9%	3.4%	31.7%
Participant (2011-2015)													
Average Savings (Therms per Participant)	264	169	219	253	209								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	20.1%	11.3%	3.7%	7.1%	10.6%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
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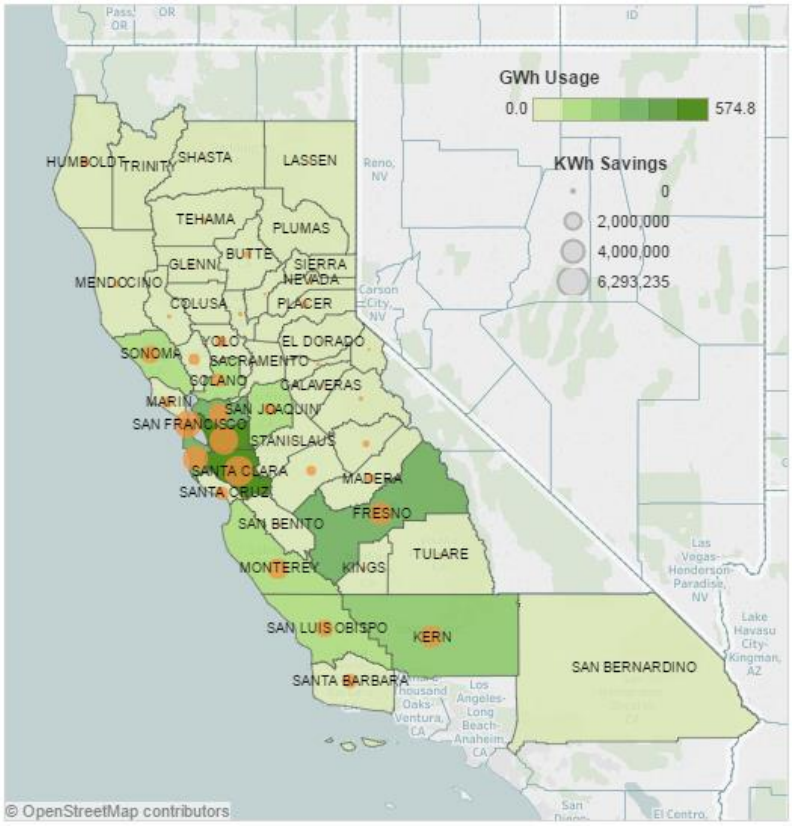
GWh Usage
0.0
574.8
KWh Savings
0
2,000,000
4,000,000
6,293,235
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA
NEVADA
MENDOCINO
COLUSA
PLACER
YOLO
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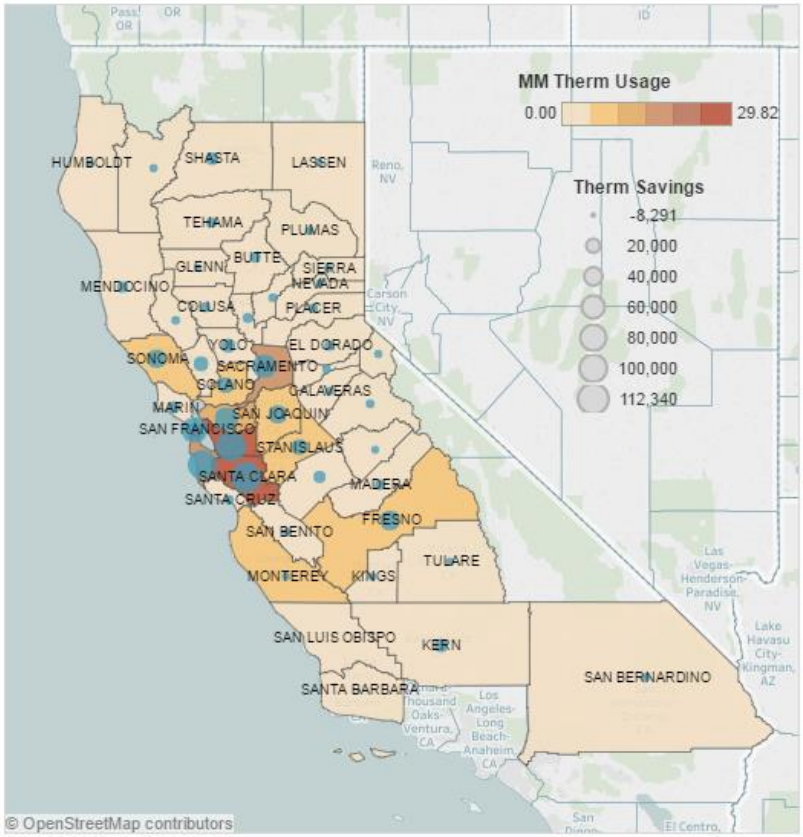
MM Therm Usage
0.00
29.82
Therm Savings
-8,291
20,000
40,000
60,000
80,000
100,000
112,340
HUMBOLDT
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA
NEVADA
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	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Healthcare													
Gas Usage (MM Therms)	99.2	13.3	4.9	0.0	117.5	84.4%	11.3%	4.2%	100%	14.9%	2.0%	0.7%	17.7%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	3,296	4,519	13,604	196	21,615	15.2%	20.9%	62.9%	99%	1.8%	2.4%	7.3%	11.5%
Customer trends (2011-2015)													
Average Usage (Therms per customer)	30,110	2,952	362	213	5,438								
Usage Rate Trends (2011-2015)													
Gas Savings (Therms)	1,023,914	28,209	19,285	3,732	1,075,140.2	95.2%	2.6%	1.8%	100%	24.2%	0.7%	0.5%	25.3%
Savings Trends (2011-2015)													
Participants (Number of Participants)	185	141	157	9	492	37.6%	28.7%	31.9%	98%	1.6%	1.2%	1.4%	4.2%
Participant (2011-2015)													
Average Savings (Therms per Participant)	5,535	200	123	415	2,185								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	5.6%	3.1%	1.2%	4.6%	2.3%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
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Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
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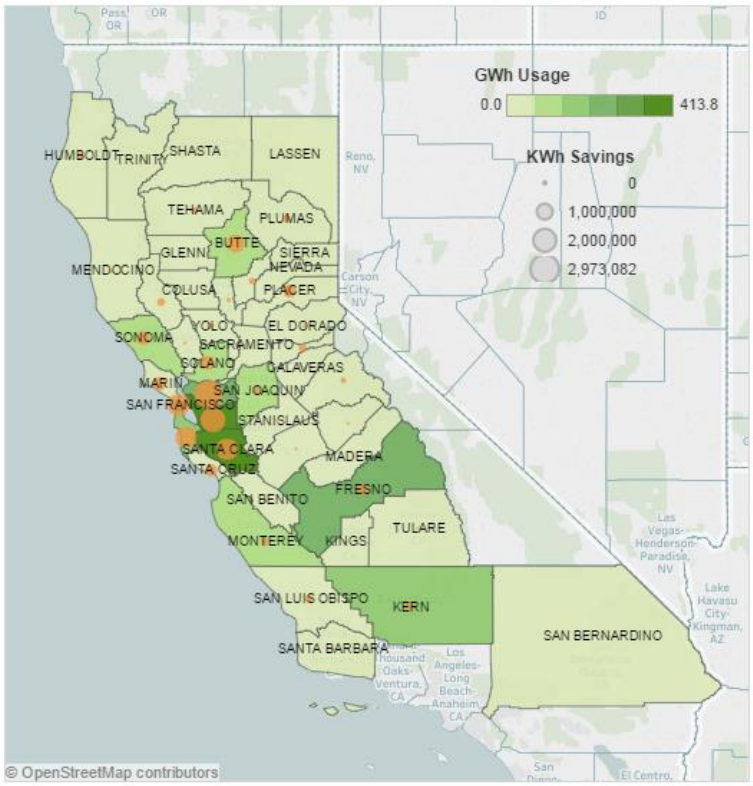
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Healthcare													
Electricity Usage (GWh)	2,196.9	359.2	189.8	0.7	2,746.6	80.0%	13.1%	6.9%	100%	7.6%	1.2%	0.7%	10%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	5,437	7,622	19,222	329	32,610	16.7%	23.4%	58.9%	99%	1.2%	1.7%	4.4%	7%
Customer trends (2011-2015)													
Average Usage (kWh per customer)	404,065	47,132	9,875	1,977	84,226								
Usage Rate Trends (2011-2015)													
Electricity Savings (MWh)	14,440	1,493	613	15	16,560.1	87.2%	9.0%	3.7%	100%	5.8%	0.6%	0.2%	7%
Savings Trends (2011-2015)													
Participants (Number of Participants)	237	153	167	8	565	41.9%	27.1%	29.6%	99%	1.7%	1.1%	1.2%	4%
Participant (2011-2015)													
Average Savings (kWh per Participant)	60,926	9,757	3,672	1,834	29,310								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	4.4%	2.0%	0.9%	2.4%	1.7%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
[c] Not evaluating 'Unknown' size customers due to incompleteness of this data
[d] May not sum to 100% due to excluding 'Unknown' size category customers
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively


GWh Usage
0.0
413.8
KWh Savings
0
1,000,000
2,000,000
2,973,082
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA
NEVADA
MENDOCINO
COLUSA
PLACER
SONOMA
YOLO
EL DORADO
SACRAMENTO
SOLANO
CALAVERAS
MARIN
SAN JOAQUIN
SAN FRANCISCO
STANISLAUS
SANTA CLARA
SANTA CRUZ
MADERA
SAN BENITO
FRESNO
MONTEREY
KINGS
TULARE
SAN LUIS OBISPO
KERN
SANTA BARBARA
SAN BERNARDINO
Reno, NV
Carson City, NV
Las Vegas-Henderson-Paradise, NV
Lake Havasu City-Kingman, AZ
Thousand Oaks-Ventura, CA
Los Angeles-Long Beach-Anaheim, CA
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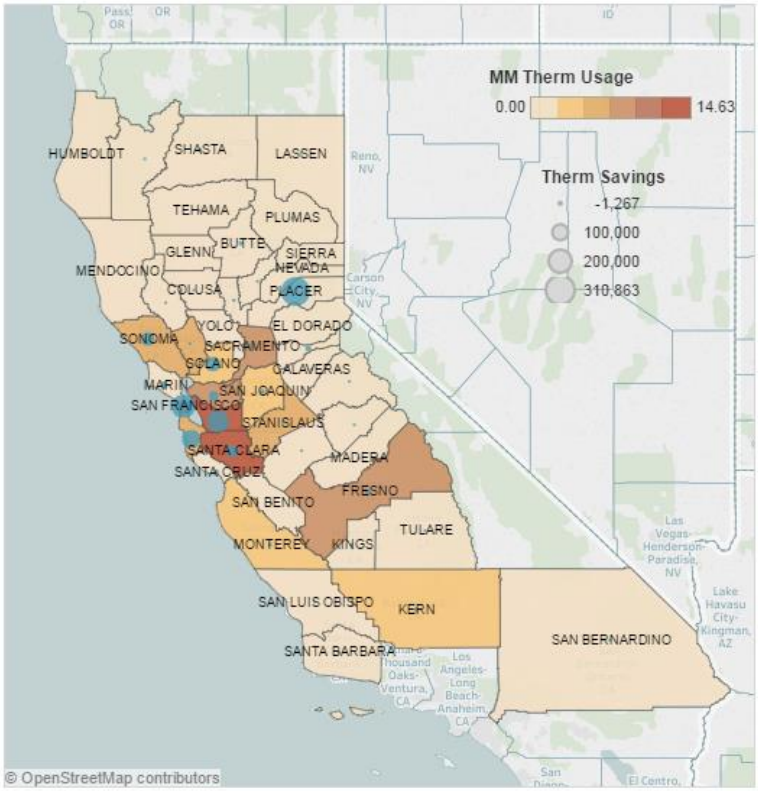
MM Therm Usage
0.00
14.63
Therm Savings
-1,267
100,000
200,000
310,863
HUMBOLDT
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA
NEVADA
MENDOCINO
COLUSA
PLACER
SONOMA
YOLO
EL DORADO
SACRAMENTO
SOLANO
CALAVERAS
MARIN
SAN JOAQUIN
SAN FRANCISCO
STANISLAUS
SANTA CLARA
SANTA CRUZ
MADERA
SAN BENITO
FRESNO
MONTEREY
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SAN LUIS OBISPO
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SAN BERNARDINO
Reno, NV
Carson City, NV
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Biotech Customer Data

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Biotech													
Electricity Usage (GWh)	717.9	19.0	1.3	0.4	738.6	97.2%	2.6%	0.2%	100%	2.5%	0.1%	0.0%	3%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	589	272	138	7	1,006	58.5%	27.0%	13.7%	99%	0.1%	0.1%	0.0%	0%
Customer trends (2011-2015)													
Average Usage (kWh per customer)	1,218,872	69,685	9,682	58,329	734,209								
Usage Rate Trends (2011-2015)													
Electricity Savings (MWh)	2,481	43	1	2	2,527.3	98.2%	1.7%	0.0%	100%	1.0%	0.0%	0.0%	1%
Savings Trends (2011-2015)													
Participants (Number of Participants)	50	5	1	1	57	87.7%	8.8%	1.8%	98%	0.3%	0.0%	0.0%	0%
Participant (2011-2015)													
Average Savings (kWh per Participant)	49,627	8,637	660	2,132	44,339								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	8.5%	1.8%	0.7%	14.3%	5.7%								
Participation Rate Trends (2011-2015)													

Notes:
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Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
[c] Not evaluating 'Unknown' size customers due to incompleteness of this data
[d] May not sum to 100% due to excluding 'Unknown' size category customers
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively

	Customer By Size[a]					Percent of Segment[c]				Percent of Sector[c]			
	Large	Med	Small	Unk[b]	Total	Large	Med	Small	Total[d]	Large	Med	Small	Total
Biotech													
Gas Usage (MM Therms)	24.3	0.3	0.1	0.0	24.7	98.3%	1.3%	0.2%	100%	3.7%	0.1%	0.0%	3.7%
Usage Trends (2011-2015)[e]													
Customers (Number of customers)	370	139	94	9	612	60.5%	22.7%	15.4%	99%	0.2%	0.1%	0.1%	0.3%
Customer trends (2011-2015)													
Average Usage (Therms per customer)	65,706	2,399	598	2,386	40,396								
Usage Rate Trends (2011-2015)													
Gas Savings (Therms)	242,047	367	101	-	242,515.0	99.8%	0.2%	0.0%	100%	5.7%	0.0%	0.0%	5.7%
Savings Trends (2011-2015)													
Participants (Number of Participants)	45	4	1	-	50	90.0%	8.0%	2.0%	100%	0.4%	0.0%	0.0%	0.4%
Participant (2011-2015)													
Average Savings (Therms per Participant)	5,379	92	101	-	4,850								
Savings Rate Trends (2011-2015)													
Participation Rates (% Participants per Cust.)	12.2%	2.9%	1.1%	0.0%	8.2%								
Participation Rate Trends (2011-2015)													

Notes:
[a] Large: ≥ 500,000 KWh or ≥ 250,000 Therms
Medium: 40,000 - 500,000 KWh or 10,000 - 250,000 Therms
Small: < 40,000 KWh or < 10,000 Therms
Unknown: Insufficient data (<12 months)
[b] 'Unknown' size category included for completeness. Represents insufficient or partial-year data
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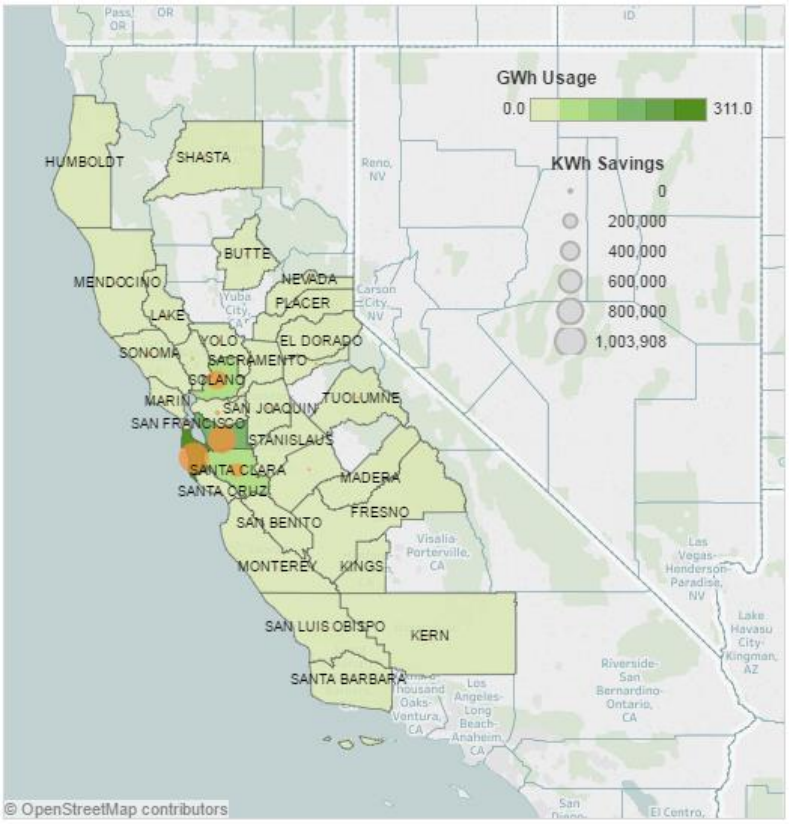
[d] May not sum to 100% due to excluding 'Unknown' size category customers
[e] Trend sparklines represent 2011 to 2015. Blue and red dots are the low and high points respectively


GWh Usage
0.0
311.0
KWh Savings
0
200,000
400,000
600,000
800,000
1,003,908
HUMBOLDT
SHASTA
BUTTE
MENDOCINO
NEVADA
PLACER
LAKE
YOLO
EL DORADO
SONOMA
SACRAMENTO
SOLANO
MARIN
SAN JOAQUIN
TUOLUMNE
SAN FRANCISCO
STANISLAUS
SANTA CLARA
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FRESNO
SAN BENITO
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SAN LUIS OBISPO
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SANTA BARBARA
Reno, NV
Carson City, NV
Yuba City, CA
Visalia-Porterville, CA
Las Vegas-Henderson-Paradise, NV
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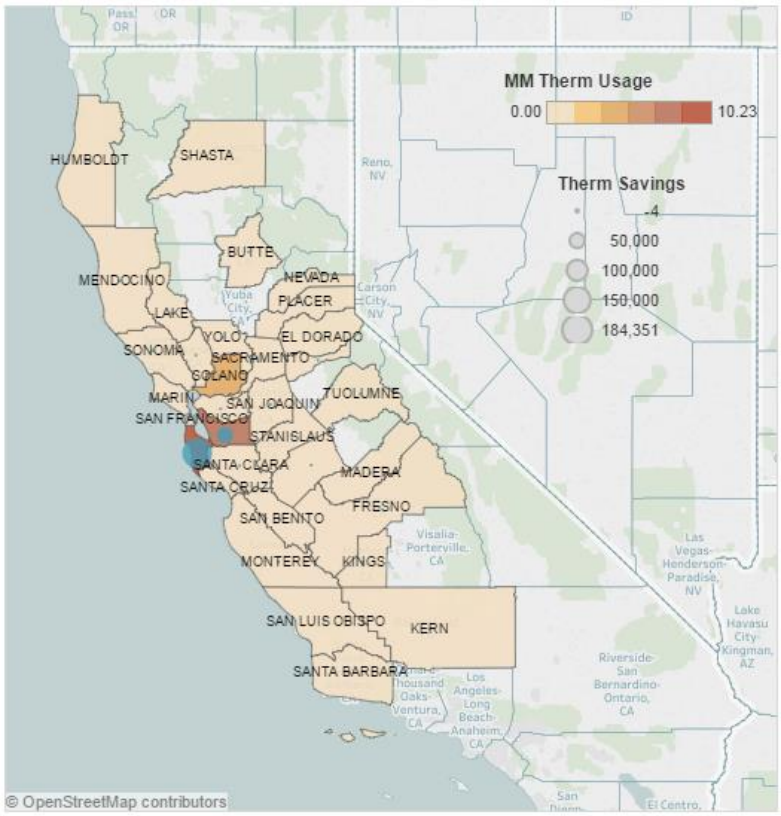
MM Therm Usage
0.00
10.23
Therm Savings
-4
50,000
100,000
150,000
184,351
HUMBOLDT
SHASTA
BUTTE
MENDOCINO
NEVADA
PLACER
LAKE
YOLO
EL DORADO
SONOMA
SACRAMENTO
SOLANO
MARIN
SAN JOAQUIN
TUOLUMNE
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FRESNO
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Appendix D: Midstream Targeted Market Transformation Initiative

As discussed in Market Intervention 1: Upstream and midstream initiatives to promote the most efficient products, components and system, PG&E plans to investigate opportunities for market transformation in the commercial sector. PG&E sees an opportunity to partner with distributors to stock and promote energy-efficient products, such as lighting, HVAC, hot water heaters, and boilers, with the intention to increase cost-effective energy savings and promote increased participation in energy efficiency initiatives.

Phase and Activity	Timeline
Phase 1: Scan and identify target markets • Evaluate technologies • Characterize markets • Collect data for baseline estimations and intervention adoption curves • Develop market model, program theory and logic model • Establish interim and long term indicators of success • Develop draft program plan	TBD
Phase 2: Stakeholder Feedback and Approval • Establish Advisory Committee • Solicit stakeholder feedback via CAEECC • Revise implementation plan and/or program details based on CAEECC feedback • Develop ex ante savings estimates • Submit program plan via Advice Letter for CPUC approval	TBDTBD
Phase 3: Implementation and Continuous Evaluation • Develop implementation plan, in coordination with CAEECC and other stakeholders • Establish market evaluations for data collection • Coordinate with downstream activities • Periodic review by Advisory Committee and/or CAEECC	TBD

Appendix E: Commercial Up/Midstream Strategies and Codes & Standards Connections

Note: Appendix E is a draft and serves as an example, and is not complete at this time.

Commercial CSEEP Goals:

- New Construction will increasingly embrace ZNE performance, reaching 100% penetration of new starts by 2030
- Support the increasing efficiency in existing buildings by simplification of T24 HVAC replacement procedures and Compliance Improve initiatives.
- Implement code driven, market transformation and customer demand for energy efficient products, and consumer demand flexibility controls to sculpt energy use to lower cost hours in response to Time-of-Use and peak demand rates.
- Support use of most efficient HVAC equipment in the replacement market with incentives and sales information.

Target end-use / measure	Long-term goal / target	C&S Strategy	Key C&S Timeline	Program strategy to support long-term goal
Electric Motors	New standards that took effect in 2016 apply to three-phase induction electric motors from 1 to 500 horsepower and are equivalent to the NEMA Premium (or IE3) efficiency levels. Updated efficiency levels, which would reduce energy losses by about 15%, can be met by more-efficient conventional induction motors as well as by advanced motor technologies including permanent magnet, switched reluctance, and synchronous reluctance motors.[152]	**Appliance Standards**: provide performance, cost, and market data to support federal standard levels for electric motors that are roughly equivalent to the Super Premium (or IE4) levels.[153]	**Appliance Standards:** • 2018 to 2022: key period of influence • ~2022: next federal standard finalized • ~2025: next standard effective	**Up/midstream**: **Downstream**: **ETP**:
Variable speed fans and variable speed condensing units	Future DOE standard for walk-ins requires variable refrigerant flow, on-cycle control of variable speed evaporator fans so that fan energy	**Appliance Standards:** Demonstrate VS technology on all sizes of walk-ins with various aggregated customer	**Appliance Standards:** • 2021 to 2022: key period of influence • ~2022: next federal standard	**Up/midstream**: **Downstream**:

[152] Appliance Standards Awareness Project (ASAP). August 2016. *Next Generation Standards*. http://www.appliance-standards.org/sites/default/files/Next%20Gen%20Report%20Final_1.pdf

[153] DOE. (2014). Final Rule: Technical Support Documents. https://www.regulations.gov/document?D=EERE-2010-BT-STD-0027-0108

Target end-use / measure	Long-term goal / target	C&S Strategy	Key C&S Timeline	Program strategy to support long-term goal
for walk-in coolers/freezers	is minimized and evaporator and condenser surfaces are effectively oversized (low TD) for most hours of the year	groups (chains) supermarkets, restaurants, schools etc. Provide performance, cost, and market data to support federal standard levels for walk-ins with VS vans and VRF refrigerant flow for condensing units. **Building Codes**: Collect information on installation cost and energy savings of retrofitting variable speed evaporator fans onto various size and configuration walk-ins. If cost-effective this could be part of an energy code but not an appliance standard.	finalized • ~2025: next standard effective **Building Codes:** Two years in advance of the Title 24 code cycle (either 2020 for 2022 T24 cycle or 2023 for 2025 T24 cycle)	**ETP**:
Fans used in commercial building HVAC systems, commercial kitchen exhaust systems, and agricultural ventilation	DOE is currently conducting a rulemaking, scheduled for completion in 2016. The most-efficient fan designs available today and would achieve weighted-average savings of 8% relative to the assumed base case efficiency levels. [154]	**Appliance Standards:** Provide performance, cost, and market data to support federal standard levels that meet max tech levels. **Building Codes**:	**Appliance Standards:** • 20224 to 2024: key period of influence • ~2024: next federal standard finalized • ~2029: next standard effective **Building Codes:**	**Up/midstream**: **Downstream**: **ETP**:
Dedicated Outside Air Systems (DOAS)	DOAS systems are the code baseline system from small commercial buildings. DOAS systems typically are more robust (less likely to fail) and are well suited for the addition of heat recovery. The primary benefit for	**Appliance Standards**: **Building Codes**: This product is not federally regulated and is impacted by building standards and retrofit programs. Collect	**Appliance Standards:** **Building Codes:** Two years in advance of the Title 24 code cycle (either 2020 for 2022	**Up/midstream**: Incentives for various high efficiency characteristics (fan efficiency, heat recovery, by-pass dampers, economizer capable etc.)

[154] Appliance Standards Awareness Project (ASAP). August 2016. *Next Generation Standards*. http://www.appliance-standards.org/sites/default/files/Next%20Gen%20Report%20Final_1.pdf

Target end-use / measure	Long-term goal / target	C&S Strategy	Key C&S Timeline	Program strategy to support long-term goal
	this technology is reduced fan energy as ventilation air is decoupled from supply air. This technology is used in IECC 2015 as one of the prescriptive "additional efficiency" paths.	performance, cost, and market data to support T-24 CASE proposal.		**Downstream**: Small commercial building incentive program using pre-qualified equipment. **ETP**: Research on performance in California climates for various occupancies. Since this technology is often combined with VRF systems for providing cooling, research would center on predicting energy performance for both technologies when used together.
Distribution Transformers	Energy losses in transformers can be significantly reduced by using amorphous metal for the transformer steel core. We analyzed standards for distribution transformers based on the use of amorphous metal that would reduce energy losses by 40–70% relative to the current standards.[155]	**Appliance Standards:** Provide performance, cost, and market data to support federal standard levels based on the use of amorphous metal. **Building Codes**: Include transformer losses model in performance method simulation tool. This requires data on current loading of transformers.	**Appliance Standards:** • 2017 to 2019: key period of influence • ~2019: next federal standard finalized • ~2022: next standard effective	**Up/midstream**: Procurement specification with IOUs, POUs etc. for procurement specification for transformers making use of amorphous steel (ideally US origin and ideally multiple suppliers) to stand up US industry to provide high efficiency transformers. Plan for trickle down to smaller size transformers over time. Utilities have the long planning times to support this type of investment. Work with CPUC to confirm this type of investment does not suffer from unintended policy barriers. **Downstream**: **ETP**: Validation of simulation tool.
Compressors	DOE is currently conducting a rulemaking that would establish the first national efficiency	**Appliance Standards:** Provide performance, cost, and market data to support federal	**Appliance Standards:** • 2022 to 2024: key period of	**Up/midstream**:

[155] Appliance Standards Awareness Project (ASAP). August 2016. *Next Generation Standards*. http://www.appliance-standards.org/sites/default/files/Next%20Gen%20Report%20Final_1.pdf

Target end-use / measure	Long-term goal / target	C&S Strategy	Key C&S Timeline	Program strategy to support long-term goal
	standards for compressors. The most-efficient compressors available today would achieve weighted-average savings of 36% relative to the assumed base case efficiency levels. 156 Also, the current rulemaking excludes reciprocating compressors which comprise 97% of the compressor market. [157] Including reciprocating compressors at the max-tech level would realize an additional 2 quads over the 30-year period of analysis. This equates to roughly half of the energy savings possible at max-tech for all compressor types considered in the rulemaking. [158]	standard levels that meet max tech levels for both rotary and reciprocating compressors. **Building Codes**:	influence • ~2024: next federal standard finalized • ~2029: next standard effective **Building Codes:**	**Downstream**: **ETP**:
ZNE Warehouses	New warehouses are constructed with satisfying the commercial ZNE goal before 2030. Heating loads reduced by radiant heating and attention to reducing infiltration. Capability to support DR or scheduling of forklift charging, capacity to not only be ZNE but also provide renewables expandability so there is flexibility to be a net generator if it is	**Building Code:** C&S program works to demonstrate ZNE warehouses that integrate efficiency, DR, storage and renewables. Collect performance, cost, and market data to support T-24 CASE proposal. Early adoption of ZNE for warehouses assists with administrative roll out of	**Appliance Standards:** **Building Codes:** Two years in advance of the Title 24 code cycle (2020 for 2022 T-24)	**Up/midstream**: Incentives for PV/battery charger systems that are energy efficient and compatible with DR signaling systems and have sufficient capabilities. **Downstream**: SBD program for ZNE new warehouses that optimize energy efficiency prior to

[156] Appliance Standards Awareness Project (ASAP). August 2016. *Next Generation Standards*. http://www.appliance-standards.org/sites/default/files/Next%20Gen%20Report%20Final_1.pdf

[157] Department of Energy (DOE). *May 2016. 2016-05-19 Energy Conservation Program: Energy Conservation Standards for Compressors; Noticed of proposed rulemaking (NOPR) and announcement of public meeting.* https://www.regulations.gov/document?D=EERE-2013-BT-STD-0040-0038

[158] Department of Energy (DOE). *May 2016. Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Air Compressors.* https://www.regulations.gov/document?D=EERE-2013-BT-STD-0040-0037

Target end-use / measure	Long-term goal / target	C&S Strategy	Key C&S Timeline	Program strategy to support long-term goal
	financially desirable. All systems well integrated so that provision for one system is not at detriment of other systems. Combined system designed for minimum life cycle cost to achieve an aggressive energy reduction goal.	ZNE for other building types in succeeding code cycles.		adding PV and DR capabilities. **ETP**: Repeatable prototypes for ZNE new and retrofit warehouses Radical design changes: forklift as demand response and energy storage system
ZNE schools	New schools and new portable classrooms are ZNE while providing a high performance environment for learning and are a community center for arts and sports. For 9 month schools they are net importers and during the summer they are net generators of electricity. These schools are robust ZNE environments which require little site maintenance to retain ZNE status over the long term but which communicate to central management when equipment is not working. Occupancy is highly variable thus occupancy sensing is used to control lights, setpoints and ventilation in individual spaces.	**Building Code:** C&S program works to demonstrate ZNE schools that integrate efficiency, DR, storage and renewables. Collect long term performance, cost, and market data to support T-24 CASE proposal.	**Appliance Standards:** **Building Codes:** Two years in advance of the Title 24 code cycle (2023 for 2025 T-24)	**Up/midstream**: **Downstream**: SBD program for ZNE new schools and major remodels that optimize energy efficiency prior to adding PV and DR capabilities. Also smart controls that tie into central energy management. Training interpreting smart control fault signals and repair. **ETP**: Demonstration projects of ZNE schools with focus on rugged equipment, low maintenance, and communication to central facilities management. HVAC that is quiet and occupancy controllable. Overlap with DOAS efforts
Unitary Package Heating and Cooling Equipment		**Appliance Standards:** **Building Codes**:	**Appliance Standards:** • 20XX to 20XX: key period of influence • ~20XX: next federal standard finalized • ~20XX: next standard effective	**Up/midstream**: **Downstream**: **ETP**:

Target end-use / measure	Long-term goal / target	C&S Strategy	Key C&S Timeline	Program strategy to support long-term goal
			Building Codes:	

Appendix F: California Job Trends