ENERGY EFFICIENCY PROGRAMS

SoCalGas®
Large Public Sector Program
Implementation Plan

Prepared by Energy Infrastructure Partners LLC
for SoCalGas

Version 1.0

November 2022

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The following Implementation Plan is located on the California Public Utilities Commission ("CPUC")-maintained website, the California Energy Data and Reporting System ("CEDARS"), in accordance with applicable CPUC decisions and Energy Division guidance.

Program Overview

The Large Public Sector in CA experiences many barriers to implementing energy efficiency (EE) projects or measures because of bureaucratic customer procurement processes, long project cycles and decision making, and a proliferation of out-of-territory stakeholders. The Large Public Sector Program (LPS) brings key interventions to overcome these unique barriers. The interventions are custom projects through capital infrastructure upgrades, deemed measures, and direct install as a target opportunity for this type of customer. Energy Infrastructure Partners (EIP) will drive a whole building solutions approach that informs a long-term strategic plan for the Large Public Sector customer. We will acquire customers through national relationships and portfolio-based channels.

EIP will identify and prioritize engagement with public buildings, agencies, and departments in hard-to-reach (HTR) and disadvantaged communities (DAC) using U.S. Census data, Department of General Services (DGS), facility maps, and the CalEnviroScreen database. We will conduct outreach to resiliency, sustainability, economic development, and finance focused stakeholders using messaging tailored to address the challenges of small capital improvement budgets, fostering resiliency, and safeguarding resident health and safety. EIP will recruit state and federal agencies and nongovernment organizations that provide support to HTR communities to disseminate information about the program through existing communication channels and programs. Outreach and direct marketing will be conducted to trade allies to make them aware of the Large Public Sector Program.

EIP will employ a combination of technologies, re-designed marketing strategies, and modified delivery approaches to reach the Large Public Sector. In addition, we will have comprehensive, long-term strategic energy plans that include site-specific energy efficiency and carbon reduction roadmaps to move public sector buildings toward zero net energy (ZNE). It is our mission to deliver deep, persistent energy and carbon savings to the Large Public Sector.

Commented [VP1]: @Jones, Joshua - please cross reference with program description in the agreement.

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Campaign Goals and Timeline

For financial goals, please refer to CEDARS. Table 1 details the planned program timeline.

Table 1. Program Timeline

Phase	*Deliverables*	*Dates*
Launch Preparation	• Kickoff Meeting • Program Implementation Plan • Program Management Plan • Program Marketing Plan • Set up IT Infrastructure • Develop Program Materials	10/1/22 – 12/31/22
Program Launch and Ramp-Up	• Provide Program training • Implement marketing campaign • Begin Customer enrollment • Deliver preliminary Program services	01/01/23 – 3/31/23
Perform Program Services	• Deliver Program services • Conduct inspections and verifications • Payment of Incentives/Rebates	01/01/23 – 10/24/25
Program Shutdown	• Shutdown Plan • Inform Stakeholders • Resolve outstanding items • Final Program Report	As determined by Shutdown Plan

Commented [MP3]: Funding for 2025 is subject to approval of the next business plan

Program Budget and Savings

1. **Program Name:** SoCalGas Large Public Sector (LPS) Program
2. **Program ID:** SCG3899

Please refer to the California Energy Data and Reporting System (CEDARS) for the following program details:

3. **Program Budget Table**
4. **Program Gross/Net Impacts Table:**
5. **Program Cost Effectiveness (TRC):**
6. **Program Cost Effectiveness (PAC):**
7. **Type of Program**
8. **Market Sector**
9. **Program Type**
10. **Market Channel(s)**
11. **Intervention Strategies**

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Implementation Plan Narrative

Program Description

The Large Public Sector Program serves large public sector customer segments located in SoCalGas territory: Local Government, Federal Government, K-12 Education, Special Districts, and Public Owned Utilities. The program offers energy efficiency solutions tailored to large public sector customers, including those serving hard-to-reach (HTR) customers and those located in disadvantaged communities (DAC). Large Public Sector customers are defined as those with a load of 50,000 Therms or greater. It will identify and manage project opportunities that utilize the deemed and custom measurement platforms.

Commented [MP5]: need to define large as accounts with load 50k therms or more

The Large Public Sector Program addresses opportunities within public sector buildings by providing eligible customers with the technical and economic resources that are otherwise difficult to obtain for comprehensive retrofits. These customers are served through an open network of trade professionals and energy service companies, community-based organizations, and local contractors and installers.

The following are key objectives of the Large Public Sector Program:

- Deliver deep, persistent energy and carbon savings.
- Serve underserved segments of the large public sector, such as those located in Disadvantaged Communities (DAC).
- Acquire customers cost-effectively.
- Drive whole building solutions that will move public sector buildings toward zero net energy (ZNE).
- Help SoCalGas maintain relevance in the market as a gas utility through promotion of emerging gas technologies and other gas measures as a part of the decarbonization solution.

Customer Segments.

The Large Public Sector program will solicit multiple segments of the public sector vertical. This program excludes State facilities (as well as State correctional facilities) as those customers are addressed through a separate program. There are however collaboration opportunities since many of the channel partners provide access to both state and federal customers, and therefore anticipate lead sharing with the respective State program implementer. This method of collaboration will also ensure no overlap with other public sector programs in California.

To define the Large Public Sector customer base, the individual target market segments are as follows

- Local Government - Cities, Counties, County Hospitals, Health Districts, Transportation, Public Housing, Water/Wastewater (not statewide), Correctional Facilities (not Statewide CDCR).
- Federal Government - Military Buildings, Federal Hospitals, Federal Agencies, Native American Tribes.
- Education - Public K-12 Schools, Public K-12 School Districts, Public K-12 Charter Schools.

Geographic Location of Offering

Large public sector customers cover the entire SoCalGas service territory. However, we expect clustering of large federal and hospital customers in the population centers. The program will also target municipal customers in outlying areas, especially those considered hard to reach (HTR) and disadvantaged communities (DAC). The program will utilize direct outreach with additional support from trade allies.

Eligible Customers

The SoCalGas Large Public Sector Program will be open to approximately 417 public sector customers with base load of 50,000 Therms or greater. Public Sector customers defined by NAICS that are eligible for this program are the following:

61 – Educational Services
62 – Health Care and Social Assistance
92 – Public Administration
49110 – Postal Service

Customers must also be in good standing with their account and not have received incentives for proposed measures in the last five years.

Measures

The SoCal Gas Large Public Sector (LPS) Program features a comprehensive suite of measures that are designed to engage Public Sector customers of all sizes within each customer segment. In addition to measures that have been historically featured in SoCal Gas programs, LPS emphasizes several underutilized measures that have high savings potential but low levels of customer adoption and awareness. A brief overview of LPS program is provided below:

Commented [MP6]: good place to specify accounts with 50k therms/year

Commented [HG7R6]: Would we note NAICS codes here as listed on page 23: Section 3. Customer Eligibility Requirements?

- **Condensing Boiler and Unit Heater Retrofits**. Condensing boilers and unit heaters offer significantly higher efficiency than their non-condensing counterparts by more effectively utilizing heat from the combustion process. Efficiency ratings of 90% to 93% are typical but can be higher with certain technologies or applications.
- **Efficient Hot Water and Steam Boilers**. New boiler installations that meet or exceed thermal efficiencies standards for hot water and steam applications. Efficiency ratings must be greater than 85%.
- **Boiler System Improvements**. Several of the deemed and custom measures are offered to optimize the performance of boiler systems including blowdown recovery, combustion VFD, and stack economizer. Each of these measures offers gas savings by more effectively utilizing waste heat.
- **Infrared Heaters.** Low-intensity infrared (IR) heaters heat objects directly rather than heating the ambient environment, thereby reducing energy use intensity.
- **Enhanced Ventilation Control.** Variable speed drives (VSD) installed on HVAC system with gas heating can yield substantial by adjusting the fan speed to match the thermal load. These measures typically require the addition of a permanent magnet motor (PMM) and advanced digital economizer controller (ADEC).
- **Insulation.** Pipe insulation, tank insulation, and fitting insulation for hot water and steam systems apply to a variety of customer operations and provide opportunities for both gas and electric savings. Insultation measures will be offered as deemed, custom, and direct install.
- **Ozone Laundry.** Retrofit of a new or existing commercial laundry system with an ozone laundry system where ozone molecules react with soils in cold water to effectively clean the load. The most common method is through a corona discharge process, where dry air is passed through an electric field to form ozone molecules.
- **Dehumidification Systems**. By removing humidity, rather than using ventilation as a means for climate control, a comfortable temperature can be obtained without adding excess load on the HVAC system. Heat generated through the dehumidification process will be repurposed when possible.
- **Energy Recovery Devices.** Energy recovery devices, like Enthalpy Wheels and Energy Recovery Ventilators, can be incorporated in the design to transfer outgoing temperature and humidity to incoming outdoor air.
- **Gas Chillers.** Efficient gas or absorption chillers use energy provided by a heat source to cool water. Additional efficiencies can be gained by recycling the waste heat produced.

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Details of all measures, including eligibility criteria, DAC/HTR applicability, and incentive amounts can be found in the supporting documents section of this Implementation Plan.

Program Delivery and Customer Services

The Program is designed to achieve the large public sector vision and goals outlined in the SoCalGas Business Plan. The Program brings a comprehensive suite of tested strategies to drive customer participation and overcome the unique barriers faced by California's public sector. To help bridge the barriers, we will develop strategic channel partnerships with entities such as the California Municipal Financial Authority and Municipal Management Association of Southern California for access to local units of government, counties, and public healthcare. Other strategic alliances will be developed with The Bureau of Indian Affairs, General Services Administration, Office of Public-School Construction for access to key stakeholders in those facilities. Through these relationships, our approach will bring the tested strategies to drive customer participation:

- **Education:** Promotion of the benefits of EE upgrades beyond utility cost savings considering public sector sustainability goals.
- **Assessment:** Evaluation of facilities and processes directly with public customers and advising them on EE solutions that best meet their needs allowing for multiple paths and a layered approach to making EE upgrades over time and at the right time in the growing cycle.
- **Benchmarking:** Quantification and comparison of building energy performance to similar buildings using Energy Star Portfolio Manager.
- **Measure Installation:** Depending on the size and type of customer and project, Program measures will be installed via direct installation, through trade allies, or by the customer.
- **Verification/Commissioning:** The Program will verify completion of work to ensure all measures are installed and operational before payment of incentive to customer or trade ally.
- **Incentive Payment:** The Program will follow necessary Company procedures to ensure timely and accurate payment of incentives to Customer/trade ally.

The detailed application process for direct install, deemed, and custom projects is described below in Table 2.

Table 2. Project Process

<table>
<tr><th></th><th>Direct Install</th><th>Deemed</th><th>Custom</th></tr>
<tr><td>Step 1 Marketing & Outreach</td><td rowspan="2">Direct Install contractors that are enrolled in the program will handle these steps.</td><td colspan="2">EIP engages a large volume of sites/customers through partner channels that have not historically been tapped to generate partnerships with public agencies. We will target architectural engineering firms as well as public sector leaders to begin influencing projects early during the design phase and across multiple sites.</td></tr>
<tr><td>Step 2 Customer Enrollment</td><td colspan="2">EIP assists interested participants with completing the application and submitting the supporting documents. The project is identified as Deemed, Custom, or Direct Install.</td></tr>
</table>

Commented [GC10]: please elaborate on the partner channels. who are they in our service territory.

	Direct Install	Deemed	Custom
		At this stage, Program staff will identify whether the participant is classified as DAC or HTR based on the ZIP code of the facility.	
Step 3 **Pre-Application/ Technical Review/ CMPA Review/M&V Review/Reservation**		Customer will purchase the qualifying high efficiency equipment. EIP will provide support and guidance where needed to ensure the eligibility requirements from the workpapers are met.	**Pre-Application –** Customer eligibility and project is verified. The project is queued for engineering review. The energy advisor determines the need for pre-installation measurement and develops an M&V plan. Throughout the process, the Program ensures adherence to CPUC and SoCalGas policies regarding custom projects. **CMPA Review - If** a project meets the Technical Review requirements, it will be submitted to the Custom Measure and Project Archive (CMPA) project list. The CPUC could select the project for in-depth review and would require the implementer, ES, and program advisor to respond to project-related data requests. The CPUC will decide if the project is approved or rejected at this stage. **Pre-approval letter –** Letter is sent to the customer including incentive amount, offer term, and any conditions associated M&V. **Pre-installation –** The energy advisor conducts pre-installation M&V.

	Direct Install	Deemed	Custom
Step 4 **Project Installation**		The installation will be carried out following the Workpaper Guidance. EIP will help ensure the completion of this step.	The customer will receive project management support throughout the project installation.
Step 5 **Post-Installation Review/** **Inspection/ Incentive Approval**	Site inspections for 10% of projects will take place (randomly selected facilities for site inspections).	Paid itemized invoices, photos of pre-existing and new equipment, specification sheets, project application, and any supplemental measure-specific information will be supplied and checked by program staff.	Post-Installation Savings Verification conducted. EIP & Franklin validate measure installation, collect necessary onsite data and documentation. Final application and package submitted to SoCalGas for review and approval incentive payment.
Step 6 **Incentive Payment**	The contractor will receive payment to offer qualifying products at a reduced cost.	Customers will receive one incentive payment once installation is complete. Incentives will vary depending on the assigned incentive level	Customers receive one incentive payment once installation is complete, verification conducted, and approval of final application from SoCalGas.

Note:

Customer projects are managed with strict Service Level Agreements (SLAs) to ensure that projects progress towards a construction completion date. At the commitment stage, the LPS team provides project management assistance where necessary to augment local facility resources to validate project scope and construction details. Typical project stages consist of Enrollment, Assessment, Project Scope, Commitment, Construction, QA/QC, Installation Approved. The time within each stage is measured for each project so we can view the average time across the portfolio and identify outliers so we can mitigate project delays and meet performance expectations.

Program Design and Best Practices

Strategic Relationships and Collaboration with Trusted Industry Partners: Public Sector customers are known for bureaucratic procurement processes, long project cycles and decision making. The Large Public Sector Program will overcome this barrier and create a whole building solution for the Public Sector through engaging all stakeholders throughout the process. The LPS Program targets architectural engineering firms as well as public sector leaders to begin influencing projects early during the design phase and across multiple sites. This approach will enable The

Program to develop long-term strategic energy savings plan and focus on project opportunities that are aligned with customer's long-term energy objectives.

Specialized Technical Assistance and Facility Energy Audits: Emphasis will be placed on providing comprehensive facility energy audits to the largest customers to identify opportunities for retrofits. Facility audits will provide a platform for engaging large customers through other means, including ongoing benchmark monitoring and strategic energy management (SEM). Participating customers will have access to local engineers and subject matter experts to quickly provide decision support, answer technical questions, and provide basic analysis.

Customer Incentives and Financing: Overcoming the first-cost barrier is a fundamental strategy of the Program. Recognizing that public sector decision makers are sometimes hard to identify, and capital planning processes are rigid, the availability of substantial incentives is paramount to a successful program. Customer incentives are limited to $1,000,000 and calculated natural gas energy savings multiplied by the measure incentive rate ($1.75 per therm for Add-on Equipment (AOE), Accelerated Replacement (AR), Normalized Consumption (NC), and Normal Replacement (NR); $0.55 per therm for behavioral, retro-commissioning, and operational (BRO) measures). Market demands may require modifications to these incentives from time to time.

The Public Sector is relationship-driven and bureaucratic in procurement processes and decision making. This requires an old-fashioned approach of direct, one-on-one interactions and a wholistic approach in connecting with all the key stakeholders involved in a project including the architects and engineers. Often the public sector misses out on incentives and takes advantage of energy efficiency programs because of the disconnected process and decision making. They often are unaware of more efficient technologies, incentives, and the process to take advantage of these programs. The Large Public Sector Program role is to work closely with the customer and key stakeholders throughout the process including providing project management assistance where necessary to augment local facility resources to ensure the customer receives as much incentives as possible and meet their energy efficiency goals.

Due to the relationship-driven nature of the public sector customer base, the Program utilizes SoCalGas Account Executive and Regional Marketing Advisor (RMA) Support Services to make customer introductions, identify known project plans, identify potential projects that need follow-up to move forward, etc. After an initial Program overview meeting, a more focused meeting will be held with key account representatives of public sector customers to identify known projects, identify potential projects that need follow-up to move forward, etc.

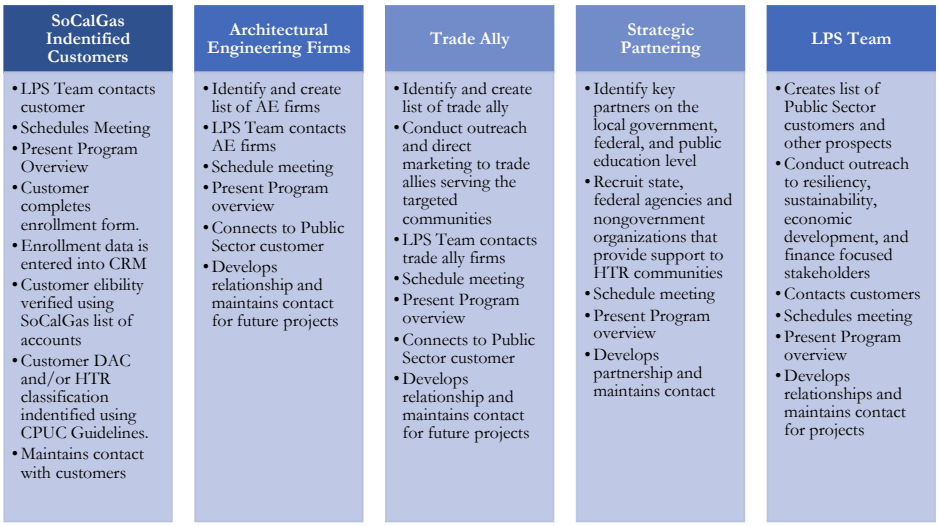
SoCalGas support services provided to the Program prior to launch to facilitate outreach and promotion include:

- List of all eligible public sector customers with contact information (business name, contact name, phone, email if available), annual gas usage, and NAICS code/market segment
- Initial customer target list
- Knowledge of past EE program participation and facility equipment for public sector customers
- Quarterly updates of customer target list to identify new accounts

The Program may collaborate with Account Executives to gain introductions to key customers and other Program stakeholders, such as vendors, trade allies, and manufacturers. The program will recruit strategic partnerships as another avenue for customer outreach. We will conduct outreach to Trade Ally's along with the customer list identified by SoCalGas and The LPS Team. Marketing collateral and onboarding slide decks will be created to educate stakeholders and customer segments to identify customers and projects for incentives. The customer identification process is illustrated below in Figure 1.

Commented [JJ11]: Where AEs or Account Executives are mentioned, please include AEs or other SoCalGas Representatives throughout the document.

Figure 1. Customer Identification Process



Innovation

The LPS team is deeply involved in the Public Sector market and creating solutions for the customers. Below are strategies the team will employ to ensure the program remains innovative and offers Customers the latest and best options.

Advanced emerging energy efficiency technologies: The Public Sector's lead time for implementation of new technologies is slow and cumbersome. As part of our wholistic approach to engaging the customer, bringing awareness to innovative technologies is a key component to our approach. Often the Public Sector is unaware of the new technology or opportunities for more efficient equipment. The LPS Team will drive emerging technologies such as gas heat pumps and gas chillers. This will assist in SoCalGas maintaining relevance in the market and an integral part of the decarbonization solution. Additionally, the Team will use an energy management system approach to technology, leveraging it to gather and analyze building data prior to stepping foot on site. The LPS Team will utilize wireless data loggers that can remain onsite and serve for continuous monitoring and feeding dashboards for customers to maintain and leverage in their ongoing energy management strategy. Highlighting the benefits of the new technology not only on an energy efficiency basis but on a non-energy benefit, such as improved productivity and quality control, will be part of the effort to drive customer adoption.

Strategic Partnerships: The key to successfully engaging the Public Sector and driving customer adoption of energy efficiency upgrades, is approaching the sector from a wholistic view. It is important to develop relationships with all stakeholders. The LPS Team will identify prospects

through multiple avenues and approaches. The Team will identify and prioritize engagement with public buildings, agencies, and departments specifically in HTR communities and those that provide essential services to the public sector. This approach requires conducting outreach to resiliency, sustainability, economic development, and finance focused stakeholders using messaging tailored to addressing the challenges of small capital improvement budgets, fostering resiliency, and safeguarding resident health and safety. We will recruit state and federal agencies, and nongovernment organizations that provide support to the HTR communities. The intent is to utilize trusted third parties to gain access to customers and develop a pipeline of projects.

Metrics

EIP will include Key Performance Indicators (KPIs) to measure and track Program success. The EIP team includes Franklin Energy. Franklin Energy has the role of engineering, assessments, and customer review. EIP will perform all programmatic functions such as program management, administration, oversight etc. It is EIP's sole responsibility for the fulfillment of all KPI's. All project data is recorded in the Program's project and customer tracking systems. Some of the KPI's will be tracked monthly with development of a KPI score (multiplier * score) on a quarterly basis. Program performance will be tracked and measured by the following Key Performance Indicators (KPIs):

Table 3. Key Performance Indicators

%	Category	Company Metric	KPI	KPI Definition	Scoring
20	Program Performance	Energy Savings	First Year Energy Savings Delivered	To date % achieved of energy savings goal split on an even pro rata basis*	0: less than 70% 1: 70 – 89% 2: 90 – 109% 3: 110 – 129% 4: greater than 130%
20	Program Performance	Energy Savings	Lifecycle Energy Savings Delivered	To date % achieved of lifecycle energy savings goal split on an even pro rata basis	0: less than 70% 1: 70 – 89% 2: 90 – 109% 3: 110 – 129% 4: greater than 130%
10	Program Performance	N/A	Goals/Expenditure Alignment	To date % of energy savings goal / to date % of budget split on an even pro rata basis	0: less than 60% 1: 60 to 69% 2: 70 to 79% 3: 80 to 89% 4: 90 to 100%
10	Program Performance	N/A	Cost Effectiveness Alignment	Actual TRC Ratio/Pre-	0: less than 59% 1: 60% – 79%

				Program Approved TRC Ratio	2: 80% – 99% 3: 100% 4: greater than 100%
10	Program Performance	Cost Per Unit Saved	Levelized PAC Cost	Actual /Forecasted levelized PAC cost	0: greater than 300% 1: 300% – 160% 2: 150% – 101% 3: 100% 4: less than 100%
5	Program Performance	N/A	Assessments to be performed by the EIP and Franklin team	Number of opportunity assessments/site visits on an annual basis	0: < 12 1: 12- 18 2: 18-24 3: 24-36 4: > 36
10	Program Performance	Penetration of EE programs	Disadvantaged Comminutes	Percentage of customers in disadvantaged communities in each county in the service territory on a per capita basis	0: < 20% 1: ≥ 20% and ≤ 30% 2: ≥ 30% and ≤ 40% 3: ≥ 40% and ≤ 50% 4: ≥ 50%
5	Supply Chain Responsibility	N/A	Diverse Business Enterprise Spend*	To date % DBE spend/DBE commitment %	0: less than 70% 1: 70% – 89% 2: 90% – 99% 3: 100% – 129% 4: greater than 130%

Commented [GC12]: please explain in more detail the role of franklin or any other consultants

10	Service Delivery	N/A	Program Administration and Implementation	Based on Contractor's reporting/data quality, timeliness, invoicing issues, meeting expectations	0: Unsatisfactory. The contractor fails to meet all reporting requirements stated in Att. 1: Below expectations. The contractor meets few reporting requirements stated in Att. 1 or is late in submitting reporting. 2: Meeting Expectations. The contractor meets the minimum reporting requirements stated in Att. 1 in a satisfactory and timely manner.

					3: Exceeding Expectations. The contractor meets all reporting requirements stated in Att. 1 on time, but revisions are required. 4: Greatly exceeding expectations. The contractor exceeds all reporting requirements stated in Att. 1 in an outstanding and timely manner.

To-Code Savings Claims

To-code savings are not applicable for the Large Public Sector Program.

Pilots

Pilot projects are not applicable for the Large Public Sector Program.

Workforce Education and Training

The Program will comply with, and shall cause its employees, agents, representatives, subcontractors, independent contractors, and all other persons performing Program services to comply with workforce qualifications, certifications, standards, and requirements. Workforce education and training efforts will address program employees and trade allies.

The Program will ensure qualified candidates are hired from a broad pool of candidates using fair hiring practices. Program managers will ensure qualified candidates have all required certifications. LPS will use local representatives to support the program and execute services as well as onboard customers and contractors/trade allies onto the program. Outreach representatives will live in the communities the Program serves and through program training will become skilled LPS facility auditors. Program staff will be provided with technical training on energy efficiency measures, facility assessment best practices, and program processes and procedures.

EIP will specifically target trade ally recruitment efforts to those located in hard-to-reach and disadvantaged communities. We will work proactively to identify diverse business enterprises and track their participation in the program. Trade allies recruited to support the program will be provided with training via a series of webinars on energy efficiency measure specifications, installation best practices, and business case for customer investment to prepare them to market qualified products and services.

Workforce Standards

To the extent possible, trade ally compliance with CPUC HVAC Workforce Standards will be self-certified by local contractors that meet the following minimum requirements:

- Completed a California or federal accredited HVAC apprenticeship.
- Be enrolled in a California or federal accredited HVAC apprenticeship.
- Completed at least five years of work experience at the journey level as defined by the California Department of Industrial Relations and passed a practical and written HVAC system installation competency test and received credentialed training specific to the installation of the technology being installed.
- Has a C-20 HVAC contractor license from the Contractors State License Board.

Disadvantaged Worker Plan

As outlined in CPUC Decision D.18-05-041, the workforce diversity metric is measured by "the percentage of incentive dollars spent on measures verified to have been installed by contractors with a demonstrated commitment to provide career pathways to disadvantaged workers. LPS energy efficiency measures are installed by independent contractors/trade allies. These trade allies will self-certify their commitment to providing job access to disadvantaged workers based on six unique criteria, including: 1) workforce training programs; 2) hiring from high unemployment areas; 3) paying family-supporting wages; 4) hiring from designated training providers; 5) providing health care insurance to employees; and 6) employing a diverse workforce. Trade allies that satisfy the Disadvantaged Worker requirements will be identified and the percentage of incentive dollars installed by trade allies that provide career pathways to disadvantaged workers will be reported annually.

Supporting Documents

Program Manual and Program Rules

Section 1. Introduction

The Large Public Sector Program serves large public sector customer segments located in SoCalGas territory: Local Government, Federal Government, K-12 Education, Special Districts, and Public Owned Utilities. The program offers energy efficiency solutions tailored to a large public sector customers, including those serving hard-to-reach (HTR) customers and those located in disadvantaged communities (DAC). It will identify and manage project opportunities that utilize the deemed and custom platforms.

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The following are key objectives of the Large Public Sector Program:

- Deliver deep, persistent energy and carbon savings
- Serve underserved segments of the large public sector, such as those located in Disadvantaged Communities (DAC)
- Acquire customers cost-effectively
- Drive whole building solutions that will move public sector buildings toward zero net energy (ZNE)
- Help SoCalGas maintain relevance in the market as a gas utility through promotion of emerging gas technologies and other gas measures as a part of the decarbonization solution.

Section 2. Eligible Measures

The table below summarizes all deemed measures eligible through the Program. Additional custom measures are eligible and will be selected on a case-by-case basis through the energy assessment process. Custom eligible measures will follow CPUC Statewide Custom Project Guidance Document requirements.

Commented [CG13]: Custom eligible measures will follow CPUC Statewide Custom Project Guidance Document requirements.

Table 4. Program Manual Measure Listing

Measure	Requirements	Customer Segment	DAC/HTR Eligible?
Custom Measures			
Boiler Burner Control Upgrade	Existing Hot Water or Steam Boiler	Commercial and Industrial	Yes
Dehumidification System	No Existing Dehumidification System	Commercial, Industrial & Multi-Family with Indoor Pool	Yes
Enthalpy Wheel	Existing Gas Heat No Existing Enthalpy Wheel	Commercial and Industrial	Yes
Air to Water Heat Exchanger	No Existing Heat Exchanger	Commercial and Industrial	Yes
O2 Trim (High Pressure Steam)	No Existing O2 Trim	Commercial and Industrial	Yes
Pre-heat Combustion Air for Boilers	Existing Hot Water or Steam Boiler	Commercial and Industrial	Yes
Retro-commissioning (Op & RCx)	Existing ~~Control~~ Systems AC Unit with Gas Heat	Commercial, Industrial & Multi-Family	Yes
Heat and Energy Recovery Ventilators	Existing Gas Heat	Commercial and Industrial	Yes
Gas Infrared Heaters	New Gas Infrared Heater	Commercial and Industrial	Yes
Gas Heat Pump Water Heaters	New Heat Pump Water Heater	Commercial and Industrial	Yes
Gas Chillers	New Gas Chiller	Commercial and Industrial	Yes
Deemed Measures			
Space Heating Boiler (>2500 kBtuh) Retrofit	Condensing Hot Water Boiler Retrofit	Commercial, Industrial & Multi-Family	Yes
Space Heating Boiler (<2500 kBtuh) Retrofit	Condensing Hot Water Boiler or Unit Heater Retrofit	Commercial, Industrial & Multi-Family	Yes
Commercial Hot Water Boiler	Efficient Hot Water Boiler	Commercial and Industrial	Yes

Commented [CG14]: I would put "Existing Systems" to be general as this covers a lot of ground. Covers - Hot water & Steam Systems (distribution system), controls, end-users.

EMS/BMS are not controls but more feedback systems that do not physically contribute to EE. They really impact behavioral which is not eligible.

Enhanced Ventilation for Packaged HVAC	No Existing VSD AC Unit with Gas Heat	Commercial, Industrial & Multi-Family	Yes
Supply Fan EMS/BMS Control	AC Unit with Gas Heat	Commercial and Industrial	Yes
Steam Boiler Economizer	Steam Condensing Dual-Stage Boiler	Industrial	Yes
Ozone Laundry	No Existing Ozone System Gas Water Heat	Commercial	Yes
Hot Water Tank Insulation	Indoor	Commercial, Industrial & Multi-Family	Yes
Hot Water Pipe Insulation (Pipe > 1")	Indoor/Outdoor	Commercial, Industrial & Multi-Family	Yes
Hot Water Pipe Insulation (Pipe < 1")	Indoor/Outdoor	Commercial, Industrial & Multi-Family	Yes
Steam Boiler (< 2500kBtuh)	New Efficient Steam Boiler	Industrial	Yes
Steam Boiler (> 2500 kBtuh)	New Efficient Steam Boiler	Industrial	Yes
Storage Water Heater	Gas Water Heat	Commercial, Industrial & Multi-Family	Yes

Section 3. Customer Eligibility Requirements

The Program provides services and incentives to public sector customers in SoCalGas territory. The utility accounts and rate codes of all applicants will be verified to ensure eligibility.

All public sector customers who have a valid SoCalGas service account with usage greater than or equal to 50,000 therms are eligible to participate in the Program. Public sector customers are defined by the following North American Industry Classification System (NAICS) codes list below. Publicly owned facilities are included in the following NAICS codes:

- 61 – Educational Services
- 62 – Health Care and Social Assistance
- 92 – Public Administration
- 491110 – Postal Service

Examples of customers include:

Local Government	• City • County • County Hospitals • Special Districts (e.g. Health Districts, transportation, Fire, Water/wastewater-not pumping, etc.)
Federal Government	• Military • Hospitals • Federal Agencies • Native American Tribes
Education	• Public K-12 schools • Public K-12 school Districts • Public K-12 Charter Schools

This program does not include state-owned facilities.

Section 4. Contractor Eligibility Requirements

Accurate installation, appropriate maintenance, and operational training ensures customers realize energy savings. To encourage these practices, the program manages a network of qualified, trained trade professionals as a part of the additional services offered to customers. The trade professional network is for companies that provide guidance, products, and services to assist large Federal, DoD, and Tribal customers with implementing energy-efficient measures. Use of a network member is not required to qualify for incentives.

To be eligible for the program's trade professional network, trades must:

- Complete a trade professional network application (available on the program website)
- Submit supporting documentation as outlined in the application (including W9, proof of
- insurance, etc.)
- Attend required program training
- Abide by all program rules and regulations as detailed in the trade professional network and customer application Terms & Conditions

Commented [JJ15]: should be included in the previous bullet

Section 5. Participating Contractors, Manufacturers, Retailers, Distributors, and Partners

The Program is a downstream program. Direct installation of certain measures will be completed by contractors selected to offer direct install services.

Section 6. Additional Services

The Program is designed to achieve the large public sector vision and goals outlined in the SoCalGas Business Plan. The Program brings a comprehensive suite of tested strategies to drive customer participation and overcome the unique barriers faced by California's public sector:

- **Education:** Promotion of the benefits of energy efficiency (EE) upgrades beyond utility cost savings considering crop/product quality improvement and building long-term relationships with the LPS customer as part of the education process.
- **Assessment:** Evaluation of facilities and advising them on EE solutions that best meet their needs allowing for multiple paths and a layered approach to making EE upgrades over time and at the right time in the growing cycle.
- **Measure Installation:** Depending on the size and type of customer and project, Program measures will be installed via direct installation, through trade allies, or by the customer.
- **Verification/Commissioning:** The Program will verify completion of work to ensure all measures are installed and operational before payment of incentive to customer or trade ally.
- **Incentive Payment:** The Program will follow necessary Company procedures to ensure timely and accurate payment of incentives to Customer/trade ally.

Section 7. Audits

Specialized Technical Assistance and Facility Energy Pre-Audits: Each public segment requires a unique approach and an understanding of specific processes, policies, and technologies relevant to that segment. Emphasis will be placed on providing comprehensive facility energy audits to identify opportunities for retrofits. Facility audits will provide a platform for engaging large customers through other means, including ongoing benchmark monitoring, planning, and strategic energy management (SEM). Participating customers will have access to local engineers and subject matter experts to quickly provide decision support, answer technical questions, and provide basic analysis.

Audits will involve interviewing key operations personnel to gain a picture of facility operations. Facility utility bills and BAS controls will be reviewed and information on the age and specs of existing equipment will be collected. Auditors will also be looking for under-performing systems; these issues can often come to light through discussions with the customer.

Verification Post-Audits: The Program will verify completion of work to ensure all measures are installed and operational before payment of incentive to customer or trade ally. Where applicable, equipment model numbers are verified to ensure they match what was supposed to be installed. Operational procedures are also confirmed through discussions with facility managers. If the measures are related to the building controls, pictures of the BAS screens will be used where possible to verify the project goals have been met. If the post-audit reveals any significant discrepancies (i.e., 10% change in savings or more) from the initial analysis, the saving analysis and incentive will be revised to capture the changes. All changes in scope should be brought to the attention of the program implementer and any increases in incentive will be subject to Program approval. The differences and analysis revisions will all be thoroughly documented in the final report.

Section 8. Sub-Program Quality Assurance Provisions

Large Public Sector has no sub-programs.

Section 9. Other Program Metrics

All project data are recorded in the Program's project and customer tracking systems. Program performance will be tracked and measured by the following Key Performance Indicators (KPIs):

Program Performance

- Gross annual therm savings
- Estimated gross therm savings of installed projects

Cost-Effectiveness

- TRC

Customer Satisfaction

- Participant satisfaction
- Workshop attendee satisfaction

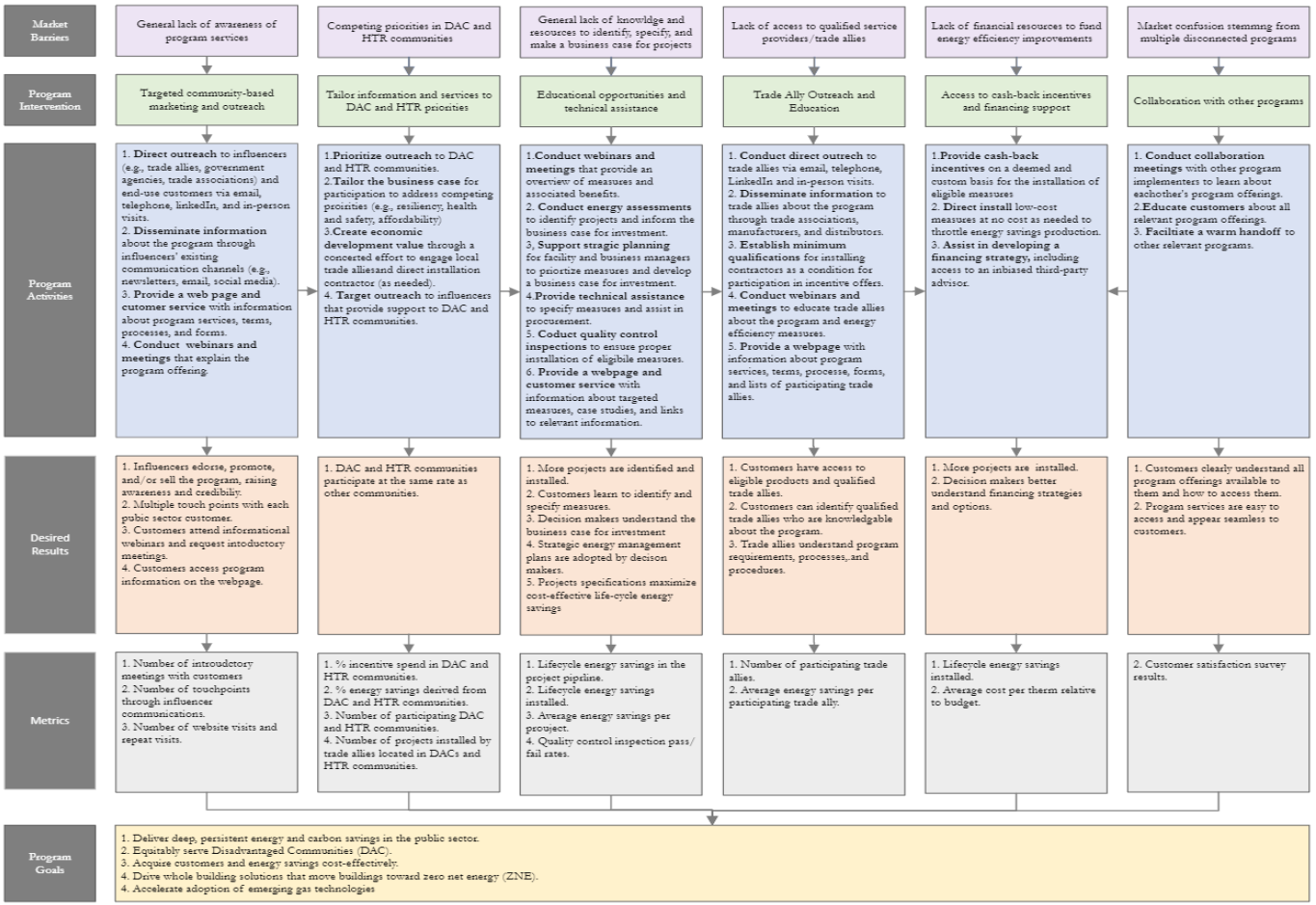
Program Delivery and Compliance

- DAC and HTR customer penetration
- Quality of delivery
- DBE Spend

Program Theory and Program Logic Model

Figure 2 below outlines the market barriers that large public sector customers and the program face along with the program design interventions intended to address them. The logic model outlines the key objectives of each strategy and potential metrics to measure progress toward achieving the objectives.

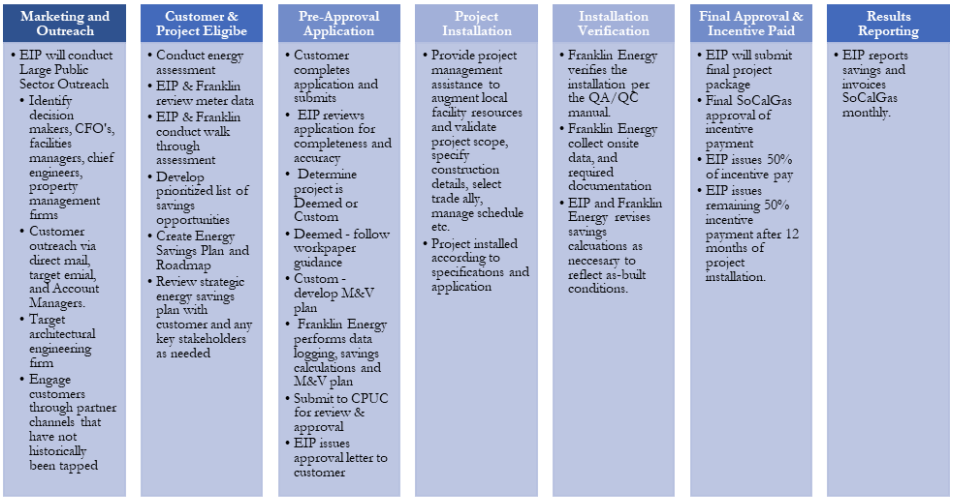
Figure 2. Program Logic Model



Process Flow Chart

Figure 3 below offers a visual flowchart of the Program's processes.

Figure 3. Process Flow Chart



Tables, Workpapers, and Software Tools

Table 5 details the primary measures and services the Large Public Sector Program will offer to customers. The Large Public Sector Program Requirements will be used to determine measure eligibility. Therm savings will be calculated using the M&V Plan.

Table 5. Program Measures

Measure	Available to DAC/HTR	Minimum Requirements	Additional Requirements	Workpaper
Custom Measures				
Boiler Burner Control Upgrade	DAC/HTR	Boiler: > 300 kBtuh 3:1 TD	Existing Hot Water or Steam Boiler	N/A - Custom
Dehumidification System	DAC/HTR		No Existing Dehumidification System	N/A - Custom
Enthalpy Wheel	DAC/HTR		Existing Gas Heat No Existing Enthalpy Wheel	N/A - Custom
Air to Water Heat Exchanger	DAC/HTR	Air Temp: >200 F	No Existing Heat Exchanger	N/A - Custom
O2 Trim (High Pressure Steam)	DAC/HTR	Steam Pressure >120 PSI	No Existing O2 Trim	N/A - Custom
Pre-heat Combustion Air for Boilers	DAC/HTR	Air Temp: >160 F	Existing Hot Water or Steam Boiler	N/A - Custom
Retrocommissioning (Op & RCx)	DAC/HTR		Existing Systems AC Unit with Gas Heat	N/A - Custom
Heat and Energy Recovery Ventilators	DAC/HTR	>1500 CFM	Existing Gas Heat	N/A - Custom
Gas Infrared Heaters	DAC/HTR	≥5000 < 15000 Btuh	New Gas Infrared Heater	N/A - Custom
Gas Heat Pump Water Heaters	DAC/HTR	≥5 < 10 Ton	New Heat Pump Water Heater	N/A - Custom
Gas Chillers	DAC/HTR	>300 Ton	New Gas Chiller	N/A - Custom
Deemed Measures				
Condensing Boiler (>2500 kBtuh) Retrofit	DAC/HTR	Boiler: > 2500 kBtuh, 94.0 Et OA Reset from 115 to 140 F	Hot Water Boiler	SWHC004-04
Condensing Boiler (<2500 kBtuh) Retrofit	DAC/HTR	Boiler: 300 - 2500 kBtuh, 94.0 Et OA Reset from 115 to 140 F	Hot Water Boiler	SWHC004-04
Efficient Hot Water Boiler	DAC/HTR	Boiler: ≥ 200 kBtuh, 85.0 Et	New Hot Water Boiler	SWWH005-05 for 2023 SWWH005-06 for 2024

Commented [CG16]: Apply same requirements you have on page 21 Table 4

Commented [DR17]: -04 is current measure

Commented [DR18]: -04 is the current measure

Commented [MA19]: -05 will be version for 2023, -06 for 2024

Enhanced Ventilation for Packaged HVAC	DAC/HTR	Fan Efficiency: ≥40%	No VSD AC Unit with Gas Heat	SWHC023-03
Supply Fan EMS/BMS Control	DAC/HTR	Fan Efficiency: ≥40%	AC Unit with Gas Heat	SWHC009-03
Steam Boiler Economizer	DAC/HTR	Economizer: 87.2 Et	Steam Condensing Dual-Stage Boiler	SWPR007-01
Ozone Laundry Commercial	DAC/HTR		No Existing Ozone System Gas Water Heat	SWAP005-02
Hot Water Tank Insulation	DAC/HTR	Insulation: 1" Temp: > 120 F	Indoor	SWWH018-04
Hot Water Pipe Insulation (Pipe > 1")	DAC/HTR	Insulation: 1" Pipe Diameter: ≥ 1" & <4"	Indoor/Outdoor	SWWH017-04
Hot Water Pipe Insulation (Pipe < 1")	DAC/HTR	Insulation: 1" Pipe Diameter: < 1"	Indoor/Outdoor	SWWH017-04
Steam Boiler (< 2500kBtuh)	DAC/HTR	Boiler: 300 - 2500 kBtuh, 82.0 Et	New Efficient Steam Boiler	Space Heating: SWHC004-04 for 2023 SWHC004-05 for 2024
Steam Boiler (> 2500 kBtuh)	DAC/HTR	Boiler: > 2500 kBtuh, 80.0 Et OA Reset from 140 to 165 F	New Efficient Steam Boiler	Space Heating: SWHC004-04 for 2023 SWHC004-05 for 2024
Storage Water Heater	DAC/HTR	Water Heater: >75 kBtuh, 90.0 Et	Gas Water Heat	SWWH011-02

Commented [MA20]: -04 for 2023, -05 for 2024

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Quantitative Program Targets

The Program is targeting annual Program participation as noted below in Table 6.

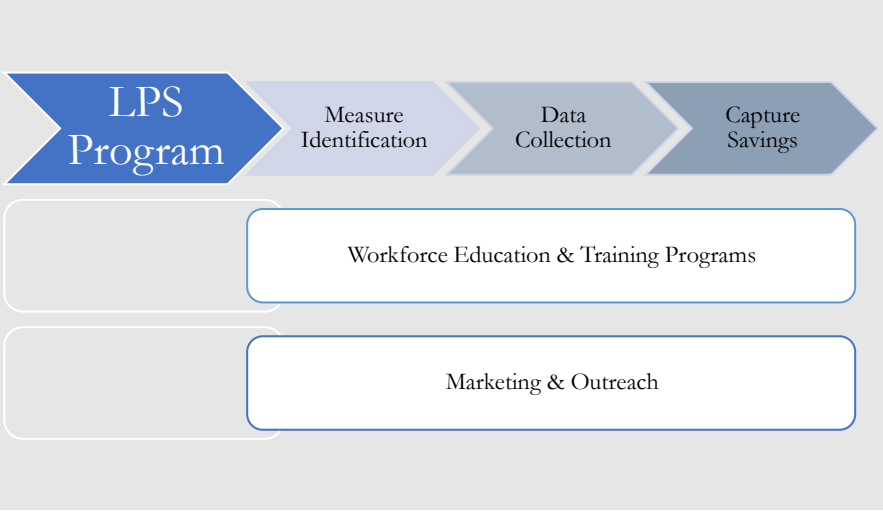
Table 6. Quantitative Program Targets

Customer Size	*No. of Participants*	*No. of DAC*	*No. of HTR*
Large	50	16	10

Diagram of Program

Figure 4 is a diagram of the overarching program activities. The relevant items noted in the CPUC IP Template (Marketing and Outreach, Workforces Education and Training Programs) are in the diagram where they take place within the program.

Figure 4. Diagram of Program



Evaluation, Measurement, and Verification (EM&V)

Section 1. Overview

The SoCalGas Large Public Sector Program is a third-party designed and implemented program that will be implemented by EIP and Franklin Energy starting January 1, 2023. The Program will generate energy savings through a mixture of deemed, custom, and direct install projects. Savings for these offerings will be verified using the industry standard International Performance Measurement and Verification Protocol (IPMVP) protocols and will meet all CPUC guidelines.

There are three different measure streams in the Program, each with unique Measurement and Verification (M&V) protocols:

- Deemed
- Custom
- Direct-Install

Franklin Energy will inspect up to 100% of custom measures and random 5% of deemed measures receiving incentives for the Program utilizing both virtual and in person inspections. Inspections will include verification of equipment, operation, and eligibility.

EIP employs a team of experienced engineers who will create project specific M&V plans that will be developed and tailored for each project based on the specific measure(s) being verified. A percentage of the deemed measures will be inspected to verify installation. Any M&V specifications from deemed workpapers will be followed. Custom measures will use the most appropriate IPMVP option for each measure to verify savings and will also include additional verification (i.e., photos of installed equipment) depending on the appropriate M&V protocol. When determining which IPMVP approach to take, EIP will ensure that the level of M&V effort is proportional to the expected energy savings and that efforts are invested in filling critical knowledge gaps.

M&V Philosophy

The measure streams listed above are ordered from least to most complex in terms of time and level of effort needed to fulfill M&V requirements. This document addresses Deemed and Custom measures. Deemed measure savings estimations will follow guidance provided in CPUC-approved workpapers. Where appropriate, pre-installation site visits will be conducted by in-house engineering staff to verify customer-supplied baseline data, and documentation of any discrepancies between customer-supplied information and data collected on site.

The level of complexity of the measure, total savings potential, measure cost, measure incentive level will determine which M&V method is employed for Custom (the methods are described below in Section 3. Custom Project M&V Guidelines). While each measure stream has a unique approach to M&V, the M&V requirements for all project types are formulated through the same lens and will be guided by the IPMVP. This lens is bounded by the following guiding principles:

1. Serve the Overarching Goal: M&V shall be performed with the goal of understanding the parameters of a project which are otherwise unknown and/or have a high degree of uncertainty. In other words, resources should not be spent on verifying that which is already known with a high degree of certainty.

2. Maintain a Reasonable Level of Effort:
    - Delegate time and effort in proportion to the level of expected savings. In general, the costs spent on M&V should not exceed 10% of the annual savings achieved for the customer.
    - The M&V approach needs to fill in critical knowledge gaps to estimate savings with a high degree of certainty, however it will be bounded by time and financial resources.
    - Where possible, leverage existing equipment to obtain data.

Section 2. Project Process

This section serves to provide a high-level description of the Deemed and Custom M&V approach to be taken for the Program; in practice custom projects will receive a site-specific M&V plan, tailored to the specifics of the unique project while also adhering to the guidelines laid out in this document. Deemed projects will follow all procedures from the workpaper.

Deemed Projects

Deemed projects are often much less rigorous than custom projects in terms of M&V. All M&V protocol specified in the workpaper will be followed for deemed projects. Verification requirements include paid itemized invoices from the project, photos of both pre-existing and new equipment, specification sheets, project application, and any supplemental measure-specific information. Inspections for 10% of deemed projects will take place.

Custom Projects

There are four overarching phases to a custom project:

1. **Pre-screening phase (Baseline Period):** Each site will be pre-screened with a site-visit to assess potential for energy savings. Data on equipment, energy use and weather for one year will be gathered to execute a high-level analysis to estimate the savings potential and confirm that they are cost effective. Implementer will notify SoCalGas Custom Engineering Services (ES) of the potential project so that pre-screening activities and site visits can be conducted in collaborative manner. ES will ensure that feasibility customer account and feasibility studies adhere to current CPUC policies.
2. **Project Feasibility Study (Baseline Period):** If a site passes the pre-screening phase, it will receive a more detailed assessment in the pre-feasibility phase. This phase involves completion of a Project Feasibility Study (PFS). The Statewide Project Feasibility Study Template from the CPUC website will be filled out for each potential Custom project. At a high-level, the PFS consists of the following elements:
    a. Baseline information (equipment age and specs, operations, upgrades, underperforming systems, any failing systems, and all static factors)
    b. Individual Energy Conservation Measures (ECM) savings expected useful life (EUL), and costs.
    c. Risk potential and a plan to mitigate risk
    d. Site-specific M&V plan will be drafted for each project. The IPMVP option choice will be selected by applying the guidance laid out in the M&V Philosophy section. Each project-specific M&V plan will be crafted in accordance with the template in Appendix A.

Pre-feasibility savings estimations will be based on engineering calculations and judgment and any data that are available at the time, rather than logged data. These estimations will inform forecasting of facility energy use for the baseline and post-installation period.

3. **SoCalGas Technical Pre-Agreement Review:** Implementer will submit the PFS to SoCalGas ES for a thorough technical review. Pre-Agreement Review (PA Review) is a formal review of ECMs before the installation of any ECMs where the PFS acts as the submission package. The PA Review verifies each ECM to comply with SoCalGas EECIP Program rules, Standard Practices (SPs), CPUC guidelines, and CPUC dispositions and documents the review results. The PA Review locks in the baseline, calculation methodology, and lists prerequisite data for projects requiring an Installation Review (IR). The PA Review will adjust the savings claim, if necessary, per ES calculations.
4. **CMPA Review:** If project's technical PA Review is approved to proceed, the project will be uploaded to the CMPA list. The project could be selected for CPUC review within 10 business days of being uploaded. If the project is not selected for review within 10 business days, the project is allowed to move forward. If the project is selected, the CPUC will then have 30 business days to review aside from supplemental data requests (SDRs). Implementer, program advisor, and ES will respond to these SDRs. The CPUC will provide a disposition at the end of the review. CPUC review timeline is pursuant to Senate Bill 1131 and details are provided in the CPUC's Timing Protocol document[1].
5. **Installation Verification:** Installation of ECMs will be verified through site inspections or pictures provided by the customer for all custom projects. Invoices for the installation will also be collected. For lower projects, photos and remote data gathering may be sufficient in lieu of an on-site inspection. Any virtual due diligence will be discussed with SCG engineering team prior to obtaining approval before proceeding with that virtual methodology.
6. **Measure Verification & Reporting:** After sufficient data are collected, and the M&V activities and analysis is complete, a Post-Installation Report (PIR) will be completed in accordance with the Statewide Post Installation Report Template on the CPUC website.5 The report will present and compare the post-installation savings and savings analysis to the pre-installation savings and savings analysis. Changes to the baseline, modeling methodology employed, and the measurement period will be noted, if applicable. If deviations from the original proposed M&V plan occurred, this will be documented and substantiated. For behavioral, retro-commissioning, and operational measures, a repair and maintenance plan that adheres to CPUC rules will be formulated. The participant must agree to carry out the plan for a minimum of three years via a signed customer agreement[2].
7. **SoCalGas Post-Technical Installation Review:** Implementer will submit the PIR to SoCalGas ES for an Installation Review. ES will conduct a site visit unless it waives it due to sufficient project data and supporting documentation. ES will verify and approve the final project energy savings. The IR will adjust the savings, if necessary, per ES calculations.

[1] The CPUC Staff Selection and Response Timing Protocol for Energy Efficiency Custom Projects Review document can be accessed here: https://www.cpuc.ca.gov/General.aspx?id=4133

[2] California Public Utilities Commission, 'Rulebook for Programs and Projects Based on Normalized Metered Energy Consumption', Version 2.0 2020, see Section II.1.B. & Section II.1.C , pg 10

8. **Post-Measurement CMPA Review:** If required by the CPUC, the project will be uploaded to the CMPA list for a post-M&V review. The CPUC post-M&V review timeline is pursuant to Senate Bill 1131 and will still follow the details in the CPUC's Timing Protocol document[3].

Tracking/Recording

Data gathered through site inspections and M&V activities will be documented for future use by Program Administrators and evaluation teams. This data will also prove useful in helping inform future program design to improve overall cost-effectiveness.

Section 3. Custom Project M&V Guidelines

Custom measures will follow the IPMVP. At a high-level, M&V can be executed in through the following options[4]:

- **Engineering Calculations** (IPMVP Option A): Inputs are sourced from known specs and/or measurements. This method is ideal for straightforward ECMs that have a high level of certainty around the load profile and equipment specifications.
- **Metering and Monitoring** (IPMVP Option B): Measurements are used to fill in knowledge gaps around the ECM. Spot measurements are sufficient for constant load profiles and continuous measurements can be taken when the load is quite variable. Most ECM savings can be determined with Option, but the difficulty and costs can be great if metering requirements are complex and are not already in place for other purposes. In general, it is harder and more costly than Option A but more certain.
- **Utility Bill Analysis** (IPMVP Option C): This method is exclusive to the facility level which poses challenges regarding understanding how a specific ECM is contributing to differences in utility data before and after the project. There are risks that factors unrelated to the ECM (i.e., weather, occupancy, system failures, etc.) that can cause changes to the utility data post-project. These changes from unrelated factors could be significant and eliminate the ability to see the effects of the ECM. Ideally, this option will only be employed for NMEC projects with advanced metering infrastructure.
- **Calibrated Computer Simulation** (IPMVP Option D): In this approach, a simulation is built and calibrated to metered data. The calibrated model provides the baseline and then it is used to model the facility with the ECMs. This method provides the ability to look at the impact of all ECMs together (which is great for capturing interactive effects) or at individual ECMs in isolation. A unique challenge of this option is that the system's energy use needs to be isolated from the rest of the facility by an appropriate meter. This option is a good choice if the savings associated with individual ECMs is desired, but the requirements of Options A and B are too difficult or costly.

[3] The CPUC Staff Selection and Response Timing Protocol for Energy Efficiency Custom Projects Review document can be accessed here: https://www.cpuc.ca.gov/General.aspx?id=4133

[4] The various IPMVP options are discussed thoroughly throughout this document: International Performance Measurement and Verification Protocol, Efficiency Valuation Organization, 'Concepts and Options for Determining Energy and Water Savings, Vol 1, 2012

As described in the M&V Philosophy section, project specifics will dictate which IPMVP is chosen for each custom project. For project scopes where the measurement or calculation boundary would encompass all or almost all the facility, Option D would be preferred. Option C would be applicable for these types of projects but is not preferred for the reasons described above; it will be reserved for NMEC projects. For standalone equipment upgrades or replacements, Option A or B will be used. Existing metering equipment will be leveraged where possible. If spec sheets and information provided from the customer can sufficiently answer all questions that the engineering team needs to calculate the estimated savings from the project, Option A will be used. If more information is needed and the savings are significant enough, metering will be done under Option B.

Section 4. Data Collection Plan

The following data will be collected:

- **Baseline:** Baseline conditions will be fully documented in the M&V plan for the specific project. All static factors relevant to the ECMs will be recorded (e.g., equipment types, production data, daily, operational hours by day, week, and season.). Specification sheets and information from the customer (e.g., production details, operational schedules). This data will serve to create a reasonable baseline model to which savings can be reliably derived from.
- **Metered Energy Use Data:** Metered data, if it is needed, will be obtained through customer-owned logging equipment where possible. If measurements are needed and it is financially feasible to do so, temporary metering equipment will be installed. The program implementers will verify that they have been recently calibrated and that the specifications meet the CPUC requirements (minimum accuracy of +/- 2%, and positive displacement meter type). Ideally, the time interval will be at least as granular as hourly, but more likely will be 15 minutes or less. A year's worth of utility data will be collected; 12 months of data from submeters on site will be collected if utility data are unavailable if it is available and helpful to the saving analysis. If there are gaps in the data, the technical reviewers will interpolate.
- **Weather Data:** The latest long-term average weather data will be used. This data will be sourced from CA Climate Zone 2022 weather files.

Data will be collected through an intake interview over the phone by an experienced LPS Program representative, and information relevant to M&V will be recorded in a secure database. Pre- and Post-Project site visits will be conducted by in-house staff in cases where data collection is necessary to supplement and/or validate customer-supplied information.

Section 5. Savings Calculation

The gross savings will be calculated after the measurement period is over and the site-level M&V requirements are satisfied. The gross savings calculation is as follows:

Energy Savings=Baseline Model Predicted Energy Use-Calculated Energy Use

The savings will be documented in the final report along with EUL and ECM costs. If deviations from the original proposed M&V plan occurred, this will be documented and substantiated. If the customer is participating in other energy efficiency programs, the gross energy savings will be

adjusted to ensure that incentivized measures from other offerings are not included in the scope of the custom savings analysis.

Section 6. Expected Useful Life

The project lifecycle savings will be based on a weighted average[5] EUL method. The weighted EUL for the recommended ECMs will be determined in the feasibility study and will be updated as needed for the final report, after installation. EULs for the ECMs will be sourced from the Database for Energy Efficient Resources (DEER).

Section 7. Key Sources

As discussed in the M&V plan, M&V for Deemed measures will be guided by workpapers and Custom measures will be guided by the IPMVP. The following sources will be key for the Custom M&V approach:

- International Performance Measurement and Verification Protocol, Efficiency Valuation Organization, 'Concepts and Options for Determining Energy and Water Savings, Vol 1, 2012
- U.S. Department of Energy, 'M&V Guidelines: Measurement and Verification for Performance-Based Contracts', version 4.0, 2015

[5] The CPUC refers to this link for guidelines to determine the weighted average EUL: ftp://ftp.cpuc.ca.gov/gopherdata/energy_division/EnergyEfficiency/RollingPortfolioPgmGuidance/Combining_Measures_Claims.DRAFT.xlsm

Appendix A

The document above provides the high-level guidelines for performing Deemed and Custom M&V. During program implementation, project-specific M&V plans will be generated for each Custom project, and they will be unique to each project. Measure type, facility characteristics, and the level of savings will dictate the most central component of the M&V plan (the IPMVP Option of choice). Table 7 is the template that will be completed for each project-specific M&V plan[6]; it is consistent with standard IPMVP guidelines[7].

Table 7. M&V Template

M&V Plan for SoCalGas LPS Project Number SCG3899
1. Executive Summary
Briefly describe the project in a few sentences (i.e., what are the measures, existing equipment age and specs, use case, and any other important details).
2. Facility Description
Describe the following details about the facility: • Facility name • Facility address • Facility type (Dairy Production, Non-Dairy Animal Production, CEA, or Winery) • Production (type and volume)
3. Operations
Describe the hours of operation and discuss any seasonal differences, holidays, and any other details regarding the hours of operation that are important to energy use.
4. Measure Description
Describe the following items for each measure: • Measure type • Relevant specifications • EUL • RUL (remaining useful life) Specification sheets, nameplate data, NREL and DEER literature can be used to help obtain this information.
5. IPMVP Option

[6] For lower rigor projects, not all sections in this template will be needed or included in the project-specific M&V Plan.
[7] See this document for comprehensive IPMVP guidelines: International Performance Measurement and Verification Protocol, Efficiency Valuation Organization, 'Concepts and Options for Determining Energy and Water Savings, Vol 1, 2012

M&V Plan for SoCalGas LPS Project Number SCG3899
Note which of the following options will be carried out for the project: • IPMVP Option A, Engineering Calculations • IPMVP Option B, Metering and Monitoring • IPMVP Option C, Utility Bill Analysis[8] • IPMVP Option D, Calibrated Computer Simulation[9]
6. Measurement Boundaries
Provide a brief description and/or diagram of the measurement scope (whole facility, measure only, isolated system, etc.) if measurements are being taken.
7. Meter Specifications
Describe what will be metered and in what units (e.g., I, V, GPM, kW, etc.). If a non-utility meter is being used, specify the meter type, meter accuracy, routine calibration processes, and how lost data will be dealt with.
8. Sampling
Describe the frequency of data collection and briefly note how it is sufficient.
9. Monitoring Responsibility
Note who will be responsible for recording the independent variables and static factors within the measurement boundary during the reporting period.
10. Baseline Energy and Conditions
The facility's baseline energy data and conditions within the measurement boundary must be documented. These details will be gained from the site-assessment in the pre-feasibility phase of the project. The following baseline characteristics should be documented: • Baseline period • Baseline energy demand and consumption • All independent variables relevant to energy use (production details, indoor air temp.) • All static factors relevant to energy use (e.g., occupancy, operational details) • Any deficiencies in existing system (e.g., under or over -sized equipment) • Building envelope characteristics • Equipment details (specs, quantities, location, condition, age, operating practices, and any outages during baseline period)
11. Baseline Period and Reporting Period

[8] We anticipate Option C will only be used for NMEC projects. Regression models will only be used for NMEC projects and will meet the statistical metrics outlined in the NMEC M&V plan for CV(RMSE), NMBE, and R^2.
[9] For Option D, we will use a USDA approved tool for greenhouses called Virtual Grower to model performance. For non-greenhouse projects under Option D, we will use standard simulation tools like eQuest.

M&V Plan for SoCalGas LPS Project Number SCG3899
Define the baseline and reporting (i.e., after installation) period length and briefly note how the periods were selected. Also note which year will be used for the baseline. The duration of the periods should span through a full operating cycle or profile. A typical operating cycle should reflect the highest and lowest consumption and capture various operating points in between. Since this is an agricultural program, capturing seasonality differences will be important.
12. Basis for Adjustment
Note any routine or non-routine adjustments made to the savings calculations and explain how and why they were made. Adjustments to the savings calculations should be made to ensure the savings predictions are representative of the typical operations. If non-routine events (NREs) occur during measurement periods, the savings model should be adjusted to ensure the NREs are not affecting the savings calculations. Routine adjustments will be made for any energy-governing factors that are expected to routinely change during the reporting period (e.g., production type or volume, weather). Baseline adjustments will also be needed if the baseline equipment is not currently performing as it will in the reporting period (e.g., if the space is under-heated). Valid techniques must be used to adjust and IPMVP literature will be used to help ensure that.
13. Analysis Methodology
Briefly describe the methodology used to estimate savings: • If Excel calculations are used, note the engineering principle(s) employed to do the calculations. • If a building performance simulation tool was used, note which one. Describe high-level modeling methodology. • Describe any calibration done. • State all assumptions. • State the variables and the units used in the calculations.
14. Energy Savings Calculation
$kWh_{Savings} = (kWh_{Baseline} - kWh_{Retrofit}) \pm$ Routine Adjustment(s) $\pm$ Non-Routine Adjustment(s)
15. Responsibility and Risk Matrix
M&V activities seek to reduce the risk of measures not performing as desired and help to ensure savings predictions are reasonable. In M&V, the work "risk" refers to the uncertainty that the expected savings will be realized, including the potential monetary consequences. The DOE has developed a "Risk, Responsibility, and Performance Matrix Template" which will be filled out for each Custom project. This template is attached in Appendix B.

Appendix B

The U.S. Department of Energy developed a "Risk, Responsibility, and Performance Matrix Template" in 'M&V Guidelines: Measurement and Verification for Performance-Based Contracts,' version 4.0, 2015. This template is included in Table 8 and shall be completed for each Custom project.

Table 8. DOE Risk, Responsibility, and Performance Matrix

Responsibility/Description	Contractor-Proposed Approach
1. Financial	
a. Interest rates: Neither the contractor nor the customer has significant control over prevailing interest rates. Higher interest rates will increase project costs, financing/project term, or both. The timing of the task order (TO) signing may impact the available interest rate and project cost.	
b. Energy Prices: Neither the contractor nor the customer has significant control over actual energy prices. For calculating savings, the value of the saved energy may either be constant, change at a fixed inflation rate, or float with market conditions. If the value changes with the market, falling energy prices place the contractor at risk of failing to meet cost savings guarantees. If energy prices rise, there is a small risk to the customer that energy saving goals might not be met while the financial goals are. If the value of saved energy is fixed (either constant or escalated), the customer risks making payments in excess of actual energy cost savings.	
c. Construction costs: The contractor is responsible for determining construction costs and defining a budget. In a fixed-price design/build contract, the customer assumes little responsibility for cost overruns. However, if construction estimates are significantly greater than originally assumed, the contractor may find that the project or measure is no longer viable and drop it before TO award. In any design/build contract, the customer loses some design control. **Clarify design standards and the design approval process (including changes) and how costs will be reviewed.**	
d. Measurement and verification (M&V) confidence: The customer assumes the responsibility of determining the level confidence that it desires to have in the M&V program and energy savings determinations. The desired confidence will be reflected in the resources required for the M&V program, and the ESCO must consider the requirement before submitting the final proposal. **Clarify how project savings are being verified (e.g., equipment performance, operational factors, energy use) and the impact on M&V costs.**	

Responsibility/Description	Contractor-Proposed Approach
e. Energy-Related Cost Savings: The customer and the contractor may agree that the project will include savings from recurring and/or one-time costs. This may include one-time savings from avoided expenditures for projects that were appropriated but will no longer be necessary. Including one-time cost savings before the money has been appropriated may involve some risk to the customer. Recurring savings generally result from reduced operations and maintenance (O&M) expenses or reduced water consumption. These O&M and water savings must be based on actual spending reductions. **Clarify sources of non-energy cost savings and how they will be verified.**	
f. Delays: Both the contractor and the customer can cause delays. Failure to implement a viable project in a timely manner costs the customer in the form of lost savings and can add cost to the project (e.g., construction interest, remobilization). **Clarify schedule and how delays will be handled.**	
g. Major changes in facility: customer controls major changes in facility use, including closure. **Clarify responsibilities in the event of a premature facility closure, loss of funding, or other major change.**	
2. Operational	
a. Operating hours: The customer generally has control over operating hours. Increases and decreases in operating hours can show up as increases or decreases in savings depending on the M&V method (e.g., operating hours multiplied by improved efficiency of equipment vs. whole facility/utility bill analysis). **Clarify whether operating hours are to be measured or stipulated and what the impact will be if they change.** If the operating hours are stipulated, the baseline should be carefully documented and agreed to by both parties.	
b. Load: Equipment loads can change over time. The customer generally has control over hours of operation, conditioned floor area, intensity of use (e.g., changes in occupancy or level of automation). Changes in load can show up as increases or decreases in "savings" depending on the M&V method. **Clarify whether equipment loads are to be measured or stipulated and what the impact will be if they change.** If the equipment loads are stipulated, the baseline should be carefully documented and agreed to by both parties.	
c. Weather: Several energy and water conservation measures are affected by weather, which neither the contractor nor the customer has control over. Should the customer agree to accept the risk for weather fluctuations, it will be contingent upon aggregate payments not exceeding aggregate savings. **Clearly specify how weather corrections will be performed.**	

Responsibility/Description	Contractor-Proposed Approach
d. User participation: Many energy conservation measures require user participation to generate savings (e.g., control settings). The savings can be variable, and the contractor may be unwilling to invest in these measures. **Clarify what degree of user participation is needed and use monitoring and training to mitigate risk.** If performance is stipulated, document and review assumptions carefully and consider M&V to confirm the capacity to save (e.g., confirm that the controls are functioning properly).	
3. Performance	
a. Equipment performance: The contractor has control over the selection of equipment and is responsible for its proper installation, commissioning, and performance. The contractor has the responsibility to demonstrate that the new improvements meet expected performance levels, including specified equipment capacity, standards of service, and efficiency. **Clarify who is responsible for initial and long-term performance, how it will be verified, and what will be done if performance does not meet expectations.**	
b. Operations: Performance of the day-to-day operations activities is negotiable and can impact performance. However, the contractor bears the ultimate risk regardless of which party performs the activity. **Clarify which party will perform equipment operations, the implications of equipment control, how changes in operating procedures will be handled, and how proper operations will be assured.**	
c. Preventive Maintenance: Performance of day-to-day maintenance activities is negotiable and can impact performance. However, the contractor bears the ultimate responsibly regardless of which party performs the activity. **Clarify how long-term preventive maintenance will be ensured, especially if the party responsible for long-term performance is not responsible for maintenance (e.g., contractor provides maintenance checklist and reporting frequency). Clarify who is responsible for performing long-term preventive maintenance to maintain operational performance throughout the contract term. Clarify what will be done if inadequate preventive maintenance impacts performance.**	
d. Equipment Repair and Replacement: Performance of day-to-day repair and replacement of contractor-installed equipment is negotiable; however, it is often tied to project performance. The contractor bears the ultimate risk regardless of which party performs the activity. **Clarify who is responsible for performing replacement of failed components or equipment replacement throughout the term of the contract.** Specifically address potential impacts on performance due to equipment failure. Specify expected equipment life and warranties for all	

Responsibility/Description	Contractor-Proposed Approach
installed equipment. Discuss replacement responsibility when equipment life is shorter than the term of the contract.	

Normalized Metered Energy Consumption (NMEC)

Section 1. Background

The Large Public Sector Program serves SoCalGas' public sector customers by delivering key measures relevant to these customers. This Large Public Sector Program pipeline will be filled with Deemed and Custom projects. In the event the Program increases in size and continues, we will gradually introduce NMEC into our design.

If the LPS expands to implement NMEC methodology, the process is laid out here. The Large Public Sector Program will evaluate the savings of a subset of projects using the site-level Normalized Metered Energy Consumption (NMEC) methodology following the guidelines laid out in the CPUC Rulebook. For each site-level NMEC project, site-level M&V plans will be created. This document fulfills the CPUC requirement of a program-level M&V plan which is required for site-level M&V programs and sets the overarching vision and guidelines for executing site-specific NMEC determined energy savings.

Section 2. NMEC M&V Overview

Determining M&V Approach

It is standard practice to follow the International Performance Measurement and Verification Protocol (IPMVP) when implementing M&V. The Large Public Sector Program will follow IPMVP guidelines and conform to the latest version of the Meter-Based NMEC Rulebook (currently ver.2.0) when NMEC M&V is implemented. The IPMVP includes four methods of approaching M&V:

This will not be an active part of the Program's delivery. As the Program progresses and grows, discussions on improvement and enhancements to the Program will include NMEC.

Table 9. Overview of IPMVP Options

IPMVP Option	Scope	Method
A	Measure Level	Engineering calculations (can include measurements)
B	Measure Level	Metering and Monitoring
C	Whole Building Level	Utility Bill Analysis
D	Whole Building or Measure Level	Calibrated Computer Simulation

These methods require varied levels of effort and there are pros and cons to each approach which are specific to the measure type, facility, and expected savings. When determining which IPMVP approach to take, it is important to ensure that the level of M&V effort is proportional to the expected energy savings and that efforts are invested in filling critical knowledge gaps, avoiding resource spend on verifying parameters that are known to a reasonably high degree of certainty.

Site-level NMEC M&V falls under the IPMVP Option C category and employs more granular data (with advanced metering infrastructure (AMI)) in tandem with advanced analytics and automated

processing. This approach helps to overcome limitations associated with traditional Option C M&V utility bill analysis and provides more accurate savings predictions.

Target Population and Eligibility Criteria

All Large Public Sector customers that have a valid SoCalGas service account and adhere to the guidelines of the CPUC and IPMVP are eligible to participate in the LPS NMEC savings platform. All projects must be for existing buildings projects. It is expected that NMEC will be used for RCx and other projects with multiple, often interactive, measures.

Guidance from IPMVP[1] and the CPUC NMEC Rulebook[2] will help determine when NMEC will be appropriate for a Large Public Sector project. NMEC is a favorable approach when:

- Interactive effects will be presented because of the Energy Conservation Measures (ECMs)
- An existing condition's baseline is suitable to model the savings from the ECMs
- There is an ability to produce a baseline energy model that reasonably represents the performance of the facility. Goodness of fit will be assessed using industry standard metrics. The LBNL denotes these metrics in their technical guidance documents to be as follows:
    - coefficient of variation of the root mean squared error (CV(RMSE)) < 25%
    - normalized mean bias error NMBE between -0.5% and +0.5%
    - coefficient of determination $R^2 > 0.7$
- The expected savings are large compared to the random or unexplained energy variations occurring at the facility level. If variations in energy use that are unrelated to the ECMs are too large, they can drown out the impact of the ECMs. IPMVP's rule of thumb is that savings should be 10% of total baseline energy or greater.
- There are a minimal number of expected non-routine events (NREs) and they can be characterized and accounted for to a reasonable extent. NREs[3] with the potential to have a significant effect on the data can eliminate the ability to see the effects of the ECMs making the computation of non-routine adjustments extremely difficult. LBNL Technical Guidelines propose a 25% threshold for NREs. If a facility's suspected NREs will affect more than 25% of the data, it will not be an ideal candidate for NMEC.

Section 3. Project Process

This section serves to provide a high-level description of the NMEC M&V approach to be taken for the LPS program; in practice each site will receive a site-specific M&V plan, tailored to the specifics of the unique project while also adhering to the guidelines laid out in this document.

There are four overarching phases to an NMEC project:

1. **Pre-screening phase (Baseline Period):** Each site will be pre-screened with a site-visit to assess whether there is an adequate savings potential (i.e., the ECM savings are likely to exceed

[1] International Performance Measurement and Verification Protocol, Efficiency Valuation Organization, 'Concepts and Options for Determining Energy and Water Savings, Vol 1, 2012
[2] California Public Utilities Commission, 'Rulebook for Programs and Projects Based on Normalized Metered Energy Consumption', Version 2.0 2020, see Section II.1.B. & Section II.1.C , pg. 8-9
[3] J. Granderson, P. Gruendling, C. Torok, P. Jacobs, N. Gandhi, 'Site-Level NMEC Technical Guidance: Program M&V Plans Utilizing Normalized Metered Energy Consumption Savings Estimation', Lawrence Berkeley National Laboratory, California Public Utility Commission, Building Metrics Inc., Strategic Energy Technologies Inc., Version 2.0, 2019, pg.7

10% of the total baseline energy; this aligns with IPMVP's guidance for Option C[4]) and if it is achievable to produce a good model of the facility's performance. Data on energy use and weather for one year will be gathered to execute a high-level analysis to estimate the savings potential and confirm that they are significant enough to produce a NMEC analysis with a reasonable level of confidence. Sites that would not be good NMEC candidates will be filtered out. See the Target Population & Eligibility Criteria section for more detail on screening criteria.

2. **Project Feasibility Study (Baseline Period):** If a site passes the pre-screening phase, it will receive a more detailed assessment in the pre-feasibility phase. This phase involves completion of a study with the following elements:

    a. Baseline information (equipment, operations, and all static factors)
    b. Individual ECM savings, expected useful life (EUL), and costs.
    c. Risk potential and a plan to mitigate risk
    d. Site-specific M&V plan will be drafted for each NMEC project. It will adhere to LBNL NMEC Technical Guidance.[5]

    Pre-feasibility savings estimations will be based on engineering calculations and judgment and any data that are available at the time, rather than logged data. These estimations will inform forecasting of facility energy use for the baseline and post-installation period.

3. **Installation Check:** Installation of ECMs will be verified through site inspections or pictures provided by the customer. Invoices for the installation will also be checked.
4. **Measure Verification & Reporting:** Facility performance will be metered and checked throughout the measurement period (no less than one year in accordance with CPUC guidelines).[6] At the end of the metering period, energy use data will be collected, and a savings analysis will be performed. Non-routine events will be identified and investigated if applicable to inform forecasting. After sufficient data is collected, a report will be completed. The report will present the savings and savings analysis and will describe the baseline, modeling methodology employed, measurement period, calibration, and adjustments for non-routine events. The report will address abnormalities and uncertainty in collected data, along with proposed remediation solutions. For behavioral, retro-commissioning, and operational measures, a repair and maintenance plan that adheres to CPUC rules will be formulated. The participant must agree to carry out the plan for a minimum of three years via a signed customer agreement.[7]

[4] International Performance Measurement and Verification Protocol, Efficiency Valuation Organization, 'Concepts and Options for Determining Energy and Water Savings, Vol 1, 2012, section 4.8, pg.25.
[5] J. Granderson, P. Gruendling, C. Torok, P. Jacobs, N. Gandhi, 'Site-Level NMEC Technical Guidance: Program M&V Plans Utilizing Normalized Metered Energy Consumption Savings Estimation', Lawrence Berkeley National Laboratory, California Public Utility Commission, Building Metrics Inc., Strategic Energy Technologies Inc., Version 2.0, 2019
[6] California Public Utilities Commission, 'Rulebook for Programs and Projects Based on Normalized Metered Energy Consumption', Version 2.0 2020, see Section II.1.B. & Section II.1.C , pg. 15
[7] California Public Utilities Commission, 'Rulebook for Programs and Projects Based on Normalized Metered Energy Consumption', Version 2.0 2020, see Section II.1.B. & Section II.1.C , pg. 10

Section 4. Modeling

Overview

The overall process of site-level NMEC savings derivations involves the analysis of metered data before and after the installation of ECMs. Modelling methods are employed to establish a reliable and reasonable representation of the baseline for the facility (i.e., 'what would have happened' without intervention). The model is fit to energy usage of a baseline year and the associated outdoor air temperature data. The model's performance is evaluated to ensure it meets the goodness-of-fit criteria (see Target Population & Eligibility Criteria). The figure below gives a snapshot of the NMEC saving modeling process:

The savings calculation is based on the type of model used, the interval of the energy data that are used in the analysis, the independent variables, and adjustments made for things like NREs. The independent and dependent variables in the analysis are as follows:

Variable Type	Variable
Independent	Weather (dry bulb temperature), operating schedule, shifts worked, seasonal distinctions, occupancy and type
Dependent	Energy consumption

The LPS Program implementers will ensure that the model is developed and reported on so that it is repeatable, transparent and uses assumptions widely accepted in the energy efficiency industry amongst M&V practitioners.

Software

To execute the goals stated above, the LPS Program will utilize readily available software such as Microsoft Excel, and open-source peer-reviewed tools that are commonly used in the M&V space to model building energy use profiles. The LPS Program will use KW Engineering's open-source, R package, nmecr. This tool is hosted on GitHub and is accessible for critical review and continuous improvement. KW engineering posts the outcomes of the regular testing they conduct against the Efficiency Valuation Organization's Advanced M&V Testing Portal.[8]

nmecr can perform site-level, whole-building energy use analysis;[9] it is an M&V practitioner's toolbox which builds upon existing work in the energy efficiency community to better model building performance and handle the growing complexities associated with tackling this challenge. The equations of the model are visible to the nmecr user which is preferred; it will enable the M&V

[8] See this link for NMEC R Code Updates: https://www.kw-engineering.com/nmec-normalized-metered-energy-consumption-r-package-energy-efficiency-project-analysis-nmecr-1-0-2/

[9] See this link for a brief description of NMECr: https://www.kw-engineering.com/2020-aeee-summer-study-virtual-sessions-papers-energy-efficiency/

practitioner to apply good judgement and to make appropriate modeling decisions. This tool calculates avoided energy (which will be helpful in the monitoring period), and normalized energy (for final reporting) and it accepts multiple types of interval data (hourly, daily, monthly).[10]

While nmecr was originally designed for use in the commercial and institutional sectors, its functionality can be extended to model energy use profiles of industrial systems.[11] We believe that it will also be able to handle the energy use profiles that will be encountered in LPS NMEC projects. The nmecr tool is coded in R; an open-source programming language with the capability to efficiently execute complex statistical analysis and visualize data in a straightforward way. It is a popular programming language for performing data analysis.

Algorithms

There are a range of algorithms available to model energy use and perform NMEC savings calculations. The IPMVP's recent white paper on advanced M&V notes that while different results will be produced based on the type of empirical model used, the variances are expected to be low. This notion is informed from findings of a pilot program.[12] NMEC models are based on linear regressions of energy use to outdoor air temperature Overall, these models fall into one of three categories:

1. Change-point: This method is more advanced than linear ordinary least squares regression and was developed under the ASHRAE Research Project 1050-RP.[13] It uses a piece-wise linear approach to model of energy use for segments of outdoor air temperature. Depending on the facility's individual load shapes the number of parameters needed in the model will be determined; caution is needed to avoid 'overfitting' by using too many parameters.
2. Time of Week and Temperature (TOWT) models: This model was developed by Lawrence Berkeley National Laboratory (LBNL) and uses a series of piece-wise linear and continuous temperature relationships using temperature bins. It uses hourly data to calculate energy savings by hour. This is also more advanced than linear ordinary least squares regression methods.
3. Heating and Cooling Degree Day Models: These models only use monthly time interval data. This method is less preferred.

There are ten modeling algorithms for energy savings analysis available for use in the nmecr tool. These algorithms differ from each other largely in terms in their ability to handle data sets with different intervals project (see the nmecr GitHub web page[14] for a full listing of the algorithms available in nmecr). These modeling algorithms cover all three of the above categories. The wide range of available model types will be beneficial for accommodating different facility types and varying levels of energy data granularity available. The LPS team will choose the algorithm best

[10] Efficiency Valuation Organization, 'IPMVP's Snapshot on Advanced Measurement & Verification,' January 2020, pg.34, Available here: https://evo-world.org/images/corporate_documents/NRE-NRA_White_Paper_Final_2701.pdf
[11] KW labs nmecr is available on GitHub here: https://github.com/kW-Labs/nmecr. More detail on nmecr is available on the GitHub link.
[12] Efficiency Valuation Organization, 'IPMVP's Snapshot on Advanced Measurement & Verification' , January 2020, Pg.14, Available here: https://evo-world.org/images/corporate_documents/NRE-NRA_White_Paper_Final_2701.pdf
[13] The paper for the ASHRAE Research Project 1050-RP can be accessed here: https://oaktrust.library.tamu.edu/handle/1969.1/2847
[14] https://github.com/kW-Labs/nmecr

suited for each site-level NMEC project; the time interval of the data will be a key factor in deciding. The following sources provide some more guidance for choosing an appropriate model:

- Efficiency Valuation Organization, 'IPMVP's Snapshot on Advanced Measurement & Verification' which is available here: https://evo-world.org/images/corporate_documents/NRE-NRA_White_Paper_Final_2701.pdf
- CALTRCK's article on the strengths and weaknesses of TWOT which is available here: https://www.caltrack.org/project-updates/week-fourteen-caltrack-update
- KW Labs GitHub which links to relate papers. (see this link: https://rdrr.io/github/kW-Labs/nmecr/#google_vignette)

The specific algorithm employed to model the savings will be recorded in the final report. The rationale for employing the algorithm will also be discussed in the report.

Dealing with Uncertainty

Errors in meter-based savings calculations occur from modeling, sampling, and measurement[15]. With meter-based M&V methods, the error from the empirical model is typically the only error that is quantified. Measurement errors are usually not quantified to NMEC projects because the meters are revenue-grade[16]. Modeling errors are errors in the mathematical modeling due to inappropriate function form, inclusion of irrelevant variable(s), or exclusion of relevant ones. The model may be based on insufficient or under-representative data[17]. Pre-screening will help assess whether there is potential to produce a good model with a high enough confidence (see discussion on goodness of fit in subsection: Target Population & Eligibility Criteria).

For cases where the baseline models are expected to use monthly data, the proposed M&V plan should demonstrate that the proposed modeling approach is likely to produce results with acceptable levels of precision (can be express in terms of uncertainty due to model error) the goodness-of-fit analysis described in Target Population & Eligibility Criteria, should be expanded to also conduct an uncertainty scenario analysis as described in ASHRAE Guideline 14 (see LBNL Technical Guidelines Section 3 for further description about this analysis[18]).

Section 5. Data Collection Plan

The following data will be collected:

- **Baseline:** Baseline conditions will be fully documented in the M&V plan. All static factors will be recorded (e.g., equipment types, production, daily, operational hours by day, week, and season.). This data will serve to create a reasonable baseline model to which savings can

[15] Efficiency Valuation Organization, 'IPMVP's Snapshot on Advanced Measurement & Verification' , January 2020, Pg.87, Available here: https://evo-world.org/images/corporate_documents/NRE-NRA_White_Paper_Final_2701.pdf
[16] Efficiency Valuation Organization, 'IPMVP's Snapshot on Advanced Measurement & Verification' , January 2020, Pg.18-19, Available here: https://evo-world.org/images/corporate_documents/NRE-NRA_White_Paper_Final_2701.pdf
[17] Efficiency Valuation Organization, 'IPMVP's Snapshot on Advanced Measurement & Verification' , January 2020, Pg.93, Available here: https://evo-world.org/images/corporate_documents/NRE-NRA_White_Paper_Final_2701.pdf
[18] J. Granderson, P. Gruendling, C. Torok, P. Jacobs, N. Gandhi, 'Site-Level NMEC Technical Guidance: Program M&V Plans Utilizing Normalized Metered Energy Consumption Savings Estimation', Lawrence Berkeley National Laboratory, California Public Utility Commission, Building Metrics Inc., Strategic Energy Technologies Inc., Version 2.0, 2019, pg.9

be reliably derived from. As IPMVP guidance notes, these data will serve to allow NREs to be identified so the appropriate adjustments can be made for determining the NMEC savings.

- **Metered Energy Use Data: Metered** data will be obtained through customer-owned submeters. The program implementers will verify that they have been recently calibrated and that the specifications meet the CPUC requirements (minimum accuracy of +/- 2%, and positive displacement meter type). Ideally, the time interval will be at least as granular as hourly. A year's worth of utility data will be collected; 12 months of data from submeters on site will be collected if utility data are unavailable. If there are gaps in the data, the technical reviewers will interpolate.
- **Weather Data:** The latest long-term average weather data will be used. This data will be sourced from CA Climate Zone 2022 weather files.

This data will be collected through an intake interview over the phone by an experienced engineer program representative, and information relevant to M&V will be recorded in a secure database. Pre- and Post-Project site visits will be conducted by in-house staff in cases where data collection is necessary to supplement and/or validate customer-supplied information.

Section 6. Monitoring

Throughout the measurement period, the LPS Program implementers will monitor the metering in accordance with the guidelines set by the CPUC.[19] The key action items that will be completed in the monitoring period are as follows:

- **Ensure proper function of metering equipment:** The program implementers will check that the data that are being properly collected in the early stages (1 -2 months after installation), ensuring that the metering equipment is functioning properly. Technical reviewers will check to make sure that the independent variables are reasonable. Anomalies in the data will be investigated and excluded if they are erroneous.
- **Check for Non-Routine Events (NREs):** The program implementers will periodically check for NREs at the facility. If any are identified, they will be recorded and adjustments to the baseline model will be made. Visual checks, communication with the customer, and intermittent assessments of the data throughout the measurement period will help identify NREs (e.g., outliers in the data for independent variables which deviate +/- 3σ from the baseline mean; the 'three-sigma rule.')
- **Verify Savings:** The program implementers will periodically report on energy savings throughout the measurement period to ensure the ECMs are performing as expected by calculating the avoided energy use (final savings will be reported as normalized savings). Avoided energy use is the reduction in energy that occurred in the reporting period relative to what would have happened if the facility had been equipped as it was in the baseline

[19] California Public Utilities Commission, 'Rulebook for Programs and Projects Based on Normalized Metered Energy Consumption', Version 2.0 2020, see Section II.1.B. & Section II.1.C , pg. 15

period but under reporting period operating conditions.[20] This information will be shared with the customer and will be an important component of delivering customer care.

The actions taken in the categories listed here will be documented and reported in the final report.

Section 7. Adjusting for Non-Routine Events (NREs)

Non-routine events that influence the facility energy use will be monitored for and recorded so that adjustments to the data can be made. These events are not related to the ECMs. The impact of NREs should be minimal. Facilities with expected, significant NREs will not be considered for NMEC; this risk is assessed in the pre-screening phase. IPMVP guidelines discuss the following examples of static factors that should be monitored for change[21] and they will be relevant to the LPS program:

- Amount of space being heated or cooled
- Building envelope characteristics
- Equipment changes
- Indoor environmental standard (e.g., light levels, temperature, ventilation rate)
- Occupancy type or schedule

If changes occur in these areas, adjustments will be made to the savings model. LBNL Technical Guidance will be followed for making the adjustments. Simple calculations may suffice for many adjustments. If the NREs create more complexity and interactive effects, a simulation is preferred. Measured data from a temporary period where a NRE occurred can be removed from the data set, keeping in mind that no more than 25% of the measured data should be removed (this is in accordance with ASHRAE Guideline 14).[22]

Section 8. Savings Calculation

The gross savings will be calculated after the measurement period is over and the site-level M&V requirements are satisfied. The gross savings calculation is as follows:

$$\text{Energy Savings} = \text{Baseline Model Predicted Energy Use} - \text{Actual Metered Energy Use} \mp \text{NRE Adjustments}$$

Final project savings claims will be determined and reported on in accordance with CPUC rules[23] which denotes that final savings claims must be normalized. Normalized savings are the reduction in energy use that occurred in the reporting period relative to what would have happened without the

[20] International Performance Measurement and Verification Protocol, Efficiency Valuation Organization, 'Concepts and Options for Determining Energy and Water Savings, Vol 1, 2012, section 4.5.3, pg.55.
[21] International Performance Measurement and Verification Protocol, Efficiency Valuation Organization, 'Concepts and Options for Determining Energy and Water Savings, Vol 1, 2012, section 4.5.3, pg.13.
[22] J. Granderson, P. Gruendling, C. Torok, P. Jacobs, N. Gandhi, 'Site-Level NMEC Technical Guidance: Program M&V Plans Utilizing Normalized Metered Energy Consumption Savings Estimation', Lawrence Berkeley National Laboratory, California Public Utility Commission, Building Metrics Inc., Strategic Energy Technologies Inc., Version 2.0, 2019, pg 12 & 19
[23] J. Granderson, P. Gruendling, C. Torok, P. Jacobs, N. Gandhi, 'Site-Level NMEC Technical Guidance: Program M&V Plans Utilizing Normalized Metered Energy Consumption Savings Estimation', Lawrence Berkeley National Laboratory, California Public Utility Commission, Building Metrics Inc., Strategic Energy Technologies Inc., Version 2.0, 2019, pg 16

ECMs under a normal set of conditions.[24] Final savings will be normalized based on long-term weather using the most up-to-date weather files (e.g., CALEE 2018).

The savings will be documented in the final report along with EUL and ECM costs. If deviations from the original proposed M&V plan occurred, this will be documented and substantiated. If the customer is participating in other energy efficiency programs, the gross energy savings will be adjusted to ensure that incentivized measures from other offerings are not included in the scope of the NMEC savings analysis.

Section 9. Expected Useful Life

The project lifecycle savings will be based on a weighted average EUL method.[25] The weighted EUL for the recommended ECMs will be determined in the feasibility study and will be updated as needed for the final report, after installation. EULs for the ECMs will be sourced from the Database for Energy Efficient Resources (DEER).

Section 10. Determining Program Influence

A program's influence is defined by the comparison between what would have happened without the intervention and what did happen. To answer this question, it is important to eliminate free ridership. The following measures will be taken in efforts to avoid free ridership:

- Project start date will be verified to ensure that the project did not start before the participant was enrolled in the program.
- Baseline equipment for the ECM will be assessed to ensure it is still functional, that its age does not exceed the EUL.
- The net savings realized when free ridership is accounted for will be calculated by multiplying gross savings by the net-to-gross (NTG) ratio.[26] The NTG applicable to LPS is 0.95 (specified in the CPUC Resolution E-4952 for non-residential NMEC projects).

Section 11. Incentive Structure

Incentives for NMEC projects will be paid out at the end of project installation and upon final verification of implementation and savings.

Section 12. M&V Plan for NMEC Platform

Proposed M&V Plan for NMEC Platform

A detailed, executable M&V plan is important to ensure accurate savings forecasts and high gross realization rates at ex-post review. The M&V rigor level is based on the measure scope, savings magnitude, and uncertainty. The EIP and Franklin team will implement an M&V plan to specify the

[24] International Performance Measurement and Verification Protocol, Efficiency Valuation Organization, 'Concepts and Options for Determining Energy and Water Savings, Vol 1, 2012, section 4.5.3, pg.57.
[25] The CPUC refers to this link for guidelines to determine the weighted average EUL: ftp://ftp.cpuc.ca.gov/gopherdata/energy_division/EnergyEfficiency/RollingPortfolioPgmGuidance/Combining_Measures_Claims.DRAFT.xlsm
[26] Granderson, P. Gruendling, C. Torok, P. Jacobs, N. Gandhi, 'Site-Level NMEC Technical Guidance: Program M&V Plans Utilizing Normalized Metered Energy Consumption Savings Estimation', Lawrence Berkeley National Laboratory, California Public Utility Commission, Building Metrics Inc., Strategic Energy Technologies Inc., Version 2.0, 2019, pg.22

measurement points including interval and monitoring period, measurement equipment with accuracy, and methods to true-up the final ex-ante estimates with post-installation data.

Data collection strategies. The EIP and Franklin Energy team has unparalleled experience with data collection for deemed, custom, and BRO measures that would feed an NMEC platform. We would collect from the following sources:

- Customer provided utility consumption data - For initial billing and baselining analysis
- Manual data loggers - We deploy HOBO loggers to measure temperature, pressure, water flow, motor on/off, air stratification, and air flow (CFM)
- Trend logs from existing EMS/BMS systems - We are also experienced with equipment level trending, such as pulling data from VFDs and Boiler burner controls

To further enhance our data logging capability, we will be using distributed wireless monitoring through Senseware. We have an established relationship with Senseware (https://www.senseware.co) to utilize their wireless equipment monitoring technology. This program will receive greater benefits and more accurate data through a remote wireless monitoring system including:

- Continuous monitoring critical to achieving project success.
- Digital monitoring reduces remote, unsafe, and inaccessible site visits which often require a lot of time to access.
- Many metering points can be incorporated into a single system.
- Operational reliability of the equipment is a concern that can be more easily monitored for important data.

Savings estimation approach. In the event the Large Public Sector Program expands and gradually implements whole-building measures (NMEC) in addition to deemed and custom platforms, the savings per measure are calculated differently based on their delivery types:

- Deemed offerings (e.g., prescriptive) - Savings for these measures come directly from SoCalGas' picklist or workpaper files
- Custom offerings / measures without workpapers - Use CEUS EUI data to estimate the baseline gas consumption for medium/large buildings and 10% natural gas reduction for savings.
- NMEC offerings - Use CEUS EUI data to estimate the baseline gas consumption for medium/large buildings and 30% natural gas reduction for savings.

Once we assign a custom project review, our engineering manager reviews the scope of work and develops the foundation of an M&V plan for each relevant custom project. Our engineer will often perform a phone screening with the trade ally and customer to gain additional project information. The team requests the specification and/or performance sheet of the equipment for all areas impacted by the custom project. At each step, we offer unbiased technical and project support

through our reviews of costs and energy savings estimates for custom projects. In addition to phone screening and reviewing project information, we use the initial billing analysis to understand the overall energy usage at the site.

The engineer schedules and performs a site visit at the customer's earliest convenience. The EIP and Franklin Energy team has a bench of regionally based engineers which allows us to meet peak times while keeping projects moving with minimal customer wait times. During site visits, the engineer captures data in the field and takes photos of the equipment and configuration, working hand in hand with the customer to explain the process and answer questions. The engineer also takes time during the site visit to talk with facility staff to understand the operation of equipment. After compiling the field data, the engineer analyzes the information to determine the saving potential and begins performing calculations and developing an M&V plan.

Our outreach manager will periodically engage the customer to gain an understanding of their implementation timeline and offer continued support during implementation. When needed, our team provides additional energy savings calculations and revises numbers as the scope changes. Our approach guides customers using one-on-one personal service, ongoing support and continual engagement that leads to high conversion rates.

After the site visit, the engineer compiles post-installation field data and analyzes captured information to determine energy savings potential and perform final calculations. The engineer revises the documentation to match final installed conditions and passes it on for final QC review by a senior engineer. At each step, our engineers prepare all documentation for easy transfer to and understanding by the program evaluator. We use International Performance Measurement and Verification Protocol (IPMVP) to capture and claim all energy savings. Throughout the process, our team will be in regular contact with customers who implement custom projects to track progress, answer questions, and provide advice on energy efficiency alternatives to complement the support they receive from their contractors. Our team is familiar with the Custom process in California, and thoroughly up to date on the procedural guidance on each programmatic process.