

2008 Energy Efficiency Program Evaluation Plan

Submitted To:

City of Lompoc

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1 UTILITY OVERVIEW

Two legislative bills (SB1037 and AB2021) were signed into law a year apart. SB1037 requires that the Publicly Owned Utilities (POUs), similar to the Investor Owned Utilities (IOUs), place cost effective, reliable, and feasible energy efficiency and demand reduction resources at the top of the loading order. They must now procure 'negawatts' first. Additionally, SB1037 (signed September 29, 2005) requires an annual report that describes the programs, expenditures, expected energy savings, and actual energy savings.

Assembly Bill 2021, signed by the Governor a year later (September 29, 2006), reiterated the loading order and annual report stated in SB1037 as well as expanding on the annual report requirements. The expanded report must include investment funding, cost-effectiveness methodologies, and an independent evaluation that measures and verifies the energy efficiency savings and reductions in energy demand achieved by the energy efficiency and demand reduction programs. AB2021 additionally requires a report every three years that highlights cost-effective electrical and natural gas potential savings from energy efficiency and established annual targets for energy efficiency and demand reduction over 10 years.

The legislative reports require both an on-going assessment of what is occurring within the programs along with a comparison of how much possible savings are left within the POU service territory. The goal of this 2008 energy efficiency program plan is to assist City of Lompoc Municipal Utility (Lompoc), to meet these requirements. This plan provides guidance and recommends Evaluation, Measurement, and Verification (EM&V) activities that will help Lompoc standardize and streamline the reporting process in order to meet the legislative requirements.

This plan identifies recommended EM&V actions based on information gathered from staff interviews, a review of existing utility records, databases, and marketing materials. Based on this review, it is recommended that Lompoc conduct the following EM&V activities:

- Review of the measures included in the residential comprehensive program and identification of additional measures that could be considered in future program offerings.
- Review of engineering assumptions compared to actual installations of its residential refrigeration equipment based on a review of the participant documentation.

1.1 General Utility Background Information

Lompoc is a municipal utility established in 1923. It serves 14,700 customers, of which 90 percent are residential. Residential customers account for 44 percent of the total electric sales while the commercial customers use 21.5 percent; industrial and demand customers 25.5 percent; and municipal facilities 9 percent. Lompoc is a winter peaking utility with a peak demand of 26 megawatts.

The City of Lompoc is located in Zone 5 California Title 24 with its weather station at Sunnyvale, CA. The Central Coastal Range is inland of the coast but has some ocean influence that keeps temperatures from hitting more extreme highs and lows. Summers are warm and dry with large daily temperature swing. Winters are cool but not severe. Heating is necessary on many days in the winter.

Table 1: Temperature Reference Points for the City of Lompoc

Base Temp: 65F	Sunnyvale, CA
Heating Degree Days (HDD)	2,643
Cooling Degree Days (CDD)	220

1.2 Key Customer Markets

Lompoc serves both residential and commercial customers and 90 percent of its customers are residential. The majority of the energy efficiency programs focus on rebates to increase appliance efficiency.

1.3 Efficiency Programs Offered

Lompoc initially implemented energy audit programs in 1981. In 1991, the programs were expanded to include energy efficiency education programs. In 2001, energy efficiency rebates and a low-income refrigerator subsidy program were added. Since then, additional programs have been added and existing programs modified to accommodate the community's needs.

1.3.1 Residential Program Summaries

Current Commercial and Residential Customer Programs:

- **Refrigerator Rebate:** A \$120 rebate is paid to electric customers or landlords who rent to City customers to replace working refrigerators or freezers manufactured before 1992 with a new model. The old appliance must be recycled at the City Landfill.
- **Refrigerator BuyBack Program:** \$35 is paid to customers who recycle, at the Landfill, any second working refrigerator or freezer. This program was first offered in May 2001.
- **Clothes Washer Rebate:** A \$120 rebate is paid to customers who replace a working (non Energy Star®) clothes washer with a new Energy Star® model. The old clothes washer must be recycled at the Landfill. This program was first offered in March 2003.
- **Dishwasher Rebate:** A \$50 rebate is paid to electric customers who replace working dishwashers, which were manufactured before 1994, with an Energy Star® model. The old dishwasher must be recycled at the Landfill. This program was first offered in March of 2003.
- **Gas Conversion Payment:** \$100 is paid to electric customers who replace and recycle an electric water heater or clothes dryer with a gas appliance. The electric appliance must be recycled at the Landfill.
- **LED Holiday Lighting:** A rebate of \$4 for up to 35 light strands and \$8 for larger strands is paid to utility customers who purchase LED holiday lighting. This program was first offered in October of 2005.
- **Energy Audits:** Lompoc provides free energy audits for all customers and an online audit for residential customers.

Current Low Income Customer Programs:

- **Income Qualifying Refrigerator Purchase Program:** Up to a \$570 payment is made for a new refrigerator for income qualifying customers. The old refrigerator must be in working order, must

have been manufactured before 1992, and must be recycled at the landfill. The customer is required to repay the City \$240 over a one-year time period.

- Rate and Energy Assistance Programs: Lompoc offers a rate discount for low-income customers and a special medical needs rate. Lompoc offers a subsidized refrigerator program to low-income customers.

Current Community Programs:

- Education Programs: Lompoc encourages energy conservation through school and community education programs.

1.3.2 Non-residential Program Summaries

Current Commercial Customer Programs:

- Commercial Lighting Rebate: A rebate of \$15 per ballast is paid to commercial customers who replace/retrofit current lighting with more energy efficient fixtures or hard wired in lamps and ballasts. This program was first offered in May 2001.
- Exit Sign Rebate: A rebate of \$15 to replace existing incandescent or fluorescent-lit exit signs with LED lights or \$30 the replace same signs with electro-luminescence signs. This rebate was first offered in 2002.

1.3.3 2007 Program Summary

Lompoc spent a total of \$64,156 in program costs, which led to total demand reductions of 12 kW and total annual energy reductions of 101,526 kWh. Table 2 summarizes the kW, kWh and program costs for Lompoc’s programs.

Table 2: 2007 Summary of Lompoc’s Energy Efficiency Programs

Residential Program	Demand Savings (KW)	Net Peak kW Savings	Net Annual kWh Savings	Incentives	Utility Direct Install Costs	Mtg, EM&V Costs	Total Program Costs
Residential Clothes Washers	1	1	2,739	\$7,440	\$930	\$401	\$8,771
Residential Dishwashers	0	0	1,258	\$1,600	\$640	\$240	\$2,480
Residential Refrigeration	8	8	76,082	\$23,650	\$1,330	\$19,918	\$44,898
Commercial Program							
Non-Res Lighting	1	1	7,544	\$1,994	\$252	\$1,339	\$3,585
Other	1	1	13,904	\$1,100	\$220	\$3,101	\$4,421
All Programs	12	12	101,526	\$35,784	\$3,372	\$25,000	\$64,156

1.4 Evaluation Priorities

In 2007, 75% of its demand kW savings and 91% of its incentives were from its residential programs. Its suite of refrigeration programs accounted for the majority of savings (67% of the peak kW savings, 75% of its annual kWh savings, and 66% of its total incentives). Lompoc has indicated its desire to evaluate its current program offerings to determine if the incentive levels are sufficient to increase continued customer participation. Lompoc is also interested in determining if its programs are cost-effective to meet its future needs.

Evaluation priorities should be based on a combination of relative size of the savings achieved as well as the degree of uncertainty with *ex ante* estimates of the savings. The cost of different evaluation approaches also is a key element in determining priorities. Savings resulting from energy residential refrigeration programs account for most of the energy savings for Lompoc. Fortunately, the *ex ante* energy savings are easily determined through a review of the deemed savings estimates, and these savings are not weather dependent.

The database used to track the energy conservation programs appears to be sound. Lompoc keeps track of much information on their program participants and the technologies included in their programs. We do not recommend a review of the tracking system, outside of incidental review based on information gathered for the impact evaluation and of the measures included in Lompoc's portfolio.

It is recommended that LOMPOC conduct the following EM&V activities:

1. Review of the measures included in the residential comprehensive program and identification of additional measures that could be considered in future program offerings.
2. Review of the deemed savings estimates used to determine residential refrigeration estimates, and to make sure they are in alignment with the types of refrigerators rebated in Lompoc's programs. Lompoc keeps extensive records on the refrigerators that are replaced by their program including verification of manufacture before 1992 and information on the type of refrigerator. A sample of these records will be reviewed.

2 EVALUATION PLAN

The primary objectives of an impact analysis are to assess gross and net demand and energy savings and the cost-effectiveness of the installed energy efficient equipment. An impact evaluation verifies measure installations, identifies key energy assumptions and provides the research necessary to calculate defensible and accurate savings attributable to the program.

2.1 Methods and Data Sources

A useful construct for thinking about the range of efficiency measures covered by the Program is the International Performance Measurement and Verification Protocol (IPMVP). Table 3 presents a listing of the IPMVP protocols, the nature of the performance characteristics of the measures to which M&V options typically apply, and an overview of the data requirements to support each option. Our approach to selecting M&V strategies follows these guidelines.

Table 3: Overview of M&V Options

IPMVP M&V Option	Measure Performance Characteristics	Data Requirements
Option A: Engineering calculations using spot or short-term measurements, and/or historical data	Constant performance	<ul style="list-style-type: none"> • Verified installation • Nameplate or stipulated performance parameters • Spot measurements • Run-time hour measurements
Option B: Engineering calculations using metered data.	Constant or variable performance	<ul style="list-style-type: none"> • Verified installation • Nameplate or stipulated performance parameters • End-use metered data
Option C: Analysis of utility meter (or sub-meter) data using techniques from simple comparison to multi-variate regression analysis.	Variable performance	<ul style="list-style-type: none"> • Verified installation • Utility metered or end-use metered data • Engineering estimate of savings input to SAE model
Option D: Calibrated energy simulation/modeling; calibrated with hourly or monthly utility billing data and/or end-use metering	Variable performance	<ul style="list-style-type: none"> • Verified installation • Spot measurements, run-time hour monitoring, and/or end-use metering to prepare inputs to models • Utility billing records, end-use metering, or other indices to calibrate models

As stated earlier, evaluation priorities should be based on a combination of relative size of the savings achieved as well as the degree of uncertainty with *ex ante* estimates of the savings. Based on the *ex ante* estimates of the savings and the level of achieved savings in 2007, the highest evaluation priority is to evaluate the savings from Lompoc’s residential refrigerator rebate program. It is our recommendation that M&V Option “A” is the most appropriate methodology. The methodology recommended is a review of the engineering estimates used to develop the *ex ante* estimates. In this particular case, the review will see if the size and features in the refrigerators receiving a rebate are similar to the size and features of the

refrigerator characterized for the deemed energy savings. The assumptions for the baseline refrigerator will also be performed.

2.2 Evaluation Tasks

Listed below are the proposed tasks for performing the evaluation work.

Task 1: Review Measure Offerings and Suggest Possible Measure Additions

Evaluation literature in California among the investor owned utilities has shown that some measures currently offered by many utility conservation programs may have high incidences of free ridership, which will decrease the cost effectiveness of offering such measures. The consultant team will review the evaluation literature for the measures currently offered by Lompoc to determine if free ridership is an issue with any of Lompoc's program offerings. In addition to this review, the evaluation team will determine if there are additional measures currently not offered by Lompoc that have been successful in other utility programs.

Task 2: Identify Impact Evaluation Sample

The number of participants that will participate in Lompoc's FY 2008 program is uncertain. The sample drawn for the records review of refrigerator characteristics should include enough participants to achieve a level of precision and confidence of 90% +/-10%. If participation is between 100-300 customers, the number of participants surveyed will be approximately 50.

Task 3: Installation Verification

Verification that measures have actually been installed is an important part of an impact evaluation. However, site visits to visually verify installation are a costly means of doing so. In lieu of on-site verification, it is recommended that verification consist of a review of the verification records kept in the program tracking database. In particular, for the refrigerator program, verification will include insuring that the disposal slips from the landfill are included for each sampled participant.

Task 4: Calculate Gross Energy and Demand Impacts

It is expected that the same methodology used to develop the *ex ante* estimates of savings will be used for the *ex post* estimates. The DEER *ex ante* savings are based on an Energy Star® calculator that provides savings estimates by refrigerator volume, door style, and features. If the survey of participants finds no substantial differences between the characteristics of the refrigerators participating in the program and the characteristics of the refrigerator used for the single deemed savings value, then this value will continue to be used. Perhaps a larger issue is how the program is designed and how the refrigerator baseline and measure lifetime are utilized. A "replace on burnout" program would use the federal refrigerator standard unit as its base and a full measure lifetime. However, "replace on burnout" programs may use a more inefficient unit as its base. If this is done, the more inefficient unit can only be claimed as the base for the remaining expected lifetime of the refrigerator being replaced. After that time period, the federal standard refrigerator must be used as the base. Program design also has a large impact on what net-to-gross adjustment value should be used. A refrigerator turn-in type of program has a much larger net to gross

value that does a replace on burnout type of program. Demand impacts will be based on the kW/kWh ratio currently used in the *ex ante* estimates.

Task 5: Process and Impact Evaluation Report

The evaluation consultant will issue a final report to the utility summarizing the results from the process and impact evaluations and describing any recommendations that come from the evaluations. These recommendations will assist Lompoc in meeting the requirements with the AB2021 requirements and will be used in their submittal to the California Energy Commission (CEC).

The final report will include:

E: Executive Summary

1. Introduction and Selected Evaluation Issues
2. Program Overview
 - 2.1. Program Objectives
3. Evaluation Plan
 - 3.1. Research Issues and Objectives
 - 3.2. Methods & Data Sources
 - 3.3. Sample Design
4. Evaluation Results
 - 4.1. Findings
 - 4.2. Recommendations
5. Evaluation Based Recommendations

3 EVALUATION PLAN TIMING

The recommended methodology for the impact evaluation does not require any billing data or on-site metering work. Therefore, the 2008 Energy Efficiency Program Evaluation can begin nearly immediately upon the completion of FY 2008.

4 ESTIMATED BUDGET

The EM&V work should cost somewhere between \$5,400 and \$9,300. By task, the cost range is:

- Task 1: Review Measure Offerings and Suggest Possible Measure Additions - \$1,500 - \$3,000
- Task 2: Identify Impact Evaluation Sample - \$200 - \$400
- Task 3: Installation Verification - \$200 - \$400
- Task 4: Calculate Gross Energy and Demand Impacts - \$1,500 - \$2,500
- Task 5: Evaluation Report - \$2,000 - \$3,000