2008 Energy Efficiency Program Evaluation Plan

Submitted To:

City of Lompoc

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SUMMIT BLUE
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1 INTRODUCTION

Two legislative bills (SB1037 and AB2021) were signed into law a year apart. SB1037 requires that the Publically 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. 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 The City of Lompoc to meet these requirements.

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 about 26 MW.

Although Lompoc serves both residential and commercial sectors, 90 percent of its customers are residential. The majority of the energy efficiency programs focus on rebates to increase appliance efficiency for this large sector.

1.2 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.

1.2.1 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.
- Renewable Resource Rebate: Any electric customer who installs a grid-tied self-generating electric system that is considered to be renewable energy will receive a rebate of $3.50 per watt. This program was first offered in February 2004.
- 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 and have been manufactured before 1992, and will 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.

1.2.2 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, or $30 the replace same signs with electro-luminescence signs. This rebate was first offered in 2002.

1.2.3 2008 Program Summary

Table 1 lists the number of residential participants who received rebates in FY 2008 under the Lompoc energy conservation programs. In terms of claimed energy savings, about 75% - 80% of the total residential and non-residential claimed savings are from the three refrigerator/freezer offerings. In FY 2008, 131 refrigerators/freezers were taken out of service and sent to the landfill.

Table 1: Summary of Lompoc's Residential Programs

Program	# of Participants
Replace existing refrigerators/freezers and dispose of the replaced appliance	61
Purchase existing second refrigerators/freezers and dispose	26
Replace existing low income refrigerators/freezers and dispose of the replaced appliance	44
Clothes Washers	62
Dishwashers	27
LED Holiday Lighting	24
Convert existing appliances to gas	12
Total	256

Table 2 lists the number of non-residential participants who received rebates in FY 2008. There were only two commercial lighting projects.

Table 2: Summary of Lompoc's Commercial Programs

Program	# of Participants
Commercial Lighting	2

1.3 Evaluation Priorities

As noted earlier, over 75% of the claimed energy savings in FY 2008 are from the three program offerings that remove inefficient existing refrigerators and freezers. For the two offerings that include replacing existing refrigerators/freezers, the new refrigerators/freezers are energy star. However, the focus of these two appliance replace offerings is to remove from the marketplace the existing appliance. Insuring that these appliances are removed from the market place allows for the claim of higher energy savings per unit.

Because of the importance of the refrigerator/freezer replacement portions of the City of Lompoc claimed energy savings, the FY 2008 impact evaluation centered only on these three refrigerator/freezer program offerings.

2 IMPACT EVALUATION PLAN

A useful construct for thinking about the range of efficiency measures covered by the City of Lompoc's programs 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	• Verified installation • Nameplate or stipulated performance parameters • Spot measurements • Run-time hour measurements
Option B: Engineering calculations using metered data.	Constant or variable performance	• 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	• 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	• 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

The focus of the impact evaluation for FY 2008 is on the three refrigerator/freezer program offerings provided by the City of Lompoc. Option "A" was used as the evaluation methodology. There are both deemed savings available for these measures as well as assumed savings used by the City of Lompoc. These savings estimates were reviewed.

2.1 Evaluation Sample

As identified in Table 1, the three refrigerator/freezer programs had a total of 131 participants. The City of Lompoc uses the same energy savings claim for all three of the programs, which is:

- Refrigerators – 2,016 kWh/year
- Freezers – 1,662 kWh/year

The value for freezers is the same as the deemed value found in the E ^{3} calculator. The E^3 deemed value for recycled refrigerators is lower at 1,946 kWh/year. However, the 2,016 value used by the City of Lompoc may be appropriate considering the portion of the offerings that include Energy Star new refrigerators.

The intent of the evaluation is to verify that the energy savings value for refrigerators used by the City of Lompoc is reasonable for use as an average across all three program offerings. The value used for freezers is the same as the deemed value and is acceptable. Verification of supporting paperwork is all that is needed for freezers.

A sample was drawn from each of the three program offerings. The sample size is large enough to insure achieving results for each sample segment with a confidence level of 80 percent with a confidence interval of +/- 20%. The overall statistical confidence for the combined sample is 90 percent with a confidence interval of +/- 15%. The sample sizes by program offering include:

- Replace existing refrigerators/freezers = 9
- Purchase existing second refrigerators/freezers = 8
- Replace existing low income refrigerators and freezers = 9
- Total sample = 26

The dataset of all FY 2008 participants was obtained by Summit Blue from the City of Lompoc. Using a random number generator, the sample was drawn and supporting documentation requested for each of the sampled participants.

3 IMPACT EVALUATION RESULTS

The methodology used to measure and verify energy savings for refrigerators/freezers included the following:

1. Draw the samples and request the hard-copy documentation maintained by the City of Lompoc.

2. Verify that the sampled documentation exists and is in good order.

3. Use the make and serial number from the sampled refrigerators to estimate the actual energy usage of each. Compare these values to the deemed values.

4. Create by program type average refrigerator energy savings using deemed savings, the values used by the City of Lompoc, and the values identified by using the model make and serial number.

5. Create a weighted average refrigerator energy savings estimate.

3.1 Measure Installation Verification

Since the refrigerators and freezers are now in the landfill, it is impossible to perform on-site verification. Therefore verification consisted of a review of the data tracking maintained by the City of Lompoc.

The City of Lompoc was provided the list of sampled participants for each of the three programs and requested to provide copies of the hard-copy documentation for each. Proper documentation was produced for each of the sampled 26 sites. Based on these findings, installation verification is considered to be 100%.

3.2 Estimated Energy Use of the Removed Refrigerators

The sample of 26 refrigerators and freezers included 21 refrigerators that had model type and serial number information. Estimates of energy use from these refrigerators were obtained from the database of refrigerators maintained on the Energy Star website. Access to the data was through their on-line calculator (http://www.energystar.gov/index.cfm?fuseaction=refrig.calculator).

Table 4 provides the estimates of average energy use from the 21 replaced refrigerators using the Energy Star database. On average, the energy use is 1,528 kWh. The lowest average consumption came from the six refrigerator replacement program refrigerators at 1,377 kWh/yr and the highest from the second refrigerator buyback program at 1,722 kWh/year.

Table 4: Estimate Average Usage of Replaced Refrigerators

Program	Number of Refrigerators	Average Use (kWh/yr)
Refrigerator Replacement	6	1,377
Buyback	6	1,722
Low Income Refrigerator Replacement	9	1,499
Total	21	1,528

These averages are all significantly lower than the deemed value of 1,946 kWh/yr found in the E^3 calculator. However, Summit Blue does not think that these findings refute the 1,946 kWh/yr deemed value. In practice, refrigerators and freezers become much less efficient when they age due to such things as deteriorating door gaskets and compressor seals. If these values are tracked from year to year, they should provide information on any trend that replaced refrigerators in the future are more efficient than current recycled refrigerators. With ever more stringent standards being placed into affect since 1990, one would expect future recycled refrigerators to be more efficient than current ones.

3.3 Estimated Impact

The current value used by the City of Lompoc for refrigerators across all three programs is 2,016 kWh/yr. This average savings incorporates savings from recycled refrigerator as well as savings from the purchase of Energy Star refrigerators.

The E^3 calculator includes estimates of energy savings from both the purchase of Energy Star refrigerators from a "Replace on Burnout (ROB)" perspective and from an "Early Retirement" perspective. They also have estimates of "Early Retirement (ER)" low income refrigerator purchases. The weighted averages for each are:

- Refrigerators – ROB = 84 kWh/year
- Refrigerators – ER = 316 kWh/year
- Refrigerators – ER Low Income Single Family = 822 kWh/year

The two City of Lompoc refrigerator programs that include new refrigerators do not fit neatly into any of these categories. For both the low income and the non-low income program that include the purchase of new refrigerators, they appear to be a combination of ROB and recycling. The ER low income estimate does not fit the Lompoc program design.

If the City of Lompoc was to estimate refrigerator impact values separately for each of the three program types, Summit Blue recommends that the Buyback program utilize the deemed refrigerator recycle value from the E^3 calculator and the two other programs use the deemed refrigerator ROB plus the refrigerator recycle values from the E^3 calculator.

Table 5 presents alternative values for refrigerator energy savings. The final assessment is that the value that the City of Lompoc currently uses across all three programs is very reasonable. The 2,016 kWh/year

value is not statistically different from the 2,013 recommended weighted value developed by Summit Blue. The alternate numbers by program type are offered for consideration, but Summit Blue agrees that the 2,016 kWh/year value is reasonable and gives it a realization rate of 100%.

Table 5: Refrigerator Energy Savings

Program	Number of Program Participants	Based on ROB & Energy Star Replacement Values (kWh/yr)	Based on ROB & E^3 Replacement Values (kWh/yr)	Current City of Lompoc Values (kWh/yr)	Recommended Values (kWh/yr)	Realization Rate
Refrigerator Replacement	61	1,461	2,030	2,016	2,030	101%
Buyback	26	1,722	1,946	2,016	1,946	97%
Low Income Refrigerator Replacement	44	1,583	2,030	2,016	2,030	101%
Total or Weighted by Program	131	1,554	2,013	2,016	2,013	100%

In summary, the Summit Blue team found the refrigerator/freezer programs offered by the City of Lompoc to be well run and well documented. The energy savings claimed for the programs also appear to be reasonable.