2008 Energy Efficiency Program Evaluation Plan

Submitted To:

Gridley Municipal Utility

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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 Gridley Municipal Utility (GMU), and its efficiency program implementer, Efficiency Services Group, to meet these requirements. This plan provides guidance and recommends Evaluation, Measurement, and Verification (EM&V) activities that will help GMU standardize and streamline the reporting process in order to meet the legislative requirements.

This plan identifies recommended E, M&V actions based on information gathered from Efficiency Services Group, a review of existing utility records, databases, and marketing materials. Based on this review, it is recommended that GMU conduct the following EM&V activities:

- A limited process evaluation of GMU's efficiency programs to ensure consistency in database tracking given the overlap in several program elements that focuses on the most active programs;
- Review of the measures included in the residential comprehensive program to determine cost-effectiveness;
- Verification of the savings for non-residential process/motor measures or non-residential lighting measures through a review of the engineering assumptions;
- Verification of installations through a review of the application and receipt documentation of sampled installations.

1.1 General Utility Background Information

Gridley is a small agricultural community with a population of just over 5,100 located in the heart of the Sacramento Valley at the foot of the world's smallest mountain range, the Sutter Buttes. Gridley is a one-hour drive north of Sacramento.

GMU was established in 1910 and provides electric service to approximately 2,650 customers of which 83% are residential. Its annual energy use is about 35 gigawatt-hours (GWh) and its peak demand is about 10.6 megawatts (MW). GMU is a summer peaking utility with the 10.6 MW peak event occurring on July 25, 2006.

GMU is located in California Title 24 Climate Zone 11, which is in the central California valley, north of Sacramento at the foot of Sutter Buttes. Here the seasons are cool to cold in the winter and hot in the summer. Annual precipitation is about 27" per year with the wettest month being January with about 5 inches. The summers are generally dry. Table 1 illustrates the heating and cooling degree-days for the nearby weather station at Oroville.

Table 1: Temperature Reference Points for Gridley Municipal Utility

Base Temp: 65F	Oroville
Heating Degree Days (HDD)	2,818
Cooling Degree Days (CDD)	1,422

1.2 Key Customer Markets

Although GMU serves both residential and commercial customers and 83% of its customers are residential, the key focus of its efficiency programs has been with their business customers. GMU does offer a number of residential programs, but most of their efficiency improvements have come from commercial sector lighting and efficient motor measures.

1.3 Efficiency Programs Offered

GMU offers a variety of energy efficiency programs to encourage its members to reduce energy consumption. These programs include a combination of informational energy audits, rebates, and giveaways as a way to help increase member awareness of energy efficiency and encourage the wise use of electricity.

1.3.1 Residential Program Summaries

There are seven residential program initiatives.

- Residential Energy Audits - GMU provides free in-home energy audits to customers who would like to learn how to reduce their energy use.
- An Energy Efficiency Hotline – A toll free line with GMU personnel is available for their customers to answer questions and provide information on energy efficiency related matters
- Residential Rebate Programs - GMU offers customers rebates for purchasing and installing:
    - Energy Star Refrigerator
    - Energy Star Room AC
    - Energy Star Clothes Washer
    - Energy Star Dishwasher
    - Ceiling Fans
- Energy Efficient Air Conditioning and Heat Pump Program - GMU provides rebates for purchasing and installing:
    - Heat Pumps

    - Central Air Conditioning
    - Evaporative Cooler
    - Whole House Fan
- CFL Rebate Program - GMU provides a rebate for the purchase and installation of CFLs.
- Weatherization Program – GMU provides financial incentives to homeowners who invest in weatherization measures.
- Education Program - Provides energy saving education and kits to 5th grade students in the GMU service territory for energy & water efficiency.

1.3.2 Non-Residential Program Summaries

There are three non-residential program initiatives.

- Lighting Retrofit – A lighting retrofit program is offered to businesses in Gridley. There is a prevalence of T-12 lighting throughout the City and most high bay lighting uses high intensity discharge fixtures instead of more efficient florescent fixtures.
- Energy Audits - GMU offers free on-site energy audits to commercial, industrial and agricultural customers who have concerns, questions or an interest in implementing measures to manage their energy usage and reduce consumption.
- Non-Residential Energy Efficiency Incentives - GMU offers financial incentives along with technical support for all non-residential customers to promote the purchase and installation of energy efficient commercial equipment and systems.

1.3.3 2007 Program Summary

GMU spent a total of $50,981 in program costs, which led to total demand reductions of 10 kW and total annual energy reductions of 85,877 kWh. Table 2 summarizes the kW, kWh and program costs for GMU's programs.

1.3.4 Customer Financing

The GMU programs offer rebates for a large number of energy efficiency applications. The residential appliance program offers the following incentives:

- Refrigerators – 19.1 cu.ft or larger ($75)
- Refrigerators – 7.75 to 19.0 cu.ft ($25)
- Clothes Washers ($75)
- Dishwashers ($25)
- Room AC (less than 15,000 Btu - $30, 15,000 Btu or more - $50)
- Electric Water Heaters ($50)

The weatherization program offers these incentives:

- Attic, floor, or wall insulation (self installed 50% of materials, contractor installed 25% of materials and labor)
- Window tinting and sunscreens ($0.75 per square foot)
- Weatherstripping and caulking (50% of material cost)
- Windows (u factor of at least 0.35 - $2.50 per square foot)

- Ceiling/attic radiant barrier ($0.10 per square foot)
- Duct insulation ($1.00 per linear foot)

The HVAC program offers the following incentives:

- Central A/C with minimum of SEER 14 (SEER 14 or more $75/ton, SEER 15 or more $150/ton, SEER 16 or more or geothermal heat pump $300/ton)
- Heat pump with minimum of HSPF of 8 (The same rebate by SEER level as outlined for Central AC plus HSPF 8 or more $100/unit, HSPF 8.5 or more $150/unit, Geothermal $150/unit)Attic, floor, or wall insulation (self installed 50% of materials, contractor installed 25% of materials and labor)
- Whole house fan and evaporative coolers ($100/unit)Window tinting and sunscreens ($0.75 per square foot)

The commercial lighting program does not specify specific technologies but is generally for T12 to T-8 and high bay HID to fluorescent applications. The incentive is 60% of the installed cost.

For residential lighting, the incentive levels are:

- CFLs ($2/unit with minimum 10 units)
- CFL torchiere ($25/unit)
- Energy Star ceiling fan ($25/unit)
- Energy Star light fixture ($25/unit)

Table 2: 2007 Summary of GMU's Energy Efficiency Programs

1.4 Evaluation Priorities

In 2007, nearly 95% of GMU's net annual energy savings and 70% of net peak demand savings came from its non-residential programs. Of these, process/motors and lighting are the most dominant.

Evaluation priorities should be based on a combination of relative size of the savings achieved as well as the degree of uncertainty with anticipated *(ex ante)* estimates of the savings. The cost of different evaluation approaches also is a key element in determining priorities. Savings resulting from energy

efficient non-residential motors and lighting make up most of the energy savings for GMU. Fortunately, the anticipated *(ex ante)* energy savings for motors and lighting are less uncertain compared to other types of measures, such as HVAC and shell measures where savings estimates are derived from building simulation modeling with the building characteristics being an average across all vintages and home sizes. With motors and lighting, hours of operation is the most critical key variable. The other key variables, such as lamp wattage and motor HP, are known factors. Weather is not a significant variable with motors and lighting.

The evaluation budget for GMU is small and limits the extent of evaluation efforts that can be undertaken. It is our recommendation that both a limited process evaluation be performed as well as an impact evaluation. Fortunately, for the process evaluation, GMU is one of five utilities that use Efficiency Services Group to implement their programs and therefore the process evaluation can encompass all five utilities with the cost shared among the five.

Based on the small budget, the relative similarity in uncertainty with anticipated *(ex ante)* estimates of the savings between process/motor and lighting measures, the fact that motor measures provide over one-half of the energy savings, and the fact that Efficiency Services Group is utilized for program implementation, it is recommended that GMU conduct the following EM&V activities. A possible alteration of these recommendations would be if 2008 projects are much different in number compared to 2007.

1. A limited process evaluation of all energy efficiency programs to ensure consistency in database tracking given the overlap in several programs. This evaluation will focus on the most active programs and it will be across all five of the utilities whose program implementation is managed by Efficiency Services Group.

2. Review of the measures included in the residential comprehensive program.

3. Verification of the savings attributable to the non-residential process/motors program. This could change to non-residential lighting depending on 2008 project accomplishments.

2 PROCESS EVALUATION PLAN

Based on a review of the program records and materials provided by the Efficiency Services Group, the consulting firm that manages the GMU programs, it is recommended that a process evaluation of the GMU programs be performed. This would not be an in-depth process evaluation, but rather a limited one that:

- reviews the current tracking system and the information gathered and recorded by that system,
- reviews the marketing materials and customer recruitment processes, and
- reviews the measures targeted in GMU's residential portfolio to determine cost-effectiveness and identify potential alternatives.

2.1 Task 1: Review Tracking Systems

Given that these programs are generally cross-promoted, the consulting team should review the ways the program data are tracked as well as insure that certain variables, such as lighting measure hours of operation for non-residential lighting, are gathered at the time of implementation.

Based on our preliminary review of the current tracking, provided by the Efficiency Services Group, the process evaluation could identify ways to simplify and streamline the data tracking process currently used. Moreover, this review would also identify more expedient ways to measure program impacts, which will streamline the reporting process to the CEC.

2.2 Task 2: Review Program Procedures and Relationships

This process evaluation would include a review of the materials and events currently used for recruiting customers to the GMU efficiency programs. This review would also identify additional messages that GMU may want to include in future program marketing efforts. This information would be supplemented by interviews with program staff, both at GMU and Efficiency Services Group, focusing specifically on the ways on the following topics:

- Program process flow and relationships.
- Program metrics including current enrollment, customer satisfaction, and savings estimates.
- Marketing and outreach activities.
- Areas for improvement .

3 IMPACT 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 systems. 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.

3.1 Impact Evaluation Research Issues and Objectives

The primary objectives of an impact analysis are:

1. Conduct a preliminary uncertainty analysis and identify and rank those factors that contribute to overall uncertainty regarding program gross and net kW and kWh savings.

2. Review engineering assumptions.

3. Develop an analysis approach designed to minimize uncertainty of reported savings.

4. Verify measure installations.

5. Calculate verified gross demand and energy savings.

6. Calculate net-to-gross factors and verified net demand and energy savings.

7. Assess program costs, including incremental costs associated with measures installed through the program.

8. Determine the cost-effectiveness of the program based on Total Resource Cost (TRC) test.[1]

[1] As defined in the California Standard Practice Manual, Economic Analysis of Demand Side Programs and Projects, October 2001

3.2 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	• 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

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 anticipated *(ex ante)* estimates of the savings. Based on the anticipated *(ex ante)* estimates of the savings and the level of achieved savings in 2007, the highest evaluation priority is to evaluate the savings from the non-residential process/motor measures. However, in reviewing the 2008 project lists provided by Efficiency Services Group, process/motors may not be the dominant measure implemented in FY 2008. Non-residential lighting may have more impact. If that is the case, then non-residential lighting should have the highest priority.

For either process/motor measures or non-residential lighting measures, 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 anticipated *(ex ante)* estimates.

For process/motors, the savings may be based on deemed estimates or calculated with spot load measurements (by the original installer), manufacturer's data, and estimated hours of operation. In either case, the underlying assumptions need to be reviewed, especially the assumed hours of operation.

In order to accurately evaluate a typical lighting installation, all that is needed is a list of fixtures/lamps removed, fixtures/lamps installed, and operational hours. Standard wattages are available for most fixtures/lamps and can be used in a straightforward calculation of savings.

3.3 Task 3: Identify Impact Evaluation Sample

The number of participants in the GMU non-residential programs is small even though most of their program savings come from them. It is uncertain how many participants there will be in FY 2008 but it will not be very many. With small populations, sample sizes begin to approach the entire population. For example, to achieve a level of precision and confidence of 90% +/-10% from a population of 20 participants would require 16 in the sample. For a population of 15, 13 would be needed in the sample. Essentially, because of the expectation of a small participant population, it is expected that nearly all participants will be in the sample.

3.4 Task 4: 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 and a phone call to the participant to verify installation. As part of the process evaluation, the current process of verifying installation and recording that verification did occur will be reviewed and any needed changes identified and made. Minimal cost beyond the process evaluation should be needed.

3.5 Task 5: Calculate Gross Energy and Demand Impacts

It is expected that the same methodology used to develop the anticipated *(ex ante)* estimates of savings will be used for the measured *(ex post)* estimates. What may change are some of the input variables into the methodology, such as hours of operation. If sampling is employed, a weighting factor will be used to normalize the results to the full participant population. Demand impacts will be based on the kW/kWh ratio currently used in the anticipated *(ex ante)* estimates.

3.6 Task 6: 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 GMU in meeting the requirements with the AB2021 requirements and will be submitted to the California Energy Commission (CEC).

The final report will include:

E: Executive Summary

1. Introduction and Selected Evaluation Issues
    1.1. Program Overview
    1.2. Program Objectives
2. Process Evaluation Plan
    2.1. Research Issues and Objectives
    2.2. Description of Evaluation Efforts
3. Impact Evaluation Plan
    3.1. Research Issues and Objectives
    3.2. Methods & Data Sources
    3.3. Sample Design
4. Data Collection Plan
5. Process Evaluation Results
    5.1. Findings
    5.2. Recommendations
6. Impact Evaluation Results
    6.1. Findings
    6.2. Recommendations
7. Evaluation Based Recommendations

4 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 immediately upon the completion of FY 2008.

5 ESTIMATED BUDGET

Since the program administrator for GMU is Efficiency Services Group, much of the work effort could be combined among the five utilities for whom Efficiency Services Group is the program administrator. For instance, Task 1 and Task 2 would be about the same cost in total for the entire group of five as it would be for just GMU. With the impact evaluation tasks, it may be possible to also combine some of the evaluation efforts since methodology is likely the same among all five utilities. However, each of the five may have different higher priority programs that they should evaluate first. By task, the cost range should be:

- Task 1: Review Tracking System - $1,500 - $3,000
- Task 2: Review Program Procedures and Inter-Relationships (costs depend on the evaluation team) - $1,500 - $3,000
- Task 3: Identify Impact Evaluation Sample - $1,000 - $2,000
- Task 4: Installation Verification - $400 - $800
- Task 5: Calculate Gross Energy and Demand Impacts - $1,500 - $3,000
- Task 6: Process and Impact Evaluation Report - $5,000 - $6,000