

2008 Energy Efficiency Program Evaluation Plan

**Submitted To:
City of Biggs**

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TABLE OF CONTENTS

1	Utility overview	4
1.1	General Utility Background Information	4
1.2	Efficiency Programs Offered	5
1.3	Evaluation Priorities	7
1.4	Program Goals and Objectives	8
2	Process Evaluation Plan.....	9
2.1	Task 1: Review Tracking Systems	9
2.2	Task 2: Review Program Procedures and Inter-Relationships.....	9
3	Impact Evaluation Plan	10
3.1	Impact Evaluation Research Issues and Objectives.....	10
3.2	Methods and Data Sources	11
3.3	Task 3: Calculate Gross Energy and Demand Impacts and Verify Installation	11
3.4	Task 4: Process and Impact Evaluation Report.....	12
4	Other Potential NCPA-wide Evaluation Initiatives.....	13
5	Evaluation Plan Timing	14
6	Estimated Budget	15

1 UTILITY OVERVIEW

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. 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 Biggs (Biggs) to meet these requirements. This plan provides guidance and recommends evaluation, measurement, and verification (E,M&V) activities that will help Biggs 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 staff of the City of Biggs and the Biggs website. However, FY 2007 achievements identify residential lighting as the most important program in terms of energy savings for Biggs, but FY 2008 projections indicate that non-residential lighting will become the dominant program. Based on this review along with consideration of the very small size of the Biggs energy conservation program and the fact that most of the energy savings appears to be shifting to non-residential lighting, it is recommended that Biggs conduct the following EM&V activities:

- 1) A limited process evaluation of GMU's efficiency programs to ensure consistency in database tracking given the overlap in several program elements;
- 2) Verification of the savings for non-residential lighting measures through a review of the engineering assumptions;
- 3) Verification of installations through a review of the application and receipt documentation of sampled installations.

1.1 General Utility Background Information

The City of Biggs was founded in 1871 to serve the agricultural commerce in the region. The town has a population of about 1,800 and is located in the Sacramento Valley about 65 miles north of Sacramento. Currently, this utility serves 611 residential customers, 55 commercial customers, and 3 industrial customers. This is a summer peaking utility with a peak demand of 4 megawatts, which was reached in July of 2007. Its annual energy usage in 2007 was 16,200 megawatt hours (MWh).

Biggs is located in Climate Zone 11, which is in the central California valley, north of Sacramento. 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". The wettest months are November through March and 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 Biggs Municipal Utilities

Base Temp: 65F	Oroville
Heating Degree Days (HDD)	2,818

Cooling Degree Days (CDD) 1,422

1.2 Efficiency Programs Offered

Biggs offers energy efficiency programs to its residential and commercial/industrial markets. It has offered efficiency programs since 1997 but completely remodeled the program offerings in mid-2005.

2007 Program Summary

Current Residential Customer Programs:

- *Appliance Rebate Program:* Provides rebates to all customers who purchase an ENERGY STAR ® refrigerator (\$200), freezer (\$200), dishwasher (\$75) and or two-speed pool pump (\$100).
- *Energy Efficient Home Improvement Rebate Program:* Provides rebates to customers who install qualifying measures as described next. To receive a rebate for qualifying air conditioning equipment, a duct pressure test and duct repairs must be performed prior to an air conditioning rebate application.
 - **Air Conditioning Replacement** - customers that purchase and install new air conditioning with a high efficiency seasonal energy efficiency rating (SEER) can receive a rebate. Each system must come with a thermal expansion valve (TVX). The rebates range from \$400 to \$600 depending on EER and SEER ratings.
 - **Attic Insulation**- a rebate of \$0.30 per square foot is available if you install attic insulation up to an R-38 (energy efficiency) value. Existing insulation levels must be R-19 or less.
 - **Wall Insulation** - a rebate of \$0.30 per square foot is available if you install wall insulation with an R-13 or greater energy efficiency value;
 - **Whole House Fan** - install a whole house fan in your home and receive a rebate of \$150; **Attic Fan** - install an attic fan and receive a rebate of \$40 if electric or \$75 if solar powered.;
 - **Sun Control Screens** - install sun control screens and receive a rebate of \$1 per square foot. *Note: the sun control screens must have at least 70% shading coefficient and not applicable to north side application.*

Current School (In-Classroom) Programs:

- *Solar Schoolhouse Program:* Provides teachers funding to participate in the “Summer Institute for Educators” and by supplying Solar Schoolhouse Educational tools for classroom use.

Current Commercial/Industrial Customer Programs:

- *Energy Audit Program:* The City of Biggs offers on-site commercial energy audits that include a lighting assessment, HVAC assessment, equipment assessment, and a review of energy use.
- *Commercial Rebate Program:* The City of Biggs provides rebates for its non-residential customers for measures that focus on peak load reduction and energy savings. These measures include such things as attic insulation, window shade screens, air conditioning equipment, ceiling fans, appliances, high efficiency lighting retrofits, and maintenance of refrigeration/HVAC equipment.
- *Investment Grade Audit Program:* The City of Biggs offer investment grade audits for all school district buildings as a way to support the district in acquiring grant funding for energy efficiency retrofits.

Table 2 summarizes the 2007 results from the largest programs in Biggs’s energy efficiency portfolio.

Table 2: 2007 Summary of the City of Biggs Energy Efficiency Programs

Program Sector	Net Annual Energy Savings (kWh)	Energy Savings % of Total	Net Peak Demand Savings (KW)	Demand Savings % of Total	Incentives & Utility Install Cost (\$)	Mktg, E M & V, and Admin Cost (\$)	Total Program Costs (\$)
Residential Appliances	74	0.2%	0	0.0%	\$75	\$16	\$91
Residential HVAC	10,428	21.9%	4	40.0%	\$5,461	\$4,319	\$9,780
Residential Lighting	19,500	41.0%	4	40.0%	\$1,344	\$2,543	\$3,887
Residential Refrigeration	11,978	25.2%	2	20.0%	\$1,200	\$3,475	\$4,675
TOTAL RESIDENTIAL	41,980	88.3%	10	100.0%	\$8,080	\$10,353	\$18,433
Non-Res Process		0.0%		0.0%			\$0
Non-Res HVAC		0.0%		0.0%			\$0
Non-Res Lighting	5,570	11.7%	0	0.0%	\$2,267	\$907	\$3,174
Non-Res Refrigeration		0.0%		0.0%			\$0
TOTAL NON-RES	5,570	11.7%		0.0%	\$2,267	\$907	\$3,174
TOTAL	47,550		10		\$10,347	\$11,260	\$21,607

1.3 Evaluation Priorities

In 2007, a little over 40% of Biggs’s net annual energy savings came from residential lighting. However, the FY2008 forecast of net annual energy savings indicates a dramatic shift of program importance. The share of savings for residential lighting falls to 0% in FY2008 while non-residential lighting grows from 12% in FY2007 to nearly 95% in FY2008. Essentially, this entire projected FY2008 savings comes from a single project.

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 efficient non-residential lighting make up most of the projected energy savings for Biggs. Fortunately, the *ex ante* energy savings for non-residential lighting measures come from the relatively simple engineering calculations.

The evaluation budget for Biggs is relatively small and limits the extent of evaluation efforts that can be undertaken. It is our recommendation that both a process and impact evaluation be performed.

1. A simple process evaluation of Biggs’s efficiency programs consisting of a review of the database tracking system to streamline program reporting and enhance comparison between and among programs.
2. Verification of the savings and installations for non-residential lighting measures through a review of the engineering assumptions from the single non-residential project and measure installation receipts. A phone call to the facility for further spot verification will be made.
3. Possible participation in a larger NCPA-wide residential lighting study in FY 2009.

1.4 Program Goals and Objectives

Biggs offers its residential and commercial customers several rebate programs as a way to encourage them to purchase and install energy efficiency measures and make energy efficiency improvements.

1.4.1 Customer Eligibility

The programs are open to Biggs customers who install qualifying equipment and provide the proper documentation. All qualifying rebates are paid through crediting the customer's account.

1.4.2 Marketing Methods

This program is primarily marketed through its website, through the solar schoolhouse program, and via print materials including brochures, flyers, and the utility newsletter.

1.4.3 Program Implementer

The program is administered in-house.

2 PROCESS EVALUATION PLAN

The City of Biggs has a very small program with a limited number of participants. Currently, a simple spreadsheet database is maintained to track program participants and other program related data.

2.1 Task 1: Review Tracking Systems

The current tracking spreadsheets will be reviewed to insure that all the data needed is being maintained. This review will determine if more expedient ways to coordinate program tracking and measure program impacts can be found and recommend possible changes if applicable. Such changes would be made with the intent to streamline the reporting process to the CEC.

2.2 Task 2: Review Program Procedures and Inter-Relationships

This process evaluation would include a review of the materials currently used for recruiting customer to all of its programs. This review would also identify additional messages that Biggs may want to include in future program updates. This information would be supplemented by interviews with the program manager, focusing specifically on the ways on the following topics:

- Program process flow and inter-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, 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	<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

Since the focus of the FY2008 impact evaluation will be on the single project that includes significant non-residential lighting savings, M&V Option “A” is recommended. The evaluation will review the project report information. In order to accurately evaluate a typical lighting installation, all that is needed is a list of fixtures removed, fixtures installed, and operational hours. Standard wattages are available for most fixtures and can be used in a straightforward calculation of savings. Standard hour reductions are also available for occupancy sensors. Daylight sensor savings (if applicable) can be calculated using a combination of operating hours and standard weather data for the installation location.

3.3 Task 3: Calculate Gross Energy and Demand Impacts and Verify Installation

It is expected that the same methodology used to develop the *ex ante* estimates of savings will be used for the *ex post* estimates. What may change are some of the input variables into the methodology, such as hours of operation. Demand impacts will be based on the kW/kWh ratio currently used in the *ex ante* estimates. Measure verification will be accomplished through a review of the receipts submitted for the project with a follow-up phone call to spot check a sample of specific measures.

3.4 Task 4: 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 Biggs in meeting the requirements with the AB2021 requirements and will be used by Biggs to develop its submittal to the California Energy Commission (CEC).

4 OTHER POTENTIAL NCPA-WIDE EVALUATION INITIATIVES

Residential CFL Lighting: Biggs may also want to consider participating in a CFL lighting impact study. This study, which would involve members across several NCPA utilities, would document the current CFL installation rates, measure persistence, hours of use, free ridership, and free drivership rates. These findings could then be calibrated for Biggs to use when reporting its savings estimates to the CEC in Program Years 2009 and 2010.

5 EVALUATION PLAN TIMING

The 2008 Energy Efficiency Program Evaluation should begin as soon as the single non-residential project is completed. The reason for moving forward quickly in the program year is to be able to provide the Biggs program manager immediate feedback on program operation, efficiency measure assumptions, and program tracking. In addition, the measures that will be evaluated are not dependent on pre and post billing or metering data.

6 ESTIMATED BUDGET

It is estimated that the evaluation, as outline, should cost between \$3,000 and \$5,000. By task, the cost range should be:

- Task 1: Review Tracking System - \$500 - \$1,000
- Task 2: Review Program Procedures and Inter-Relationships - \$1,000 - \$1,500
- Task 3: Calculate Gross Energy and Demand Impacts and Verify Installation - \$1,000 - \$1,500
- Task 4: Process and Impact Evaluation Report - \$500 - \$1,000