
E, M & V Best Practices: Lessons Learned from California Municipal Utilities

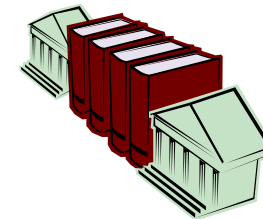
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January 27, 2009

Overview

California Senate Bill 1037 (Kehoe), signed into law in September 2005, established several important policies regarding energy efficiency.

- Created a statewide commitment to cost-effective and feasible energy efficiency
- All utilities consider energy efficiency before investing in any other resources to meet growing demand.
- Assembly Bill 2021 (Levine) added supplemental provisions in 2006, including the need to verify energy efficiency program results.



NCPA Participating Utilities

NCPA is a joint powers agency that provides support for the electric utilities operations of seventeen member communities and districts in Northern and Central California. The participating utilities^[1] in the E, M&V approach are:

- Alameda Power & Telecom
- City of Biggs
- City of Gridley
- City of Healdsburg
- City of Lompoc
- City of Ukiah
- Lodi Electric Utility
- Plumas-Sierra Rural Electric Cooperative
- Redding Electric Utility
- Turlock Irrigation District
- City of Shasta Lake (Non-NCPA member)
- Lassen (Non-NCPA member)

CA Public Municipal Utilities Reporting Requirements

- Identify all potentially achievable cost-effective electricity efficiency savings
- Establish realistic annual savings targets
- Report annually the energy and demand targets
- Report program cost effectiveness reporting using standard tests defined in the California Standard Practices Manual and the National Action Plan for Energy Efficiency

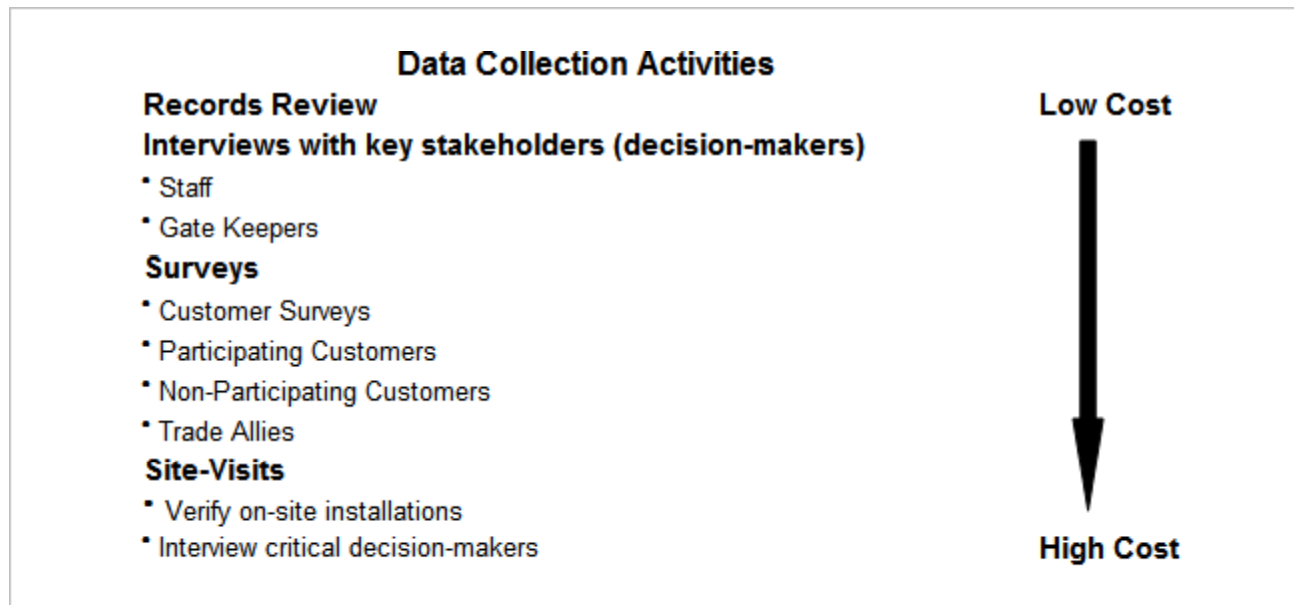
Guiding Principles of NCPA's Approach to Energy Efficiency

- Social and Environmental Responsibility
- Operational Energy Efficiency
- Demand-side Energy Efficiency
- Cost-effective Energy Efficiency

NCPA Program/Member Characteristics

- **Varied Utility Size**
 - Small utilities with 500 customers to large utilities with 100,000+ customers
- **Varied Funding Levels**
 - From slightly under \$50K funding in the City of Lompoc, to approximately \$3.7 million in Silicon Valley Power (SVP), with the average funding level of \$249,000 annually
- **Varied Experience with Energy Efficiency Programs**
 - Some NCPA utilities have maintained energy efficiency programs for years while others are just starting.
- **Overall Project Goal**
 - Develop an E, M&V framework to properly document the results achieved through these programs.
 - Included both process and impact evaluations

Successful and Cost-Effective Elements of a Process Evaluation



Review Tracking Systems

- Review the database tracking system to streamline program reporting
 - Enhanced regulatory compliance reporting process by standardizing templates/reports
- Review measures targeted in utility's residential and commercial energy efficiency program portfolios
 - Identify most cost-effective measures and which ones had achieved market transformation



Review Program Procedures and Inter-Relationships

- Review marketing materials used to recruit customers to participate in the energy efficiency programs.
 - Identified additional messages that the NCPA utilities may want to include in future program marketing efforts.
- Supplemented by interviews with program staff 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

Successful and Cost-Effective Elements of an Impact Evaluation

- **Establish Good Quality Participation Data**
 - Conducted a coordinated review of the program files and databases
 - Identified the type (deemed or custom calculated) and source of claimed energy savings
 - Provided estimates of impacts by site and the review would also identify contact information at each site

Match the Data Collection Strategy to the Data Needs

- On-site data collection is expensive and time consuming
 - So most saving estimates are derived from the deemed saving values of the DEER database
 - However, some form of installation verification is needed; either on-site, by telephone, or through invoice reviews
- More complex measures, those installed under non-residential custom program, sometimes require more rigorous evaluation techniques.
 - May include an engineer reviewing the submitted custom calculations and assumptions, short term metering, or with specific weather sensitive measures

Apply the Appropriate Analytic Approach

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

Assignment of IPMVP EMV& Protocols to a Sample of Program Measures

Measure Category	IPMVP Option				Comments
	A	B	C	D	
High-Efficiency lighting equipment	✓				Constant performance, low uncertainty in performance parameters
Lighting controls (occupancy sensors)	✓				
Lighting controls / daylighting		✓		✓	Can be analyzed with either end-use metered data set or simulation model
High-Efficiency HVAC equipment		✓		✓	Pre-/post-installation metering can be used alone or to prepare inputs to simulation models
HVAC Diagnostics		✓		✓	Datasets such as outputs from diagnostic tools may be used as analysis inputs
HVAC Quality Installation		✓		✓	Datasets such as outputs from diagnostic tools may be used as analysis inputs
High-efficiency motors	✓				
Variable speed drives		✓			
Building envelope measures				✓	
Weatherization			✓	✓	Billing record analysis is often used; since measures are envelope, simulation modeling is also effective
New construction whole house performance			✓		
Refrigeration measures		✓	✓		
Process measures			✓		
Appliances	✓	✓			
Water heaters and hot water measures	✓				

Key Lessons Learned/Best Practices

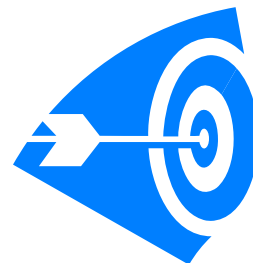
- **Don't Reinvent the Wheel**

- The resurgence of interest in the development, deployment, and evaluation of DSM programs has led to a greater standardization of industry requirements.
- Leveraged other existing work such as the National Action Plan Guidelines and the IMPVP E,M&V protocols and California Energy Efficiency Evaluation Protocols.



Target the Most Important Programs

Evaluation Priorities by Utility	Residential Programs	Commercial Programs
Alameda Power & Telecom		√
City of Biggs	√	
City of Gridley	√	
City of Healdsburg	√	
City of Lompoc	√	
City of Ukiah	√	
Lassen	√	
Lodi Electric Utility		√
Plumas-Sierra Rural Electric Cooperative	√	
Redding Electric Utility	√	
Shasta Lake	√	
Turlock Irrigation District		√



Allow Time in the Process for Mutual Education and to Build Trust

- Small utilities face a steep learning curve when tackling program evaluation for the first time.
 - NCPA and the Summit Blue team developed a series of workshops and planning meetings.
 - Allowed the utilities to learn about evaluation concepts while helping the evaluation team to understand the unique aspects of each individual utility.
 - Led to better understanding by all on how to develop effective evaluation plans.



Conduct Evaluations Across Multiple Utility Territories

- NCPA utilities will consider pursuing a collaborative effort across their entire service territories.
 - **Residential CFL Lighting:** Joint CFL lighting impact evaluation study to better assess current CFL installation rates, measure persistence, hours of use, free ridership, and free drivership rates.
 - **Residential Audits:** NCPA member utilities are considering participating in a joint impact evaluation to identify savings from audit programs

Report Findings Consistently to Facilitate Information Sharing

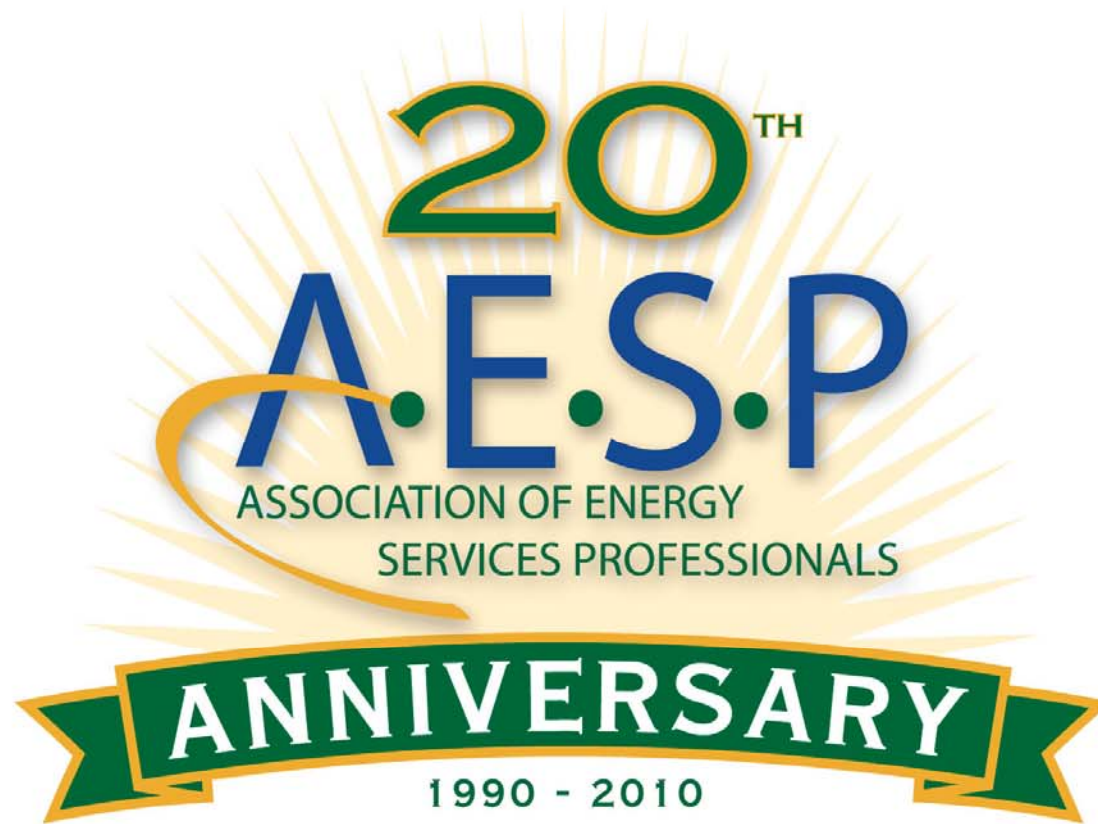
- These E, M&V reports needed to offer reporting consistency for NCPA as a whole,
 - The team developed a consistent, albeit somewhat generic, outline that was then modified for each utility report.

Conclusion

- Small utilities can effectively implement program evaluation activities that are both cost-effective and comprehensive.
- NCPA and the Summit Blue Consulting team worked together to develop an evaluation, measurement, and verification framework to properly document the results achieved through their energy efficiency programs.
- Questions?

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