

EVALUATION, MEASUREMENT & VERIFICATION PLAN

For *Hawaii Energy* Conservation and Efficiency Programs

Program Year 2010
(July 1, 2010-June 30, 2011)

Activities, Priorities and Schedule

3 March 2011

James Flanagan Associates

1. Purpose

This document presents an overview of the plan for determining the energy savings impacts of the *Hawaii Energy*¹ Conservation and Efficiency Programs (HECEP) (Programs), in conjunction with additional evaluation, measurement and verification (EM&V²) in support of the Programs and program infrastructure. The document summarizes roles and responsibilities, presents some of the evaluation issues considered in preparing the plan, and provides a general framework and schedule for EM&V activities and deliverables through January 31, 2012.³ This plan is based upon review of the Hawaii Energy Annual Plan Year 2010 and the Hawaii Energy EM&V report for Program Year 2009-2010.⁴

¹ <http://www.hawaiienergy.com/>

² Evaluation is a general term related to determining impacts, net and/or gross, at a program level or for the portfolio, and conducting other research or developing information (for example market studies) related to the programs. Measurement and verification relates to determining gross impacts at a project level. "Evaluation, Measurement and Verification" (EM&V) is a catch-all term that refers broadly to all of these related evaluation activities, typically as relates to programs or program components (as opposed to individual projects) and/or the entire program portfolio.

³ The plan may be updated as circumstances and new information dictate. The next evaluation plan will be prepared on approximately January 31, 2012 although this does not preclude the possibility that evaluation activities underway in the current cycle will continue beyond that date.

⁴ The *Hawaii Energy* Annual Plan Year 2010 is available at: <http://www.hawaiienergy.com/75/hawaii-energy-reports>. The *Hawaii Energy* EM&V Report for Program Year 2009-2010 is in the final draft stage and will be available at <http://www.hawaiienergy.com/75/hawaii-energy-reports> in March 2010.

2. Background

Pursuant to Hawaii Revised Statutes (HRS) sections 269-121 and 122, the State of Hawaii Public Utilities Commission (Commission), through Decision and Order No. 23258, filed on February 13, 2007:

- Established a Public Benefit Fund (PBF) for energy efficiency programs; and,
- Selected a Contract Manager (CM), Fiscal Agent (FA) and third-party, Public Benefit Fund Administrator (PBFA) and an EM&V Contractor (EM&V Contractor) to evaluate and support the Programs

These actions thus transitioned the administration of the energy efficiency programs from the Hawaiian Electric Company, Inc. (HECO), and its subsidiaries, Maui Electric Company, Ltd. (MECO), and Hawaii Electric Light Company, Inc. (HELCO) (Collectively the HECO Companies) to the Commission and the selected contractors.⁵

Through a competitive procurement process, the Commission selected Science Applications International Corporation, Inc. (SAIC) to serve as the PBFA and to offer the Programs to the HECO Companies' customers beginning on July 1, 2009. (Note that as a result of restructuring within SAIC, this contract is now administered by R.W. Beck, an SAIC Company.) James Flanagan Associates (JFA) was retained to serve as the CM for the Commission. The CM is responsible for: (a) administering the contract between the Commission and the PBFA; and (b) managing the independent EM&V of the energy efficiency programs administered by the PBFA through December 31, 2013 (and has an option, with mutual agreement, to extend for a three year period). Bank of Hawaii was selected as the FA and is responsible for the financial management of the PBF. ECONorthwest was selected as the EM&V Contractor through a competitive procurement process. (Note that as a result of personnel migration and restructuring, this work is now being conducted by Evergreen Economics; the change allowed all key members of the EM&V Contractor team remain in place and performing their duties per the contract.)

This document constitutes the second update of the EM&V Plan for the initial two-year implementation contract that has been awarded to the PBFA. The initial two-year program period is comprised of two one-year program cycles:

- Program Year (PY) 1 (2009 Program cycle) -- July 1, 2009 through June 30, 2010; and,
- Program Year (PY) 2 (2010 Program cycle) – July 1, 2010-June 30, 2011.

⁵ Note that Kauai Island Utility Cooperative (KIUC) does not participate in the PBF and operates its own programs. See: <http://www.kiuc.coop/>

The initial EM&V Plan (dated 15 July 2009) covered the first one-year program cycle. This EM&V Plan covers the second one-year program cycle.

3. Contract Manager Evaluation Responsibilities

In addition to facilitating the relationship between the Commission and the PBFA for program implementation, the CM is responsible for managing independent EM&V to monitor and support the Programs. The management of these evaluation functions includes the preparation of evaluation plans with input from the Technical Advisory Group (TAG).

The CM is also responsible for periodically preparing evaluation plans, such as this one, with budgets, scopes of work, and prioritization of activities. As indicated in the CM's contract, in preparing the evaluation plan, the CM will assess the need for and propose the following types of studies:⁶

- a. Measure Savings Characterization Studies
 - Technical Reference Manual (TRM)/Workpaper Review
 - Fieldwork (as needed)
- b. Market Characterization and Baseline Studies
 - *Full or partial market, measure and/or sector-oriented studies*
 - *Penetration, saturation and potential studies*
- c. Savings Verification
 - Verification
 - *Impact Evaluation and Cost-Effectiveness Analysis*
- d. *Process Evaluation*
 - *Program/Portfolio Implementation*
 - *Benchmarking.*

Using results of the EM&V Contractor's efforts, the CM is also responsible for facilitating completion of: (a) an annual impact evaluation report that summarizes and analyzes the energy efficiency savings, total resource benefits and costs, and societal benefits of the Program portfolio, and (b) an annual impact savings verification report in conformance with the evaluation plan. Pursuant to HRS section 269-124(7), every three years the CM shall also provide for a separate verification by an independent auditor of the reported savings associated with the Programs. The first independent audit was provided to the Hawaii State Legislature on January 2, 2011; the next is due on January 2, 2014.

⁶ Items in italics are not directly enumerated in the contract but represent important EM&V functions.

4. Evaluation Budget

The budget for evaluation studies conducted by the EM&V Contractor is currently set at just under five percent of the overall Program budget (including customer incentives). The total evaluation budget for PY 1 and PY 2 is thus approximately \$1,773,618, as described in Table 1 below.

Table 1: Program and EM&V Contractor Budgets for PY 1 and P Y2⁷

	PY1: 2009-2010	PY2: 2010-2011	Total
Program Budget	\$17,833,960	\$17,638,406	\$35,472,366
EM&V Contractor	\$891,698	\$881,920	\$1,773,618
EM&V % of Program Budget	5.0	5.0	5.0

The EM&V budget for subsequent years will presumably remain at approximately 5 percent of the total Program budget for subsequent years.

The EM&V expenditures for PY 1 and PY 2 were “frontloaded” to a degree, in recognition of the additional attention required for start-up activities in PY 1. Thus, approximately \$1,000,000 was expended to evaluate PY 1 and the remainder has been reserved for PY 2.

5. Overarching Issues for Evaluation Framework

In consultation with the Commission and TAG, and based on EM&V results from PY 1 (2009-2011) the CM proposes establishment of this overall evaluation framework for the Programs for PY 2 (2010-2011). The CM’s recommendation is to provide a comprehensive EM&V approach that focuses evaluation resources on:

- a. Review and approval of *ex ante* savings estimates and ensuring that the sound values and methodologies are used for estimating energy savings in the *Hawaii Energy Technical Reference Manual (TRM)*. The TRM is updated for each Program cycle, and/or as needed, and includes the following information:
 - Stipulated energy savings and demand reductions values and calculation assumptions for specific efficiency deemed measures and deemed calculated measures when such values can be defined with sufficient certainty, including applicability conditions.

⁷ These figures are for the EM&V Contractor and do not include budgets for the CM or an independent audit to be conducted for the Legislature once every three years.

- Custom measure protocols consisting of standard engineering calculations and/or other methods that are used for determining energy savings and/or peak demand reductions for efficiency measures which do not have applicable stipulated savings values
 - Savings estimates for known and new measures, kW and annual kWh
 - Measure lifetime defined as “effective useful life” (EUL) – the median expected number of years the measures installed (or activities undertaken) will be in place and operable, that is, producing saving
 - Standard calculation procedures for well-established measures
 - Values, such as incremental measure costs, for use in calculating program cost-effectiveness
 - Net-to-gross (NTG) and spillover – based on existing values.
- b. *Ex post* impact evaluations of all Programs with an emphasis on measures and sites with high impact (and/or relatively high savings uncertainty) while allowing for expenditures on other useful evaluation activities.
- The overarching approach to *ex post* evaluation will be based on verification of installed measures, using savings claims approved in the TRM review. The verification activities are conducted to validate a sample of the site-by-site, measure-by-measure savings reported by the PBFA including cost-effectiveness program and portfolio analyses using the Total Resource Cost Test. The approach will include database review and verification, telephone verification, site inspections and “desk” reviews of PBFA project reports.

Verified information is expected to include:

- Annual Net Electric Energy Savings
- Total Resource Benefits
- Peak Demand Performance
- Island Equity
- Market Transformation⁸
 - Retro-Commissioning Program Launch
 - State Buildings (10 sites)
 - Community Partnership (4 agreements).

⁸ Market transformation metrics will be reviewed by the EM&V Contractor and/or the CM, as appropriate.

- c. Additional *ex post* impact evaluation (including onsite metering and/or billing analysis) for measures for which existing TRM values are uncertain or may need updating due to evolving market conditions (as needed):
 - Custom projects and/or HVAC
 - Residential solar hot water heaters
 - Operating hours for residential and business lighting (review and analysis of secondary data, supplemented by limited primary data collection).

- d. Follow-up on measures that received less attention in PY 1 (2009-2010) *ex post* EM&V:
 - Residential Low Income CFL verification surveys
 - Inspection of measures installed at military sites (residential and non-residential).

- e. Process evaluation of Program implementation including issues such as:
 - Customer satisfaction
 - Leveraging of trade allies
 - Analysis of program staffing, infrastructure and operations
 - Targeting and incentives
 - Marketing, outreach, and training
 - Tracking, and database management
 - Development of new strategies, and,
 - Progress toward short-, mid- and long-term goals.

- g. Special assessment of initiatives offered through *Hawai Energy's "New Programs"* incubators (both residential and business). The assessment will include:
 - Program design review
 - Baseline assessment
 - Assessment of data and tracking requirements and plans
 - Identification of EM&V requirements (current and future)
 - Initial EM&V
 - Review of program accomplishments and transition gateways.

- f. An analysis of the economic impacts of the Programs.

- g. Coordination with PBFA market research, if such research is undertaken.

- h. Other evaluation activities, as needed, to be developed in conjunction with TAG and interaction with other energy efficiency research programs in Hawaii, in particular those related to the Hawaii Clean Energy Agreement of 2008, residential

and commercial saturation studies and other studies undertaken by the HECO Companies, the American Reinvestment and Recovery Act of 2009 (ARRA), Commission Docket 2010-0037, Instituting a Proceeding to Investigate Establishing Energy Efficiency Portfolio Standards (EEPS), Pursuant to Act 155, Session Laws of Hawaii 2009 and Hawaii Revised Statutes Section 269-96, and other related activities.

6. Rationale for Proposed PY 2 (2010-2011) EM&V

The following issues have been considered in the development of this EM&V plan.

- a. The TRM for PY 1 (2009-2010) was reviewed and approved by the EM&V Contractor. No changes were required for PY 1, however, some changes were requested for PY 2 (2010-2011) (in addition to changes required to generally update the TRM, for example, for new program offerings). The *ex ante* estimates provided in the TRM for PY 2 will be reviewed, for completeness and accuracy, appropriateness, documentation and applicability of sources and assumptions, inclusion of new measures, and to prioritize measures for evaluation efforts according to uncertainty in values as a function of portfolio risk. The Commission may request changes to the TRM based on recommendations from the CM and advice from the EM&V Contractor. If such changes are requested, they will be implemented for the applicable Program cycle.
- b. Impact evaluation in the form of verification (database review, document review, selected onsite and/or telephone verification of a sample of project applications and documentation reports) is of high importance for due diligence in monitoring Program implementation.
- c. Additional impact evaluation will likely be recommended for selected programs/measures, pending assessment of program activity as of March 31, 2011 (three-quarters of the PY 2 Program cycle).
 - The market for residential solar hot water heaters has been evolving, and may not be capturing the same population upon which *ex ante* savings estimates were measured. Furthermore, measures have been in place for a time, and whether the performance for the life of the measure is in accord with *ex ante* assumptions, or is differing from those is an appropriate question. Residential solar hot water heaters account for an estimated 7 percent of Program portfolio savings for PY 2 (2010-2011). Thus, additional EM&V, likely including onsite inspections and billing analysis will be conducted to study this measure. Changes to *ex ante* TRM values, if recommended, would be incorporated for PY 3 (2011-2012) and beyond. These activities will be conducted in conjunction with a process evaluation of the program, focusing on a new financing initiative.

- Since customized projects and some nonresidential HVAC projects have higher uncertainty than installations for which *ex ante* measure savings are described in the TRM, and since custom project account for 6 percent of Program goals and nonresidential HVAC for 18 percent, EM&V resources will be devoted to additional analysis of the savings from these programs (including engineering review, site inspection and/or metering, and additional analysis as needed).
 - High efficiency lighting still dominates the Program portfolio, with CFLs anticipated to capture 23 percent of Program savings (19 percent residential and 4 percent business). Research in other jurisdictions (e.g., California) has dramatically reduced estimates of savings for these measures. These reductions are driven in part by operating hours, which can depend on where the measures are installed, and the level of measure saturation. EM&V conducted for PY 2 (2010-2011) will review the applicability of these estimates for the Programs, given market conditions in Hawaii including usage patterns, saturations and market acceptance in conjunction with the rollout of federal lighting standards to inform assessment of lighting savings *ex ante* estimates for PY 3 (2011-2012).
- d. Program activity PY 1 (2009-2010) which was were addressed only lightly in the verification component of the EM&V included installation assessment for Residential Low Income CFLs and onsite inspections of residential and non-residential military sites. Additional attention will be devoted to these areas during the current evaluation cycle:
- Residential Low Income CFL verification surveys. The bulk of measures were distributed in Q4 of PY 1 and therefore received less EM&V attention in the Hawaii Energy 2009-2010 EM&V Report, since sampling for onsite visits was based on participation through March 31, 2009.
 - Inspection of measures installed at military sites (residential and non-residential). Achieving access to these sites requires additional lead-time and coordination for onsite visits, and was not completed for the *Hawaii Energy* 2009-2010 EM&V Report.
- e. Current net-to-gross (NTG) savings ratios were reviewed by the EM&V Contractor in conjunction with review of the PY 1 (2009-2010) TRM and found to be generally consistent with NTG values used in other jurisdictions. Given that approaches used to measure NTG ratios have been shown to produce unstable results, and given that the definition of NTG is controversial in the presence of market effects from prior programs and existing Program and non-program activity (which contributes to the instability and potential unreliability of measurements), the CM recommends retaining the stipulated value (.73) described in the TRM. This

approach balances the desire to ensure that claimed savings are “real” and would not have occurred in the absence of the Programs while avoiding expenditure of EM&V resources on activities that yield results that may at best be unreliable and/or could contribute to analytic uncertainty of program savings results. This approach will be monitored in subsequent Program cycles.

- f. A process evaluation will build on information developed in the *Hawaii Energy* EM&V Report for Program Year 2009-2010. Of particular interest for purposes of the evaluation will steps taken to incorporate and/or build upon feedback from prior *Hawaii Energy* EM&V, to ensure that the feedback mechanism envisioned by the Commission is operating effectively.
- g. An analysis of the economic impacts of the Programs will be conducted using input-output analysis to calculate changes in a regional economy due to specific activities, in this case, the *Hawaii Energy* Programs.
- h. “New Program Incubators” or pilot projects, are anticipated to account for 12 percent of Program impacts (7 percent residential and 5 percent business). Since there is significant uncertainty, as well as significant promise, with the pilot programs, special EM&V attention will be devoted to these programs during PY 2 EM&V.
- i. Determining “multiplier” effects of investments in energy efficiency is a relatively new area of interest, but an important one given the desire to promote “green jobs” and a “green economy.” An economic analysis of the Program effects on the local economy will be conducted as part of PY 2 (2010-2011) EM&V.
- j. Where possible, EM&V activities will be conducted in a manner that evaluates and supports the Programs, improves the analytic infrastructure for the Programs, and/or provides information useful for, and in a suitable format coordination with ongoing state and utility research (e.g., HECO residential and commercial saturation studies, Hawaii Clean Energy Agreement activities, federal ARRA funding and the Commission’s EEPS Docket.
- h. The EM&V Contractor must continue to coordinate with the PBFA in terms of data tracking protocols to ensure completeness and suitability for subsequent evaluation requirements, especially for new/non-standard activities.

7. Key Dates for PY1 2009-2010 and-PY2 2010-2011 Verification Activity

Preparation and approval of the PBFA's annual savings claim will proceed on a regular schedule for Program Years not subject to an independent audit.⁹ In years not subject to the independent audit, the verification activity will follow a slightly longer timeframe, as described in Table 3. Information contained in the table is drawn from the PBFA contract. The timeframes proposed for reviewing and preparing revisions to documents submitted by the PBFA are relatively short. In order to meet these timeframes it is anticipated that key documents will be submitted to the CM by the PBFA on schedule and that an accurate and complete representation of program accomplishments through March 31, 2011 (three-fourths of the Program year) will be provided to the EM&V Contractor before May 1 2011 with additional true-up of the final Program data to follow before August 1, 2011. The schedule for EM&V activities is outlined in Table 2, below.

Table 2: Key EM&V Deadlines for PY2 (2010-2011)

	Prepared By	Date
Technical Reference Manual	PBFA	Fall, 2010
Complete Program Data and Documentation through March 31, 2011	PBFA	April 25, 2011
Complete Program Data and Documentation through June 30, 2011	PBFA	August 1, 2011
Draft Annual Report	PBFA	September 1, 2011
Annual Report	PBFA	October 1, 2011
Annual Savings Verification Review Process	CM, EM&V Contractor	November 30, 2011
Legislative Annual Report (any changes to Impacts)	CM	December 1, 2011
Final Determination of Savings	Commission	January 1, 2012
Final EM&V Report	EM&V Contractor	January 1, 2012

⁹ Every third year, for example in 2014, the schedule will be accelerated to allow for a Fiscal Audit.