

RTR Appendix

Southern California Edison, Pacific Gas and Electric, Southern California Gas, and San Diego Gas and Electric (“Joint Utilities” or “Joint IOUs”) developed Responses to Recommendations (RTR) contained in the evaluation studies of the 2010-2012 Energy Efficiency Program Cycle. This Appendix contains the Responses to Recommendations in the report:

<p><i>HVAC Energy Efficiency Maintenance Study</i> (2010, Davis Energy Group, Inc., Calmac ID# SCE0293.01)</p>
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The RTR reports demonstrate the Joint Utilities’ plans and activities to incorporate EM&V evaluation recommendations into programs to improve performance and operations, where applicable. The Joint IOUs’ approach is consistent with the 2013-2014 Energy Division-Investor Owned Utility Energy Efficiency Evaluation, Measurement and Verification (EM&V) Plan (version 3) ¹ and CPUC Decision (D.) [07-09-043](#) ².

Individual RTR reports consist of a spreadsheet for each evaluation study. Recommendations were copied verbatim from each evaluation’s “Recommendations” section. ³ In cases where reports do not contain a section for recommendations, the Joint IOUs attempted to identify recommendations contained within the evaluation. Responses to the recommendations were made on a statewide basis when possible, and when that was not appropriate (e.g., due to utility-specific recommendations), the Joint IOUs responded individually and clearly indicated the authorship of the response.

The Joint IOUs are proud of this opportunity to publicly demonstrate how programs are taking advantage of evaluation recommendations, while providing transparency to stakeholders on the “positive feedback loop” between program design, implementation, and evaluation. This feedback loop can also provide guidance to the evaluation community on the types and structure of recommendations that are most relevant and helpful to program managers. The Joint IOUs believe this feedback will help improve both programs and future evaluation reports.

¹ Page 336, “Within 60 days of public release of a final report, the program administrators will respond in writing to the final report findings and

recommendations indicating what action, if any, will be taken as a result of study findings. The IOU responses will be posted on the public document website.” The Plan is available at http://www.energydataweb.com/cpucFiles/pdaHomeDocs/2/2013-2014_Energy_Efficiency_EMV_Plan.zip (visited on 10/1/14).

² Attachment 7, p.4, “Within 60 days of public release, program administrators will respond in writing to the final report findings and recommendations indicating what action, if any, will be taken as a result of study findings as they relate to potential changes to the programs. Energy Division can choose to extend the 60 day limit if the administrator presents a compelling case that more time is needed and the delay will not cause any problems in the implementation schedule, and may shorten the time on a case-by-case basis if necessary to avoid delays in the schedule.”

³ Recommendations may have also made to the CPUC, the CEC, and evaluators. Responses to these recommendations will be made by Energy Division at a later time and posted separately.

EM&V Impact, Process, Market Assessment Study Recommendations

Study Title: HVAC Energy Efficiency Maintenance Study (SCE0293.01); Published December 29, 2010

Program: Commercial HVAC Quality Maintenance Program

Author: Davis Energy Group & Team

Item #	Page	Findings	Best Practice / Recommendations	Recommendation Recipient	Disposition (Accept, Reject, or Other)	Disposition Notes (e.g. Description of Specific Program Change or Reason for Rejection or Under Further Review)
1	E-1 - E-2; 69	Uncertainties are inherent in programs such as these and are not well accounted for. There are many interrelated sources of uncertainty, including measurement errors, uncertainties in predicting human behavior, and the compounding effect of performing calculations on imperfect data. It is impossible to eliminate all sources of uncertainty, but they should be mitigated where possible.	A good understanding of uncertainties by program designers, contractors, and technicians is important.	All IOUs	Other	This recommendation lacks specifics, however, the following are the IOU's general response to current activities: a.) There are currently several studies underway to understand the uncertainties faced by contractors and technicians including ED-led HVAC Studies, HVAC-4 HVAC Deemed Measures and HVAC-2 Quality Installation b.) A high level of uncertainty was accounted for in ex-ante savings estimates, but the 2010-2012 WO32 EM&V study suggests that uncertainty may be even higher than estimated, and includes the potential for negative savings. The study calls for programs to account for these negative savings, but this would have a detrimental effect to program cost effectiveness, which is already low. A better approach would be to modify program policies to largely prevent the potential for negative savings. For example, the WO32 EM&V study identifies the issue that technicians are increasing minimum ventilation as part of their efforts to repair and adjust economizers. It also indicates that economizer leakage alone may satisfy ventilation requirements, and that technicians use rules of thumb to set ventilation positions. A requirement that ventilation position may not be adjusted unless requirements are calculated and measured ventilation is found to be low would drastically reduce instances of technicians increasing ventilation unnecessarily. In addition, integration with computerized diagnostic tools with sensor inputs and providing Fault Detection and Diagnostics can assist with measurement error. The effect of measurement uncertainty should be investigated further through field testing of treated units in order to validate the theory that contractors stop at the worst allowable installation and do not aim at attaining target values. Contractors should be encouraged to shoot for the target instead of 5 degrees of superheat or 3 degree of sub-cooling. c.) For SDG&E, program implemented requirements in 2010 that superheat and sub-cooling tolerances both must be met for TxV and Fixed metering devices. The frequency of field side by side observations increased in 2011 to include multiple rooftop training and observation meetings upon initial technician training and quarterly evaluations thereafter. These address uncertainties in technician delivery, skill and may reveal sources of measurement error or order-of-operations that may affect delivery.
2	E-2; 69-70	Quality maintenance programs have the potential to be successful, but their design and structure could be improved;	Additional screening and more sophisticated diagnostic/servicing approaches would benefit future programs.	All IOUs	Accept	The IOUs agree that addition and/or improving screening and diagnostics would benefit programs. a.) Standard 180 Maintenance task requirements, adopted since 2010, promotes comprehensive HVAC screening and diagnostics. In addition to the diagnostic and screening improvements over the past few years, the IOUs programs are being revamped and are looking at all available research to determine the best screening and diagnostic/servicing approaches. b.) Regarding diagnostics, the QM programs have continually improved diagnostics from 2010 through 2013. A Purdue evaluation of FDD protocols suggests further improvements are possible by continuing to improve FDD algorithms and accepting additional high-performing FDD tools into the program. c.) Regarding screening it would be beneficial to introduce tools to help participants decide between Early Retirement, tune-ups and Quality Maintenance, and Advanced Retrofit Add-On Measures. The programs could leverage the decision tree tools that the DOE has developed for the Advanced RTU Campaign to fill this need. WHPA has undertaken a project of providing guidance to technicians seeking to implement the standard on RTUs with Economizers.

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3	E-2; 70	Human factors are significant but are poorly understood. The behavior, motivations, preparation, and constraints on technicians, owners, tenants, contractors, and EM&V specialists can make or break a program.	This is an area that has been overlooked in the field of behavioral research, and a better understanding of why people do what they do is critical;	All IOUs	Accept	While the Programs do not have the funding to perform this specific type of in-depth research, the IOUs strongly support continued research in this area and will continue to work with EM&V specialists to continuously improve participation, training, and savings based on a better understanding of contractor, employer, and building owner motivations. There are currently two IOU studies (CA HVAC QI/QM Customer Decision-Making Study and the California HVAC Contractor & Technician Behavior Study, Phase II) underway to understand the behavior, motivations, preparation, and constraints on technicians, owners, tenants and contractors. The IOUs anticipate that the studies' results, in addition to studies that provide insight on marketing to homeowners, and suggested process approaches will improve contractor participation and homeowner education.
4	E-2; 70	Measurement and verification processes must be improved. One-time field EER measurements appear to be of marginal value since uncertainties can approach ±20%. Even with high-quality, time-series EER measurements, there is uncertainty in simulating the annual kWh savings, in part due to behavioral factors affecting occupancy and thermostat patterns.	EM&V processes and instrumentation need to be improved and integrated with program delivery, quality control and reporting; Longer term, broadly implemented pre- and post measurements of kWh consumption would reduce uncertainty, and could be implemented using utility smart meters and/or web based sub metering.	All IOUs	Accept	The IOUs do not conduct the impact evaluation for these programs but support broadly implemented pre-post whole building and/or submetering, such as measuring savings using the full-systems approach rather than measure-by-measure. One-time EER field testing and limited post-inspections may not yield representative or accurate results. Potential metering of systems through smart meters could provide a continuous process to determine the effect of aging on systems. Improving our understanding of system wear and tear will lead to improved savings and program delivery. The IOUs agree that EM&V should be more integrated with program delivery and seek greater collaboration with Energy Division.
5	E2-E3; 70	Over the long term, achieving large energy savings might be possible with replacement of existing systems and integration with whole-building energy efficiency measures.	Intuitively, the whole-building approach to energy efficiency should be much more effective than implementing energy efficiency measures in a piecemeal fashion, with the potential to achieve savings of over 50%.	All IOUs	Other	<p>While the IOUs are revamping their HVAC maintenance programs and will consider adding whole-building energy efficiency measures, it should be noted that comprehensive approaches that involve building shell, HVAC system downsizing, and whole-building approaches only offer the potential to achieve greater savings per building. The barriers are higher program administrative costs, higher customer costs (in both time and resources), and current Regulatory policies that work at cross-purposes to this goal.</p> <p>This approach is more much more capital intensive for program participants which will restrict the market potential. In some cases, it is more effective to aim for smaller, incremental savings across a larger number of buildings. Reaching vast numbers of customers and servicing millions of HVAC systems may be more effectively achieved by removing participation barriers associated with more costly whole-building approaches. One-stop and low-cost maintenance programs fill an important niche in delivering immediate and widespread HVAC savings.</p> <p>For RQI, the integrated approach can be effective when combined with a strong HVAC support system, including training, QC, and QA. However, RQI and EUC: Home Upgrade currently work at cross-purposes, with both programs competing for the same HVAC jobs. Home Upgrade currently provides higher incentive for lower quality work (without requiring or QC'ing on manual J, for example). The support provided through efficiency programs needs to balance the needs of individual sectors such as HVAC systems, with training and hand-offs to other market actors, for programs like Home Upgrade.</p>

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6	71-72		<p>Collaboration Strategies:</p> <p>(a) Work with the Western HVAC Performance Alliance;</p> <p>(b) Sponsor a Short-Term Pilot: The pilot could form the stage for human factor research and a test case for advanced measures. This pilot could also serve to support the integration of ACCA Standards 4 and 180 into programs as a way to achieve persistent savings. This pilot would initially be challenged to provide cost-effective savings, but would ultimately provide the intelligence and the confidence for a more extensive program with significant energy and demand savings;</p> <p>(c) Establish and Support a Diagnostic Protocol and Testing Taskforce: A public process that involves all stakeholders is needed to develop, lab test, field test, and pilot test a new diagnostic protocol.</p> <p>(d) Establish and Support a Web-Based Monitoring Taskforce;</p> <p>(e) Policy Changes - utilities, the CPUC, and other stakeholders can work towards making policy improvements. The DEER database needs modification, which is both a technical and a policy problem. Sufficient lab and field studies must be conducted to provide the technical foundation needed to make changes in DEER to more fully recognize that savings from QM and QI are real and can be implemented in the field by qualified technicians. Then a more open process is needed to implement the research results into the DEER to allay the existing distrust of the results. Even more important is having a recognized work paper procedure to calculate the impact of targeted programs for kWh savings with and without demand response.</p>	All IOUs	Other	<p>The IOUs' programs are being revamped and we will continue to collaborate with the WHPA to refine the program design. The IOUs will consider each one of these program design changes. The program actively participates in the WHPA QM subcommittee, and has worked with Emerging Technologies to review, vet and deploy technologies that support increased energy savings and/or more comprehensive services during HVAC maintenance visits. When the programs' redesigns are complete the IOUs will discuss how this recommendation is being adopted in the final program design.</p> <p>The IOUs also agree that the DEER database needs both technical and policy modifications. To date only relatively minor updates for new code cycles have been performed. More meaningful updates would be calibration of commercial baseline models against existing stock, migration to a more modern engine such as EnergyPlus, and creation of a flexible framework that can incorporate more sophisticated savings algorithms based on site measurements or observations, not just building type and climate zone. Policy modifications would recognize non-compliance and degradation as discounts to code savings attribution, and as opportunities for utilities to realize savings. Under the current structure these savings are not recognized, even if utility programs achieve them. Policy direction is not well coordinated. Some guidance indicates that only a code baseline is acceptable for IOU programs, while AB 758 and the strategic plan recognize that there is significant opportunity in upgrading the existing building stock and addressing maintenance issues that have resulted in a degraded stock of HVAC units. Existing baselines, whole building savings methodologies, and the allowance of more sophisticated deemed algorithms are all needed to address these issues.</p>