

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 2013-2015 Energy Efficiency Program Cycle. This Appendix contains the Responses to Recommendations in the report:

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| <i>RTR for the Impact Evaluation of 2015 Commercial Quality Maintenance Programs (HVAC3)</i> (DNV GL, Calmac ID #CPU0117.04, ED WO #ED_D_HVAC_3) |
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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 2013-2016 Energy Division-Investor Owned Utility Energy Efficiency Evaluation, Measurement and Verification (EM&V) Plan¹ and CPUC Decision (D.) 07-09-043².

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/cpuc>.

² Attachment 7, page 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 been 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.

Response to Recommendations (RTR) in Impact, Process, and Market Assessment Studies

Study Title: Impact Evaluation of 2015 Commercial Quality Maintenance Programs (HVAC3)
Program: HVAC
Author: DNV GL
Calmac ID: CPU0117.04
ED WO: ED_D_HVAC_3
Link to Report: http://www.calmac.org/publications/HVAC3_2015_Impact_Report.pdf

| Item # | Page # | Findings | Best Practice / Recommendations (Verbatim from Final Report) | Recommendation Recipient | Disposition | Disposition Notes |
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| | | | | If incorrect, please indicate and redirect in notes. | Choose: Accepted, Rejected, or Other | Examples: Describe specific program change, give reason for rejection, or indicate that it's under further review. |
| 1 | 107 | HVAC Quality Maintenance—QM: The 2015 evaluation added promising new field instrumentation to determine refrigerant cycle performance. The equipment was used for the evaluation of the coil cleaning measure in this evaluation but it could be applied to all measures either individually, or the comprehensive QM measure. | Continuing to develop in-field performance measurement. Humidity sensors could be added to improve estimation of the coil bypass factor. | PG&E, SCE, SDG&E | Accepted | Any changes to required instrumentation or data collection by participating contractors would need to be evaluated for cost-effectiveness, costs imposed on contractors or customers, and potential program participation barriers. |
| 2 | 103 | HVAC Quality Maintenance—QM: The link between the tracking data claims and the implementer data is not well established. We found it difficult to use the large volume of data collected by the programs, without this link. | Improve the data that support tracking system claims | PG&E, SCE, SDG&E | Accepted | Any changes to data collection and tracking system would need to be evaluated for cost-effectiveness and potential program participation barriers. |
| 3 | 106 | HVAC Quality Maintenance—QM: This evaluation developed savings estimates by using repeatable field measurements that correlate to laboratory performance data for coil cleaning and RCA measures. It also provided an evaluation methodology that accounted for variability across building types and climate zones through modeling, which made data collection efforts more cost-effective. | We recommend scaling this approach to add sample points and implementer data can be used to support more accurate savings estimates. | PG&E, SCE, SDG&E | Other | This appears to be a recommendation for the evaluators. We agree increasing the sample size and use of the implementer data will improve the calibration of DEER savings. |
| 4 | 103 | Commercial HVAC Quality Maintenance—QM: The results from this evaluation suggest that the coil cleaning and refrigerant charge aspects of QM provide marginal energy impacts. | We recommend continuation of pilots and development of holistic measures including improvement of previously installed non-functioning advanced digital economizer controls and increased incentives to replace the dirty, rusty, poorly functioning units as opposed to maintaining them. | PG&E, SCE, SDG&E | Accepted | We agree that it would be preferable to replace rather than repair old non-functioning economizers. However, current DEER savings combined with the REA EUL for economizers make it challenging to achieve a TRC greater than 1. |

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| 5 | 103 | Commercial HVAC Quality Maintenance—QM: We found that the newer advanced digital economizer controllers (referred to as ADEC) were malfunctioning due to setup errors rather than equipment failure more often than the older analog type. | Recommend that programs increase training on how to install and program the units, as they are more complicated and we found setup errors such as incorrectly wired sensors and incorrectly programmed controllers. | PG&E, SCE, SDG&E | Accepted | Current program requirements prior to starting advanced economizer work include WE&T economizer training completion through itsaboutq.net or through the National Comfort Institute (NCI). The IOUs recognize that there is a need for reinforcement of the ADEC training for the contractor industry. The programs will continue to work closely with the manufacturers of ADEC controllers to keep contractors up to date on this evolving technology and provide the latest guidance on installation, setup and troubleshooting. Finally, as we continue to develop pilots, the IOUs will evaluate incorporating additional training. |
| 6 | 104 | Commercial HVAC Quality Maintenance—Economizer Repair: The California Title 24 Standards require that economizers be integrated. | We recommend that the programs include this aspect of economizer control setup in their training courses. | PG&E, SCE, SDG&E | Accepted | WE&T efforts have incorporated these training courses in support of HVAC programs. Economizer control setup training is currently provided as a part of our economizer training module. Credentials from an approved provider is required to perform any work on economizers. Credentials from one of the following is required to perform the final functional test: NEBB, TABB, AABC, NBC, and NCI Light Commercial. |
| 7 | 107 | Commercial HVAC Quality Maintenance—Economizer Repair: Initial investigation into air flow suggests there is room for further investigation. | Collecting economizer airflow data to further quantify outside airflow rates, particularly at low flow conditions. And continue with more investigation of baseline economizer outside air flows. | PG&E, SCE, SDG&E | Accepted | The IOUs will evaluate incorporating airflow data collection as part of an air-side evaluation where economizer repair is offered as part of the program. Currently the WE&T economizer course curriculum in some cases already include training the contractors to perform measurement data collection and calculation of mixed air scenarios. |
| 8 | 107 | Commercial HVAC Quality Maintenance—Economizer Repair: During our field data collection, we found a number of economizers not functioning properly. | Collecting additional data on why economizers are not functioning. Specifically, if we collect more information to characterize failure modes it should lead to more focused repairs in the future. | PG&E, SCE, SDG&E | Accepted | Where economizer repair is offered as part of the program, information on the as-found condition of the economizer is being collected, allowing the program to identify the specific reason for non-functioning economizers. Field technicians have been instructed to thoroughly document any circumstance of inoperative economizers with specific notes and photographs. The data is also reviewed monthly in a feedback loop meeting with WE&T to inform modifications to trainings, identify intervention points, strategies, and record circumstances and experiences. |
| 9 | 104 | Commercial HVAC Quality Maintenance—Thermostat Adjustment & Supply Fan Controls: We found a number of thermostats replaced or reprogrammed that did not meet the program requirements for setback (cooling) or setup (heating) temperatures during unoccupied building periods. | Recommend that programs who do not adjust thermostats quarterly move toward remotely-adjustable thermostats so they can be periodically checked to maintain energy savings throughout the claimed measure life. | PG&E, SCE, SDG&E | Other | CQM is based on the ASHRAE/ACCA Standard 180 minimum task schedule which includes a semi-annual check of control system devices such as thermostats. Remotely-adjustable thermostats are not a requirement but will be evaluated for inclusion. |
| 10 | 107 | Commercial HVAC Quality Maintenance—Thermostat Adjustment & Supply Fan Controls: We observed a number of "smart" thermostats entering program during our field data collection. | Further study on "smart" thermostats can serve as a demand control vehicle. These thermostats could potentially improve the persistence of the thermostat measure. | PG&E, SCE, SDG&E | Accepted | IOUs are actively investigating the energy savings potential of more advanced HVAC controls including but not limited to smart thermostats. |
| 11 | 105 | Commercial HVAC Quality Maintenance—Supply Fan Controls: | Recommend better targeting of the measure to units that do not already have the supply fan in automatic mode or switched off during unoccupied | PG&E, SCE, SDG&E | Accepted | Where supply fan control measures are offered, the program targets to only incentivize as-found cases where the fan is always on. |

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| | | We found most the fans were described with the controls set at auto or intermittent baseline-states, rather than always on during unoccupied periods. | building periods. A baseline study could help determine the potential for savings from this measure. | | | An independent baseline study would determine the percentage of units that are in manual mode. |
| 12 | 104 | Commercial HVAC Quality Maintenance—Evaporator & Condenser Coil Cleaning: We found a high degree of variation in energy savings from units tested and suspect that the savings vary depending not only on the potential for savings given the degree and type of fouling, but also on the cleaning technique. | We recommend continuing this measure as a low-cost, low-savings item. Coil cleaning still has a very important role from a hygiene perspective, and we do not recommend that the practice be abandoned. | PG&E, SCE, SDG&E | Accepted | Per the ACCA 180 Standard, contractors are still required to clean the coils. Evaporator, condenser and condensate cleaning is emphasized in WE&T curriculum for hygienic and efficiency measures. |
| 13 | 105 | Commercial HVAC Quality Maintenance—Refrigerant Charge Adjustment (RCA): We measured the refrigerant charge of 25 single-compressor and 11 dual-compressor packaged rooftop air conditioner units after service and combined that data with service data on the refrigerant adjustments made by the service technician to estimate the pre-service charge. In total, we observed four refrigerant circuits completely devoid of refrigerant in this study and our previous HVAC3 evaluation. | We recommend continuing this measure only in cases where the refrigerant circuit is low or devoid of refrigerant because savings are small for the observed adjustments. | PG&E, SCE, SDG&E | Accepted | The recommendation is accepted for traditional condenser designs. However, this will need to be reevaluated for packaged units with microchannel condenser which are more sensitive to refrigerant charge. |
| 14 | 105 | Commercial HVAC Quality Maintenance—Refrigerant Charge Adjustment (RCA): As previously found by HVAC5, the process of attaching and detaching refrigerant hoses can release refrigerant, harming the atmosphere and slightly reducing refrigerant in the circuit each time it is checked. | Although it is important to detect circuits with extremely low refrigerant charge, we recommend against over-use of refrigerant pressure measurement devices to avoid loss of refrigerant. | PG&E, SCE, SDG&E | Accepted | WE&T includes curriculum emphasizes the best practices of not attaching gauge hoses for regular maintenance purposes. The contractor is only required to test each refrigerant circuit once, upon enrollment into the CQM program. The IOUs are investigating procedures that minimize the excessive use of refrigerant gauges for RCA. |
| 15 | 106 | Residential HVAC Quality Maintenance—QM: The billing analysis implemented by 2013 and 2014 program participants found SDG&E's residential QM program had no net energy savings and PG&E's had a net realization rate of 26%. | The evaluation team recommends the residential QM programs apply the workpaper disposition savings per ton for RCA and fan repair. The ex ante estimate of blower motor savings appears to exceed the realized values and may need to be adjusted downward as well. | PG&E, SDG&E | Accepted | Using workpaper disposition savings per ton for RCA is acceptable to the joint utilities, however, SDG&E has no fan repair measure as part of its Residential HVAC Quality Maintenance Program. PG&E is in support of applying workpaper disposition savings to per-ton for the fan repair measure. |
| 16 | 106 | Residential HVAC Quality Maintenance—QM: The energy savings impact analysis of residential QM programs found low realization rates for PG&E's program and no discernable savings for SDG&E's program. | The evaluation team recommends the residential QM programs either review implementation issues that have the potential to adversely impact savings or consider major program design changes and new measures. | PG&E, SDG&E | Accepted | The joint IOUs regularly review and discuss implementation issues generally and especially those that impact savings. These discussions include potential program design changes and new measures. Additionally, with the move to Statewide Program Implementation, one of the downstream pilots is planned to be Residential Quality Installation and Quality Maintenance. It is anticipated that this will be a third party proposed, designed and delivery program which will certainly consider major program design changes and new measures. |

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| 17 | 106 | Residential HVAC Quality Maintenance—QM: The energy savings impact analysis of residential QM programs found low realization rates for PG&E’s program and no discernable savings for SDG&E’s program. | Subsequent evaluation work may also want to devote resources to a more field-based engineering assessment that would provide more insight into factors driving measure performance that is possible with a billing analysis. | PG&E, SDG&E | Accepted | The joint IOUs support a “more field-based engineering assessment”, however, this is a recommendation for the Energy Division. |
| 18 | 9 | Commercial HVAC Quality Maintenance—QM: Recall that the baseline for both the gross and the net savings estimates was the absence of the measure rather than a poorly installed measure. Contractor responses in the NTG survey indicated that in many instances they installed the same measures outside of the program as within the program which lead to a low NTG ratio. To address measure quality in the future, the workpapers need to be updated so the gross baseline is a poor maintenance rather than quality maintenance. | We recommend a baseline study of measures installed in the absence of utility QM or tuneup programs. | PG&E, SDG&E | Accepted | A baseline study would be beneficial to understanding the conditions that exist in absence of the program and to understand the ability of the program to affect market transformation. |
| 19 | ? | HVAC Quality Maintenance—QM: The kWh NTGRs are less than 50% for most of the measures, three of the four programs, and for the blended program designs indicates that these HVAC programs are having only modest impacts on the maintenance practices of these HVAC contractors. Other evidence from the contractor surveys—such as the small percentage of HVAC contractors reporting changes in their maintenance service offerings due to program participation—support the conclusion that these effects are modest. | A non-participant baseline study of HVAC maintenance standard practice would be extremely valuable, and we would recommend doing such a study before making any drastic program changes. | PG&E, SCE, SDG&E | Accepted | A non-participant baseline study would be beneficial to understanding HVAC maintenance standard practice and to understand the ability of the program to affect market transformation. |
| 20 | ? | HVAC Quality Maintenance—QM: As described in the methodology, the NTG evaluation method was designed to be consistent with the gross methodology, where savings were broken down to a measure level, and the baseline was assumed to be the pre-maintenance state. | DNV GL recommends assessing both the gross savings and NTG assessments if future evaluations were to consider the issue of service maintenance quality improved through the QM program. | PG&E, SCE, SDG&E | Accepted | Assessing both the gross savings and NTG in future evaluations makes sense and is supported by IOUs. |