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:

***RTR for the Southern California Edison Miscellaneous End-Use Loads Methodological Review Final Report*** (Cadmus, Calmac ID #SCE0360.03)

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) Plan[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.

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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:** Southern California Edison Miscellaneous End-Use Loads Methodological Review Final Report
**Program:** MELS
**Author:** Cadmus
**Calmac ID:** SCE0360.03
**Link to Report:** http://calmac.org/publications/SCE_MELs_Phase_2_Report_FINAL.pdf

| | | | | | PG&E (if applicable) | | SCE (if applicable) | | SCG (if applicable) | | SDG&E (if applicable) | |
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| **Item #** | **Page #** | **Findings** | **Best Practice / Recommendations (Verbatim from Final Report)** | **Recommendation Recipient** | **Disposition** | **Disposition Notes** | **Disposition** | **Disposition Notes** | **Disposition** | **Disposition Notes** | **Disposition** | **Disposition Notes** |
| | | | | 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. | Choose: Accepted, Rejected, or Other | Examples: Describe specific program change, give reason for rejection, or indicate that it's under further review. | Choose: Accepted, Rejected, or Other | Examples: Describe specific program change, give reason for rejection, or indicate that it's under further review. | Choose: Accepted, Rejected, or Other | Examples: Describe specific program change, give reason for rejection, or indicate that it's under further review. |
| **Data Collection: Metering and Customer Data** | | | | | | | | | | | | |
| 1 | 42 | There is limited availability of hardware and software solutions to collect granular data on individual end uses. Current research is focused on improving the accuracy of primary end-use disaggregation, not on identifying MELs. The EMI option is intriguing and showed promise for directly collecting load data for individual end uses in a case study. It is unfortunate that there is no commercially available solution at this time. | Collect data on both primary and miscellaneous end-use loads as part of a future MEL research effort. Use plug load meters to collect data on individual end uses of interest and perform analyses to understand end-use loads in the population. If the IOUs are interested in contributing to the research and development of disaggregation algorithms, then they should analyze the end-use data along with AMI data. | All IOUs | Other | PG&E agrees with SCE's response regarding the difficulty of estimating savings from MELs. If it is decided that the costs to collect this kind of data are justified in terms of supporting a TRC of 1.25, then PG&E will follow this recommendation of how the data is collected. | Rejected | It is becoming much more difficult for IOU's to offer cost effective measures that meet or exceed a TRC of 1.25. Estimating savings from measures targeting MELs is inherently challenging due to the nature of these end-uses and related technologies. SCE believes it may be more reasonable to pursue further research on MELs within the confines of NMEC proceedings. | Other | Not applicable. While SoCalGas is a partner in this study, MEL are not gas load (elemental appliances, motors, plug loads) and this recommendation does not apply. | Other | SDG&E agrees with SCE and PG&E's response. Given the current cost-effectiveness constraints of the portfolio, it is important to focus on efforts that can use compliance. However, in addition to SCE's recommendation of pursuing further research within the context of the NMEC proceeding, SDG&E also suggests that this could be explored as a Market Transformation Initiative, or within the context of the CPUC's building decarbonization OIR. |
| 2 | 42 | Utilities will face logistic and cost challenges in metering MELs directly. Directly metering the power draw corresponding to charging portable devices such as cell phones, tablets, and laptops will either require strict guidelines for participating customers, new and improved plug meter technologies, or development of software applications for self-metering of devices. Current plug load meters are not designed to be portable. | Future research should focus on energy consumption associated with a limited number of MELs or MEL groups that remain stationary and can easily be metered using plug meters (e.g., entertainment center). | All IOUs | Other | PG&E agrees with SCE's response regarding the difficulty of estimating savings from MELs. If it is decided that the costs to collect this kind of data are justified in terms of supporting a TRC of 1.25, then PG&E will follow this recommendation. | Other | It is becoming much more difficult for IOU's to offer cost effective measures that meet or exceed a TRC of 1.25. Estimating savings from measures targeting MELs is inherently challenging due to the nature of these end-uses and related technologies. SCE believes it may be more reasonable to pursue further research on MELs within the confines of NMEC proceedings. | Other | SoCalGas agrees with SCE's response regarding the difficulties of estimating savings from MELs as described in Table 4. Additional research is needed to disaggregate natural gas usage with current metering technologies. | Other | SDG&E agrees with SCE and PG&E's response. Given the current cost-effectiveness constraints of the portfolio, it is important to focus on efforts that can use compliance. However, in addition to SCE's recommendation of pursuing further research within the context of the NMEC proceeding, SDG&E also suggests that this could be explored as a Market Transformation Initiative, or within the context of the CPUC's building decarbonization OIR. |

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| 3 | 42 | Currently, disaggregation tools cannot provide real-time or near real-time disaggregation for end-use load monitoring and thus do not comply with AB-793. | California IOUs should continue to monitor advancements in disaggregation technology and performance of methods over time. Research and development in this area is ongoing, and experts expect improvements in accuracy of load disaggregation methods over the next 3-5 years. | All IOUs | Accepted | PG&E will monitor advancements in disaggregation technology. | Accepted | SCE will continue to monitor advancements in disaggregation technology. | Other | Not applicable. While SoCalGas is a partner in this study, MEL are not gas load (elemental appliances, motors, plug loads) and this recommendation does not apply. | Accepted | SDG&E will continue to monitor advancements in disaggregation technology. |
| **Predictive Analytics: Assess the Predictive Power of Customer and AMI Data** | | | | | | | | | | | | |
| 4 | 42 | ***Framework***<br><br>Researchers have applied several approaches to model whole-home or primary end-use loads using statistical regression, stochastic modeling, artificial intelligence, and combinations of these methods with engineering algorithms. Using statistical analysis, researchers have correlated whole-home and primary end-use loads with the characteristics of utility customers. Utilities could use similar methods in combination with commercially available household data or surveys to correlate MELs with customer characteristics. The dearth of research in this area underscores the need for future research to help the California IOUs plan and design effective energy efficiency programs. | Because MELs cannot be reliably estimated directly using existing disaggregation technologies, California IOUs should consider directly metering MELs or statistical methods to estimate MELs or a combination of these approaches. Prior to designing a research study, the IOUs should develop a research framework with stated objectives and scope.<br><br>The Cadmus team recommends that the California IOUs conduct a pilot study focused on one or two significant MELs to test the viability of correlating MELs with customer characteristics using one or more of the approaches and methods outlined in the previous chapter.<br><br>**Pilot Study**<br><br>The pilot study should select one or two miscellaneous end uses of particular interest and should deploy end-use meters in a sample of homes to meter the corresponding MELs. It should develop surveys to collect end-use and customer data and also collect commercial customer data for the sampled customers. The pilot should compare the survey data with the commercial data and the correlation of both with MELs. Correlations between the survey data and | All IOUs | Rejected | PG&E supports SCE's response. | Rejected | It is becoming much more difficult for IOU's to offer cost effective measures that meet or exceed a TRC of 1.25. Estimating savings from measures targeting MELs is inherently challenging due to the nature of these end-uses and related technologies. SCE believes it may be more reasonable to pursue further research on MELs within the confines of NMEC proceedings. | Other | Not applicable. While SoCalGas is a partner in this study, MEL are not gas load (elemental appliances, motors, plug loads) and this recommendation does not apply. | Rejected | SDG&E agrees with SCE and PG&E's response. Given the current cost-effectiveness constraints of the portfolio, it is important to focus on efforts that can use compliance. However, in addition to SCE's recommendation of pursuing further research within the context of the NMEC proceeding, SDG&E also suggests that this could be explored as a Market Transformation Initiative, or within the context of the CPUC's building decarbonization OIR. |

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| | | | MELs should be examined in all data sources to determine the feasibility of using AMI data, commercial customer data, and end-use surveys in place of a large number of plug meters for a full-scale study. The pilot should focus on two to three customer segments between which differences in MEL usage are expected.<br><br>The following research questions should be addressed in the pilot study:<br><br>• How accurate are the third-party customer data in comparison to the self-reported survey data?<br>• How accurate are the survey data on presence and time of use in comparison to on-site observations and end-use metered data?<br>• Are MEL usage patterns (in the metered data and the survey data) correlated with patterns observed in AMI data? Which fatures in the AMI data are most useful for detecting these correlations?<br>• Are MEL usage patterns (in the metered data and the survey data) correlated with customer characteristics (in the commercial data and the survey data)?<br>• What is the variation of MELs within customer segments, e.g., do customers in different segments own home entertainment systems at similar rates and is time of use correlated with which segment the customer is in?<br>• At what resolution do correlations matter, i.e., do hourly, daily, or weekly MELs, on-peak MELs, MEL time or duration data all provide insight into customer MEL usage or is one metric more useful than the others? | | | | | | | | | |

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| | | | • Are MEL usage patterns consistent over time, e.g., do customers tend to use miscellaneous end uses at the same time and for the same duration over the course of the study period?<br>• Do customers with similar MELs share a set of customer characteristics other than those defined by the segments? Are the combination of characteristics distinct (in both the survey and commercial data)?<br><br>Answering these questions will provide the California IOUs with insight into the feasibility and direction of a future full-scale study. Understanding the accuracy of the commercial customer data and survey data will help to determine whether these data should be used in large scale study and how the data collection should be augmented to make them more useful. Understanding correlations between patterns in whole-house AMI and MEL usage will provide insight into whether or not AMI data should be used in a future study. Understanding the variation of MELs within customer segments and if the expected differences in MEL usage between segments exist will impact the scope of a future research study. For example, if predefined customer segments correlate strongly with MEL usage, then a future study will require less research to determine which customer characteristics to include in a predictive model than if other customer characteristics correlate with MELs more strongly. In this case, additional work will be required to define the characteristics to cluster customers with for the purpose of predicting MELs. | | | | | | | | | |

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| | | | The pilot study should sample customers at random in the customer segments of interest. Survey and plug-load metering sample sizes of roughly 30 customers per segment should provide a sufficient number of data points to examine MEL usage patterns in the segments and to determine if they correlate to customer segments and AMI usage patterns. If additional research questions evolve from interesting findings in the preliminary sample, additional customers could be sampled to investigate them further. | | | | | | | | | |
| 5 | 44 | ***Research Design*** | Future research on predicting MELs should adhere to rigorous study design principles. In particular, future research should:<br><br>• Define the MELs characteristic of interest (e.g., household MEL total, MEL on peak, MEL time of use, etc.)<br>• Collect a reliable data set that can be used to train and test one or more predictive models<br>• Assess the predictive accuracy of analytic approaches and methods<br>• Determine the best methods and approaches that the California IOUs can use to develop and efficiently update a model that accurately predicts MELs based on customer characteristics<br><br>A future study will require, first and foremost, a highly reliable data set for the study population. Cadmus recommends that any such data include the following:<br><br>• **Customer demographic and household characteristic data**. The California IOUs can utilize commercial data sets that they | All IOUs | Accepted | PG&E agrees with SCE's response regarding the difficulty of estimating savings from MELs. If it is decided that the benefits of future research justify the costs to collect this kind of data, and are justified in terms of supporting a TRC of 1.25, then PG&E will follow these recommendations regarding study design and rigor. | Other | It is becoming much more difficult for IOU's to offer cost effective measures that meet or exceed a TRC of 1.25. Estimating savings from measures targeting MELs is inherently challenging due to the nature of these end-uses and related technologies. SCE believes it may be more reasonable to pursue further research on MELs within the confines of NMEC proceedings. | Other | Not applicable. While SoCalGas is a partner in this study, MEL are not gas load (elemental appliances, motors, plug loads) and this recommendation does not apply. | Other | SDG&E agrees with SCE and PG&E's response. Given the current cost-effectiveness constraints of the portfolio, it is important to focus on efforts that can use compliance. However, in addition to SCE's recommendation of pursuing further research within the context of the NMEC proceeding, SDG&E also suggests that this could be explored as a Market Transformation Initiative, or within the context of the CPUC's building decarbonization OIR. |

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| | | | have previously purchased for customer marketing and segmentation. The customer demographic and household characteristic data must be of similar quality as the data expected to be available and used for predictions once an algorithm has been developed.<br>• **Customer AMI data**. The California IOUs already collect AMI data for most residential customers.<br>• **End-use meter data**. The California IOUs should collect accurate metered end-use energy consumption data for a representative sample of homes. The sample size should be sufficient to estimate the MELs with the desired confidence and precision.<br>• **Customer survey data**. The California IOUs should survey a representative sample of customers about the miscellaneous end uses present in their homes and hours of operation of each. We recommend comparing the predictive accuracy of a method that relies on survey data to the accuracy of a method that employs metered end-use data. If the methods yield similar and accurate predictions, researchers may be able to update the predictive models mostly using information obtained from surveys. A limited number of end-use metering may be required to test the accuracy of the survey responses. This approach would be more cost-effective to collect data collection and update the model. | | | | | | | | | |