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 2013-2014 Energy Efficiency Program Cycle. This Appendix contains the Responses to Recommendations in the report:

RTR for the *Lighting Controls Training Assessment* (ASWB and ODC, Calmac ID #SCE0392.01)

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.

EM&V Impact, Process, Market Assessment Study Recommendations

Study Title: **Lighting Controls Training Assessment**

Program: **2013-2016 Statewide WE&T Program & Non-Residential Lighting**

Author: **ASWB and ODC**

Calmac ID: **SCE0392.01**

Link to Report: http://calmac.org/publications/Lighting_Controls_Training_Assessment_Report_2016-04-08b.pdf

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1	5-11	The CALCTP Installer Technical Course seems to fill an important gap in the lighting controls installation arena. Some of the specific gaps that CALCTP training can address include: • Some installers work on projects using products from manufacturers that do not provide installer training on their controls. There appears to be no appropriate source of relevant training for these installers other than the CALCTP training. • Many installers work on projects that include components from multiple manufacturers. Even the best available installation training from manufacturers does not include much if any content on how to work with heterogeneous controls configurations, and none of the manufacturer training has hands-on practice with "mixed-manufacturer" installation. The CALCTP course does include components from multiple manufacturers and includes hands-on labs working with them. • Many installers have very demanding schedules and do not have the time or patience to "hunt down" appropriate training for multiple resources. Even when manufacturers provide "general concept" or Title 24 Part 6 training that would help installers regardless of the products they work with, it often is difficult to identify and enroll in that training. The CALCTP course provides a "one-stop-shop" for most of the essentials.	**Continue to support the CALCTP efforts to provide training for lighting controls installers.** Specific kinds of support to consider include: • Provide classroom space for CALCTP-oriented training activities • Fund deliveries of the course at IOU customer training centers • Explore with CALCTP other appropriate ways in which the IOUs may be able to support the installer training effort. This this may include discussions around: o Sources of funding for updating and enhancing the training o Alternatives for developing online self-study update modules that would qualify for continuing education credits o Ways to help encourage collaboration with manufacturers who provide training on a range of brands, current technology, etc.	All IOUs	Accepted	The IOUs agree with these recommendations, and will continue to collaborate to support the delivery of CALCTP. The IOUs will continue to (1) providing classroom space, as available, for CALCTP-oriented training activities, (2) funding the delivery of courses at the appropriate levels for each IOU, and (3) initiating discussions with CALCTP to explore other ways to support installer training efforts. This may include but not limited to exploration of online/on-demand delivery methods, and finding ways to collaborate with manufacturers to expand and integrate brand-specific training. The IOUs will continue this support, but would like to see program administration, and curriculum development self-sustaining and/or funding expanded beyond the IOUs to include a broad based industry support and endorsement. We strongly encourage CALCTP to develop more industry support for curriculum development and other collaborative arrangements. Furthermore, the IOUs would like to formalize these strategies using the IOUs standard procurement process, which will improve the clarity of expectations and outputs for all concerned. The IOUs agree to complete this discussion with CALCTP during 2016 so new business processes can be phased in during 2017.

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2	5-11	It is uncertain whether the CALCTP training is having a significant impact on skills and knowledge of the individuals who complete the training.

The current training design for the CALCTP Installer Technical Course measures what participants know and can do at the end of the training. It does not measure participants' entry-level knowledge and skills (except for ensuring a minimum baseline prerequisite).

It is possible that many individuals who choose to participate in the course are already well versed in the areas the course addresses. (People who are interested in controls may tend to seek out training and information on the topic, and may have already reached competence through other avenues.) | **Encourage CALCTP to consider ways to measure the likely impact of the training on participants' competence.**

One approach that could reasonably provide useful information about the overall impact of the CACLTP training on individuals who participate in the training is to conduct a pilot evaluation study that could use a pre-test / post-test design to determine whether the people who come to the training already are competent or whether they develop significant skills and knowledge as a result of the training.

Some general guidelines for a valid pre- and post-test to address this issue are outlined under "2.3. Assessment of Training Impact on Competence" in the "Assessment Yardstick."

Similar to the current CALCTP certification test, it would be very helpful and informative to consult a psychometrician3F for this pre-test design. A psychometrician could provide:

• Guidance on test methods and construction if pursuing a pilot using a pre-test / post-test configuration

• Recommendations for other approaches to effectively and efficiently meet the goal of measuring the likely impact of the CALCTP training on overall workforce competence | All IOUs | Accepted | The IOUs agree with these recommendations, and encourage CALCTP to work with the IOU WE&T and EM&V teams to explore the most effective ways to measure impact of training on participants' competence.

Pre- and post-tests are one way of assessing knowledge gain. Knowledge gain is one method of determining the impact of an education and training effort. For hands-on and technical classes, conducting a pre-course test presents challenges that would need to be discussed further. The IOUs will request a report from CALCTP on its current methods of measuring participant's knowledge gain.

Furthermore, the IOUs would like to formalize these strategies using the IOUs standard procurement process, which will improve the clarity of expectations and outputs for all concerned. The IOUs agree to complete this discussion with CALCTP during 2016 so new business processes can be phased in during 2017. |
| 3 | 5-11 | The CALCTP Installer Technical Course is well-designed and executed; however, there are areas with potential for improvement in the existing training. Installers we interviewed cited a number of specific suggestions regarding improvements to the course content and delivery.

The most pressing was to keep the content and equipment boards up to date.
• The curriculum for CALCTP was developed in close association with lighting controls manufacturers and other stakeholders. This meant that the curriculum and the equipment boards used in training were up to date in the beginning. | **Support CALCTP efforts to enhance and update the training.**

• Encourage CALCTP to review the specific recommendations suggested by the installers interviewed in this assessment. (See pp. 54, 56, and 58.)

It should be noted that some of these comments may have already been addressed through revisions since the installers participated in the training; other comments may be addressed via the major revision that currently is under way.

In addition, some comments may be "outliers" that wouldn't add much value to the course. A | All IOUs | Accepted | The IOUs agree with these recommendations, and will support a discussion with CALCTP to move to a uniform statewide approach to continue funding of training administration and curriculum development. While the IOUs have provided funding for activities in the past, CALCTP needs to transition to a more self-sustaining funding approach. The IOUs request that CALCTP to provide a business plan for this transition in 2017 so the implementation can start in 2017.

Furthermore, the IOUs would like to formalize these strategies using the IOUs standard procurement process, which will improve the clarity of expectations and outputs for all concerned. The IOUs agree to complete this discussion with CALCTP during 2016 so new business processes can be phased in during 2017. |

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		• While the training is frequently updated to address factual errors and remove references to obsolete technology, there have been five major updates since 2008, with the last major update in 2013. However, the technology is constantly evolving, and this gives rise to two problems: o Equipment boards are very expensive, so it is probably not feasible to update them often enough to keep the program completely current. o Although manufacturers are involved at some level for all updates of CALCTP programs and continuing education, heavy manufacturer involvement is not built in to the program on an ongoing basis. This leaves the program vulnerable to being outdated over time. Another area of possible improvement is to make it easier for potential participants to find deliveries in their areas. • Some installers indicated it was difficult to get enrolled in the course, largely because they didn't know when and where it was being offered. • The CALCTP website does not prominently display a calendar of upcoming deliveries. (Rather it suggests the user contact CALCTP to learn of courses being held in their area.)	thorough and objective review of the comments should be made before specific changes are targeted. • Explore ways to encourage manufacturer participation in CALCTP training. • Consider other approaches to providing ongoing support activities noted under conclusion #1 above. • Explore ways to provide broad and consistent marketing and outreach for the CALCTP installer training, making access easier for all installers and contractors.			
4	5-11	Manufacturer and CALCTP installer training have important — and different — strengths. Some of the major strengths of the CALCTP installer training is that it includes: • A variety of control types; variety of brands • How different brands of products can be appropriately configured together in one system • Extensive hands-on practice and assessment Some of the major strengths of manufacturers' installer training include: • In-depth exploration of product-specific requirements and considerations • Frequent updates to reflect the latest (manufacturer-specific) technology	**Explore ways to support training that combines "the best of both worlds."** Consider ways to provide a coherent learning experience that capitalizes on the strengths of both CALCTP and manufacturer training. One approach for accomplishing this would be to: • Establish the CALCTP training as the foundational component of the curriculum • Provide manufacturer-specific modules as recommended "advanced" components of the curriculum • Encourage installers to complete a	All IOUs	Accepted	The IOUs agree with these recommendations, and look forward to working with CALCTP and manufacturers on a relevant and balanced approach to maximize the breadth, scale, and effectiveness of the installer training classes. There are many ways to approach the integration of brand-specific training, advanced curriculum components, and clear learning pathways. The IOUs look forward to working with CALCTP and key stakeholders to develop a comprehensive solution. In 2016, the IOUs will work with CALCTP to initiate a planning process to address the need for enhanced manufacturers collaboration and partnership, to achieve these recommendations in future business plans, funding requests, and procurement agreements with and to the IOUs, beginning in 2017.

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			manufacturer-specific module before engaging in projects that use that manufacturer's controls • Ensure the "full" curriculum is clearly presented in terms of a recommended learning path (pre-requisites, foundational course, and manufacturer-specific deep-dives, including extensive hands-on practice) on the CALCTP website and in all marketing and outreach communications. It is useful to note that as of fall 2015, CALCTP is developing a continuing education program, in collaboration with major lighting manufacturers, which will address emerging products and control strategies.			
5	5-11	One of the most frequently cited barriers to quality installation is a function of poor lighting control system design. All of the installers and several manufacturers indicated that the lighting designs often are inappropriate or inadequate: all too often the plans are not customized to the customer needs and project configuration, don't comply with code, and provide insufficient detail for installers to execute properly. Lighting system plans may be developed by people in a variety of roles, most often architects, lighting designers, design/build lighting contractors, or engineers. Engineers were most often cited by installers as the source of inadequate or inappropriate plans, but it is unclear whether that was a general term they employed (assuming an engineer developed the plans) or it really does indicate an electrical engineer drew up the plans. Regardless, it is possible to have "good installation of a bad design," which is something outside the installer's scope of responsibility.	**Consider supporting training (and other related resources such as quick references or decision tools) to help improve nonresidential lighting system designs.** There are other related efforts that should be explored before finalizing any plans for such training: • The Statewide Codes and Standards Compliance Improvement (Energy Code Ace) team is actively pursuing "designer" training in 2016. • The Energy Code Ace website currently has two online self-study courses focused specifically on Title 24 Part 6 mandatory measures and prescriptive requirements for nonresidential lighting. • The California Lighting Technology Center (CLTC) has developed Lighting Guides specific to nonresidential applications, and delivers training on lighting technology and code requirements. • CALCTP has begun development of a course focused on lighting system design. (This project currently is on hold due to funding issues.)	All IOUs	Accepted	The IOUs agree with these recommendations, and look forward to working with CALCTP to explore the development of new curriculum, resources, and tools to help improve non-residential lighting system designs. The IOUs have already provided funding in past years, and agreed to provide additional funding in 2016 for the development of two new curriculum components, commercial sector specifiers training, and building operating professionals training. While the IOUs have provided funding for these activities, CALCTP needs to transition to a more self-sustaining funding approach, through a mix of funding sources that include key industry stakeholders. The IOUs request that CALCTP include a plan for this transition in future business planning and funding requests to the IOUs, beginning in 2017. The IOUs will work with CALCTP to initiate this process starting in 2016.

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6a	5-11	Work quality as described in this report has the potential to help ensure lighting control projects realize their energy-savings potential. Evidence of work quality can be assessed at various stages of a project. • During the design or design/bid phase, key system design elements can be verified, as shown on the plans and related documentation. • Immediately after a project, issues directly associated with installation quality, code compliance, and functionality can be verified. After some time (six month, a year, or longer) has passed since the installation was completed, issues associated with persistence and occupant satisfaction can be assessed.	**Consider requiring evidence of work quality before and after installation for incentivized lighting control projects, especially when these activities are consistent with the adopted codes.** • This implementation can be built into existing program processes such as conducting reviews at Rebate Reservation or Equivalent (before project start) for sample projects to collect baseline data. In addition, design quality and evidence of documentation that effectively communicates between design and installation teams could be assessed by reviewing materials that documents the following:4F o Evidence of required permits o The customer's project requirements (energy efficiency goals, hours of operation, and expectations for equipment and systems) o Lighting system design intent— a written explanation of how the design meets the customer's project requirements (including energy savings calculations if appropriate) o Sequence of operation o Statement of goals and rationales of the design that can be referenced by the installer in case unforeseen issues arise, making it inadvisable or impossible to install as designed. • At Project Completion it is feasible to measure key aspects of work quality by requiring: o Relevant Acceptance Test forms (NRCA-LTI-##-A) signed by a certified Acceptance Test Technician (ATT). o Commissioning documentation (for new construction only) For the upcoming High Opportunity Projects and Program (HOPP) implementation, these requirements are also consistent with the intent of AB802 requirements.	All IOUs	Other	The IOUs agree with the importance of this recommendation. While IOUs are supportive of all Codes and Standard the IOUs are not a substitute for the local jurisdiction to directly enforce these important code requirements. To support this recommendation, the IOU's through their current ALCS trials/pilots will explore ways to engage with project responsible parties. The IOUs believe the building owners, lighting manufacturers and installers together could take on greater responsibility for proper lighting control system design and installation, to ensure a productive outcome. During these trials/pilots activities, the IOUs will enhance its current non-residential lighting control system program process by requiring the following: • will track evidence of required permit, • will track evidence of system commissioning, • will track evidence of user-acceptance testing. The above items will be identified in the trials/pilots documentation as "Yes" or "No" items. The IOUs also have the following comments for this recommendation: • IOUs agree with the study recommendations but they must be balanced with required resources, cost effectiveness, and lighting design expertise. • IOUs will encourage manufacturers to serve a significant role in assuring design meets project needs, followed by proper Commissioning and User Acceptance processes and procedures required by Title-24. • IOUs agree that evidence of permits, commissioning and acceptance testing can be included in this process but these requirements may limit program participation due industry widely lacking of in code compliance. We will explore other alternatives on an ongoing basis. • IOUs support Advanced Lighting Control Systems through the Designlights Consortium (DLC). The specifications will address needs for consistency, interoperability and system design.

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6b	5-11	Work quality as described in this report has the potential to help ensure lighting control projects realize their energy-savings potential.	**For incentive programs in which significant long-term energy savings is a major consideration, consider evaluating the "Persistence" element of work quality.** If it seems reasonable to measure "persistence" for selected lighting projects, methods of verifying performance in an evaluation study after six months or a year could include: • Perform a walkthrough of the job site to: o Observe the operator interface to verify the control strategy is still in place and operating o Check a sample of sensors and controls to confirm they still are in place and functioning as intended o Survey occupants and operations personnel to determine their satisfaction with the system and identify any issues that may hinder ongoing performance per the design. o Analyze meter data to confirm energy savings and control system function These study activities can also be included in the evaluation activities to support the SCE and SDG&E Advanced Lighting Control Pilot initiatives.	All IOUs	Other	• IOUs agree that energy savings persistence is the key to success for any control measures especially for Advanced Lighting Control System implementation. The IOUs' non-residential program team will explore new program concepts to look at energy savings persistence through efforts such as Pay for Performance, Monitored based Real Time Data, and other AMI related initiatives. For these program designs, energy savings persistence and performance are more likely to be addressed as a part of program reporting M&V efforts. This will be a part of 2017 and beyond business planning and implementation efforts. • IOUs are evaluating future program options and performance based program designs such as Whole Building Monitoring Program. IOUs will learn more when the various ALCS Pilots are completed in 2017. The subsequent pilot evaluation assessment will answer many questions. • IOUs will explore additional options and will include our latest thinking in the upcoming business plan and/or implementation plan.