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05/31/19
04:59 PM

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Concerning Energy Efficiency Rolling Portfolios, Policies, Programs, Evaluation, and Related Issues.	R.13-11-005

PACIFIC GAS AND ELECTRIC COMPANY (U 39-M), SAN DIEGO GAS & ELECTRIC COMPANY (U 902-M), AND SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E) STATEWIDE LIGHTING MARKET TRANSFORMATION REPORT

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Dated: **May 31, 2019**

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Pursuant to Ordering Paragraph 22 subsection (c) of California Public Utilities Commission (Commission) decision D.09-09-047, Southern California Edison Company (SCE), hereby submits the Statewide Lighting Market Transformation Program Report dated May 31, 2019, which is attached hereto as **Appendix A** on behalf of itself, Pacific Gas and Electric Company (PG&E), and San Diego Gas & Electric (SDG&E).[1] The report is also being served on the service list of this proceeding.

[1] Pursuant to Rule 1.8(d), counsel for PG&E and SDG&E have authorized SCE to file and serve this report on their behalf.

Respectfully submitted,

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Appendix A

STATEWIDE LIGHTING MARKET TRANSFORMATION PROGRAM REPORT

MAY 31, 2019

2019 Statewide Lighting Market Transformation Annual Report

Table of Contents

Introduction

This Lighting Market Transformation Annual Report for the 2018 program year is jointly submitted by Southern California Edison Company (SCE), Pacific Gas and Electric Company (PG&E), and San Diego Gas and Electric Company (SDG&E), referenced collectively in this report as California's Investor-Owned Utilities (IOUs). The IOUs expect that this may be the last issue of the Lighting Market Transformation Annual Report, due to anticipated program changes for 2019 and beyond. More information regarding program and portfolio results for the 2018 program year can be found in each IOU's 2019 EE Annual Report.[1]

Background

The 2008 California Long Term Energy Efficiency Strategic Plan (Strategic Plan) called for transformation of markets for energy-consuming equipment, including residential and nonresidential lighting applications, to maximize energy efficiency (EE) and minimize energy consumption and greenhouse gas (GHG) production. On September 23, 2010, the California Public Utilities Commission (CPUC) published the Lighting Chapter of the Strategic Plan, outlining goals for reducing lighting energy consumption in California by 60%–80% by 2020. The essential goal of market transformation for lighting programs is to shape naturally occurring market practices and consumer-driven dynamics, so these interventions would no longer be needed.[2] The market transformation initiatives for lighting changed the shape and size of market adoption over time, focusing on program interventions, market and market actor dynamics, and user behaviors. The success of the IOUs' residential and nonresidential lighting program designs has been demonstrated by the quick transition of lighting markets and end-users from traditional light sources to energy-efficient LEDs.

The 2019 Statewide Lighting Market Transformation Annual Report summarizes the following lighting-related programs and activities:

- Lighting Market Transformation (LMT) Subprogram
- Primary Lighting Subprogram (Residential Upstream)
- Nonresidential Custom and Deemed Lighting Activities
- Midstream Distributor Lighting Program (Nonresidential Midstream)
- Lighting Innovation Subprogram — Demonstration and Pilot Activities
- Lighting Codes and Standards (C&S) Activities, and
- Evaluation, Measurement, and Verification Activities.

Lighting Market Transformation Subprogram Activities

The Lighting Market Transformation Subprogram employed a statewide program strategy that coordinated IOU efforts to promote efficient lighting technologies and best practices in California. The

[1] IOUs filed their 2019 EE Annual Report for Program Year 2018 and posted to EESTATS at http://eestats.cpuc.ca.gov/Views/AnnualReport/AnnualReport.aspx?ContentId=2.

[2] Per the definition of market transformation in Decision (D.) 09-09-047, p. 87.

subprogram developed innovative data-driven strategies to adapt utility lighting programs to the ever-changing energy and lighting markets to support the Strategic Plan. The program tracked, coordinated, and provided collaboration opportunities for utility, government, and industry lighting market transformation activities. The LMT Subprogram helped ensure the efficient progression of lighting solutions into and out of energy efficiency programs.

Lighting Market Transformation Subprogram - SCE

SCE's LMT Subprogram was instrumental in developing the Lighting Innovation Subprogram, which allowed testing of concepts, conduct pilots, and demonstration projects. Thanks to the influx of light-emitting diode (LED) technology to the market and LMT's success in helping to ensure the efficient progression of lighting solutions into customer EE programs, this program has ramped down.

Lighting Market Transformation Subprogram – SDG&E

During 2018, SDG&E collaborated with the statewide IOU lighting team and stakeholders on the future of this subprogram. Due to the significant increase in LED product availability and decreasing LED costs, SDG&E reassessed the subprogram's market strategies. This reassessment led to shifting LMT Subprogram funds to the Primary Lighting Subprogram, because of its high demand, to further provide cost-effective product solutions to new, hard-to-reach customer locations.

Residential Lighting Activities

The IOUs' Residential Lighting Program included an upstream Primary Lighting Program and downstream program activities targeting multifamily customers. The Primary Lighting Program offers upstream rebates to participating manufacturers to reduce the retail cost of energy-efficient lighting products. It introduces new premium-efficiency lighting products into the market and attempts to influence the future purchasing and installation behaviors of residential customers.

Primary Lighting Program – SCE

In 2018 the program continued to expand the variety of retailers to include hard-to-reach (HTR) and disadvantaged communities. The program optimized savings and cost-effectiveness by adjusting the measure mix, quantities, and incentive amounts to adhere to Work Paper values. For example, Compact Fluorescent Lamps (CFLs) were removed from the program because their savings and cost-effectiveness yielded no value according to the Work Papers and other analyses; additionally, the transformed lighting market was shifting to LEDs.

Primary Lighting Program – PG&E

PG&E's focus in the Primary Lighting subprogram has been to increase manufacturer participation and prepare manufacturers for upcoming code changes. Every year since 2014, PG&E has substantially increased the number of manufacturer partnerships, so that in 2018, PG&E had 14 manufacturers participating in the program. This approach ensures that the subprogram supports code readiness as broadly as possible in the market.

2018 marked the fifth full year in which the program solely supported LED lamps that met the new advanced LED specification as designed by the CEC. The program required the products to comply with the more stringent Tier II CEC specifications, in addition to ENERGY STAR® compliance.

Primary Lighting Program – SDG&E

The SDG&E Primary Lighting Program is based on a mass-market approach targeted at all SDG&E residential customers and promotes only high quality, premium-efficiency LEDs.

Other Residential Downstream Lighting Program Activities

In addition to upstream Primary Lighting activity, the IOUs also offered downstream program services to support the residential multifamily sector.

Residential Multifamily Downstream Lighting Activities - SCE

In 2018, approximately 34% of SCE's Multifamily EE Rebate (MFEER) Program's energy savings were achieved through implementation of lighting measures. As a result of increased stringency in the CPUC Lighting Dispositions that went into effect on 7/1/2018, in Federal and California Building Codes and Appliance Standards, and in industry standard practices (ISP), the Statewide Multifamily programs are expected to have minimal energy savings claims from residential lighting measures. The SCE MFEER Program will continue to work toward diversifying its measure mix beyond lighting end uses.

Residential Multifamily Downstream Lighting Activities – PG&E

In addition to the Primary Lighting Program, which has typically been focused on manufacturers, high product volumes, and product quality, PG&E has a number of downstream and direct-install residential programs that address lighting for individual customers. These include the Multifamily Upgrade Program, the Moderate Income Direct Install (MIDI) Program, the Mobile and Manufactured Homes Program, the Energy Fitness Program, and the Rising Sun Program. Many of these programs serve a high percentage of disadvantaged, hard-to-reach, or low-income customers. Installation of low cost/no cost LED measures for these customers yields immediate savings and customer satisfaction. The lighting measures are often used as a gateway to more extensive interventions, including HVAC maintenance and duct replacement measures.

Residential Multifamily Downstream Lighting Activities – SDG&E

In 2018, SDG&E had a significant decrease in market penetration when compared to previous years. This was primarily caused by the reduction in deemed savings associated with the CPUC Lighting Dispositions effective as of 7/1/2018. SDG&E continued to seek out cost-effective offerings for its Residential Multifamily market (through the Multifamily Energy Efficiency Rebate Program) and worked with a third-party implementer to provide low cost/no cost lighting solutions in its service territory. Many of the properties served in 2018 were in hard-to-reach and/or disadvantaged communities, and these customers benefited from the energy savings associated with the installation of LED T8 Lamps and LED Screw-in PAR30 lamps in the common areas of their properties.

Nonresidential Lighting Activities

Nonresidential Custom and Deemed Lighting Program – SCE

The Commercial, Industrial, and Agriculture Calculated program includes the Calculated (or "Customized") Energy Efficiency Program and the Behavioral, Retrocommissioning and Operational (BRO) Program. The Calculated EE Program offers eligible business customers incentives that encourage deep, integrated energy savings. Projects are identified and influenced through these incentives, utility EE audits, customer communications with SCE representatives, SCE Trade Professionals, and/or other relationships. The top Customized measures installed in 2018 were interior and exterior lighting (submitted when lighting measures were still eligible), fan controls, and variable speed drives. Interior and exterior lighting measures were removed from the downstream program due to CPUC dispositions, market studies, and ISP studies. The top BRO measure was Agricultural Pump System Overhauls.

The Commercial, Industrial, and Agriculture Deemed programs, marketed to customers as "Express Solutions," had minimal lighting offerings in 2018. The majority of nonresidential deemed lighting measures were offered by the Midstream Point of Purchase (MPOP) program. LED street lights were the only nonresidential deemed offering in the Express program, and incentives on LED street lights were offered from June through December of 2018.

Nonresidential Custom and Deemed Lighting Program – PG&E

To comply with CPUC guidance on moving standard practice baselines to be based on LED technologies and incentivize more efficient products, PG&E worked closely with the CPUC ex ante review (EAR) team to update its LED Outdoor Lighting and LED Highbay / Lowbay lighting offerings. These temporary solutions included interim incremental measure costs (IMCs) as there was agreement that a new cost methodology may be adopted to yield positive IMCs. In December 2018, PG&E developed updates to the Work Papers for these measures and for the LED Linear Ambient. These revisions updated the standard practice baseline to include linear LED replacement lamps as part of the LED technology baseline, and also updated measure costs to reflect this revised baseline, yielding positive IMCs. Since the CPUC guidance extended to Custom projects, PG&E also implemented the guidance for its Custom program, which included updates to the Lighting Calculator.

Nonresidential Custom and Deemed Lighting Program – SDG&E

The nonresidential midstream lighting delivery program continued through 2018, working directly through distributors to buy down the cost of lighting products and passing the incentive through to customers in the form of an instant discount. This delivery channel helped mitigate the high demand on lighting rebates and allowed for immediate integration of new lighting requirements into the program. The program offerings included interior LED T8 lamps, interior LED troffers/retrofit kits, interior LED highbay / lowbay fixtures, as well as a variety of LED screw-in lamps and exterior lighting fixtures. The nonresidential Custom program (Energy Efficiency Business Incentives) offers eligible business customers incentives that encourage deep, integrated energy savings. Custom measures include interior and exterior lighting (if qualifiable), fan controls, lighting controls, and variable speed drives.

Midstream Distributor Lighting Program

Midstream Point-of-Purchase (MPOP) Program – SCE

The MPOP Program offered point-of-purchase (POP) incentives on qualified LED lighting technologies to nonresidential customers through a distributor delivery channel. SCE reimburses the participating distributor a pre-authorized incentive amount for each qualifying product sold to an eligible business customer. The distributor collects the customer information at the point of purchase and provides product data to SCE through an online tool for invoice processing. SCE validates the customer and product data and issues payment to the distributor.

In 2018, SCE offered On-Bill Financing (OBF) for MPOP lighting measures to customers for the first time in program history. SCE also brought LED highbay / lowbay measures (which had previously been withdrawn) back into the program, and introduced LED exterior lighting measures in June of 2018. The top measures installed (by savings) in the 2018 MPOP Program were LED T8 Type A tubes and LED highbay / lowbay fixtures of various wattages.

Midstream Distributor Lighting Program – PG&E

PG&E's Midstream Distributor LED Replacement Lamp Program, focused only on LED screw-in replacement lamps, continued to decline in 2018 as compared to 2017 because of increased ex-ante baselines. With the retirement of LED A-Lamps in mid-2018, the Program's lamp volume dropped to approximately 40% of the volume generated in 2017.

Midstream Distributor Lighting Program – SDG&E

The Midstream Distributor Lighting Program was fully deployed in 2018. This midstream channel worked directly through distributors to buy down the cost of lighting products and pass incentives through to customers in the form of a discount. Available throughout 2018, the Program experienced a significant increase in participation.

Lighting Innovation Subprogram — Demonstration and Pilot Activities

Nonresidential Advanced Lighting Control System (ALCS) Pilot – SCE

SCE's ALCS Pilot, aka the Sustainable Office Lighting Control Pilot Program, studied the energy impacts of Advanced Lighting Control (ALC) systems and collected data to support the CPUC's Decision (D.)12-05-015, which directed California's IOUs to collect information on installation costs, participation impacts, and short- and long-term benefits associated with these systems. The ALCS Pilot was instrumental in helping the IOUs learn about the installation of ALCS Systems from the contractor workforce. The ALCS Pilot ended in December 2017 and Camus Group, a third-party evaluator, developed its evaluation report throughout 2018; the final report will be published in Q2 of 2019.

Nonresidential Advanced Lighting Control System (ALCS) Tool Trial Program – PG&E

PG&E continued making progress on its final Lighting Innovation Trial, the Advanced Lighting Control System (ALCS) Calculator Trial, which launched in Q2 2016. This trial is a part of a coordinated approach among the IOUs to support Goal #2 of the Strategic Plan's Lighting Action Plan (LAP) to "define and

advance best practices for design, installation, operation and maintenance of integrated systems to achieve sustainable lighting solutions for all spaces." Each of the California electric IOUs is targeting different aspects of ALCS. PG&E's contribution to the ALCS Calculator is intended to enable simplified savings estimation for various advanced lighting control strategies. The ALCS Calculator Trial is expected to be completed in Q2 2019.

Emerging Technology and Market Activities – SDG&E

SDG&E initiated a new project (ET18SDG1011 – DC Lighting Systems) in 2018 to evaluate Direct Current (DC) distribution systems for interior commercial lighting applications. A laboratory evaluation of various DC distribution systems for interior commercial lighting will be conducted, to quantify their performance and compare it to that of traditional Alternating Current (AC) systems. The study, which will identify potential market barriers for each technology and develop recommendations to reduce those barriers, is scheduled to be completed in Q4 of 2019.

SDG&E initiated another new project (ET18SDG7011) in 2018, testing side-by-side growing containers: one with traditional High Intensity Discharge (HID) or High Pressure Sodium (HPS) lighting used in indoor growing operations, and the other with LED lighting integrated with an HVAC system. This study is scheduled to be completed in Q2 of 2020.

Emerging Technology and Market Activities – SCE

In Q3 of 2018, SCE completed the LED Track Lighting assessment project (ET14SCE1140 – LED Track Lighting [3]). The goal of this project was to evaluate the two main approaches toward using LED technologies in existing track-lighting applications:

> (1) Replacing screw-base halogen lamps in existing track-lighting luminaires with screw-base LED replacement lamps, and
>
> (2) Replacing existing track-lighting luminaires that include screw-base halogen lamps with LED track-lighting luminaires (that is, luminaires with dedicated LED sources that cannot be replaced by other light sources).

Evaluation criteria included luminous, energy, and economic performance, using halogen track-lighting luminaires as the performance baseline. In the first case, the LED screw-base replacement lamp technology resulted in 70.6% savings when compared to the pre-retrofit halogen track-lighting technology. In the second case, the LED track-lighting luminaire technology resulted in 70.3% savings when compared to the pre-retrofit halogen track-lighting technology. However, due to new LED lighting dispositions, neither technology was adopted as a measure in the lighting programs.

In Q2 of 2018, SCE completed its street name sign evaluation project (ET15SCE1200 – LED Street Name Sign Lighting). This assessment demonstrated that LED retrofit kits can provide substantial energy savings to cities and jurisdictions operating illuminated street name signs. Energy savings can be as much as 70% from the existing illuminating technology, assuming 12-hour daily operation 365 days a year. For demand reduction, our study measured as much as 70 watts per sign by comparing the retrofit kit with the lowest power draw to the fluorescent baseline with the highest power draw.

[3] All of SCE's completed ET project reports are posted on the ETCC website at www.etcc-ca.com.

In Q4, 2018 SCE initiated a demonstration project (ET18SCE8010 – Smart Street Light Poles Demonstration) to test street light poles that integrate LEDs and controls and new devices such as signage, cameras, microphones, environmental sensors, and electric charging of devices. This project is scheduled to be completed in Q2 of 2020.

Lighting Codes and Standards (C&S) Activities

Residential Lighting Requirements - Title 24, Part 6, 2016 and 2019

On May 9, 2018, the California Energy Commission adopted the 2019 update to California's Building Energy Efficiency Standards (Title 24, Part 6 2019), which will apply to all new construction and major retrofit projects permitted on or after January 1, 2020.

As part of the Title 24, Part 6 2019 update process, the Statewide Building Standards Advocacy program team supported the continuation and refinement of the requirements in Joint Appendix 8 (JA8), which informs the residential lighting requirements in Title 24, Part 6. Although residential lighting was not part of the formal Codes and Standards Enhancement (CASE) report development for this code cycle, it is important to continue to support the energy savings potential connected to the requirements in the Title 24, Part 6 2016 Standards (which are currently in effect).

To support compliance with the Title 24, Part 6 2016 Standards, the compliance improvement team offered tools, training, and resources through Energy Code Ace that are similar to what is described in the nonresidential lighting section above. Selected offerings include:

- Application guide: Residential Lighting.
- Fact Sheets:
    - Residential Lighting
    - Residential High Efficacy Lighting for Manufacturers
    - State-Regulated Lamps
    - Title 20 Lighting FAQ, and
    - Overview 2016 Title 24, Part 6 "What's New" and "What's Changed" fact sheets for residential and nonresidential projects.
- Training:
    - 2016 Title 24 Part 6 Essentials Standards & Technology for Residential Lighting, and
    - 2016 Title 24 Part 6 Essentials Test, Certify & Comply: California's High Efficacy Lighting Requirements for Residential Applications.

Resources to further support compliance with JA8 and Title 20 are currently in progress. The effective date of Title 24, Part 6 2019 is January 1, 2020. The Compliance Improvement subprogram is evaluating what tools, training, and resources should be updated to support the new code cycle.

Nonresidential Related Activities

The IOUs supported the CEC's 2019 Rulemaking by developing 40 building code proposals which resulted in 23 "2019 Final Title 24 CASE Reports and Results Reports" submitted to the CEC,[4] comparing what was proposed to what was adopted. Expected savings from the measures supported through

[4] The 2019 CASE reports are available online at: http://title24stakeholders.com/2019casetopics/.

these reports are approximately 603 GWh/year, 3.2 million therms, and 30 million gallons of water for each year's construction following the intended effective date of January 1, 2020. Nonresidential lighting represented approximately 529 GWh/year, or 88 percent, of the total GWh/year savings potential.

Nonresidential Lighting: Expected Energy Savings Breakdown

Measure Name	Energy savings (GWh/yr)
Indoor Lighting Controls	10
Lighting Alterations	21
Outdoor Lighting Controls	12
Indoor Lighting Source	368
Outdoor Lighting Source	118
TOTAL	**529**

The most significant lighting activities included a transition toward lighting power densities (LPDs) to be based on all-LED lighting systems:

- The average LPDs under the Area Category declined 28% over the Title 24 2016 values, and
- The Complete Building Method LPDs were lowered by an average of 34%.

This activity represents the largest energy use-reduction measure, accounting for 55% of total savings across the 23 CASE reports. Other lighting topics supported include Advanced Daylighting Design, Indoor Lighting Controls, Outdoor Lighting Sources, and Outdoor Lighting Controls. Support was also provided to the Energy Commission on calculating cost-effectiveness for proposed changes to the lighting alterations.

Compliance improvement efforts to support implementers of the nonresidential lighting components of Title 24, Part 6 included the design and deployment of many tools, training offerings, and resources. January 1, 2017 was the effective date of Title 24, Part 6 2016, necessitating many new offerings to support compliance. Many resources are offered online.[5]

Examples include:

- The Energy Code Ace Indoor Lighting Wheel is designed as a "quick reference" to check whether an indoor lighting installation in various areas of a nonresidential building meets Title 24, Part 6 2016 requirements, without the need to dive into the Standards language itself. It covers both new construction and alterations. This popular hand-held tool makes complex information more accessible to those who must navigate the Standards to support their work.
- Short application guides include compliance requirements and recommendations for implementing Title 24, Part 6 in nonresidential and residential new construction, additions, and

[5] See http://www.energycodeace.com.

renovation projects. Lighting-focused guides included *Residential Lighting and Nonresidential Lighting* and *Electrical Power Distribution*.

- Energy Code Ace fact sheets provide quick-reference summaries of key requirements, forms, definitions, and resources for implementing Title 24, Part 6 and Title 20. For nonresidential lighting these include:
    - Nonresidential Lighting Controls for Credit
    - Nonresidential Lighting Mandatory Controls
    - Nonresidential Daylighting and Daylighting Controls, and
    - Overview Title 24, Part 6 2016 "What's New" and "What's Changed" fact sheets for residential and nonresidential projects.
- Trigger sheets are table-format quick references offering component-by-component summaries of sections of Title 24, Part 6 that are triggered based on project scope. Lighting topics include:
    - Nonresidential Exterior Lighting, and
    - Nonresidential Interior Lighting Alterations.
- A suite of free tools has also been updated and improved for the 2016 Standards:
    - Installation Ace™: A field guide providing photos and text to assist in identifying proper installation techniques
    - Navigator Ace™: A step-by-step guide to the Title 24, Part 6 compliance process
    - Forms Ace™: A web-based tool that helps determine which compliance forms apply to a specific project, and
    - Reference Ace™: A tool that helps navigate the standards using keyword search capabilities, hyperlinked tables, and related sections.
- Available Nonresidential Lighting training courses include:
    - "2016 Title 24 Part 6 Essentials Standards & Technology for Nonresidential Lighting"
    - "2016 Title 24 Part 6 Essentials – Nonresidential Standards & Technology for Indoor Lighting Mandatory Measures"
    - "2016 Title 24 Part 6 Essentials – Nonresidential Standards & Technology for Indoor Lighting Prescriptive Compliance"
    - "Decoding 2016 Title 24, Part 6: Let's Talk Nonresidential Lighting," and
    - "Decoding 2016 Forms: Let's Talk about the NEW NRCC-LTI-E."

Reach Codes for Local Governments

In addition to state and national building codes, the C&S Program provides technical support to local governments that wish to adopt reach codes — ordinances that exceed statewide Title 24 minimum energy efficiency requirements for new buildings, additions, or alterations. Reach code support for local governments includes:

- Research and analysis to establish performance levels and cost-effectiveness relative to Title 24 by climate zone
- Drafting of model ordinance templates to encourage regional consistency
- Assistance for completing and expediting the application process required for approval by the CEC, and

- Supporting implementation once effective.

The Reach Codes (RC) Subprogram supports local governments seeking to establish residential or commercial energy conservation ordinances for both new construction and existing buildings. To improve reach code resource accessibility, the RC Subprogram maintains a website[6] which contains all program studies, and model ordinance and resolution language which jurisdictions may use to facilitate drafting ordinances. The City of Fremont, with the technical assistance of our statewide program, adopted an energy ordinance that included reduced lighting power allowances for seven outdoor space types. In addition to energy savings, reducing outdoor lighting energy usage also helps mitigate light pollution since new fixtures must comply with backlight, uplight, and glare requirements. Analysis included the effects of reducing the maximum allowed lighting levels in seven specific outdoor lighting applications, including:

- Drive-up windows
- Outdoor sales frontages and sales lots
- Non-sales canopies
- Vehicle service station hardscapes
- Outdoor dining areas, and
- Primary entrances to 24-hour and emergency occupancies, including hospitals and police stations.

To encourage other jurisdictions to do the same, supporting documentation is publicly available on the RC Subprogram website.[7]

General Service Lamp Rulemaking – Adopting a Minimum 45 Lumen per Watt Efficacy Standard

In February 2019, the U.S. Department of Energy (DOE) published a notice of proposed rulemaking (NOPR) and request for comment.[8] According to this NOPR, the DOE proposed to withdraw the updated definitions of general service lamps and general service incandescent lamps which would become effective on January 1, 2020. The final outcome of DOE's NOPR is uncertain. The California IOUs, however, believe that a minimum 45 lumen per watt efficiency standard will become effective on January 1, 2020 per U.S. Code Title 42, §6295(i)(6)(A)(v), which states:

> "If the Secretary fails to complete a rulemaking in accordance with clauses (i) through (iv)…, effective beginning January 1, 2020, the Secretary shall prohibit the sale of any general service lamp that does not meet a minimum efficacy standard of 45 lumens per watt."

Compliance improvement efforts included continuing work for 2018 that started in 2016, including preparing for the effective date of LED replacement lamp standards (GSLs, A-lamps, small diameter, and portable luminaires) and conducting assessments to understand the needs of the lighting market for successful implementation of the Title 20 and Title 24 lighting measures.

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6 The LocalEnergyCodes website is available at: http://localenergycodes.com/.

7 The RC Subprogram website is available at: https://localenergycodes.com/download/68/file_path/fieldList/NR-OutdoorLtg%20Cost-Eff%20Report.

8 https://www.regulations.gov/document?D=EERE-2018-BT-STD-0010-0001.

Evaluation, Measurement, and Verification Activities

Nonresidential Advanced Lighting Controls System (ALCS) Tool Trial and Program Evaluation – PG&E

In 2018, PG&E continued implementing, and EMI Consulting continued evaluating, the PG&E Advanced Lighting Controls Tool (ALCS Tool) Trial Program. The ALCS Tool is designed for use by lighting professionals and lighting control agents[9] when calculating the energy and demand savings potential of possible commercial lighting retrofits. The overarching goal of this study is to evaluate the ALCS Tool during the current trial and provide recommendations that will support wide-scale use of the ALCS Tool by program staff and implementation contractors. Because the trial experienced some challenges in recruiting participants, only four sites participated in the trial, all of which received pre- and post-metering. Given these participant recruitment challenges, the evaluation team worked with PG&E and the implementation contractor to identify alternative data sources and evaluation activities to support the research objectives. For example, participant interviews with contractors and facility managers were added to the scope of the evaluation to improve understanding of the barriers to participation. A final report is expected in the Second Quarter of 2019.

Exterior Lighting Standard Practice Baseline and Work Paper Support Study (SCE0426.01)

On behalf of the California electric IOUs and led by SCE, TRC Market Research (a consulting firm) conducted this study to identify standard practice in California — defined as exterior lighting sales for new construction and retrofits, excluding maintenance — to support work paper updates. This study found that LEDs dominate standard practice for exterior fixtures:

- LEDs comprise 94% of current exterior fixture sales for new construction and retrofits and will grow to 98% by 2020 and 99% by 2023.
- Designlights Consortium (DLC) Standard fixtures are the most prevalent (approximately 58%), followed by DLC Premium (31%), and finally non-DLC listed (10%).
- Standard practice efficacy for almost all product categories is approximately 100 Lumens per Watt or higher.

The study recommends that the CPUC revisit the approach of the incremental measure cost (IMC) calculation for retrofit fixture projects, so it reflects a mix of retrofits (LED fixtures) and maintenance products (typically High Intensity Discharge [HID] lamps), to better reflect a customer's decision and significantly increase IMC results, which will enable the offering of incentives. TRC recommends that IOU intervention continue for existing exterior lighting projects, to help customers overcome the first-cost barrier of performing an LED retrofit, rather than maintaining the existing system by replacing failed lamps with incumbent technologies. The final report can be found online.[10]

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[9] Qualified ALCS manufacturers, manufacturers' representatives, lighting designers, architects, or value-added resellers. In particular, regional installation contractors and lighting specifiers.

[10] The *Exterior Lighting Standard Practice Baseline and Work Paper Support Study* is available at: http://www.calmac.org/publications/TRC_-_SCE_Ext_Lighting_SP_and_WP_Support_Final_Report.pdf.

Statewide California LED Quality and Market Characterization Study – PG&E

On behalf of the California electric IOUs and led by PG&E, Navigant in 2018 began conducting this market share study to (1) determine the size of the nonresidential LED market and the relative market share of products on the Design Lights Consortium Qualified Products List (DLC QPL), and to (2) develop a proposed definition of "quality" for nonresidential LED lighting. The study includes the following research objectives:

1. Within a set of DLC QPL priority product categories agreed upon by the California IOUs, how can the market for nonresidential LED lighting be characterized?
2. What is the market share of the DLC QPL and DLC "premium" for LED priority products?
3. What are the criteria and specifications that define nonresidential LED products that match the ENERGY STAR® "Top-Half" lighting quality listings?

The final report can be found online.[11]

[11] The *Statewide California LED Quality and Market Characterization Study* is available at: http://www.calmac.org/publications/CA_SW_LCDC_Study_FINAL_REPORT_2018-06-18.pdf.