Work Paper SCE13LG116

**Revision 0**

**Southern California Edison Company**

**LED Residential GU-24 Lamps**

# At-a-Glance Summary

|  |  |
| --- | --- |
| ****Solution and Measure Codes:**** | Refer to Table 1 |
| **Measure Description:** | LED GU-24 Lamp |
| **Base Case Description:** | CFL GU-24 Lamp |
| **Units:** | Per lamp |
| **Energy Savings:** | Refer to Excel Calculation Attachment |
| **Gross Measure Cost ($/unit):** | Refer to Excel Calculation Attachment |
| **Measure Incremental Cost ($/unit):** | Refer to Excel Calculation Attachment |
| **Effective Useful Life:** | ILtg-Res-LED-20000hr, 16 or 3.3 years depending on hours of operation |
| **Measure Application Type:** | Retrofit – First Baseline Only (REF), Replace on Burnout (ROB) |
| **Net-to-Gross Ratio:** | All-Default<=2yrs: 0.7, Res-Default-HTR-di: 0.85 |
| **Important Comments:** | **This work paper document does not contain a data set in conformance with the 4/1/2014 Ex Ante Database Specification provided by the California Public Utilities Commission (CPUC) Commission Staff (CS); SCE will provide that data set separately.** |

# Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision # | Revision Date | Author (Affiliation) | Summary of Changes |
| 0 | 2/13/15 | Yun Han (SCE) | * New WP for the 2013-15 cycle * WP effective 1/1/2015-12/31/2015 |

# Section 1: General Measure & Baseline Data

## 1.1 Measure Description & Background

This work paper details the replacement of GU-24 CFL lamps with GU-24 LED lamps ranging from 9 to 37 Watts. The list of measures is shown in Table 1.

Table 1: Measures and Codes

|  |  |
| --- | --- |
| Solution Code | Measure Name |
| LT-84831 | LED GU-24 Lamp 9-10 Watts |
| LT-68275 | LED GU-24 Lamp 10-11 Watts |
| LT-67943 | LED GU-24 Lamp 11-12 Watts |
| LT-55659 | LED GU-24 Lamp 12-13 Watts |
| LT-92510 | LED GU-24 Lamp 13-14 Watts |
| LT-68679 | LED GU-24 Lamp 14-15 Watts |
| LT-90171 | LED GU-24 Lamp 15-16 Watts |
| LT-52253 | LED GU-24 Lamp 16-17 Watts |
| LT-66009 | LED GU-24 Lamp 17-18 Watts |
| LT-64941 | LED GU-24 Lamp 18-19 Watts |
| LT-51387 | LED GU-24 Lamp 19-20 Watts |
| LT-55327 | LED GU-24 Lamp 20-21 Watts |
| LT-80226 | LED GU-24 Lamp 21-22 Watts |
| LT-68809 | LED GU-24 Lamp 22-23 Watts |
| LT-66341 | LED GU-24 Lamp 23-24 Watts |
| LT-60466 | LED GU-24 Lamp 24-25 Watts |
| LT-78090 | LED GU-24 Lamp 25-26 Watts |
| LT-75217 | LED GU-24 Lamp 26-27 Watts |
| LT-97114 | LED GU-24 Lamp 27-28 Watts |
| LT-68145 | LED GU-24 Lamp 28-29 Watts |
| LT-91773 | LED GU-24 Lamp 29-30 Watts |
| LT-97446 | LED GU-24 Lamp 30-31 Watts |
| LT-93707 | LED GU-24 Lamp 31-32 Watts |
| LT-54923 | LED GU-24 Lamp 32-33 Watts |
| LT-57998 | LED GU-24 Lamp 33-34 Watts |
| LT-72215 | LED GU-24 Lamp 34-35 Watts |
| LT-92842 | LED GU-24 Lamp 35-36 Watts |
| LT-94242 | LED GU-24 Lamp 36-37 Watts |

To qualify for incentives, the GU-24 LED lamp must be on the Energy Star Certified Lamps Qualified Products List (QPL) [A].

The SCE Multifamily Energy Efficiency Rebate (MFEER) Program offers rebates on a wide variety of energy-saving products, including select energy-efficient products and services at “no cost.”  
The no cost or Direct Installation measures are implemented by authorized-program contractors who perform program outreach and provide project management which includes energy audits, customer enrollment, product procurement, installation and quality assurance. The MFEER program quality control ensures correct documentation of replacement wattages determined by the lumen output required to provide appropriate illumination. Consistent with program policies and procedures, field inspections are also conducted to verify installations and accuracy of the information provided in the incentive application.

This measure applies to all Residential building types including Single Family, Multi-family, and Mobile Home – Double-Wide in all SCE Climate Zones.

## 1.2 Technical Description

The measure described in this work paper is specifically for A-lamps lamps with a GU-24 base. GU-24 is a base designed to meet high-efficiency requirement from the Title 24 [355] ruling, different from the typical E26/27 Edison screw base. GU-24’s pins (center to center distance is 24mm) twist and lock into the socket. Energy Star requires the lamps to meet the ANSI standard lamp shapes.

## 1.3 Application Types and Delivery Mechanisms

See Appendices A and B for definitions of application types and delivery mechanisms.

The delivery method that is available for these measures is:

* Financial Support – Direct Install

The program/install type for the above measures is:

* Retrofit – First Baseline Only (REF)
* Replace on Burnout (ROB)

## 1.4 Measure and Base Case Cost Effectiveness Data

### 1.4.1 DEER Measure and Base Case Analysis

The savings in this work paper are based on a 1.33 WRR, which was derived from the Energy Division WRR of 2.96 for A19 lamps. GU-24 LED lamp measures are not in DEER.

Table 2: DEER Difference Summary

|  |  |
| --- | --- |
| DEER Difference Summary Table | |
| Referenced versions of DEER and READI | N/A |
| Summary of deviation from DEER | DEER does not contain this measure. |
| DEER measures scaled? | No |
| DEER eQUEST prototypes used? | No |
| DEER operating hours used? | Yes |

**Net-to-Gross Ratio**

The NTG values were obtained using the DEER READI tool. The relevant NTG values for the measures in this work paper are in the table below.

Table 3: Net-to-Gross Ratio

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NTGR ID | Description | Sector | BldgType | ProgDelivID | NTG |
| All-Default<=2yrs | All other EEM with no evaluated NTGR; new technology in program for 2 or fewer years | All | Any | Any | 0.7 |
| Res-Default-HTR-di | All other EEM with no evaluated NTGR; direct install hard-to-reach only. | Res | Any | DirInstall | 0.85 |

Note: Direct install measures that are not hard-to-reach will use the default NTG value.

**Installation Rate**

The IR values were obtained using the DEER READI tool. The relevant IR values for the measures in this work paper are in the table below.

Table 4: Installation Rate

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| GSIA ID | Description | Sector | BldgType | ProgDelivID | GSIAValue |
| Def-GSIA | Default GSIA values | Any | Any | Any | 1 |

**Spillage Rate**

Spillage rates are not tracked in work papers; they are tracked in an external document which will be supplied to the Commission Staff.

**Technology Fields**

The Technology Fields were obtained from the Ex Ante Database Specification. The relevant Use Category, Use Sub-category, Technology Group, and Technology Type values for the measures in this work paper are in the table below.

Table 5: Technology Fields

|  |  |
| --- | --- |
| Classification | Value |
| Measure Case UseCategory | Lighting |
| Measure Case UseSubCats | Indoor General Lighting, Indoor Common Area Lighting |
| Measure Case TechGroups | Lighting - Lamps |
| Measure Case TechTypes | LED Lamp |
| Base Case TechGroups | Lighting - Lamps |
| Base Case TechTypes | Integral CFL (screw-in) |

**Effective and Remaining Useful Life**

The EUL and RUL values were obtained using the DEER READI tool. DEER defines the RUL as 1/3 of the EUL value. The RUL value is only applicable to the first baseline period for an RET measure with an applicable code baseline. The relevant EUL and RUL values for the measures in this work paper are in the table below.

Table 6: EUL and RUL

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| EUL ID | Description | Sector | UseCategory | EUL (Years) | RUL (Years) |
| ILtg-Res-LED-20000hr | LED lamp - Indoor - Residential | Res | Lighting | Varies by building type | EUL/3 |

### 1.4.2 Codes and Standards Analysis

**Title 20** 2014 [422], Section 1605.1(k) – Lamps section lists the minimum requirements for incandescent reflector lamps, medium base compact fluorescent lamps, and general service incandescent lamps which affect the measures in this work paper.

**Energy Star** issued a document, ENERGY STAR Program Requirements for Integral LED Lamps – Partner Commitments Version 1.4 [B] which details the Energy Star requirements for Integral LED Lamps. The requirements in the document consist of two parts; general requirement for all LED lamps and lamp type specific requirement. Those requirements are the minimum requirements for an integral LED lamp to be adopted by any SCE energy efficiency program.

Although code exists, this work paper uses recommended wattage reduction ratios from the Energy Division’s Workpaper Disposition for Lighting Retrofits (30May2014 [481]) to calculate the base case wattage. Therefore, Title 20 code is not used.

Replacing lamps does not trigger Title 24 2013 [355].

Table 7: Code Summary

|  |  |  |
| --- | --- | --- |
| Code | Applicable Code Reference | Effective Dates |
| Title 20 (2014) | 2014 Appliance Efficiency Regulations | July 1, 2014 |
| Energy Star | Version 1.4 | 2012 |

### 1.4.3 Non-DEER Study Review

N/A

# Section 2: Calculation Methodology

The methodology of the wattages to be used for energy savings is based on the LED wattage being offered and the Wattage Reduction Ratio (WRR). Typically, for A19 lamp types, the Energy Division provides a WRR of 2.96 to be factored into the LED wattage to calculate for the baseline. The WRR is based on a mixture of baselines that the LED covers which includes incandescent, halogen, CFL. For the GU-24 lamps described in this work paper, the only baseline to be considered is the CFL. Using a 100% CFL saturation, the WRR is calculated at 1.33 which will be used for the basis of this work paper [C].

The energy savings estimates are calculated as follows:



The following is a sample energy savings calculation for a 9 Watt LED GU-24 Lamp in Multi-Family (Common Area) building type, Climate Zone 6.

The demand reduction estimates are calculated as follows:



The following is a sample demand reduction calculation for a 9 Watt LED GU-24 Lamp in Multi-Family (Common Area) building type, Climate Zone 6.

A complete list of energy savings and demand reduction for other measures in different building types and climate zones can be found in the attachment [D].

# Section 3: Load Shapes

The ideal load shape for net benefits estimates would represent the difference between the base case and measure case. The closest load shapes that are applicable to the measures in this work paper are listed in the table below.

Table 9: Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| Building Type | Load Shape | E3 Alt. Building Type |
| Residential Single Family | DEER:Indoor\_CFL\_Ltg | RES |
| Residential Multi-family | DEER:Indoor\_CFL\_Ltg | RES |
| Residential Mobile Home - Double-Wide | DEER:Indoor\_CFL\_Ltg | RES |

# Section 4: Base Case & Measure Costs

For Direct Install measures, SCE directly utilizes one or more contractors as part of the program. The actual cost can vary by contractor, the date in which the work occurred, and by the volume of business. Contractor costs are confidential information and are based upon contractually agreed upon pricing as established in their purchase order with SCE; therefore, the SCE program tracking system is the only source for this data.

# Attachments

1. 2.

# References



[355]

[422]

[481]

[A] <http://www.energystar.gov/productfinder/download/certified-light-bulbs/>

[B] ENERGY STAR® Program Requirements for Integral LED Lamps Partner Commitments, DOE/Energy Star Program

[C] Attachment 2 – WRR.xlsx

[D] Attachment 1 – Calculation Template 2015 v5.xlsm

# Appendix A: Application Types

This table compares the application types in SCE’s systems with those in DEER.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| SCE Application (Program) Type | DEER Application Type | Savings | | Cost | | Life | |
| **1st Baseline (BL)** | **2nd BL** | **1st BL** | **2nd BL** | **1st BL** | **2nd BL** |
| New Construction (NEW) | New Construction (Nc) | Above Code or Standard | N/A | Incremental Cost | N/A | EUL | 0 |
| Replace on Burnout (ROB) | Replace on Burnout (Rob), Normal Replacement (NR) | Above Code or Standard | N/A | Incremental Cost | N/A | EUL | 0 |
| Retrofit (RET) | Early Replacement (ER) | Above Customer Existing | Above Code or Standard | Full Cost | Incremental Cost | RUL | EUL-RUL |
| Retrofit – First Baseline Only (REF) | Early Replacement RUL (ErRul) | Above Customer Existing | N/A | Full Cost | N/A | EUL | 0 |
| Retrofit Add-on (REA) | N/A | Above Customer Existing | N/A | Full Cost | N/A | EUL | 0 |

# Appendix B: Delivery Mechanisms

A delivery mechanism is a delivery method paired with an incentive method. SCE’s delivery methods include:

* Appliance Turn-in and Recycling
* Audit/Information
* Commissioning
* Financial Support
* Innovative Design
* Midstream Programs
* Partnership
* Upstream Programs

The following table describes the incentive methods.

|  |  |
| --- | --- |
| Incentive Method | Description |
| Direct Install | The utility program performs an assessment of the customer’s facility, provides recommendations, and implements energy efficiency measures for free. |
| Down-Stream Incentive - Deemed | The customer installs qualifying energy efficient equipment and submits an incentive application to the utility program. Upon application approval, the utility program pays an incentive to the customer. |
| Exchange - Replacement | The utility program holds events where customers can trade functional equipment for similar but more energy efficient equipment, free of charge. |
| Giveaway | The utility program provides customers with energy efficient equipment for free. |
| Mid-Stream Incentive | The utility program offers buydowns and incentives to third parties (typically retailers, distributors, and contractors), who then stock, promote, lower prices on, and/or sell energy efficient equipment. Contractors install energy efficiency equipment, sometimes using specified quality procedures, at the customer’s property. |
| On-bill Finance - loan | Customers can finance energy efficiency projects at 0% interest and repay the loan through their monthly utility bill. |
| Testing Services / Other | The utility program performs free testing services or assessments of the customer’s facility and provides information and recommendations for potential energy efficiency measures. |
| Up-Stream Buy Down, Up-Stream Incentive | The utility program offers buydowns and incentives to vendors (typically manufacturers and distributors), who then manufacture, stock, promote, lower prices on, and/or sell energy efficient equipment. There is some overlap between the mid-stream and up-stream approaches. |