Work Paper SCE17LG017

**Revision 1**

**Southern California Edison**

**Interior Integral, Non-Dimmable (Screw-in) CFLs**

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Measure Codes** | LT-10566, LT-46312, LT-48984, LT-71032, LT-13421, LT-56121, LT-89941, LT-38194, LT-12918, LT-44329, LT-28401, LT-44133, LT-52345, LT-78965, LT-38498, LT-89584, LT-90135, LT-69840, LT-79693, LT-86739, LT-77458, LT-68581, LT-81933, LT-91878, LT-75322, LT-74990, LT-62706, LT-99557, LT-75726, LT-97219, LT-59300, LT-73056, LT-55230, LT-71988, LT-62375, LT-87274, LT-75856, LT-73388, LT-18651, LT-18652, LT-18653, LT-18654, LT-18901, LT-18898 |
| **Measure Description** | Interior integral non-dimmable (screw-in) compact fluorescent lamps (CFL) |
| **Base Case Description** | CFL (50%), LED (25%)andr Incandescent lamp (25%), with wattage determined by multiplying the measure case wattage by a wattage reduction |
| **Units** | Per lamp |
| **Energy Savings** | Refer to Excel Calculation Attachment |
| **Full Measure Cost ($/unit)** | Refer to Excel Calculation Attachment |
| **Incremental Measure Cost ($/unit)** | Refer to Excel Calculation Attachment |
| **Effective Useful Life** | Commercial: 10,000 / hours of use  Residential: 3.5 years |
| **Measure Installation Type** | Replace on Burnout (ROB) |
| **Net-to-Gross Ratio** | Refer to Net to Gross Ratio Table |
| **Important Comments** | This work paper has a complementary Ex Ante Database data set that will be provided in a separate submission to the California Public Utilities Commission (CPUC). |

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 11/18/2016 | Lake Casco (TRC) | * This work paper is an update of SCE13LG017.2. * New Calculation Template for 2017 program year * Solution codes for 33W (LT-18651, LT-18653), 34W (LT-18652, LT-18654) and 45W (LT-18901, LT-18898) Spiral CFL measures were added to the work paper. * Added calculation methodology section for Wattage Reduction Ratios (WRR) for 33W, 34W and 45W spiral measures * Savings updated based on DEER 2017 * Updated Labor Costs to more closely align with WO17 * Updated code language to reflect 2016 Title 24 |
|  | 6/19/2017 |  | The following updates were made based on CPUC Lighting dispositions provided on March 1st and May 26th of 2017.   * New WRR values used for savings. * Updated NTG values for upstream measures. * Costs updated for baseline equipment based on new assumed fractions of technologies in the baseline. |

# Commission Staff and Cal TF Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rev** | **Party** | **Submittal Date** | **Comment Date** | **Comments** | **WP Developer Response** |
|  |  |  |  |  |  |

Cal TF website: <http://www.caltf.org/>

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

**Base, Standard, and Measure Cases**

|  |  |
| --- | --- |
| **Case** | **Description of Typical Scenario** |
| Measure | Interior integral non-dimmable (screw-in) compact fluorescent lamp (The lamp type can be Spiral, Spiral with Reflector, Integral A, and Globe) |
| Existing Condition | N/A |
| Code/Standard | CFL (50%), LED (25%) and Incandescent lamp (25%), with wattage determined by multiplying the measure case wattage by a wattage reduction ratio |
| Industry Standard Practice | N/A |

Measures and Codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure Codes** | | | | **Measure Name** |
| SCG | SDG&E | SCE | PG&E |
| N/A | N/A | LT-10566 | N/A | 12 Watt Integral A CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-46312 | N/A | 14 Watt Integral A CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-48984 | N/A | 18 Watt Integral A CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-71032 | N/A | 19 Watt Integral A CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-13421 | N/A | 20 Watt Integral A CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-56121 | N/A | 14 Watt Integral Globe CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-89941 | N/A | 19 Watt Integral Globe CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-38194 | N/A | 9 Watt Integral Globe CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-12918 | N/A | 15 Watt Integral Spiral with Reflector CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-44329 | N/A | 23 Watt Integral Spiral with Reflector CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-28401 | N/A | 16 Watt Integral Spiral with Reflector CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-44133 | N/A | 18 Watt Integral Spiral with Reflector CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-52345 | N/A | 25 Watt Integral Spiral with Reflector CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-78965 | N/A | 26 Watt Integral Spiral with Reflector CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-38498 | N/A | 15 Watt Integral Spiral CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-89584 | N/A | 32 Watt Integral Spiral CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-18651 | N/A | 33 Watt Integral Spiral CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-18653 | N/A | 34 Watt Integral Spiral CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-90135 | N/A | 40 Watt Integral Spiral CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-69840 | N/A | 42 Watt Integral Spiral CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-18898 | N/A | 45 Watt Integral Spiral CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-79693 | N/A | 55 Watt Integral Spiral CFL replacing Com CFL Base Case, Total Watts = 1.59 x Msr Watts |
| N/A | N/A | LT-86739 | N/A | 12 Watt Integral A CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-77458 | N/A | 14 Watt Integral A CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56x Msr Watts |
| N/A | N/A | LT-68581 | N/A | 18 Watt Integral A CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56x Msr Watts |
| N/A | N/A | LT-81933 | N/A | 19 Watt Integral A CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-91878 | N/A | 20 Watt Integral A CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-75322 | N/A | 14 Watt Integral Globe CFL replacing Non-Refl CFL Base Case, Total Watts = 2.48 x Msr Watts |
| N/A | N/A | LT-74990 | N/A | 19 Watt Integral Globe CFL replacing Non-Refl CFL Base Case, Total Watts = 2.48 x Msr Watts |
| N/A | N/A | LT-62706 | N/A | 9 Watt Integral Globe CFL replacing Non-Refl CFL Base Case, Total Watts = 2.48 x Msr Watts |
| N/A | N/A | LT-99557 | N/A | 15 Watt Integral Spiral with Reflector CFL replacing Reflector CFL Base Case, Total Watts = 1.74 x Msr Watts |
| N/A | N/A | LT-75726 | N/A | 23 Watt Integral Spiral with Reflector CFL replacing Reflector CFL Base Case, Total Watts = 1.74 x Msr Watts |
| N/A | N/A | LT-97219 | N/A | 16 Watt Integral Spiral with Reflector CFL replacing Reflector CFL Base Case, Total Watts = 1.74 x Msr Watts |
| N/A | N/A | LT-59300 | N/A | 18 Watt Integral Spiral with Reflector CFL replacing Reflector CFL Base Case, Total Watts = 1.74 x Msr Watts |
| N/A | N/A | LT-73056 | N/A | 25 Watt Integral Spiral with Reflector CFL replacing Reflector CFL Base Case, Total Watts = 1.74 x Msr Watts |
| N/A | N/A | LT-55230 | N/A | 26 Watt Integral Spiral with Reflector CFL replacing Reflector CFL Base Case, Total Watts = 1.74 x Msr Watts |
| N/A | N/A | LT-71988 | N/A | 15 Watt Integral Spiral CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-62375 | N/A | 32 Watt Integral Spiral CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-18652 | N/A | 33 Watt Integral Spiral CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-18654 | N/A | 34 Watt Integral Spiral CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-87274 | N/A | 40 Watt Integral Spiral CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-75856 | N/A | 42 Watt Integral Spiral CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-18901 | N/A | 45 Watt Integral Spiral CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |
| N/A | N/A | LT-73388 | N/A | 55 Watt Integral Spiral CFL replacing Non-Refl CFL Base Case, Total Watts = 1.56 x Msr Watts |

**Implementation Requirements**

This measure is eligible in the following building types:

* Residential Single Family
* Office - Small

## 1.2 Technical Description

Integral CFLs contain the lamp, ballast, and screw-in base together as a single unit. As a result, when the CFL burns out, the entire unit is replaced [406]. The specialty bulbs involved in this measure are the following shapes and sizes [407]:

* Integral A – Has the look of an incandescent bulb but has the efficiency of a spiral bulb;
* Integral globe – Most commonly used in bathroom vanity bars and ceiling pendants;
* Integral spiral – Most popular type of CFL;
* Integral spiral with reflector – Most commonly used in directional lighting, specifically in recessed ceiling fixtures; and

## 1.3 Installation Types and Delivery Mechanisms

The delivery method is:

**Up-Stream Buy Down**

The upstream strategy is used to stimulate sales of energy efficient lighting. The lighting measures are promoted and tracked separately from other point of service (POS) rebate measures. Lighting incentives and promotions influence customers to purchase energy-saving lighting products at retail outlets and install them in homes and small businesses.

The install type is:

**Replace on Burnout (ROB)**

ROB measures replace existing equipment with more energy efficient equipment when the existing equipment has failed or passed its useful life.

**Installation Type Descriptions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Installation Type** | **Savings** | | **Life** | |
| 1st Baseline (BL) | 2nd BL | 1st BL | 2nd BL |
| Replace on Burnout (ROB) | Above Code or Standard | N/A | EUL | N/A |

A delivery mechanism is a delivery method paired with an incentive method. Delivery mechanisms are used by programs to obtain program participation and energy savings.

**Delivery Method Descriptions**

|  |  |
| --- | --- |
| **Delivery Method** | **Description** |
| Up-Stream Programs | *See Up-Stream Incentive in the Incentive Method Descriptions table.* |

**Incentive Method Descriptions**

|  |  |
| --- | --- |
| **Incentive Method** | **Description** |
| Up-Stream Buy Down | The program gives a financial incentive to an upstream market actor (manufacturer or distributor) to encourage the manufacture, provision, or distribution of efficient measures. Buy Down means that the incentive is required to be passed down to the end-use customer. |

## 1.4 Measure Parameters

### 1.4.1 DEER Data

DEER Difference Summary

|  |  |
| --- | --- |
| **DEER Item** | **Used for Workpaper?** |
| Modified DEER methodology | No |
| Scaled DEER measure | Yes |
| DEER Base Case | Yes using WRR |
| DEER Measure Case | Yes |
| DEER Building Types | Yes |
| DEER Operating Hours | Yes |
| DEER eQUEST Prototypes | No |
| DEER Version | DEER 2017, READI v2.4.7 |
| Reason for Deviation from DEER | New WRR values provided in CPUC Lighting Disposition |
| DEER Measure IDs Used | No |

**Net-to-Gross Ratio**

The NTG values were obtained from the CPUC Lighting disposition provided on March 1st, 2017 [Attachment 3]. The relevant NTG values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NTGR ID** | **Description** | **Sector** | **BldgType** | **Measure Delivery** | **NTGR** |
| NonRes-sAll-mCFL | All nonresidential CFLs, all delivery mechanisms | NonRes | Any | Any | 0.85 |
| Res-sAll-mCFL | All residential CFLs, all delivery mechanisms | Res | Any | Any | 0.85 |

**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.

**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.

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

**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 relevant EUL and RUL values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** |
| ILtg-CFL-Com | CFL Lamps - Indoor- Commercial - 10,000 Rated Hours | Com | Lighting | 10,000/ HOU | EUL/3 |
| ILtg-CFL-Res | “2015 Uncertain Measures – WP Updates” Guidance | Res | Lighting | 3.5 | EUL/3 |

### 1.4.2 Codes and Standards Analysis

This work paper uses CPUC-specified wattages and wattage ratios to determine code case wattages; these satisfy or exceed any energy consumption requirements mentioned below.

Title 24 (2016) Building Energy Efficiency Standards [496] includes standards for both non-residential and residential buildings. Section 150.0 (k) 1 and Section 150.0 (k) 6 pertain to residential luminaries. Both Sections call out that installed luminaries need to be high efficacy lighting as defined by Table 150.0-A. According to Table 150.0-A, GU-24 sockets for compact fluorescent lamps are classified as high efficacy. Thus, the measures outlined in this work paper satisfy the requirement as a high efficacy lighting technology. Since this measure includes replacing only lamps, it does not trigger 2016 Title 24 for non-residential buildings.

Title 20 (2015) Appliance Efficiency Regulations [493] includes standards for both federally regulated appliances and non-federally-regulated appliances. The standards within these regulations apply to appliances that are sold or offered for sale in California. Table K-5 lists the minimum efficacy (lumens/watt) requirements for medium base compact fluorescent lamps. It is assumed that the measures listed in DEER 2016 comply with the 2015 Title 20, Table K-5.

Code Summary

|  |  |  |
| --- | --- | --- |
| **Code** | **Reference** | **Effective Dates** |
| Title 24 (2016) | 2016 Building Energy Efficiency Standards  Section 150.0 (k) | January 1, 2017 |
| Title 20 (2015) | Table K-5 Standards for Medium Base Compact Fluorescent Lamps | July 1, 2015 |

## 1.5 EM&V, Market Potential, and Other Studies – Base Case and Measure Case Information

The DEER READI tool and the WO17 study [475] were consulted for the values used in this work paper, and there are no applicable non-DEER studies associated with this work paper. Regarding the WRR values to calculate the savings, March 1, 2017 disposition was consulted to update the savings values.

## 1.6 Data Quality and Future Data Needs

The savings and other values such asEUL and GSIA values for this work paper are downloaded from the DEER READI tool, and Work Order 17 – the Ex Ante Measure Cost Study is utilized for the costs.

# Section 2. Calculation Methodology

**Wattage Reduction Ratios (WRRs)**

All savings in this workpaper were calculated using using the WRR values as provided in May 26th, 2017 disposition [Attachment 4]

|  |  |
| --- | --- |
| **CFL Type** | **2017 WRR** |
| Residential globe & candelabra (revised) | **2.48** |
| Residential interior reflector | **1.74** |
| Residential interior non-reflector | **1.56** |
| Residential exterior | **1.74** |
| Nonresidential globe & candelabra (revised) | **1.59** |
| All nonresidential | **1.59** |

**Energy Savings and Demand Reduction**

Examples of savings calculations for a 34W spiral CFL, climate zone 06, are provided below:

Non-Residential: Office – Small

Residential: Single Family Home

See the calculation template (Attachment 1) for all results.

# 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.

Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| **Building Type** | **Load Shape** | **E3 Alternate Building Type** |
| Residential Single Family | DEER:Indoor\_CFL\_Ltg | RES |
| Office – Small | DEER:Indoor\_CFL\_Ltg | NON\_RES |

# Section 4. Costs

## 4.1 Base Case Cost

The base cost values include material costs for incandescent, CFL and LED lamps based on the mix of technologies given in the CPUC disposition for screw in lamps provided on March 1st, 2017. The disposition uses the following fractions to estimate baseline costs: 50% CFLs, 25% LEDs and 25% incandescent. The base costs for each of the technologies were found in the following ways:

* CFL Costs: The lamp costs are the same as the measure costs and are from the latest ex ante database through the READI tool v.4.7.1.
* Incandescent Costs: Baseline incandescent lamp wattage was estimated based on the WRR values provided by the CPUC for each measure. The wattages were placed into bins of common incandescent lamp wattages for each style. A survey of online retailers was used to find the cost for each binned wattage and style.
* LED Costs: A survey of online retailers was also used to find the LED costs. Suitable LED lamp products were estimated using the binned incandescent wattage for each measure, assuming the standard replacement suggested by the online retailer or manufacturer.

These material costs and calculations are found in Attachment 2.

Labor costs for the base case lamps were obtained from WO17 [475]. Details are found in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measures** | **Lamp Types** | **Labor Hours** | **Labor Rate** | **Labor Cost** |
| LT-10566, LT-46312, LT-48984, LT-71032,  LT-13421, LT-86739, LT-77458, LT-68581,  LT-81933, LT-91878, LT-38498, LT-89584,  LT-90135, LT-69840, LT-79693, LT-71988,  LT-62375, LT-87274, LT-75856, LT-73388,  LT-18901, LT-18898, LT-18653, LT-18652, LT-18654 | A-lamps and Spiral  Non-Reflectors | 0.08 | $72.26 | $5.78 |
| LT-56121, LT-89941, LT-38194, LT-75322,  LT-74990, LT-62706 | Globes | 0.05 | $72.26 | $3.61 |
| LT-12918, LT-44329, LT-28401, LT-44133,  LT-52345, LT-78965, LT-99557, LT-75726,  LT-97219, LT-59300, LT-73056, LT-55230 | Spiral Reflectors | 0.06 | $72.26 | $4.34 |

For a complete breakdown of base case costs, please refer to Attachment 2.

## 4.2 Measure Case Cost

All of the cost values are from the latest ex ante database through the READI v2.4.7 except for the following Cost IDs:

* SCE17LG017\_01\_M001 – Interpolated the DEER measure costs for 33W and 36W CFL measures to find the measure cost for the 34W CFL measure.

These costs and calculations are found in Attachment 2.

The same labor rates were used for the measure case as for the base case.

## 4.3 Full and Incremental Measure Cost

**Full and Incremental Measure Cost Equations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| ROB | (MEC + MLC) – (BEC + BLC) | (MEC + MLC) – (BEC + BLC) | N/A |

MEC = Measure Equipment Cost; MLC = Measure Labor Cost

BEC = Base Case Equipment Cost; BLC = Base Case Labor Cost

For a complete breakdown of full and incremental measure costs, please refer to Attachment 1 and Attachment 2.

# Attachments

1. SCE17LG017.1 A1 – Calculation Template\_Final.zip
2. SCE17LG017.1 A2 – Cost Calculations.xlsx
3. SCE17LG017.1 A3 – 2017SCrewInLampDisposition – 1March2017-Final
4. SCE17LG017.1 A4 – 2017SCrewInLampDisposition – Revisions-26May2017

# References

1. References\_12122016\_100741.xlsx

|  |
| --- |
| [406] |
| [407] |  |
| [475] |  |
| [493] |  |
| [496] |  |