Work Paper SCE13LG085

**Revision 4**

**Southern California Edison**

**Interior Compact Fluorescent Fixture**

# At-a-Glance Summary

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| --- | --- |
| **Measure Codes** | See Section 1. |
| **Measure Description** | Compact fluorescent (CFL) fixtures |
| **Base Case Description** | Common/Dwelling measures: Incandescent fixtures |
| **Units** | Fixture |
| **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** | ILtg-CFLfix-Res: 16 years  ILtg-CFLfix-ResCmnArea: 15 years |
| **Measure Installation Type** | Early Retirement (RET) and Replace on Burnout (ROB) |
| **Net-to-Gross Ratio** | Res-Default>2: 0.55  Res-Default-HTR-di: 0.85 |
| **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 | 4/9/12 | Kristine Falletta/PECI  Brian V. O’Keefe/SCE | Original work paper template for 2013 PC  Updates from original draft:  - Extracted measures directly from READi Tool for the dwelling areas  - Updated to the newest calculation template, version 2.2  - Updated measure names to reflect new WRR values |
| 1 | 7/30/13 | Yun Han/SCE | * Updated range measures to lowest value based on ED’s disposition * T24 code language updated to 2013 * Delivery & Incentive Mechanism language corrected   Deleted unused NTGs |
| 2 | 12/4/13 | Yun Han/SCE | * Added 10 missing measures from Rev 0 * Updated cost section that showed IMC in GMC section   Removed Residential Building Types from Non-Res measures |
| 3 | 3/28/14 | David Pruitt/PL Energy | * New template for 2015 program year * Used measure Wattages from the ED lighting disposition table dated 30 May, 2014   Included the new READI fields. |
| 8/4/14 | Jack Melnyk/SCE | * WRR of CFL Fixtures updated from 3.47 to 3.53, including measure names * Updated 64W Interior Common Area measure SC from LT-27559 to LT-72843 * Adjusted CFL Fixture savings based on DEER operating hours from Motel Corridor to Common Areas for Common Area measures * Removed READI savings and used DEER methodology for Dwelling measures * Added code baseline for HID measures * Workpaper updated for reporting period, effective 7/1/2014-12/31/2014 |
| 4 | 9/28/15 | Alfredo Gutierrez (SCE), Jason Wang (SCE) | * Updated the work paper to the 2016 template. * Added HTR language. * Updated with costs based on web scraping and WO017 * Removed all non-residential measures because IMC was negative (CFL fixture costs less than metal halide fixture). |

# Commission Staff and Cal TF Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rev** | **Party** | **Submittal Date** | **Comment Date** | **Comments** | **WP Developer Response** |
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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 CFL Fixture |
| Existing Condition | Incandescent fixtures (Total Watts = 3.53 x Msr Watts) |
| Code/Standard | Incandescent fixtures (Total Watts = 3.53 x Msr Watts) |
| Industry Standard Practice | N/A |

Measures and Codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure Codes** | | | | **Measure Name** |
| SCG | SDG&E | SCE | PG&E |
|  |  | LT-79504 |  | 16 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-19423 |  | 22 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-68432 |  | 23 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-80989 |  | 25 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-97876 |  | 26 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-39075 |  | 27 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-81657 |  | 30 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-23209 |  | 32 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-59876 |  | 36 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-87943 |  | 39 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-49660 |  | 40 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-49593 |  | 44 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-67654 |  | 46 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-85876 |  | 52 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-19143 |  | 54 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-34841 |  | 55 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-38978 |  | 64 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-56473 |  | 69 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-78567 |  | 72 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-90776 |  | 92 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-39256 |  | 16 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-93432 |  | 22 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-50765 |  | 23 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-40994 |  | 25 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-89854 |  | 26 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-24867 |  | 27 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-73649 |  | 30 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-59687 |  | 32 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-45765 |  | 36 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-79523 |  | 39 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-35476 |  | 40 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-62735 |  | 44 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-50587 |  | 46 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-78765 |  | 52 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-90987 |  | 54 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-27559 |  | 55 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-72843 |  | 64 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-45343 |  | 69 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-65832 |  | 72 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |
|  |  | LT-87453 |  | 92 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts |

**Eligibility Requirements**

* The Common and Dwelling Area measures are applicable to the Residential Multi-family and Residential Mobile Home - Double-Wide building types.

## 1.2 Technical Description

The measure case CFL fixtures will have lumen output that is comparable to the fixtures being replaced.

## 1.3 Installation Types and Delivery Mechanisms

RET

* Financial Support: Direct Install

ROB

* Financial Support: Down-Stream Incentive – Deemed
* Financial Support: Direct Install

**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 |
| New Construction (NEW/NC) | Above Code or Standard | N/A | EUL | N/A |
| Retrofit or Early Replacement (RET/ER) | Above Customer Existing | Above Code or Standard | RUL | EUL-RUL |
| Retrofit First Baseline Only (REF) | Above Customer Existing | N/A | EUL | N/A |
| Retrofit Add-on (REA) | Above Customer Existing | 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** |
| Appliance Turn-in and Recycling | The program motivates customers, through financial incentives, to recycle appliances that are functional but inefficient. This prevents the continued use of those appliances, by both the current owner and potential future owners. |
| Audit - Information - Testing Services | The program performs a free assessment of a customer’s facility and provides the customer with information and guidance on energy efficiency opportunities. |
| Financial Support | The program motivates customers, through financial incentives such as rebates or low interest loans, to implement energy efficient measures or projects. |
| Mid-Stream Programs | *See Mid-Stream Incentive in the Incentive Method Descriptions table.* |
| Partnership | The program implements projects through a partnership between the utility and an institutional, government, or community-based organization. |
| Up-Stream Programs | *See Up-Stream Incentive in the Incentive Method Descriptions table.* |

**Incentive Method Descriptions**

|  |  |
| --- | --- |
| **Incentive Method** | **Description** |
| Direct Install | The program implements energy efficiency measures for qualifying customers, at no cost to the customer. |
| Down-Stream Incentive | 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. Such an incentive may be deemed or customized. |
| 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 program provides customers with energy efficiency equipment or services for free. |
| Mid-Stream Incentive  Mid-Stream Buy Down | The program gives a financial incentive to a midstream market actor (distributor, vendor, or retailer) to encourage the promotion of efficient measures. Buy Down means that the incentive is required to be passed down to the end-use customer. |
| On-bill Finance – Loan (OBF) | The program offers financing for the cost of an efficient measure as part of the utility bill. This can be an add-on option to an existing program or can serve as an organizing principle for its own program. |
| Up-Stream Incentive  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 | No |
| DEER Base Case | Yes |
| DEER Measure Case | Yes |
| DEER Building Types | Yes |
| DEER Operating Hours | Yes |
| DEER eQUEST Prototypes | No |
| DEER Version | DEER 2016, READI v2.3.0 |
| Reason for Deviation from DEER | N/A |
| DEER Measure IDs Used | e.g. R-In-CFLfixt-16w(16w)-dWP40 |

**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.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NTGR ID** | **Description** | **Sector** | **BldgType** | **Measure Delivery** | **NTGR** |
| Res-Default-HTR-di | All other EEM with no evaluated NTGR; direct install hard-to-reach only. | Res | Any | DirInstall | 0.85 |
| Res-Default>2 | All other EEM with no evaluated NTGR; existing EEM with same delivery mechanism for more than 2 years | Res | Any | Any | 0.55 |

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

This work paper includes measures that are offered via direct install activities into hard-to-reach (HTR) customer homes. “Final Resolution E-4700”, dated December 18, 2014, defines specific criteria to classify customer homes as HTR. The “Required Corrections to Measure Level Input Parameters Identified by Commission Staff per D.14-10-046 Order Paragraph 16”, dated November 3, 2014, includes additional clarification for the geographic criteria.

SCE’s Multi-Family Energy Efficiency Rebate (MFEER) program addresses the ongoing concern with “split incentives”, where the residents are not the owners of the property, so they lack incentive to improve their energy usage. Similarly, the property owners do not live on-site and pay higher utility expenses due to inefficient appliances, thus lack any incentive to upgrade. The MFEER is designed to drive this customer segment toward participation by offering property owners a variety of energy efficiency measures and services. The MFEER program will offer and track measure installations in both common and dwelling areas of multifamily complexes and common areas of mobile home parks and condominiums. Measures offered via direct install activities in both common and dwelling areas of multifamily complexes and common areas of mobile home parks and condominiums will receive the HTR NTG. Other measures in the MFEER program will receive default NTG (NTGR\_ID: Res-Default>2), unless otherwise specified in DEER.

This work paper includes measures that are offered via direct install activities into hard-to-reach (HTR) customer facilities. “Final Resolution E-4700”, dated December 18, 2014, defines specific criteria to classify customer facilities as HTR and also states that two criteria are sufficient to identify HTR customers if one of the criteria met is the geographic criteria.

SCE’s Commercial Direct Install program delivers free and low cost energy efficiency hardware retrofits through installation contractors to reduce peak demand and energy savings for small and medium commercial customers. The barriers for customer participation include limited capital resources, lack of expertise and understanding of the understanding of the benefits of energy efficiency, a suspicion of the “free offer” and its legitimacy, and language and cultural barriers. The program also addresses the ongoing concern with “split incentives”, where the customer is not the owner of the property, and therefore, lack incentive to improve their energy usage. SCE’s Commercial Direct Install program will track the following three (3) customer data points to identify direct install activities in HTR customer facilities. If geography and business size criteria are satisfied, SCE will identify the customer as HTR. If geography and language criteria are satisfied, SCE will identify the customer as HTR. Other measures in the Commercial Direct Install program will receive default NTG (NTGR\_ID: Com-Default>2), unless otherwise specified in DEER.

o **Business Size** – Customer must have less than ten employees

o **Language** – Customer’s primary language spoken is not English

o **Geography** – Businesses in areas other than the United States Office of Management and Budget (OMB) Combined Statistical Areas (CSA) of the San Francisco Bay Area, the Greater Los Angeles Area and the Greater Sacramento Area or the OBM metropolitan statistical areas or San Diego County

The “Required Corrections to Measure Level Input Parameters Identified by Commission Staff per D.14-10-046 Order Paragraph 16”, dated November 3, 2014, includes additional clarification for the geographic criteria:

“Notes on OMB CSA designations:

The OMB has designated a 12-county CSA titled the San Jose-San Francisco-Oakland, CA Combined Statistical Area which includes the nine counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma which border the San Francisco Bay plus the three counties of San Joaquin, Santa Cruz, and San Benito that are economically tied to the nine counties that that border the San Francisco Bay.”

The OMB definition of this CSA includes Los Angeles, Orange, San Bernardino, Riverside and Ventura counties.

The OMB definition of this CSA includes Sacramento, Yolo, El Dorado, Placer, Sutter, Yuba, and Nevada counties.”

**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** |
| MFm-IntCF-All | Interior Compact Fluorescent fixture; Annual Installation Rate; Multi-family | Res | Mfm | NonUpStrm | 0.799 |

**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.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** |
| ILtg-CFLfix-Res | CFL Fixtures - Indoor - Residential | Res | Lighting | 16 | 5.33 |
| ILtg-CFLfix-ResCmnArea | CFL Fixtures - Indoor - Residential Common Area | Res | Lighting | 15 | 5 |

### 1.4.2 Codes and Standards Analysis

This measure is not addressed in the Title 20 2015 Appliance Efficiency Regulations [493].

In Section 140.0(b)2I ii and iii of California’s Title 24 2013 Non-Residential Building Energy Efficiency Standards [355], the Alteration codes and standards language states:

**Lighting System Alterations** shall meet the applicable requirements in TABLE 141.0-E and the following:

1. Lighting System Alterations include alterations where an existing lighting system is modified, luminaires are replaced, or luminaires are disconnected from the circuit, removed and reinstalled, whether in the same location or installed elsewhere.

**EXCEPTION 1 to Section 141.0(b)2Iii:** Alterations that qualify as a Luminaire Modification-in-

Place.

**EXCEPTION 2 to Section 141.0(b)2Iii:** Portable luminaires, luminaires affixed to moveable partitions, and lighting excluded in accordance to Section 140.6(a)3.

**Luminaire Modifications-in-Place** shall meet the applicable requirements in TABLE 141.0-F and the following:

1. To qualify as a Luminaire Modification-in-Place, luminaires shall only be modified by one or more of the following methods:
   1. Replacing lamps and ballasts with like type or quantity in a manner that preserves the original luminaire listing.
   2. Changing the number or type of light source in a luminaire including: socket renewal, removal or relocation of sockets or lampholders, and/or related wiring internal to the luminaire including the addition of safety disconnecting devices.
   3. Changing the optical system of a luminaire in part or in whole.
   4. Replacement of whole luminaires one for one in which the only electrical modification involves disconnecting the existing luminaire and reconnecting the replacement luminaire.
2. Luminaire Modifications-In-Place shall include only alterations to lighting system meeting the following conditions:
   1. Luminaire Modifications-in-Place shall not be part of or the result of any general remodeling or renovation of the enclosed space in which they are located.
   2. Luminaire Modifications-in-Place shall not cause, be the result of, or involve any changes to the panelboard or branch circuit wiring, including line voltage switches, relays, contactors, dimmers and other control devices, providing power to the lighting system.

**EXCEPTION to Section 141.0(b)2Iiii2.** Circuit modifications strictly limited to the addition of occupancy or vacancy sensors

Code Summary

|  |  |  |
| --- | --- | --- |
| **Code** | **Reference** | **Effective Dates** |
| Title 24 (2013) | 2013 Non-Residential Building Energy Efficiency Standards, Section 140.0(b) | January 1, 2014 |
| Title 20 (2015) | N/A | N/A |

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

No other studies were used in the development of this work paper.

## 1.6 Data Quality and Future Data Needs

The data used for this work paper come directly from DEER2016, READI tool, version 2.3.0.

# Section 2. Calculation Methodology

All measures are directly from DEER:

|  |  |  |
| --- | --- | --- |
| **Solution Code** | **Measure Name** | **DEER MeasureID** |
| LT-79504 | 16 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-16w(16w)-dWP40 |
| LT-19423 | 22 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-22w(22w)-dWP55 |
| LT-68432 | 23 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-23w(23w)-dWP58 |
| LT-80989 | 25 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-25w(25w)-dWP63 |
| LT-97876 | 26 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-26w(26w)-dWP65 |
| LT-39075 | 27 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-27w(27w)-dWP68 |
| LT-81657 | 30 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-30w(30w)-dWP75 |
| LT-23209 | 32 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-32w(32w)-dWP80 |
| LT-59876 | 36 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-36w(36w)-dWP91 |
| LT-87943 | 39 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-39w(39w)-dWP98 |
| LT-49660 | 40 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-40w(40w)-dWP101 |
| LT-49593 | 44 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-44w(44w)-dWP111 |
| LT-67654 | 46 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-46w(46w)-dWP116 |
| LT-85876 | 52 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-52w(52w)-dWP131 |
| LT-19143 | 54 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-54w(54w)-dWP136 |
| LT-34841 | 55 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-55w(55w)-dWP139 |
| LT-38978 | 64 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-64w(64w)-dWP161 |
| LT-56473 | 69 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-69w(69w)-dWP174 |
| LT-78567 | 72 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-72w(72w)-dWP182 |
| LT-90776 | 92 Watt Interior Fixture (Dwelling Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-In-CFLfixt-92w(92w)-dWP232 |
| LT-39256 | 16 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-16w(16w)-dWP40 |
| LT-93432 | 22 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-22w(22w)-dWP55 |
| LT-50765 | 23 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-23w(23w)-dWP58 |
| LT-40994 | 25 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-25w(25w)-dWP63 |
| LT-89854 | 26 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-26w(26w)-dWP65 |
| LT-24867 | 27 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-27w(27w)-dWP68 |
| LT-73649 | 30 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-30w(30w)-dWP75 |
| LT-59687 | 32 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-32w(32w)-dWP80 |
| LT-45765 | 36 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-36w(36w)-dWP91 |
| LT-79523 | 39 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-39w(39w)-dWP98 |
| LT-35476 | 40 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-40w(40w)-dWP101 |
| LT-62735 | 44 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-44w(44w)-dWP111 |
| LT-50587 | 46 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-46w(46w)-dWP116 |
| LT-78765 | 52 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-52w(52w)-dWP131 |
| LT-90987 | 54 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-54w(54w)-dWP136 |
| LT-27559 | 55 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-55w(55w)-dWP139 |
| LT-72843 | 64 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-64w(64w)-dWP161 |
| LT-45343 | 69 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-69w(69w)-dWP174 |
| LT-65832 | 72 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-72w(72w)-dWP182 |
| LT-87453 | 92 Watt Interior Fixture (Common Area) CFL replacing CFL Fixture Base Case, Total Watts = 3.53 x Msr Watts | R-InCmn-CFLfixt-92w(92w)-dWP232 |

All savings are listed in Attachment 1.

# 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 Mobile Home - Double-Wide | DEER:Indoor\_CFL\_Ltg | RES |
| Residential Multi-family | DEER:Indoor\_CFL\_Ltg | RES |

# Section 4. Costs

## 4.1 Base Case Cost

Base case material costs are from an online retailer. Both CFL and Incandescent fixture costs were collected, for ceiling flushmount, bathroom wall sconce, and pendant type fixtures. The costs for the different fixture types were averaged. The base case cost is weighted 40% CFL and 60% Incandescent, as specified in DEER2016. The labor costs are from RS Means Electrical 2010, section 25 51 13 4900 Ceiling /wall, surface mounted incandescent fixtures: $39.00.

## 4.2 Measure Case Cost

Measure case material costs are from an online retailer, and are an average of the CFL ceiling flushmount, bathroom wall sconce, and pendant type fixtures. The labor costs are the same as in 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 |
| NEW/NC |
| RET/ER | (MEC + MLC) – (BEC + BLC) | MEC + MLC | (MEC + MLC) – (BEC + BLC) |
| REF | (MEC + MLC) – (BEC + BLC) | MEC + MLC | N/A |
| REA | MEC + MLC | MEC + MLC | N/A |

MEC = Measure Equipment Cost; MLC = Measure Labor Cost

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

**Full and Incremental Costs (a sample)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| LT-19423 | RET | $29.24 | $139.01 | $29.24 |
| LT-19423 | ROB | $29.24 | $29.24 | N/A |
| LT-23209 | RET | $38.25 | $159.74 | $38.25 |
| LT-23209 | ROB | $38.25 | $38.25 | N/A |
| LT-39075 | RET | $35.46 | $149.38 | $35.46 |
| LT-39075 | ROB | $35.46 | $35.46 | N/A |
| LT-59876 | RET | $43.22 | $168.04 | $43.22 |
| LT-59876 | ROB | $43.22 | $43.22 | N/A |
| LT-68432 | RET | $30.48 | $141.08 | $30.48 |
| LT-68432 | ROB | $30.48 | $30.48 | N/A |
| LT-79504 | RET | $24.52 | $126.57 | $24.52 |
| LT-79504 | ROB | $24.52 | $24.52 | N/A |
| LT-80989 | RET | $32.97 | $145.23 | $32.97 |
| LT-80989 | ROB | $32.97 | $32.97 | N/A |
| LT-81657 | RET | $35.76 | $155.60 | $35.76 |
| LT-81657 | ROB | $35.76 | $35.76 | N/A |
| LT-87943 | RET | $46.96 | $174.26 | $46.96 |
| LT-87943 | ROB | $46.96 | $46.96 | N/A |
| LT-97876 | RET | $34.21 | $147.30 | $34.21 |
| LT-97876 | ROB | $34.21 | $34.21 | N/A |

# Attachments

1. 

1. 

# References



[355]

[493]