**Work Paper SCE13LG092**

**Revision 1**

**Southern California Edison Company**

**Fluorescent Lamp to Fluorescent Lamp**

# At-a-Glance Summary

|  |  |
| --- | --- |
| ****Applicable Measure Codes:**** | LT-21844, LT-97103, LT-69153 |
| **Measure Description:** | Retrofit of an existing linear fluorescent lamp with more efficient linear fluorescent lamp of the same tube diameter. |
| **Base Case Description:** | F54T5 or F32T8 linear fluorescents |
| **Energy Impact Common 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 (years):** | Refer to Table 7 for EULs |
| **Measure Application Type:** | Replace on Burnout (ROB) |
| **Net-to-Gross Ratios:** | Refer to Table 3 for NTG ratios |
| **Important Comments:** | **This work paper document does not contain a data set in conformance with the 4/1/14 CPUC Ex Ante Database Specification; SCE will provide that data set separately.** |

# Document Revision History

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Work Paper and Revision # | Tech. Revision | MM/DD/YY | Author/Affiliation | Summary of Changes |
| SCE13LG092.0 | No | 05/15/12 | Neha Arora / SCE | Updated to latest work paper template v0.1 from WPSCNRLG0092 including Interactive Effects, Codes/Standards or Update Base Case, NTG, EUL, Cost, and Dual Baselines. |
| SCE13LG092.1 | Yes | 03/05/14 | Andrew Nishida/Lincus, Inc. | Updated to the 2013 Title 24 Requirements and ED Lighting Disposition.  Work paper updated for reporting period, effective 7/1/2014 – 12/31/2014. |

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

The work paper details the replacement of an existing linear fluorescent lamp with a more efficient linear fluorescent lamp of the same tube diameter, e.g. T8 to T8; or T5 to T5.

Table 1 below shows the measure description classifications that the existing base case lamps can be replaced with. This measure assumes that only the lamp is replaced.

Table 1 Measure Names

|  |  |
| --- | --- |
| Solution Code | Measure name |
| LT-21844 | (1) 48in Reduced Wattage (28W) T8 Linear Fluorescent replacing (1) 48in T8 Linear Fluorescent (32W) |
| LT-97103 | (1) 48in Reduced Wattage (25W) T8 Linear Fluorescent replacing (1) 48in T8 Linear Fluorescent (32W) |
| LT-69153 | (1) 46in (1) Instant Start Ballast - Normal Light Output - Energy Saver T5 Linear Fluorescent (49W) replacing (1) 46in T5 Linear Fluorescent (54W) |

Measure eligibility requirements for the measures addressed in this work paper are established in the 2013-2014 Southern California Edison Solutions Directory.

Eligibility Requirements: Existing 4-foot 32-watt T8 fluorescent lamps must be replaced, one-for-one, with 4-foot 28-watt or 25-watt T8 fluorescent lamps.

General Lighting Eligibility Requirements in the 2013-2014 Solutions Directory are as follows:

* All new lighting fixtures, retrofit kits, and components must carry the appropriate, designated Underwriters Laboratory (UL) or Edison Testing Laboratory (ETL) label, and be Consortium for Energy Efficiency (CEE) approved.
* The new lighting equipment must be compatible with the existing equipment and controls.
* Where applicable, lighting fixtures must meet existing case and proposed case requirement tables within the 2013-2014 Solutions Directory [B].
* New lamp wattage must be less than the wattage of lamp being replaced.

*T8 or T5 Linear Fluorescent Lamps and Electronic Ballasts – General Requirement*

* Proposed ballast must have a power factor of greater than or equal to 0.90.
* At full light output, ballasts must have a total harmonic distortion of less than or equal to 20%.
* The ballast must be programs start/programmed rapid-start for T5 lamps installations.
* For T5 lamps being replaced in low bay installations (under 15 feet) must only provide indirect lighting.
* T8 and T5 replacement lamps and ballasts must meet the color rendering index (CRI) and rated lamp life standards listing in the 2013-2014 Solutions Directory Lamp and Ballast requirement table [B]. Manufacturer’s specification sheets for lamps and ballasts must be provided for each measure.

## 1.2 Technical Description

A linear fluorescent lamp is a mercury-vapor gas-discharge lamp that utilizes electric current to excite the low pressure gas contained to produce fluorescent light. Luminous efficacy, or how much light is produced by a lamp in comparison to the energy it consumes, is generally higher in fluorescent lamps than in most incandescent lighting, thus making it the preferred type in offices and warehouses where consistent, prolonged operation is required. However, while it is more energy efficient, fluorescent lamps require a ballast to regulate the current through the lamp, consequently increasing the initial cost. An instant-start ballast lamp is used in one of the measures addressed within this work paper. This ballast starts lamps without heating by using an adequately high voltage to break down the gas and mercury column. Instant-start ballasts are the most efficient of the linear fluorescent ballast types, but also allow for fewer starts. Consequently, instant-start ballasts ideal in places where light usage is more constant rather than frequently being turned off and on.

The types of linear tubular lamps being replaced in this work paper are 1 inch diameter T8 lamps which generally produce lighting in the range of 80 lumens/watt and 5/8 inch diameter T5 lamps that produce lighting in the range of 100 lumens/watt. The measure objective is to replace current T8 and T5 linear fluorescent lamps with reduced wattage T8 and T5 bulbs, respectively, of the same length. Installation of a new lamp with adequate lumen output and lower power load for the duration of its expected useful life (EUL) will result in energy savings from the baseline.

## 1.3 Measure Application Type

The delivery methods for this work paper are Financial Support / Down-Stream Incentive - Deemed, Financial Support / Direct Install, Partnership / Down-Stream Incentive - Deemed, and Partnership / Direct Install.

The measure install type is Replace on Burnout (ROB).

Note: See Appendix A for a comparison of the application types used by and incorporated into SCE systems versus the application types available in the newest revision of DEER 2014. Appendix A will serve as a translation between the outputs of this work paper and application types used by READi.

## 1.4 Measure and Base Case Cost Effectiveness Data

### 1.4.1 DEER Measure and Base Case Analysis

These specific measures are not included in the 2014 Database for Energy Efficient Resources (DEER) [49]. DEER contains multiple linear fluorescent measures; however, none of the DEER measures exactly match the measures in this work paper.

Table 2 DEER Difference Summary

|  |  |
| --- | --- |
| DEER Difference Summary Table | |
| Modified DEER Methodology | No |
| Scaled DEER Measure | No |
| DEER Building Prototypes Used | No |
| Deviation from DEER | DEER14 does not contain this type of measure. |
| DEER Version | N/A |
| DEER Run ID and Measure Name (Sample) | N/A |

**Net to Gross**

The NTG value was obtained from the “DEER2011\_NTGR\_2012-05-16.xls” on the DEER website as required by Version 5 of the California Public Utilities Commission (CPUC) Energy Efficiency Policy Manual [351]. The relevant NTGR for this measure is shown in Table 3 below. Note that for the direct install delivery mechanism, a distinction between hard to reach and non-hard to reach markets will be made on a project by project basis. This work paper shows the NTG associated with a hard to reach direct install delivery mechanism and the defaulted NTG value, where in fact, a measure offered through direct install and is not “hard to reach” will receive a default NTG value.

Table 3 Net-to-Gross Ratio

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NTGR\_ID\* | Description\* | Sector\* | BldgType\* | ProgDelivID | NTG\* |
| NonRes-sAll-mT5T8-dn | T5 and T8 lamps | Com | Any | PreRebDown | 0.70 |
| NonRes-sAll-mT8-dir | T8 lamps | Com | Any | DirInstall | 0.89 |
| 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 |
| Res-Default-HTG-di | All other EEM with no evaluated NTGR; direct install hard-to-reach only. | Res | Any | DirInstall | 0.85 |
| Ind-Default>2yrs | All other EEMs with no evaluated NTGR; existing EEM in programs with same delivery mechanism for more than 2 years | Ind | Any | Any | 0.6 |
| Ind-Default-HTR-di | All other EEM with no evaluated NTGR; direct install to hard-to-reach only. | Ind | Any | DirInstall | 0.85 |
| Agric-Default>2yrs | All other EEMs with no evaluated NTGR; existing EEM in programs with same delivery mechanism for more than 2 years | Ag | Any | Any | 0.6 |
| Com-Default-HTR-di | All other EEM with no evaluated NTGR; direct install hard-to-reach only. \*\* | Com | Any | DirInstall | 0.85 |
| Agricult-Default-HTR-di | All other EEM with no evaluated NTGR; direct install to hard-to-reach only. | Ag | Any | DirInstall | 0.85 |
|  |  |  |  |  |  |

\* Denotes that the column is taken from the DEER NTG Table.

\*\* Used for direct install T5 lamps

**Installation Rate**

The installation rate (IR) is identified in the calculation attachment. This value is obtained from the support table available in READi. Currently there is no versioning on the installation rate table. To address appropriate selection of the installation rate the date of the work paper will serve as the last date checked for updated IR values. The installation rate varies by end use, sector, technology, application, and delivery method. The relevant IR values for this measure are shown in Table 4 below.

Table 4 Installation Rate

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| GSIA\_ID\* | Description\* | Sector\* | BldgType\* | ProgDelivID | GSIAValue\* |
| Def-GSIA | Default GSIA values | Any | Any | Any | 1.00 |

**Spillage Rate**

Spillage rate will also be applied to measures however the values will not be tracked in the work papers. The spillage rate will be tracked in an external table to be supplied to the Energy Division.

**READi Technology Fields**

To support the development of the ED ex ante tables, select fields from the ex ante database will be identified in the work paper. For a full set of values associated with the measures in the work paper refer the Excel calculation template.

Table 5 READi Tech IDs

|  |  |
| --- | --- |
| READi Field Name | Values included in this work paper |
| Measure Case UseCategory | Lighting |
| Measure Case UseSubCats | InGen |
| Measure Case TechGroups | Ltg\_Lmp+Blst |
| Measure Case TechTypes | LF\_LampBlst |
| Base Case TechGroups | Ltg\_Lmp+Blst |
| Base Case TechTypes | LF\_LampBlst |

### 1.4.2 Codes and Standards Analysis

Lighting power densities (LPD) for spaces for lighting fixtures defined as “Lighting System Alterations” are regulated by Standards Table 141.0-E of California’s Title 24 2013 Building Energy Efficiency Standards [A]. The measures addressed in this work paper fall under the Title 24 Standards for “Lighting System Alterations”.

*“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.”*

The exception to this standard is the case of alteration qualifying as a “Luminaire Modification-in-Place”. The measures addressed in this work paper do not qualify as a “Luminaire Modification-in-Place” because it violates the following Standard listed in California’s Title 24 [2013] Building Energy Efficiency Standards [A]:

“*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.”*

Since the measures addressed are to change out the lamp for a reduced wattage lamp, and not the respective ballast, they do not qualify as “Luminaire Modification-in-Place”, thus must comply with the Table 141.E in California’s Title 24 2013 Building Energy Efficiency Standards [A], and a lighting power density (LPD) analysis must be performed in this situation [E]. However, this paper uses the measure and baseline wattages listed within the Energy Division Lighting Disposition [C] in lieu of performing an LPD analysis. Please refer to Section 2 for more information.

New 2012 Federal Standards for General Service Fluorescent Lamps (GSFL) issued by Department of Energy contain an Energy Conservation Standard that applies to various linear fluorescent lamp types [D].

New 2014 Title 20 Appliance Efficiency Regulations issued by the California Energy Commission contains standards for fluorescent lamp ballasts and for federally-regulated general service fluorescent lamps that applies to all fluorescent lamp ballasts and fluorescent lamp types [F].

Table 6 Code Summary

|  |  |  |
| --- | --- | --- |
| Code | Applicable Code Reference | Effective Dates |
| Title 24 (2013) | 2013 Building Efficiency Standards, Table 140.6-C and Table 141.0-E | July 1, 2014 |
| Title 20 (2014) | Standards for Fluorescent Lamp Ballasts and Replacement Fluorescent Lamp Ballasts (Table J-1) and Federally Regulated General Service Fluorescent Lamps (Tables K-1 and K-2) | July 1, 2014 |
| NEMA (2012) | Federal standards for general service fluorescent lamps issued by DOE | July 14, 2012 |

### 1.4.3 Non-DEER Study Review

There were no non-DEER studies that were utilized in the development of this work paper.

### 1.4.4 Measure and Base Case Effective Useful Life

DEER14 update documentation provides EUL and RUL information to be used for the 2015 program cycle extension on [www.deeresources.com](http://www.deeresources.com). The DEER documentation “DEER2014-EUL-table-update\_2014-02-05.xlsx” provides the RUL value as a flat 1/3 of the EUL value. The RUL value will only be applied to the first baseline period for retrofit measures that have applicable code that will affect the energy savings (RUL is not applicable for ROB measures). In all other installation types and retrofit with no applicable code that affects the energy savings, the RUL is not applicable to either the first or second baseline period.

Table 7 below identifies the value/methodology used for the measures in this work paper. The EUL/RUL Values and Summary Documentation, provided on the DEER website, the effective useful life (EUL) for linear fluorescent fixtures is calculated by dividing a 70,000 lifetime operating hour value by the pre-existing annual (occupancy sensor) building operating hours [49]. If this value exceeds 15 years, then 15 years is used. These EUL values are calculated in the excel calculation attachment.

Table 7 DEER14 EUL Value/Methodology

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| READi EUL ID | Market | Enduse | Measure | EUL (Years) | RUL (Years) |
| ILtg-Lfluor-Elec | Commercial | Lighting | Fluorescent Lamps | EUL varies by building type  EUL = Rated Life of Ballast (70,000 hours) / Annual usage for building type (usage provided by DEER) OR  15 years (whichever is less). | N/A |

# Section 2. Energy Savings & Demand Reduction Calculations

The T5 and T8 base and measure case lamp wattages were taken from the ED Lighting Disposition [C].

Table 8 shows the lamp codes as well as the specific features and wattage of the fixtures.

**Table 8 Base and Measure Case Standard Fixture Wattages**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Solution Code | Base Case Lamp Code | Lamps per Fixture | Ballast Type | Watts/Lamp | Measure Case Lamp Code | Ballast Type | Watts/Lamp |
| LT-21844 | F32T8  (32W) | 1 | CEE High-Performance Ballasts\* | 30.5 | F28T8 (28W) | CEE Reduced Wattage\* | 30.3 |
| LT-97103 | F32T8  (32W) | 1 | CEE High-Performance Ballasts\* | 30.5 | F28T8 (25W) | CEE Reduced Wattage\* | 27.7 |
| LT-69153 | F54T5  (54W) | 1 | Programmed Start | 54 | F54T5  (49W) | Programmed Start | 49.3 |

\*CEE’s lists of approved high performance and reduced wattage lamps and ballasts can be found in the ED Lighting Disposition [C].

The ΔWatts is the difference in wattage from the base case to the measure as shown below. Refer to the embedded excel spreadsheet in the attachment section for the detailed lighting calculation.

ΔWatts = *Base Case Wattage - Measure Wattage*

The energy savings estimates are based upon the DEER methodology for Express Efficiency type programs. Calculations were performed on a “per lamp” unit basis.

Equation 1 illustrates the energy savings estimation methodologies used to calculate Non-CFL interior lighting measures.

Equation 1



The annual energy savings are based on DEER Annual Operating Hours and Energy Interactive Effects by Building Type for Non-CFL Lighting for each market sector. Energy interactive effects are the additional savings resulting from the reduced air conditioning load because of the reduction in internal heat gains from the more efficient lighting system.

The following illustrates a step-by-step sample calculation for “Retail, Single-story Large” market sector in CZ6 using the methodology shown in Equation 1 for (1) 48in Reduced Wattage (28W) T8 Linear Fluorescent replacing (1) 48in (32W) T8 Linear Fluorescent:

Energy Savings

(Retail, Single Story Large)

(Retail, Single Story Large)

The demand reduction estimates are based upon the DEER methodology for Express Efficiency type programs. Equation 2 illustrates the peak demand reduction estimation method used.

Equation 2



The following illustrates a step-by-step sample calculation for “Retail, Single-story Large” market sector in CZ6 using the methodology illustrated in Equation 3 for (1) 48in Reduced Wattage (28W) T8 Linear Fluorescent replacing (1) 48in (32 W) T8 Linear Fluorescent.

See calculation sheet [G] for Annual Operating Hours, Energy Interactive Effects, Demand Interactive Effects, and Coincident Diversity Factors by Building Type.

# Section 3. Load Shapes

The difference between the base case load shape and the measure load shape would be the most appropriate load shape; however, only end-use profiles are available. Therefore, the closest load shape chosen for this measure is the DEER:Indoor\_Non-CFL\_Ltg load shape. See Table 9 for a list of all building Types and Load Shapes. See the KEMA report [31] for a more thorough discussion regarding the load shapes for this measure.

Table 9 Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| Building Type | E3 Alt. Building Type | Load Shape |
| Agricultural | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Assembly | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Education - Primary School | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Education - Secondary School | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Education - Relocatable Classroom | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Education - Community College | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Education - University | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Grocery | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Food Store | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Health/Medical - Hospital | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Health/Medical - Nursing Home | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Health/Medical - Clinic | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Lodging - Hotel | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Lodging - Guest Rooms | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Lodging - Motel | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Manufacturing - Bio/Tech | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Manufacturing - Light Industrial | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Industrial | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Misc - Commercial | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Office - Large | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Office - Small | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Restaurant - Fast-Food | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Restaurant - Sit-Down | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Retail - Multistory Large | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Retail - Single-Story Large | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Retail - Small | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Storage - Conditioned | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Storage - Unconditioned | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Transportation - Communication - Utilities | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Warehouse - Refrigerated | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |
| Residential Multi-family | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |

# Section 4. Base Case & Measure Costs

## 4.1 Base Case Cost

DEER 2014 data does not provide information on or costs for T8 and T5 lamps. Base case cost information was obtained from various online resources [H]. Prices are per lamp assuming the purchase of 1 box of lamps. See Table 10 below for the list of base equipment costs.

## 4.2 Measure Case Cost

DEER 2014 data does not provide information on or costs for T8 and T5 lamps. Measure case cost information was obtained from various online resources [H]. Prices are per lamp assuming the purchase of 1 box of lamps. See Table 10 below for the list of measure equipment costs.

## 4.3 Gross and Incremental Measure Cost

### 4.3.1 Gross Measure Cost

Per the E3, the gross measure cost (GMC) is the cost to install an energy efficient measure. In the case of ROB, GMC means the cost premium required to install the energy efficient measure over a less efficient piece of equipment.

For ROB, GMC is represented by the equation below:

GMC = (Measure Equipment Cost + Measure Labor Cost) –

(Base Case Equipment Cost + Base Case Labor Cost)

\*Note: Unless stated otherwise the measure case labor and base case labor are assumed to be the same value reducing the equation to the following:

*GMC = Measure Equipment Cost – Base Case Equipment Cost*

See Table 10 below for the list of gross measure costs.

Table 10 Gross Measure Costs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Solution Code | Base Case Lamp | Base Equipment Cost | Measure Case Lamp | Measure Equipment Cost | ∆cost/unit |
| LT-21844 | CEE High-Performance T8 Lamps\* | $2.86 | 48” Reduced Wattage T8 (28W) | $4.49 | $1.63 |
| LT-97103 | CEE High-Performance T8 Lamps\* | $2.86 | 48” Reduced Wattage T8 (25W) | $5.19 | $2.33 |
| LT-69153 | Lamp | $9.95 | 46” Energy Saver T5 HO | $12.12 | $2.17 |

\*CEE’s lists of approved high performance and reduced wattage lamps and ballasts can be found in “Measure Cost Calculations”.

### 4.3.2 Incremental Measure Cost

For ROB, the incremental measure cost (IMC) is the equal to the gross measure cost.

# Attachments







# References

[31]

[49]

[351]



[A] Title 24 [2013] Building Energy Efficiency Standards for Residential and Nonresidential Buildings

[B] Southern California Edison 2013-2014 Solutions Directory, pgs. 6-7

[C] Attachment 2 - Energy Division Lighting Disposition, Rows 1714-1722

[D] NEMA New 2012 Standards for General Service Fluorescent Lamps (GSFL)

[E] Title 24 [2013] Building Energy Efficiency Standards for Residential and Nonresidential Buildings,

Section 140.6 Prescriptive Requirements for Indoor Lighting

[F] 2014 Appliance Efficiency Regulations (Title 20)

[G] Attachment 1 – Calculation Template v4

[H] Attachment 3 – Measure Cost Calculations

# Appendix A – SCE/ED Application Types

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