**Work Paper SCE13LG097**

**Revision 1**

**Southern California Edison Company**

**LED Street Lighting**

# At-a-Glance Summary

|  |  |
| --- | --- |
| ****Applicable Measure Codes:**** | See Table 1. |
| **Measure Description:** | This measure replaces high pressure sodium (HPS) and pulse start metal halide (PSMH) high intensity discharge (HID) street lighting fixtures on SCE lighting tariffs LS-2 and LS-3 with light emitting diode (LED) fixtures. Base HID and LED measure costing is based solely on cobra style fixtures. |
| **Base Case Description:** | The existing base case fixtures are cobra style HID. |
| **Energy Impact Common Units:** | The work paper units are per fixture. |
| **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):** | The effective measure (fixture) useful life is 12 years. |
| **Measure Application Type:** | The application type is Replace on Burnout (ROB)/Normal Replacement (NR). |
| **Net-to-Gross Ratios:** | The net-to-gross (NTG) factor used for this energy efficiency measure is 0.60 for Deemed Downstream and Midstream programs. |
| **Important Comments:** | -The measures apply to all the base case HPS and PSMH wattages (except 1000W PSMH and 1500W probe start MH for which LED product is currently being developed) on SCE lighting tariffs LS-2 (customer-owned, unmetered) and LS-3 (customer-owned, metered).  -Street lighting here means service for the lighting of automobile-carrying streets, highways, and other public thoroughfares, and publicly-owned and publicly–operated automobile parking lots.  -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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Workpaper and Revision # | Tech. Revision | MM/DD/YY | Author/Affiliation | Summary of Changes |
| SCE13LG097  REV 0 | No | 4/13/2012 | John Rossi/EMCOR Energy Services | Updated to the 2013-2014 template. |
| SCE13LG097  REV 1 | No | 7/8/2014 | Jack Melnyk/SCE | * Added new solution (Measure) Codes to expand LED wattage choices * The existing base HID and new measure LED fixtures are not limited by style but the costing (and, therefore incentive development) is based on HID and LED cobra styles * Adjusted annual operating hours from 4140 to 4100 per DEER * Trued baseline connected wattages to 2013 SPC Standard Fixture Watts values * Moved Application Requirements and Recommendations from References to paper body * Added NTG & IR values and codes to calc sheet * Added backup attachment as basis for LED measure ranges * Work paper updated for reporting period, effective 7/1/2014-12/31/2014 |

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

This work paper details the calculation methodology used in determining annual energy savings by replacing a cobra style high intensity discharge (HID) luminaire (fixture) in street lighting applications with a light emitting diode (LED) fixture. Two HID sources are addressed: high pressure sodium (HPS) and pulse start metal halide (PSMH). The measure savings for this work paper are based on the replacement of HID lighting sources, specifically HPS and PSMH, with LED fixtures. The following Table 1 lists all of the measures applicable to this work paper.

Note: Street lighting is defined for this document as service for the lighting of automobile-carrying streets, highways, and other public thoroughfares, and publicly-owned and publicly–operated automobile parking lots.

Table 1 Measure Names

|  |  |
| --- | --- |
| Solution Code | Measure Name |
| LT-27419 | LED Street Lighting Up to 28 Watts Replacing 50W HPS |
| LT-73136 | LED Street Lighting 29-43 Watts Replacing 70W HPS |
| LT-80500 | LED Street Lighting 44-54 Watts Replacing 100W HPS |
| LT-24820 | LED Street Lighting 55-90 Watts Replacing 150W HPS |
| LT-78130 | LED Street Lighting 91-130 Watts Replacing 200W HPS |
| LT-35164 | LED Street Lighting 131-190 Watts Replacing 250W HPS |
| LT-61338 | LED Street Lighting 191-222 Watts Replacing 310W HPS |
| LT-81983 | LED Street Lighting 223-260 Watts Replacing 400W HPS |
| LT-94198 | LED Street Lighting 29-43 Watts Replacing 70W PSMH |
| LT-18053 | LED Street Lighting 44-54 Watts Replacing 100W PSMH |
| LT-39353 | LED Street Lighting 55-90 Watts Replacing 150W PSMH |
| LT-59292 | LED Street Lighting 55-90 Watts Replacing 175W PSMH |
| LT-35035 | LED Street Lighting 91-130 Watts Replacing 250W PSMH |
| LT-46736 | LED Street Lighting 131-190 Watts Replacing 400W PSMH |

Note: All MH lamp wattages <150W have always been PSMH since the arc tube legs are too small to accommodate a probe starter electrode. The wattage range of 175W through 400W has been available in PSMH for over a decade and most of those earlier probe start systems have been replaced. 150W is the lowest probe start MH wattage but the ballast is a 175W one (probe: M57).The lamp is made low in voltage (110V vs 132V for 175W) which causes the lamp to operate at 150W. (source is Tom Harding Senior Lighting Engineer and a primary designer of PSMH, Venture Lighting (a Division of Advanced Lighting Technologies)).

## 1.2 Technical Description

The proposed measure cases, shown in Table 1 are based on SCE Design & Engineering Services LED Assessment Studies conducted in conjunction with the SCE Street and Outdoor Lighting Organization (SOLO). Note: The measure case ranges are based on LED fixture system (light engine + driver) wattages.

## 1.3 Measure Application Type

The delivery methods available for these measures are:

* Financial Support / Down-Stream Incentive – Deemed
* Midstream Programs/Mid-Stream Incentive

The delivery method is ROB which has a first baseline only. There are no applicable codes/standards to calculate savings for the second baseline period.

**Application Requirements**

1. SCE tariff LS-1 is not covered by this workpaper. LS-1 includes company (SCE)-owned and maintained street lighting. Customers on LS-1 specify type of service, lamp size, and location of street lights.
2. Customer incentives may be developed for cobra style fixtures on SCE tariffs LS-2 and LS-3, which are addressed by this workpaper. On LS-2 and LS-3, the customer owns the street lighting equipment including, but not limited to the pole, mast arm, fixture and lamp, and all connecting cable in a street light system. Like LS-1, the customer specifies the type of service, lamp size (here LED fixture wattage), and location of street lights.
3. Customers on SCE Tariffs LS-2 and LS-3 should select *complete LED fixtures* from the Design Lights Consortium (DLC) Qualified List. LED retrofit kits *do not qualify for LS-2 or LS-3 service.*
4. To initiate an incentive application for LS-3 fixtures the customer must submit existing fixture and meter location maps showing , for each affected circuit, voltage, and fixture quantities, wattages, and sources.
5. Dimmable (or field tunable) LED fixtures cannot installed on the unmetered LS-2 tariff. Customers desiring dimmable (or field tunable) LED fixtures shall install them only on LS-3. On a per circuit basis, customers on the unmetered LS-2 do have the option to convert to the metered LS-3 after paying SCE meter installation costs (obtain from SOLO). “Dimmable” means step dimmable, continuously dimmable, or field tunable.
6. The LEDs must replace high pressure sodium (HPS) or pulse start metal halide (PSMH) high intensity discharge lighting.

**Application Recommendations**

1. For any of these LED replacements it is recommended the customer engage a qualified lighting contractor.
2. Customers installing dimmable LED on LS-3 are encouraged to voluntarily meet part load driver power factor (PF) performance and total harmonic distortion, current (THDi) performance. The voluntary performance limits are a minimum of 0.75 PF and a maximum 15% THDi over the full dimmable range of the LED fixture at its operating voltage.
3. The luminaire wattage ranges for this workpaper were developed from raw source LED’s of approximately 100 lumens per watt (85 lumens per watt average maintained).
4. LED fixtures on LS-2 and LS-3 have no color temperature requirements. An LED color temperature range of 4000K+/-350K CCT is suggested because a national consensus and preference has developed for this range.
5. Fixture/enclosure type is recommended certified by NEMA/IEC as wet.
6. It is recommended the LED fixture including all of its electrical and mechanical components be designed for operation in an ambient temperature range of -40 deg C to +50 deg C for outdoor applications.
7. It is recommended that customers whose light fixtures may experience accelerated corrosion due to coastal salt air environments specify marine finish and stainless steel fittings and fitters.

## 1.4 Measure and Base Case Cost Effectiveness Data

### 1.4.1 DEER Measure and Base Case Analysis

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 | DEER does not contain this type of measure. Operating hours are based on DEER dusk-to-dawn interval. |
| DEER Version | N/A |
| DEER Run ID and Measure Name | 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.

**Table 3 Net-to-Gross Ratio**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NTGR\_ID\* | Description\* | Sector\* | BldgType\* | ProgDelivID | NTG\* |
| Com-Default>2yrs | All other EEMs with no evaluated NTGR; existing EEM in programs with same delivery mechanism for more than 2 years | Com | Any | Any | 0.60 |

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

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 non-residential defaulted NTG value, where in fact, a measure offered through direct install and is not “hard to reach” will receive a default NTG value.

**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 workpaper 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 |

**Spillage Rate**

Spillage rate will also be applied to measures however the values will not be tracked in the workpapers. 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 workpaper. For a full set of values associated with the measures in the workpaper refer the Excel calculation template.

Table 5 READi Tech IDs

|  |  |
| --- | --- |
| READi Field Name | Values included in this workpaper |
| Measure Case UseCategory | Lighting |
| Measure Case UseSubCats | Outdoor Dusk to Dawn Lighting |
| Measure Case TechGroups | Lighting - Fixtures |
| Measure Case TechTypes | LED Fixture |
| Base Case TechGroups | Lighting - Fixtures |
| Base Case TechTypes | HID Fixture |

### 1.4.2 Codes and Standards Analysis

**Title 20:** These measures do not fall under Title 20 of the California Energy Regulations [422].

**Title 24:** The 2013 Title 24 [355] Outdoor Lighting Requirements are specified in Section 147. However, as specified in Section 147 Exception 3: public streets, roadways, highways and traffic signage lighting, and occurring in the public right-of-way are exempted. Thus, Title 24 does not apply to these measures.

**Federal Standards:** These measures do not fall under Federal DOE or EPA Energy Regulations.

The following Table 6 summarizes the code analysis.

Table 6 Code Summary

|  |  |  |
| --- | --- | --- |
| Code | Applicable Code Reference | Effective Dates |
| Title 24 (2013) | N/A | N/A |
| Title 20 (2012) | N/A | N/A |

### 1.4.3 Non-DEER Study Review

No additional studies were reviewed. The basis of this work paper is SCE lighting engineering experience and judgment supported by experience with, and computer modeling of, LED designs, installations, operations, and controls. See Attachments 3 and 4.

### 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 “Summary of EUL-RUL Analysis for the April 2008 Update to DEER” 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. 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.

**Relevant data:**

A six-hundred (600) fixture covered parking lot application at Long Beach State University installed in 2009 has demonstrated LED reliability and life showing only 2 fixture failures in over 45,000 continuous hours of operation. The two (2) fixtures that failed were improperly installed- a deluge of rainwater through cracks in the decking shorted them out. Regarding LED reliability Ed Ebrahimian, Director, Los Angeles Bureau of Street Lighting states (Forbes magazine 1 25 2013): “LED fixtures fail at a lesser rate than incumbent technologies. After 36 months of initial operation, for instance, high-intensity discharge (HID) fixtures in Los Angeles recorded an average annual failure rate of 10%; the average annual failure rate for LED cobra style fixtures, according to the latest figures, is 0.2% (189 of 98,000 installed)” It is further known that by mid-2014 LA had 144,000 cobra style LED installed. Of that Cree Lighting reported 187 LED failures among its 117,000 fixtures (0.16% failure rate).

To obtain the EUL value the DEER14 update documentation, EUL\_Summary\_10-1-08.xls [213], was consulted. Table 7 below identifies the value/methodology used for the measures in this work paper.

Table 7 DEER14 EUL Value/Methodology

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| READi EUL ID | Market | Enduse | Measure | EUL (Years) | RUL (Years) |
| Oltg-LED | CC | Lighting | LED lighting | 12 | 4 |

# Section 2. Energy Savings & Demand Reduction Calculations

This measure is based on the replacement of HID lighting sourced fixtures with LED fixtures. Refer to

Table 8 for the base case HID fixture wattages.

The lighting demand difference or *∆watts/unit*, shown in

Table 8, is simply the difference between the electric demand of the base unit and the electric demand of the energy efficient measure unit.

*∆watts/unit = Base watts/uni**t – Energy Efficient watts/unit*

Table 8 Off-Peak Demand Savings

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measure Description | Base Case Demand (W) | Proposed  Measure Case (W) | Source (HID base) | Off-Peak Demand Savings  (W) |
| LED Street Lighting Up to 28 Watts | 66 | 28 | HPS | 38 |
| LED Street Lighting 29-43 Watts | 95 | 43 | HPS | 52 |
| LED Street Lighting 44-54 Watts | 138 | 54 | HPS | 84 |
| LED Street Lighting 55-94 Watts | 188 | 90 | HPS | 98 |
| LED Street Lighting 95-130 Watts | 250 | 130 | HPS | 120 |
| LED Street Lighting 131-196 Watts | 295 | 190 | HPS | 105 |
| LED Street Lighting 197-222 Watts | 365 | 222 | HPS | 143 |
| LED Street Lighting 223-258 Watts | 465 | 260 | HPS | 205 |
| LED Street Lighting up to 28 Watts | 95 | 28 | PSMH | 67 |
| LED Street Lighting 29-43 Watts | 128 | 54 | PSMH | 74 |
| LED Street Lighting 55-94 Watts | 190 | 90 | PSMH | 100 |
| LED Street Lighting 55--94 Watts | 215 | 90 | PSMH | 125 |
| LED Street Lighting 55-94 Watts | 295 | 130 | PSMH | 165 |
| LED Street Lighting 131-196 Watts | 458 | 190 | PSMH | 268 |

The LED wattages are developed in attachment 5 for HPS and PSMH. The LED wattage ranges are developed to approximate HID light levels +/- 15% lumens. Attachment 5 is backup for

Table 8. It develops an application approach based on engineering judgment and uses relative average raw source efficacies, typical and estimated fixture and light-to-target efficiencies to pick appropriate comparable LED light, and wattages.

Using the *∆watts/unit* and the annual operating hours, the annual electric kWh savings can be calculated. The operating hours are approximated at 4,100 hours per year for night operation per DEER.

The following example calculates the annual electric kWh savings for the “LED Street Lighting Up to 28 Watts” measure:

 [**Equation 1**]



The same technique can be used for the remainder of the measures to yield Table 9, a summary of the annual electric savings.

Table 9 Annual Electric kWh Savings per Measure

|  |  |  |  |
| --- | --- | --- | --- |
| HID base/conn. W | Measure | Measure Description | Annual Savings  (kWh) |
| HPS | LED | LED Street Lighting Up to 28 Watts | 155.8 |
| HPS | LED | LED Street Lighting 29-43 Watts | 213.2 |
| HPS | LED | LED Street Lighting 44-54 Watts | 344.4 |
| HPS | LED | LED Street Lighting 55-90 Watts | 401.8 |
| HPS | LED | LED Street Lighting 91-130 Watts | 492 |
| HPS | LED | LED Street Lighting 131-190 Watts | 430.5 |
| HPS | LED | LED Street Lighting 191-222 Watts | 586.3 |
| HPS | LED | LED Street Lighting 223-260 Watts | 840.5 |
| PSMH | LED | LED Street Lighting up to 28 Watts | 274.7 |
| PSMH | LED | LED Street Lighting 44-54 Watts | 303.4 |
| PSMH | LED | LED Street Lighting 55-90 Watts | 410 |
| PSMH | LED | LED Street Lighting 55-90 Watts | 512.5 |
| PSMH | LED | LED Street Lighting 91-130 Watts | 676.5 |
| PSMH | LED | LED Street Lighting 131-190 Watts | 1098.8 |

Complete calculation methodologies for the energy savings are in the calculation worksheet, Attachment [1].

On-Peak Demand Reduction (kW/unit) for these measures are reported as 0 kW because all exterior fixtures controlled by the photocells do not operate during peak daytime periods.

# 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 Outdoor Lt load shape. See Table 10 for a list of all Building Types and Load Shapes applicable to this paper. See the KEMA report [31] for a more thorough discussion regarding the load shapes for this measure.

**Table 10 Building Types and Load Shapes**

|  |  |  |
| --- | --- | --- |
| Building Type | E3 Alt. Building Type | Load Shape |
| Misc. - Commercial | Misc.\_Commercial | Outdoor LT |

# Section 4. Base Case & Measure Costs

Base and measure costs come from multiple sources all compiled in attachment [2].

**4.1 Base Case Cost**

Three lighting distributors provided base reference costs for the measures defined in this work paper. Table 11 shows base case material costs. Details for the fixtures based on comparable HID to LED performance are attached in the References section in Attachment 2.

**Table 11 Base Case Equipment Costs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Solution Code | Source ( HID base ) | HID Base Case Lamp Wattage (nominal W/connected W) | HID Base Equipment Cost ($) | HID Base Labor Cost ($) | Total HID Base Cost ($) |
| LT-27419 | HPS | 50/66 | 174.25 | 68.00 | 242.25 |
| LT-73136 | HPS | 70/95 | 174.25 | 68.00 | 242.25 |
| LT-80500 | HPS | 100/138 | 174.25 | 68.00 | 242.25 |
| LT-24820 | HPS | 150/188 | 174.25 | 68.00 | 242.25 |
| LT-78130 | HPS | 200/250 | 214.74 | 68.00 | 282.74 |
| LT-35164 | HPS | 250/295 | 225.67 | 68.00 | 293.67 |
| LT-61338 | HPS | 310/365 | 268.18 | 68.00 | 336.18 |
| LT-81983 | HPS | 400/465 | 343.04 | 68.00 | 411.04 |
| LT-94198 | PSMH | 70/95 | 213.11 | 68.00 | 281.11 |
| LT-18053 | PSMH | 100/128 | 213.11 | 68.00 | 281.11 |
| LT-39353 | PSMH | 150/190 | 240.89 | 68.00 | 308.89 |
| LT-59292 | PSMH | 175/215 | 233.77 | 68.00 | 301.77 |
| LT-35035 | PSMH | 250/295 | 249.54 | 68.00 | 317.54 |
| LT-46736 | PSMH | 400/458 | 342.44 | 68.00 | 410.44 |

**4.2 Measure Case Cost**

Three lighting distributors provided base reference costs for the Applications defined in this work paper.

**Table 12** includes material as well as labor costs.

**Table 12 Measure Equipment and Labor Costs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Solution Code | LED Measure Wattage | LED Measure Equipment Cost ($) | LED Measure Labor Cost ($) | Total Measure Cost ($) |
| LT-27419 | **28** | 361.53 | 68.00 | 429.53 |
| LT-73136 | 43 | 378.06 | 68.00 | 446.06 |
| LT-80500 | **54** | 411.44 | 68.00 | 479.44 |
| LT-24820 | **90** | 448.51 | 68.00 | 516.51 |
| LT-78130 | **130** | 505.93 | 68.00 | 573.93 |
| LT-35164 | **190** | 667.97 | 68.00 | 735.97 |
| LT-61338 | **222** | 814.73 | 68.00 | 882.73 |
| LT-81983 | **260** | 777.60 | 68.00 | 845.60 |
| LT-94198 | **28** | 324.72 | 68.00 | 392.72 |
| LT-18053 | **54** | 331.50 | 68.00 | 399.50 |
| LT-39353 | **90** | 332.53 | 68.00 | 400.53 |
| LT-59292 | **90** | 339.99 | 68.00 | 407.99 |
| LT-35035 | **130** | 496.70 | 68.00 | 564.70 |
| LT-46736 | **190** | 755.74 | 68.00 | 823.74 |

## 4.3 Gross and Incremental Measure Cost (GMC & IMC respectively)

*For ROB*: *GMC = IMC = (Measure Equipment Cost –Base Case Equipment Cost)*

### 4.3.1 Gross Measure Cost

The GMC is equal to the IMC and they are shown in

**Table 12**.

**4.3.2 Incremental Measure Cost**

For the ROB measure category the first baseline cost is the incremental cost. See Table 13 and Appendix A.

**Table 13 Measure and Base Case Equipment Costs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Solution Code | HID Base Source | LED Measure Equipment Cost ($) | HID Base Case Equipment Cost ($) | Incremental Measure Cost ($) |
| LT-27419 | HPS | 361.53 | 174.25 | 187.28 |
| LT-73136 | HPS | 378.06 | 174.25 | 203.81 |
| LT-80500 | HPS | 411.44 | 174.25 | 237.19 |
| LT-24820 | HPS | 448.51 | 174.25 | 274.26 |
| LT-78130 | HPS | 505.93 | 214.74 | 291.19 |
| LT-35164 | HPS | 667.97 | 225.67 | 442.3 |
| LT-61338 | HPS | 814.73 | 268.18 | 546.55 |
| LT-81983 | HPS | 777.60 | 343.04 | 434.56 |
| LT-94198 | PSMH | 324.72 | 213.11 | 111.61 |
| LT-18053 | PSMH | 331.50 | 213.11 | 118.39 |
| LT-39353 | PSMH | 332.53 | 240.89 | 91.64 |
| LT-59292 | PSMH | 339.99 | 233.77 | 106.22 |
| LT-35035 | PSMH | 496.70 | 249.54 | 247.16 |
| LT-46736 | PSMH | 755.74 | 342.44 | 413.30 |

**Attachments**

1 2345

# References



[31]

[213]

[351]

[355]

[422]

# 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 |