Short Form Work Paper WPSDGENRLG0083

**Revision 1**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**LED Ambient Commercial Fixtures and Retrofit Kits (Troffers)**

**Implementations IDs: 464226 to 464261**

**January 2, 2018**

# LED Ambient Commercial Fixtures and Retrofit Kits (Troffers)

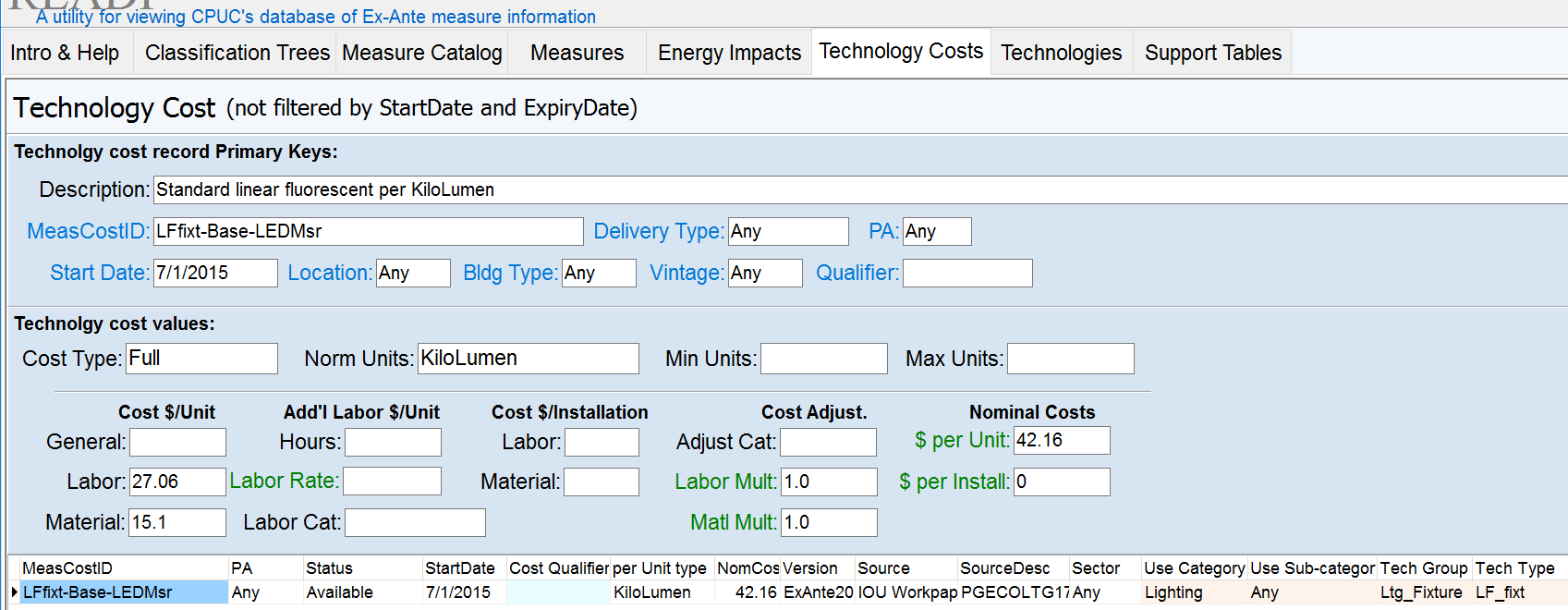
# Short Form WP

## Introduction

This short form workpaper documents the values adopted from PGE’s workpaper entitled “LED Ambient Commercial Fixtures and Retrofit Kits” (PGECOLTG179 R5 LED Ambient Com Fixt-Ret Kits.doc). SDG&E adopts all of the values in PGECOLTG179 R5 LED Ambient Com Fixt-Ret Kits with these exceptions:

1. **SDG&E Ex-ante data includes “Com” building type but all reporting shall be based on actual installation site building type and climate zone.** **SDG&E reporting will not include “Com” building type for claims purposes.**
2. To simplify the number of unique standard Cost IDs SDG&E adopted a DEER/READI Standard Cost ID.

|  |  |  |  |
| --- | --- | --- | --- |
| DEER/READI Cost ID | Material Cost | Labor Cost | Nominal Cost |
| LFfixt-Base-LEDMsr | $15.10 | $27.06 | $42.16 |



1. Created the following new Measure Cost IDs (Norm Unit: KiloLumen):

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PGE Product Code** | **SDGE Measure Cost ID** | **Measure Cost**  **($/unit)** | **Labor Cost ($/unit)** | **Nominal Cost**  **($/unit):** | **Incremental Cost ($/unit)** |
| LT148 | SDGE\_LEDfixt125LPW-2x4-new | $25.83 | $27.06 | $49.10 | $6.94 |
| LT149 | SDGE\_LEDfixt140LPW-2x4-new | $35.99 | $27.06 | $59.26 | $17.10 |
| LT150 | SDGE\_LEDfixt125LPW-2x2-new | $21.89 | $27.06 | $45.16 | $3.00 |
| LT151 | SDGE\_LEDfixt140LPW-2x2-new | $48.29 | $27.06 | $71.56 | $29.40 |
| LT152 | SDGE\_LEDfixt125LPW-1x4-new | $34.18 | $27.06 | $57.45 | $15.29 |
| LT153 | SDGE\_LEDfixt140LPW-1x4-new | $56.08 | $27.06 | $79.35 | $37.19 |
| LT154 | SDGE\_LEDfixt125LPW-2x4-kit | $23.00 | $27.06 | $46.27 | $4.11 |
| LT155 | SDGE\_LEDfixt140LPW-2x4-kit | $32.38 | $27.06 | $55.65 | $13.49 |
| LT156 | SDGE\_LEDfixt125LPW-2x2-kit | $23.41 | $27.06 | $46.68 | $4.52 |
| LT157 | SDGE\_LEDfixt140LPW-2x2-kit | $48.29 | $27.06 | $71.56 | $29.40 |
| LT158 | SDGE\_LEDfixt125LPW-1x4-kit | $27.58 | $27.06 | $50.85 | $8.69 |
| LT159 | SDGE\_LEDfixt140LPW-1x4-kit | $32.04 | $27.06 | $55.31 | $13.15 |

1. Created the following new Incremental Cost

|  |  |  |
| --- | --- | --- |
| **SDG&E Product Code** | **Measure Description** | **Incremental Measure Cost** |
| WPSDGENRLG0083-Rev01-Msr003 | 2'x4' LED new Luminaire; rated ≥125 LPW, Ambient Interior Commercial Spaces | $6.94 |
| WPSDGENRLG0083-Rev01-Msr009 | 2'x4' LED new Luminaire; rated ≥140 LPW, Ambient Interior Commercial Spaces | $17.10 |
| WPSDGENRLG0083-Rev01-Msr002 | 2'x2' LED new Luminaire; rated ≥125 LPW, Ambient Interior Commercial Spaces | $3.00 |
| WPSDGENRLG0083-Rev01-Msr008 | 2'x2' LED new Luminaire; rated ≥140 LPW, Ambient Interior Commercial Spaces | $29.40 |
| WPSDGENRLG0083-Rev01-Msr001 | 1'x4' LED new Luminaire; rated ≥125 LPW, Ambient Interior Commercial Spaces | $15.29 |
| WPSDGENRLG0083-Rev01-Msr007 | 1'x4' LED new Luminaire; rated ≥140 LPW, Ambient Interior Commercial Spaces | $37.19 |
| WPSDGENRLG0083-Rev01-Msr006 | 2'x4' LED Integrated retrofit kit; rated ≥125 LPW, Ambient Interior Commercial Spaces | $4.11 |
| WPSDGENRLG0083-Rev01-Msr012 | 2'x4' LED Integrated retrofit kit; rated ≥140 LPW, Ambient Interior Commercial Spaces | $13.49 |
| WPSDGENRLG0083-Rev01-Msr005 | 2'x2' LED Integrated retrofit kit; rated ≥125 LPW, Ambient Interior Commercial Spaces | $4.52 |
| WPSDGENRLG0083-Rev01-Msr011 | 2'x2' LED Integrated retrofit kit; rated ≥140 LPW, Ambient Interior Commercial Spaces | $29.40 |
| WPSDGENRLG0083-Rev01-Msr004 | 1'x4' LED Integrated retrofit kit; rated ≥125 LPW, Ambient Interior Commercial Spaces | $8.69 |
| WPSDGENRLG0083-Rev01-Msr010 | 1'x4' LED Integrated retrofit kit; rated ≥140 LPW, Ambient Interior Commercial Spaces | $13.15 |
|  | | |

## Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 06/30/2017 | Kelvin Valenzuela, SDG&E | Adopted from PG&E, PGECOLTG179 R3 LED Ambient Com Fixt-Ret Kits.doc |
| **0.1** | **12/05/2017** | **Ed Reynoso, SDG&E** | 1. **Revised workpaper to address CPUC ex-ante review comments dated 7/18/2017. Revised savings calculations to align with lower end of lumen bins.** 2. **Added Mid-Stream/ Upstream program narrative on collecting customer site information for reporting purposes.** 3. **SDG&E Ex-ante data includes “Com” building type but all reporting shall be based on actual installation site building type and climate zone.**   **All energy efficiency savings, measure cost, base cost and IMCs are based on using the lower lumen range per bin.** |
| **1** | **1/02/2018** | **Eduardo Reynoso, SDG&E** | 1. **SDG&E revised short form workpaper measures and Ex-ante data by removing lumen/fixture bins and replacing measures based on PGE Kilo-Lumen savings impacts and cost.** 2. **Revised short form workpaper to better align with PGE workpaper “**PGECOLTG179 R5 LED Ambient Com Fixt-Ret Kits.doc’ dated 7/12/2017. 3. Adopted DEER Base Cost ID “LFfixt-Base-LEDMsr” per exceptions as discussed in the Introduction, herein. 4. Created new Measure Cost IDs as discussed in the Introduction, herein. |
|  |  |  |  |

## Measure Summary

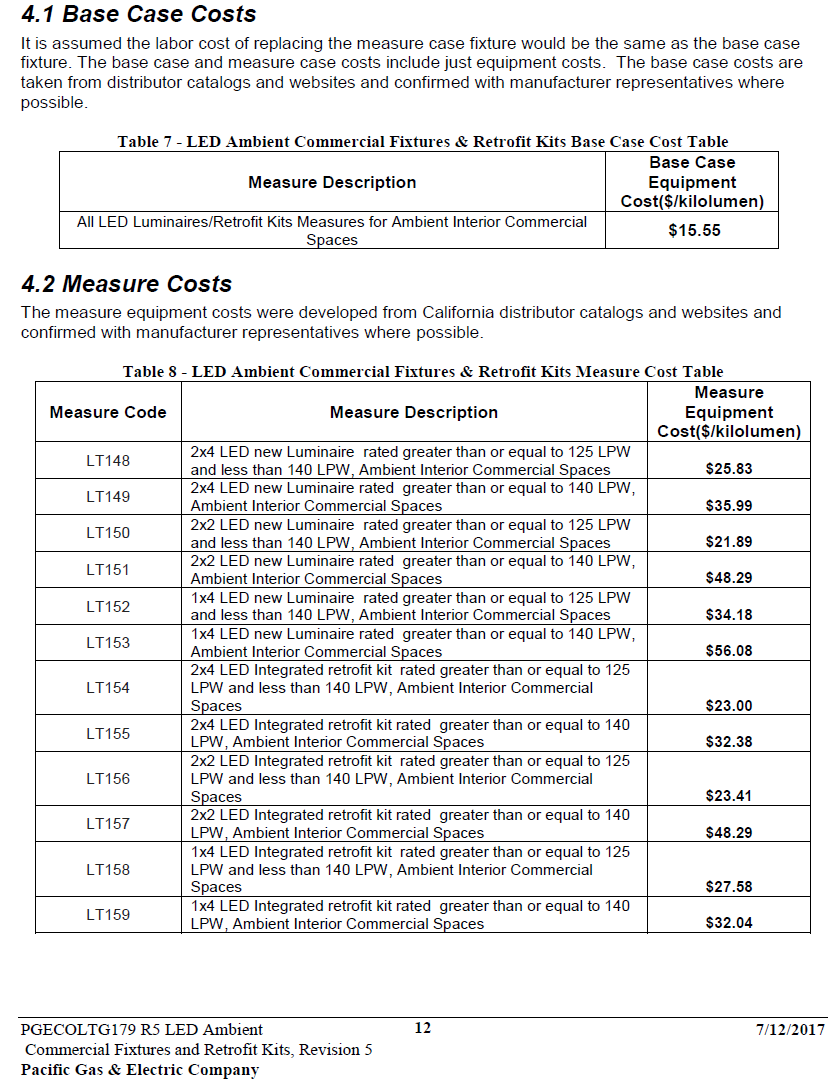
Table 1: Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This work paper documents the values adopted from PG&E’s workpaper entitled “LED Ambient Commercial Fixtures and Retrofit Kits” (PGECOLTG179 Rev 5). |
| **1.1 Eligibility & Technical Requirements** | This short form workpaper summarizes the replacement of linear fluorescent fixtures with LED Ambient Commercial Fixtures & Integrated Retrofit Kits. The LED fixture or integrated retrofit kit must replace a linear fluorescent fixture on a 1-for-1 basis.  DLC requirements for Integrated Retrofit Kits and Luminaires for Ambient Lighting of Interior Commercial Spaces include:   * 5-year warranty * 50,000 hour L70 Lumen Maintenance * 36,000 hour L90 Lumen Maintenance * ≥ 80 Color Rendering Index (CRI) * ≥ 125 lumens / Watt * ≤ 5000 Kelvin Correlated Color Temperature (CCT) * Spacing Criteria from 1.0 to 2.0 in both the 0-180° and 90-270° directions * ≥75% of Lumen Output in the 0-60° zone   **General Eligibility Requirements**[[1]](#footnote-1)   1. Must be a one for one replacement for a Linear Fluorescent Fixture with T8 or T5 lamps 2. Must be a Design Lights Consortium (DLC) approved New Luminaire or an Integrated Retrofit Kit, listed on the DLC qualified product list as Luminaires/Integrated Retrofit Kits for Ambient Lighting of Interior Commercial Spaces in one of the following sizes: 2x4, 2x2, 1x4 3. Must be listed as DLC Premium by the Design Lights Consortium 4. DLC-listed initial light output must be ≥ 2200 lm and ≤ 6500 lm 5. Linear LED replacement lamps do not qualify 6. LED Linear Retrofit kits on the DLC QPL do not qualify. 7. Only Fixtures and Retrofit kits that include new lenses between the LED package and the viewer qualify. 8. Self-ballasted or screw-based lamps do not qualify. 9. 5-year warranty minimum 10. Must meet the minimum efficacy requirements ≥ 125.   **Exclusions:**   * Other fixtures configurations, including LED troffer linear retrofit kits, linear ambient luminaires (direct/indirect) or external driver lamp-style retrofits (UL, Type C), do not qualify for this rebate. * Exterior or high/low-bay installations of these products do not qualify for this rebate. * Products in the above listed category <2,199 lumens or >6501 lumens do not qualify for this rebate. |
|  | **Product Technical Description:**  Light emitting diode (LED) sources have improved over the past decade making them an efficient and reliable lighting technology. Many LED products have successfully replaced other lighting sources in some applications and made their way into the market through continuous improvement and compete with more established sources across many applications.  Recessed rectangular light fixtures, sometimes known as troffers, have traditionally used linear fluorescent light sources: T8 lamps predominate currently, with small T5 market share and a diminishing T12 presence in non-residential building stock. Similar fixture shapes are in use for much less common surface mountings in non-residential buildings, for spaces where recessed ceiling space is unavailable, but ease of maintenance dictates a common lamp type. 4 foot lamps predominate, with 2 foot or U-bent 4 foot lamps also common.  LED Ambient Commercial products, which are most commonly used in recessed ceilings but may also be surface-mounted or suspended, are available both as complete new fixtures (a.k.a. luminaires) and as integrated retrofit kits. Both options include new LED chips, an LED driver or power supply, and optical control or lenses. Retrofit kits allow these components to be fit into existing linear fluorescent metal housing, whereas new LED luminaires are sold complete with a new metal housing. |
| Measure 1 | The following are the PGE Product Code (Implementation IDs) for LED Luminaires/Retrofit Kits rated ≥125 LPW, Ambient Interior Commercial Spaces.   |  |  |  | | --- | --- | --- | | Product Code | | Measure Description | | SDGE | PGE | | WPSDGENRLG0083-Rev01-Msr003 | LT148 | 2x4 LED new Luminaire rated greater than or equal to 125 LPW and less than 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr009 | LT149 | 2x4 LED new Luminaire rated greater than or equal to 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr002 | LT150 | 2x2 LED new Luminaire rated greater than or equal to 125 LPW and less than 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr008 | LT151 | 2x2 LED new Luminaire rated greater than or equal to 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr001 | LT152 | 1x4 LED new Luminaire rated greater than or equal to 125 LPW and less than 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr007 | LT153 | 1x4 LED new Luminaire rated greater than or equal to 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr006 | LT154 | 2x4 LED Integrated retrofit kit rated greater than or equal to 125 LPW and less than 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr012 | LT155 | 2x4 LED Integrated retrofit kit rated greater than or equal to 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr005 | LT156 | 2x2 LED Integrated retrofit kit rated greater than or equal to 125 LPW and less than 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr011 | LT157 | 2x2 LED Integrated retrofit kit rated greater than or equal to 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr004 | LT158 | 1x4 LED Integrated retrofit kit rated greater than or equal to 125 LPW and less than 140 LPW, Ambient Interior Commercial Spaces | | WPSDGENRLG0083-Rev01-Msr010 | LT159 | 1x4 LED Integrated retrofit kit rated greater than or equal to 140 LPW, Ambient Interior Commercial Spaces | |  | | | |
| Code for Measure 1 | Linear Fluorescent Fixture with T8 or T5 lamps |
| Mid-Stream Lighting | **Mid-Stream Lighting (Delivery Method: PreRebUp)**  SDG&E’s Midstream implementation strategy is a hybrid of upstream and downstream rebate strategy. It is basically the same as a downstream approach except rather than providing the customer or its contractor with a rebate; the incentive is paid to the distributer/supply house. SDG&E will work with various trade allies to promote the measures. SDG&E will verify LED luminaire fixture specification and site-specific information by working with its trade allies including participating lighting distributors who will provide incentives on qualified LED new luminaires and integrated retrofit kits products.  SDG&E will coordinate with its trade allies to stock and promote and a variety of products that meet SDG&E’s workpaper requirements.  LED Integrated Retrofit kits and New Luminaires will be pre-approved for use in the Midstream program to ensure that only LED luminaire with specification sheets that list the DLC QPL tested and/or reported lumens, and LPW are eligible for incentives.  Distributors will provide the necessary documentation to SDG&E processing to verify the product is eligible for incentives. Customers willing to participate in the Mid-Stream Lighting Program will need to provide installation site information that includes utility meter. All claims and reporting process includes the installation site information so all savings to be based on standard DEER building types and climate zone. The “Com” building type will not be used for reporting purposes. |
| **1.3 Installation Type and Delivery Mechanisms** |  |
| Installation Type | * Replace On Burnout (ROB) * New Construction (New/NC)   All the measures within this workpaper are calculated for both ROB and NC. |
| Delivery Mechanisms | * Financial Support - PreRebUp – Deemed * Financial Support – DirInstall – Deemed * Financial Support – PreRebDown – Deemed   Incentive Methods Descriptions   |  |  | | --- | --- | | Incentive Methods | Description | | Direct Install | The program implements energy efficiency measures for qualifying customers, at low or 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. | | Mid-Stream Incentive | The program gives a financial incentive to a midstream market actor, such as a distributor, retailer or contractor, to encourage the promotion of efficient measures. The incentive may or may not be passed on to the end-use customer. | | Up-Stream | The program gives a financial incentive to an upstream market actor, such as a manufacturer or distributor, to encourage the manufacture, provision, or distribution of an efficient measure. The incentive may or may not be passed on to the end-use customer. | |
| **1.4.1 DEER Data** |  |
| DEER Measure ID |  |
| Net-to-Gross Ratio | NTG = All-Default<=2yrs will be used until 12/31/2018   |  |  |  | | --- | --- | --- | | Sector | NTG ID | NTG value | | Any | All-Default<=2yrs | 0.7 |   On 1/1/2019   |  |  |  | | --- | --- | --- | | Sector | NTG ID | NTG value | | Non-Res | Com-Default>2 | 0.6 | | Res | Res-Default> | 0.55 |   Note: Applies to all delivery types: PreRebDown/PreRebUp/DirInstall |
| GSIA ID: | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | GSIA ID | Description | Sector | BldgType | ProgDelivID | GSIA Value | | Def-GSIA | Default GSIA value | Any | Any | Any | 1 | |
| Effective and Remaining Useful Life | ILtg-Com-LED-50000hr+16yr; EUL = 16 years |
| **Section 2. Calculation Methodology** | PG&E’s calculation methodology is based on the delta watts/kilolumen unit.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | PGE Measure Code | Measure Description | Base Case system wattage per kilolumen (Com) | LED Watts per kiolumen | Delta Watts per kilolumen (Com) | | LT148, LT150, LT152, LT154, LT156, LT158 | LED Luminaires/Retrofit Kits rated ≥125 and <140 LPW, Ambient Interior Commercial Spaces | 14.8-16.3 | 8.0 | 6.8-8.3 | | LT149, LT151, LT153, LT155, LT157, LT159 | LED Luminaires/Retrofit Kits rated ≥140 LPW, Ambient Interior Commercial Spaces | 14.8-16.3 | 7.1 | 7.7-9.2 | |
| Energy Savings/Peak Demand Reduction Measures | Various per building type (See 20171204\_WPSDGENRLG0083-Rev01.mdb) |
| **Section 3. Load Shapes** | ElecImpProfile: SDGE:DEER:Com:Indoor Non-CFL Ltg  GasImpProfile: Winter Only |
| **Section 4. Costs** |  |
| DEER/ READI  Base CostID | Norm Units: KiloLumen   |  |  |  |  | | --- | --- | --- | --- | | DEER/READI Cost ID | Material Cost | Labor Cost | Nominal Cost | | LFfixt-Base-LEDMsr | $15.10 | $27.06 | $42.16 | |
| Measure Cost | Refer to the SDG&E Ex-ante database for more information.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | PGE Measure Code | SDGE Measure Cost ID | Measure Cost  (cost/unit) | Labor Cost (cost/unit) | Nominal Cost  (cost/unit): | | LT148 | SDGE\_LEDfixt125LPW-2x4-new | $25.83 | $27.06 | $49.10 | | LT149 | SDGE\_LEDfixt140LPW-2x4-new | $35.99 | $27.06 | $59.26 | | LT150 | SDGE\_LEDfixt125LPW-2x2-new | $21.89 | $27.06 | $45.16 | | LT151 | SDGE\_LEDfixt140LPW-2x2-new | $48.29 | $27.06 | $71.56 | | LT152 | SDGE\_LEDfixt125LPW-1x4-new | $34.18 | $27.06 | $57.45 | | LT153 | SDGE\_LEDfixt140LPW-1x4-new | $56.08 | $27.06 | $79.35 | | LT154 | SDGE\_LEDfixt125LPW-2x4-kit | $23.00 | $27.06 | $46.27 | | LT155 | SDGE\_LEDfixt140LPW-2x4-kit | $32.38 | $27.06 | $55.65 | | LT156 | SDGE\_LEDfixt125LPW-2x2-kit | $23.41 | $27.06 | $46.68 | | LT157 | SDGE\_LEDfixt140LPW-2x2-kit | $48.29 | $27.06 | $71.56 | | LT158 | SDGE\_LEDfixt125LPW-1x4-kit | $27.58 | $27.06 | $50.85 | | LT159 | SDGE\_LEDfixt140LPW-1x4-kit | $32.04 | $27.06 | $55.31 | |
| Incremental Measure  Cost (IMC) | Refer to supporting cost tables on pages 10-12 attached herein. |

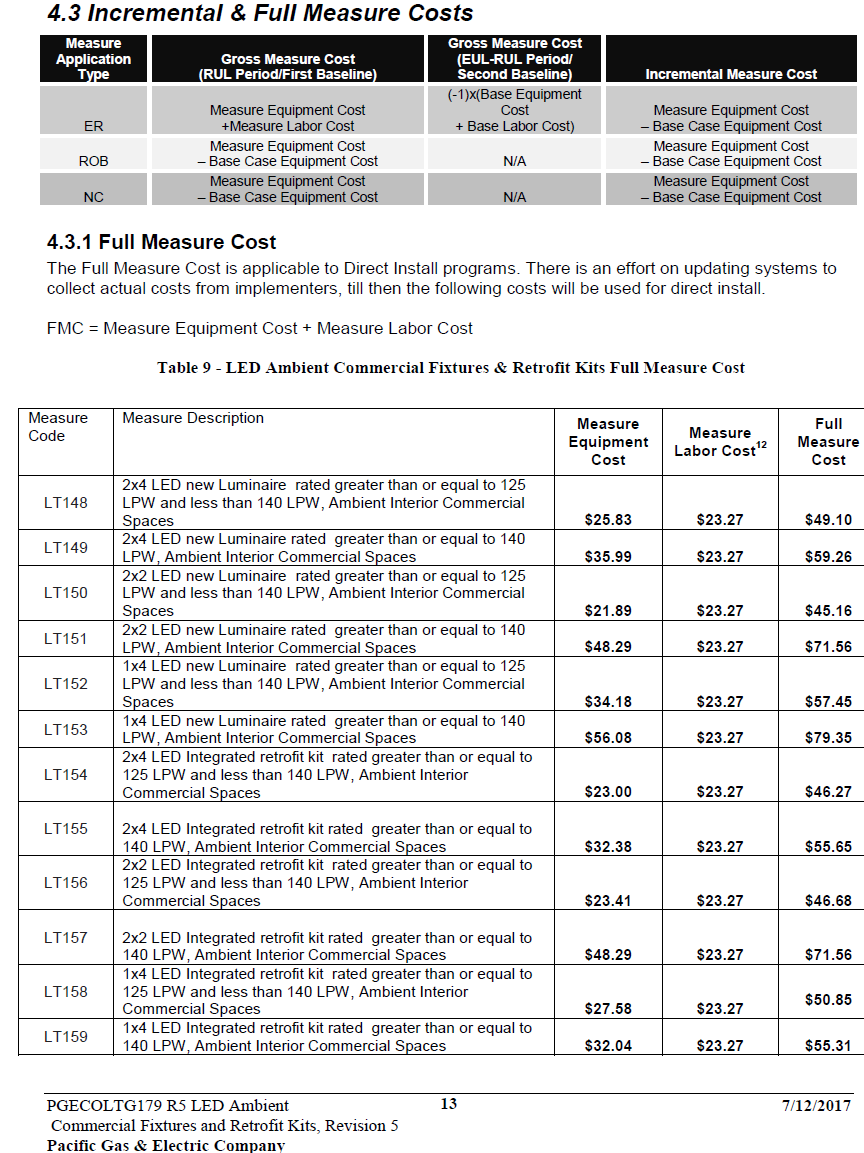
1. SDG&E Incremental Cost:

|  |  |  |
| --- | --- | --- |
| **SDG&E Measure ID** | **Measure Description** | **Incremental Measure Cost** |
| WPSDGENRLG0083-Rev01-Msr003 | 2'x4' LED new Luminaire; rated ≥125 LPW, Ambient Interior Commercial Spaces | $6.94 |
| WPSDGENRLG0083-Rev01-Msr009 | 2'x4' LED new Luminaire; rated ≥140 LPW, Ambient Interior Commercial Spaces | $17.10 |
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| WPSDGENRLG0083-Rev01-Msr007 | 1'x4' LED new Luminaire; rated ≥140 LPW, Ambient Interior Commercial Spaces | $37.19 |
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| WPSDGENRLG0083-Rev01-Msr010 | 1'x4' LED Integrated retrofit kit; rated ≥140 LPW, Ambient Interior Commercial Spaces | $13.15 |

1. PG&E Base and Measure Cost Table:



1. PG&E Incremental and Full Measure Cost:



1. [↑](#footnote-ref-1)