Short Form Work Paper WPSDGENRLG0082

**Revision 2.1**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**LED Refrigeration Case Lighting**

**August 21, 2017**

# SDG&E LED Refrigeration Case Lighting

## Introduction

This short form workpaper documents (WP) the values adopted from PGE’s WP entitled “LED Refrigeration Case Lighting” (PGECOLTG174 R2 LED Ref Case Lighting). SDG&E adopts all of the values in PGECOLTG174 R2 LED Ref Case Lighting, with the following exceptions:

1. SDG&E use different measure wattage ranges, which creates only 4 implementations versus PGE’s 14.

2. SDG&E does not include no HVAC interactive effects.

## Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 1 | 07/17/2009 | SDG&E | No revision history found. See Rev1 for workpaper information |
| 1.1 | 05/23/2014 | Judelson Enriquez / RMS | INTERNAL UPDATES ONLY  1. No material impacts made.  2. EUL ID changed from "ILtg-LED"" to "GrocDisp-FixtLtg-LED" but values did not change.  3. NTG/GSIA/Load Shape IDs do not differ from PB.   1. Updated workpaper to new format. 2. Updated measure description, measure requirements, DEER difference analysis, code analysis, EUL, NTG section, Section 2 with 2014 updated IE/hours of operation methodology approach, measure wattage table, cost language, load shape ID, and cost table. 3. Added code summary table, EUL table, NTG table, and GSIA language and table. |
| 2 | 10/18/2016 | SDG&E Workpaper Team | Utilized base wattage and refrigeration compressor savings values from PG&E’s LED workpaper of the same name (PGECOLTG174, Revision 2) to generate SDG&E specific measure saving. |
| 3 | 07/31/2017 | Eduardo Reynoso  SDG&E | - Minor revision change to workpaper by creating new Direct Install (DI) implementation for 5 foot and 6 foot case lighting (463838 and 463839). No change to EE savings impacts. |

## Measure Summary

Table 1: Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This short form workpaper documents ex-ante load impacts and cost-effectiveness values for Refrigeration LED Case Lighting. The base wattage and refrigeration compressor savings values from PG&E’s LED workpaper of the same name (PGECOLTG174, Revision 2). Since SDG&E’s measure offering is different than that of PG&E, SDG&E’s measure wattage is substituted to compute the wattage differential (delta watts). SDG&E’s measures are offered in either 5-foot or 6-foot. SDG&E used PG&E’s per foot values and converted to its respective length. Energy and load impact savings are based on the delta watts multiplied by the DEER 2016 “Building Occupancy Sensor” operating hours and coincident demand factor for the grocery (GRO) building type. Similar to PGE’s workpaper, because Grocery (GRO) is the dominant building type for these measures, the default Com building type will use the operating hours for GRO building type.  Any Upstream savings calculated using the Com default building type will be based on GRO operating hours. |
| **1.1 Measure & Baseline Data** | Measure:  402270 / 463838 - LED Refrigeration Case Lighting - Premium Tier 5' Case Door  402273 - LED Refrigeration Case Lighting - Standard Tier 5' Case Door  402271 / 463839 - LED Refrigeration Case Lighting - Premium Tier 6' Case Door  402274 - LED Refrigeration Case Lighting - Standard Tier 6' Case Door  Baseline: Linear fluorescent T12/T8 refrigeration case lighting. |
| **1.2 Technical Description** |  |
| Measures | See Requirements |
| Code for All Measures | See PGECOLTG174, Revision 2 at Page 6. These measures do not fall under Title 20 [2015], are not required by Title 24 (2013) except for controls, and are not addressed as a specific technology for refrigerated cases in the Federal Standards. |
| Requirements | * Only complete, new Linear LED strips or fixtures qualify * LED tubes do not qualify * Must replace existing fluorescent lighting * Qualifying fixtures must be listed on one of the following lists   Energy Star: https://www.energystar.gov/productfinder/product/certified-light-fixtures/results https://www.energystar.gov/products/lighting\_fans/light\_bulbs  DLC: http://www.designlights.org/QPL and Appendix E: Table of Approved LED Lighting & Utility Approval Process (xls) |
| **1.3 Installation Type and Delivery Mechanisms** |  |
| Installation Type | Replace on Burn-out (ROB) |
| Delivery Mechanisms | Downstream Rebate – Deemed  Direct Install - Deemed  NOTE: Measures are offered in the SDG&E Direct Install program yet require a customer co-pay and are treated as downstream deemed. |
| **1.4.1 DEER Data** |  |
| Net-to-Gross Ratio | Com-Default>2yrs |
| Effective and Remaining Useful Life | GrocDisp-FixtLtg-LED |
| **Section 2. Calculation Methodology** | DEER 2016 |
| Energy Savings/Peak Demand Reduction – All Measures | Base wattage is based on PG&E’s Tier 2 (≤5-foot = 10.45 watts/foot & > 5-foot = 24.96 watts/foot). The Refrigeration Compressor Savings Factor = 1.374 for PG&E’s workpaper at page 9, Section 2.01.  Energy and load impact were computed using DEER 2016 “Building Occupancy Sensor” operating hours and coincident demand factor for the grocery (GRO) building type (5,390 & 0.886, respectively) |
| **Section 3. Load Shapes** | DEER:Com:Indoor\_Non-CFL\_Ltg |
| **Section 4. Costs** |  |
| **Section 4.1 Base and Measure Costs** |  |
| Base Cost |  |
| 402270/402273 | $3.14/foot x 5 feet = $15.70 (PG&E LB07) |
| 402271/402274 | 7.01/foot x 6 feet = $42.06 (PG&E LB09) |
| 463838/463839 | Direct Install 3P Contracted Cost |
| Measure Cost | $24.84/foot (PG&E LB07 & LB09) |
| 402270/402273 | 24.84/foot x 5 feet =$124.2 |
| 402271/402274 | 24.84/foot x 6 feet =$149.04 |
| 463838/463839 | Direct Install 3P Contracted Cost |

## Savings Calculation Methodology

SDG&E does not accept the HVAC interactive effects since the refrigerated cases are considered self-contained and any interactive effect is absorbed by the refrigeration compressor, not the HVAC system.

* Measure Unit = Case Door (Door)
* Compressor Savings Factor = 1.374 (Section 2 above)
* ∆Watts/door =(Base Case Watts/door - Measure Case Watts/door) x Compressor Savings Factor

As an example, SDG&E product code 402270 assumes a 5 door refrigerated display case. 5 foot lamps (52.25W per lamp, per PG&E), which has a fixture wattage of 62.7W per door.

* Annual Electric Savings [kWh/door] = (∆Watts/door) x (DEER 2016 Annual Hours of Operation)/ (1,000 Watts / kW)
* Demand Reduction [kW/door] **=** (∆Watts/door) x (DEER 2016 Lighting Coincident Demand)/(1,000 Watts/kW)

(See calculation workbook for specific computations)

## Savings Calculation Workbook

