Short Form Work Paper WPSDGEREHC1064

**Revision 1**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Quality Installation for**

**Residential Split Systems and Packaged Units**

**December 7, 2017**

**SDG&E** **Quality Installation for Residential Split Systems and Packaged Units**

## Introduction

This short form workpaper documents the values adopted from SCE’s workpaper entitled “Quality Installation for Residential Split Systems and System Upgrade” (SCE17HC023.0-QI For Residential Split Systems\_Final.docx). SDG&E adopts all the values in SCE17HC023.0-QI For Residential Split Systems\_Final, with the following exceptions:

1. SCE workpaper includes energy efficiency upgrade in addition to quality installation. SDG&E has adjusted energy savings and costs to only include quality installation of a 15 SEER, 16 SEER or 17 SEER unit.
2. SDG&E will only reference SDG&E climate zones of CZ06, CZ07, CZ08, CZ10, CZ14 and CZ15.

## Document Revision History

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| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | Unknown  06/25/2012 | KEMA Services, Inc  Peter Ford / SDG&E | * Added climate zone 7 to WPSCRESH0023.3 * Adopted KEMA WP, corrected NTG to DEER 2011, and clarified TOU Adjustment Factor |
| 0.1 | 06/28/2014 | Judelson Enriquez / RMS Energy Consulting, LLC | * INTERNAL REVISION ONLY – no material impacts made   Updated DEER/Code language. Generated calculation template. |
| 1 | 12/7/17 | Keith Valenzuela/SDGE Contractor | * Adapted SCE’s workpaper SCE17HC013.0 but only referenced SDG&E climate zones of CZ06, CZ07, CZ08, CZ10, CZ14 and CZ15. |

## Measure Summary

Table : Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This short form workpaper documents ex-ante load impacts and cost-effectiveness values for quality installation of residential split system HVAC units. Quality installation is defined by Energy Star as having properly sized units, properly matched components, refrigerant charge, airflow, and sealed ducts. Given the magnitude of refrigerant charge loss required to impact the unit performance, the refrigerant charge is considered adequate in both the baseline and measure units for the purposes of this workpaper. The savings reported are based on the impact of properly sizing the unit, sealing the ducts, and setting the airflow to 400 cfm/ton. The base case for this workpaper is considered an equally efficient (equivalent SEER), but poorly installed unit. As such, the base unit efficiency upgrades are not counted as part of this work paper. |
| **1.1 Measure & Baseline Data** | |
| **1.2 Technical Description** | This work paper includes quality installation of HVAC units. The measure and base cases for residential quality installation are based on the recommendations of Work Order 32 per SCE workpaper SCE17HC013.0. Base case includes a unit installed following standard practices. A unit installed following standard processes may be over-sized, may contain ducts that are not properly sealed, may have less than appropriate airflow, may have a total duct system static pressure that is too high, and may have inappropriate refrigerant charge. Measure cases include an equivalent SEER to the base case with proper installation. A quality installed unit includes the unit being properly sized, sealing the ducts, meeting the airflow (cfm/ton) standards, confirming that the total duct system static pressure meets installation standards, and confirming appropriate refrigerant charge. |
| Measures | Measure:  420144 - Quality Installation – SEER 15  464088 - Quality Installation – SEER 16  464089 - Quality Installation – SEER 17+ |
| Code for All Measures | Title 20 requires a minimum 14.0 SEER value for single phase air conditioners and heat pumps less than 65,000 Btu/h. This is not applicable because the workpaper is only accounting for savings based on the installation. Efficiency of the units are equivalent in the base and measure case.  Title 24 does require the same installation practices; however, the compliance rates for these have been historically low. Data from WO032 is utilized in this work paper to account for the most recent base and measure installation practices. Given these low compliance rates, the base case is considered non-compliant. |
| Requirements | Must follow the measure requirements of the incentive and partnership programs. |
| **1.3 Installation Type and Delivery Mechanisms** | |
| Installation Type | Replace on Burnout (ROB) |
| Delivery Mechanisms | PreRebDown |
| **1.4.1 DEER Data** | |
| Net-to-Gross Ratio | All-Default<=2yrs |
| Effective and Remaining Useful Life | HV-ResAC  EUL= 15 years  RUL=EUL/3=5 |
| GSIA | GSIA ID: Def-GSIA |
| **Section 2. Calculation Methodology** | |
| Energy Savings/Peak Demand Reduction – All Measures | The annual energy and demand savings for the residential sector are based on SCE’s workpaper SCE17HC013.0. The SCE workpaper includes multiple measures. Two of the included measures are:  1. Energy efficiency upgrade (T20 to SEER15/16/17) with quality installation  2. Energy efficiency upgrade (T20 to SEER15/16/17) with standard installation  SDG&E has adjusted energy savings to only include quality installation of a 15 SEER, 16 SEER or 17 SEER unit. The energy savings for standard installation were subtracted from the energy savings of a quality installed unit to determine the energy savings associated with the quality installation of the unit. The base case and measure case SEER are equal, the only difference is the installation method (standard or quality). |
| **Section 3. Load Shapes** | |
| Load Shape | SDGE:DEER:HVAC\_Eff\_AC Annual |
| **Section 4. Cost** | |
| **Section 4.1 Base and Measure Costs** | |
| Base Cost | The base case is the cost of standard installation based on SCE’s workpaper SCE17HC013.0. Please see cost table in measure cost description. |
| Measure Cost | The costs are based on SCE’s workpaper SCE17HC013.0. The SCE workpaper includes multiple measures. Two of the included measures are:  1. Energy efficiency upgrade (T20 to SEER15/16/17) with quality installation  2. Energy efficiency upgrade (T20 to SEER15/16/17) with standard installation  SDG&E has adjusted the costs to only include quality installation of a 15 SEER, 16 SEER or 17 SEER unit. The costs for standard installation were subtracted from the costs of a quality installed unit to determine the IMC associated with the quality installation of the unit. The base case and measure case SEER are equal, the only difference is the installation method (standard or quality). |