Short Form Work Paper WPSDGEREHC0032

**Revision 2**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Residential HVAC Quality Maintenance**

**December 18, 2018**

# SDG&E Refrigerant Charge Adjustment

## Introduction

This short form workpaper documents the values adopted from SCE’s workpaper entitled “Residential HVAC Quality Maintenance” (SCE17HC029 Revision 2). SDG&E adopts all the values in SCE17HC029 Revision 2, with the following exceptions:

1. Measure Application Type was adjusted to BRO-RCx from Retrofit Add-On (REA) per E-4818.
2. DEER Measure ID’s RE-HV-RefChrg-Inc-TXV-typ and RE-HV-RefChrg-Dec-NoTXV-typ are switched in SCE17HC029 Revision 2 calculations template file. The values were mapped to the correct measure in this short form workpaper.
3. SCE calculation method for Measure 7: Air Flow Adjustment deviated from Energy Division Workpaper Disposition for Residential HVAC Quality Maintenance dated May 2, 2013. To be consistent with the calculation methodology of Measure 5: Condenser Coil Cleaning and Measure 6: Evaporator Coil Cleaning the calculation methodology from Energy Division Workpaper Disposition for Residential HVAC Quality Maintenance dated May 2, 2013 was used to calculate impacts for Measure 7: Air Flow Adjustment.
4. Energy impacts for SDG&E climates zones were adopted from PA specific SDG values from READi v2.5.1.

## Document Revision History

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| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 12/22/17 | Keith Valenzuela/SDGE Contractor | Adopted READI v.2.4.7 energy impacts for DEER 2018 updates with adjustment factors from Energy Division Workpaper Disposition for Residential HVAC Quality Maintenance dated May 2, 2013. |
| **0.1** | **02/28/18** | Keith Valenzuela/SDGE Contractor | Updated Delivery Type to include downstream |
| 1 | 11/05/18 | Keith Valenzuela/SDGE Contractor | Updated workpaper to remove incidence factor adjustment from savings calculations from stand-alone measures (Measure 1 and Measure 4). |
| 2 | 12/18/18 | Keith Valenzuela (AESC) | - Adopted SCE17HC029 Revision 2 energy impact and cost values  - Changed workpaper name from “Refrigerant Charge Adjustment” to “Residential HVAC Quality Maintenance”.  - Removed and retired “Residential refrigerant charge and airflow adjustment” and “AC Diagnostic, Repair and Tune-up 1995-2005” measures.  -Added “Condenser Coil Cleaning”, “Evaporator Coil Cleaning”, “Duct Seal Med to Low”, and “Duct Seal High to Low” measures.  -Updated this workpaper to include all measures (listed above) from SDG&E workpapers “WPSDGEREHC1067 Revision 1 Duct Seal” and “WPSDGERERN001 Revision 4 Res Condenser Coil Cleaning”. Both of these workpapers will be retired effective 1/1/2019.  -Added new Measure Application Types and Delivery Type for 1/1/19. |

## Measure Summary

Table 1: Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **1.1 Measure & Baseline Data** | Please reference SCE17HC029 Revision 2 Section 1.1 Measure Description & Background. |
| **1.2 Technical Description** | Please reference SCE17HC029 Revision 2 Section 1.2 Technical Description |
| Measures | Measures and Codes   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Measure Codes** | | | | **Measure Name** | | SCG | SDG&E | SCE | PG&E | | N/A | 465497  465498 | AC-20329 | N/A | Decrease Refrigerant Charge - System with No thermal expansion valve (TXV) - Typical (8% rated charge) | | N/A | 465499  465500 | AC-20326 | N/A | Decrease Refrigerant Charge - System with thermal expansion valve (TXV) - Typical (8% rated charge) | | N/A | 465501  465502 | AC-20327 | N/A | Increase Refrigerant Charge - System with No thermal expansion valve (TXV) - Typical (8% rated charge) | | N/A | 465503465504 | AC-20328 | N/A | Increase Refrigerant Charge - System with thermal expansion valve (TXV) - Typical (8% rated charge) | | N/A | 420138  464288 | AC-56069 | N/A | Condenser Coil Cleaning | | N/A | 465507  465508 | AC-95345 | N/A | Evaporator Coil Cleaning | | N/A | 420147  464293 | AC-94699 | N/A | Air Flow Adjustment | | N/A | 421024  465512 | AC-60036 | N/A | Duct Seal Med to Low | | N/A | 421023  465514 | AC-21964 | N/A | Duct Seal High to Low |   Note: SDG&E has two measure codes per measure to account for each available delivery type (Direct Install and Downstream Incentive) |
| Code for All Measures | Please reference SCE17HC029 Revision 2 Section 1.4.2 Codes and Standards Analysis |
| Requirements | Please reference SCE17HC029 Revision 2 Section 1.1 Measure Description & Background.  In accordance with the requirements referenced above SDG&E Quality Assurance and Quality Control Plan (QAQCP) technicians must receive training as follows:  **“**New technicians receive individual classroom training from the production supervisor and on-the-job training by serving as a helper from a certified trainer.  All technicians receive electrical training and follow safe electrical protocols, standards and practices.  The contractor regularly enrolls its technicians in technical training.  All technicians are required to attend a weekly tailgate meeting, plus a monthly technician meeting for on-going training. The type of information that is covered in these training sessions would include measure and service standards, review of safety standards, motivation, customer service, and quality control instruction.  The production supervisor or assistant production manager also provides one-on-one training to technicians in the field.”  In addition, the airflow must meet ACCA 4 Standard minimum requirements.  Note: Contractor referenced must be SDG&E approved. |
| **1.3 Installation Type and Delivery Mechanisms** | |
| Installation Type | BRO-RCx |
| Delivery Mechanisms | DnDeemed  DnDeemDI |
| **1.4 DEER Data** | |
| Net-to-Gross Ratio | Please reference SCE17HC029 Revision 2 Section 1.4.1 DEER Data |
| Effective and Remaining Useful Life | Please reference SCE17HC029 Revision 2 Section 1.4.1 DEER Data |
| GSIA | Please reference SCE17HC029 Revision 2 Section 1.4.1 DEER Data |
| **Section 2. Calculation Methodology** | |
| Energy Savings/Peak Demand Reduction – All Measures | Please reference SCE17HC029 Revision 2 Section 2 Calculation Methodology  Measure 7: Air Flow Adjustment savings were adjusted from SCE17HC029 Revision 2 per Energy Division Workpaper Disposition for Residential HVAC Quality Maintenance dated May 2, 2013.  From Workpaper Disposition:  “Based on the data collected, 45% of all serviced units had charge adjustments less than 10%. No significant energy savings related to charge adjustment occurs for those units. From this, when the level of charge adjustment is ignored, the charge adjustment savings (based on values in the 2011 DEER) must be reduced by the number of units for which no significant savings are expected. In consideration of values from Figure 1 as well as the possibility that some refrigerant charge adjustments may result in increased energy use, staff has assigned an incidence fraction of 0.40 to savings values for RCA.”  “Staff estimate that non-charge related services may account for an additional 25% savings on top of RCA. Based on this assessment, published DEER benefits are segregated into charge adjustment and non-charge adjustment remedies as follows:  Gross Charge Adjustment Savings = DEER values  Gross Non-Charge Adjustment Savings = DEER values \* 0.25  **Non-Charge Adjustment Savings Modifiers:**  There is no known evidence as to the relative impact from the three measures – condenser coil cleaning, evaporator coil cleaning and air flow adjustment - that generate non-charge adjustment savings. It is generally recognized that typical efficiency improvements associated with condenser coil cleaning is much larger than the other two. Given a paucity of direct measurements of field conditions, Commission staff recommends the following apportioning of non-charge adjustment savings among the three possible measures:  Condenser Coil Cleaning: 50% of the total  Evaporator Coil Cleaning: 25% of the total  Air Flow Adjustment: 25% of the total.”  Airflow Correction  The measure includes an airflow adjustment.  Workpaper Savings = (DEER values \* 0.25\*0.25) |
| **Section 3. Load Shapes** | |
| Load Shape | Please reference SCE17HC029 Revision 2 Section 3 Load Shapes |
| **Section 4. Cost** | |
| **Section 4.1 Base and Measure Costs** | |
| Base Cost | Please reference SCE17HC029 Revision 2 Section 4.1 Base Case Cost for details on how baseline cost estimates were determined.  SDG&E adopts all cost and created SDG&E measure cost IDs for reporting purposes. SDG&E measure cost IDs are included in Ex-Ante tables submission. |
| Measure Cost | Please reference SCE17HC029 Revision 2 Section 4.2 Measure Case Cost for details on how measure cost estimates were determined.  SDG&E adopts all cost and created SDG&E measure cost IDs for reporting purposes. SDG&E measure cost IDs are included in Ex-Ante tables submission. |