Short Form Work Paper PGECOAPP120

**Revision 7**

**Pacific Gas and Electric**

**Customer Energy Solutions**

**Air-Cooled Constant Speed Screw Chiller**

**December 20, 2017**

# PG&E Air-Cooled Constant Speed Screw Chiller

## Introduction

This short form workpaper documents (WP) the values adopted from SCE’s WP entitled “Air-Cooled Packaged Chiller” (SCE17HC030.1\_Air-Cooled Chiller\_Final.docx). PG&E adopts all of the values in SCE17HC030Rev 1 – Air-Cooled Packaged Chiller, with no exceptions.

## Document Revision History

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Workpaper and Revision # | Tech. Revision | MM/DD/YY | Author/Affiliation | Summary of Changes |
| Revision 0 | Yes | 02/28/08 | Megan Johnson (Energy Solutions)  Jennifer Roecks (PG&E) | Air-Cooled Packaged Chillers  PGECOHVC120 R0.doc |
| Revision 1 | Yes | 5/1/2009 | Judith Jennings (PG&E) | Air-Cooled Packaged Chillers PGECOHVC120 R1.doc |
| Revision 2 | Yes | 5/28/10 | Megan Johnson (Energy Solutions)  Judith Jennings (PG&E) | Updated kW and kWh values per DEER 2008. |
| Revision 3 | Yes | 8/28/12 | Judith Jennings (PG&E) | Updated EUL and NTG values per DEER 2011. Added tables of Measure Application Type per new PG&E guidelines.  Measure application type changed to ROB, GRRs to 1, vintage to Any, units to Cap-tons. |
| Revision 4 | Yes | 07/01/2014 | Ryan Cho (SCE)  Sherry Hu (PG&E) | - Added solution codes and updated measure names.  - Updated to 2013 Title 24 Building Codes.  - Updated to DEER2014 CZ2010 weather data files. |
| Revision 5 | No | 03/01/2016 | Sherry Hu (PG&E) | - Ex Ante Data Spreadsheet formatting update. |
| Revision 6 | Yes | 02/13/2016 | Henry Liu (PG&E) | -Adopted the lead utility’s workpaper SCE17HC030.0  - Converted PG&E’s workpaper PGECOHVC120 R5 to short form workpaper  - Work paper is updated with chiller efficiencies from 2016 Title-24 code requirement.  - Measure impacts have been adopted from DEER 2017  - New solution codes added replacing old solution codes.  - Baseline and Measure material costs have been updated based on manufacturers’ quotes. Labor costs are based on 2010-2012 WO017 Study Report.  - NEW program type has been added in this work paper revision.  - Work paper revised to include only “Com” building type for ROB program type.  - All (16) climate zones added for both ROB and NEW Program types.  - Two calculation templates separating ROB and NEW program types have been created. |
| Revision 7 | Yes | 12/20/2017 | Jia Huang (PG&E) | Adopted SCE workpaper SCE17HC030 Revision 1.  - Measure impacts have been adopted from updated DEER2017  - New measure codes added replacing old measure codes.  - Baseline and Measure costs updated per manufacturers’ data. |

## 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 Air-Cooled Chillers. The energy savings and load impacts are based on the lead IOU workpaper “SCE17HC030 Rev1 – Air-Cooled Constant Speed Screw Chiller”, which have measures included in DEER 2017. |
| **1.1 Measure & Baseline Data** | Measure: Air-Cooled Constant Speed Screw Chillers for use in non-residential buildings, exceeding the 2016 Title 24 minimum efficiency requirements in both full load AND part load conditions by 10% (Tier 1) and 20% (Tier 2).  Baseline: Air-Cooled Constant Speed Screw Chillers , for use in non-residential buildings, meeting the 2016 California Title 24 minimum efficiency standards in both full load AND part load conditions |
| **1.2 Technical Description** | Per cited per SCE17HC030.1 workpaper |
| Measures | |  |  |  | | --- | --- | --- | | Measure ID | PG&E Measure Code | SCE Solution Code | | NE-HVAC-Chlr-AirCldScrewChlr-gte150tons-11.1EER-15.4IPLV | HV378 | AC-20094 | | NE-HVAC-Chlr-AirCldScrewChlr-gte150tons-12.1EER-16.9IPLV | HV379 | AC-20095 | | NE-HVAC-Chlr-AirCldScrewChlr-lt150tons-11.1EER-15.1IPLV | HV380 | AC-20096 | | NE-HVAC-Chlr-AirCldScrewChlr-lt150tons-12.1EER-16.6IPLV | HV381 | AC-20097 | |
| Code for All Measures | Air-Cooled Chillers Constant Speed, for use in non-residential buildings, meeting the 2016 California Title-24 minimum efficiency. |
| Requirements | As cited per SCE17HC030.1 workpaper:  Units are required to meet both full (EER) AND part-load (IPLV) efficiency requirements.  These measures have tiered incentive levels. According to Resolution E-4867 [511], two tiers are defined:   1. Tier 1, the full load AND part load efficiencies of the chiller should exceed Title 24 requirement by 10%.   Tier 2, the full load AND part load efficiencies of the chiller should exceed Title 24 requirement by 20%. |
| **1.3 Installation Type and Delivery Mechanisms** |  |
| Installation Type | * Replace on Burnout (ROB) |
| Delivery Mechanisms | * Upstream Incentive |
| **1.4.1 DEER Data** | As cited per “SCE17HC030.1” lead IOU workpaper |
| Net-to-Gross Ratio | Com-Default>2yrs  All other EEMs with no evaluated NTGR; existing EEM in programs with same delivery mechanism for more than 2 years |
| GSIA | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | GSIA | Description | Sector | BldgType | ProgDelivID | GSIAValue | | Def-GSIA | Default GSIA | Any | Any | Any | 1 | |
| Effective and Remaining Useful Life | |  |  |  |  | | --- | --- | --- | --- | | EUL ID | Description | Sector | UseCategory | | HVAC-Chlr | High Efficiency Chillers | Com | HVAC | |
| **Section 2. Calculation Methodology** |  |
| Energy Savings/Peak Demand Reduction – All Measures | All Energy Impacts per DEER2017, D17 v3, using the following Measure IDs:  NE-HVAC-Chlr-AirCldScrewChlr-gte150tons-11.1EER-15.4IPLV  NE-HVAC-Chlr-AirCldScrewChlr-gte150tons-12.1EER-16.9IPLV  NE-HVAC-Chlr-AirCldScrewChlr-lt150tons-11.1EER-15.1IPLV  NE-HVAC-Chlr-AirCldScrewChlr-lt150tons-12.1EER-16.6IPLV |
| **Section 3. Load Shapes** | ElecImpactProfileID: PGE:DEER:Com:HVAC\_Chillers  GasImpactProfileID: Annual |
| **Section 4. Costs** | All cost adopted and cited from the “SCE17HC030.1” workpaper. |
| **Section 4.1 Modeled Costs** | All cost have been normalized per Cap-Tons from “SCE17HC030.1” workpaper. |
| Base Cost | Refer to data submission. |
| Measure Cost | Refer to data submission. |