Work Paper PGE3PHVC157

**Revision 2**

**Short Form**

**Southern California Edison**

**Unoccupied Supply Fan Control**

**Introduction**

This short form workpaper documents (WP) the values adopted from PGE’s WP entitled “Unoccupied Supply Fan Control” (PGE3PHVC157 R3). SCE adopts all the values in PGE3PHVC157 R3 – “Unoccupied Supply Fan Control”, with the following exceptions.

1. Changed applicable climate zones to only SCE climate zones.
2. Added Up-Stream Programs: Up-Stream delivery mechanism and Financial Support: Down-Stream Incentive - Deemed
3. Corrected load shapes for Heat Pump measures from AC-unit load shape to Heat Pump load shape in calculation template.
4. The following building had no savings calculated in the PGE workpaper and were removed in this adoption:
   1. Health/Medical - Hospital (Hsp)
   2. Health/Medical - Nursing Home (Nrs)
   3. Lodging - Motel (Mtl)
5. Added clarification on SCE’s incentive method description and applicability.
6. For 2019 program year, the install type has been updated to Retrocommissioning, “BRO-RCx”.
7. Workpaper Revision 2 is applicable for the 2019 program cycle

# Document Revision History

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| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 1 | 12/27/2018 | Sergio Corona/TRC | * Transferred savings to calculation templates the 2018 program year. * Changed applicable climate zones to only SCE climate zones. * Added Up-Stream Programs: Up-Stream & Financial Support: Down-Stream Incentive - Deemed delivery mechanism * Corrected load shapes for Heat Pump measures in calculation template. * Removed Hospital, Nursing Home, and Motel building types.   General Policy Requirements:   * 2018 Workpaper Updates are primarily in response to D.16-08-019 which created the Behavioral, Operational, and Retrocommissioning (BRO) measure classification with EUL values of one to three years with retrocommissioning assigned a three-year EUL. Resolution E-4818 directed that all measures which utilize a degraded performance baseline and/or are restorative of performance in nature be classified as retrocommissioning. |
| 2 | 12/27/2018 | Sergio Corona/TRC | * Transferred savings to calculation templates the 2019 program year. * For 2019 program year, the install type has been updated to Retrocommissioning, “BRO-RCx”.   General Policy Requirements:   * 2019 Workpaper Updates are primarily in response to Resolution E-4818 which added new measure application types including but not limited to Add-On Equipment (AOE) and BRO-Retrocommissioning (BRO-RCx) |

**Measure Summary**

Table 1: Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This sort form work paper documents the inputs for measures that reduce energy associated supply fan operation in existing nonresidential split systems and unitary HVAC equipment. The savings values are based on PGE’s workpaper PGE3PHVC157 R3 – “Unoccupied Supply Fan Control” document.  The target market for this measure is nonresidential buildings served by direct expansion (DX) unitary and split systems that do not serve process or refrigeration loads. These measures are defined for all SCE California climate zones. Applicable building types vary by measure – refer to full PGE workpaper for details. |
| **1.1 Measure & Baseline** | Baseline  This measure assumes the existing unit operates the supply fan continuously during unoccupied periods.  Measure  Unoccupied fan control on a variety of AC and heat pump HVAC units. The supply fan should be set to “Auto” or have intermittent operation during unoccupied periods.  Please refer to Attachment #1 Calculation for additional information on codes and baseline condition. |
| **1.2 Technical Description** |  |
| **Measures** | AC-11568: Unoccupied Fan Control on AC Unit with Gas Heat (PGE ID – HV326)  AC-11566: Unoccupied Fan Control on AC Only Unit (PGE ID – HV327)  AC-11570: Unoccupied Fan Control on Heat Pump (PGE ID – HV328)  AC-11585: Unoccupied Fan Control on Variable Volume AC Unit with Gas Heat (PGE ID – HV329)  The Unoccupied Fan Control measure modifies existing thermostat settings during unoccupied periods from continuous fan operation to intermittent fan operation. Energy savings are achieved through reducing unoccupied supply fan runtime unless zone conditions call for cooling or heating. Reduction in unoccupied supply fan runtime can also prevent bringing potentially unfavorable outside air into the conditioned space through leaky economizer dampers, causing an unnecessary increase in space heating or cooling. |
| **Code for All Measures** | These maintenance measures are not governed by either state or federal codes and standards. The document Standard 180-2008, Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems may be used by QM programs as a guide for measure implementation. Only licensed California contractors will participate in the program. As required by the California State Licensing Board, contractors will be responsible for meeting all applicable codes. In general, maintenance and repairs do not require permits. |
| **Requirements** | Eligibility Requirements:   * Nonresidential direct expansion (DX) unitary and split HVAC system * Unit cannot serve process or refrigeration loads   Implementation and installation requirements:  This measure requires field documentation of the existing conditions that verify the measure was necessary and that the measure was successfully applied. This measure does not apply if the unoccupied supply fan operation is already set to “Auto” or intermittent.  Measures presented in this Workpaper apply to SCE climate zones. The non-residential building types eligible for this measure vary slightly by solution code. Please refer to Attachment #1 Calculation Templates for additional details. |
| **1.3 Installation Type and Delivery Mechanisms** |  |
| **Installation Type** | Deviation. Install type changed from Retro-Commissioning (RC) to **Retrocommissioning (BRO-RCx)** |
| **Delivery Mechanisms** | Financial Support: Direct Install  Mid-Stream Programs: Mid-Stream Incentive  Deviation from PG&E, Adding:   * **Financial Support: Down-Stream Incentive – Deemed** * **Up-Stream Programs: Up-Stream Incentive**   For SCE, incentive methods include On-bill Finance/Loan - The program offers financing for the cost an efficient measure as part of the utility bill. This can be an add-on option to an existing program or can serve as an organizing principle for its own program. |
| **1.4.1 DEER Data** |  |
| **Net-Gross-Ratio** | Deviating from PG&E’s NTG Section.  All Non-Upstream NTG ID:   * NonRes-sAll-mHVAC-RCA (NTGR: 0.73)   Midstream & Upstream NTG IDs:   * Com-Default>2yrs (NTGR: 0.60) * Ind-Default>2yrs (NTGR: 0.60) * Agric-Default>2yrs (NTGR: 0.60) |
| **Effective and Remaining Useful Life** | EUL ID: NonRes-RCx-Operational (EUL: 3.0 / RUL: 1.0) |
| **Section 2. Calculation Methodology** |  |
| **Energy savings/Peak Demand Reduction – All Measures** | Energy savings and demand reduction for the measures contained in this workpaper were estimated using eQUEST version 3.64.7130 energy modeling software. DEER 2014, 2015, and 2017 prototypes were generated using MASControl software for the customer average (CAv) cases of the following Tech IDs:   * D08-NE-HVAC-airAC-SpltPkg-110to134kBtuh-11p5eer * D08-NE-ILtg-Power-Exit-60pct, D08-NE-HVAC-airAC-SpltPkg-110to134kBtuh-11p5eer * D08-NE-ILtg-Power-Exit-60pct * D08-NE-HVAC-airHP-SpltPkg-110to134kBtuh-11p5eer-3p4cop * D08-NE-HVAC-airHP-PkgEcono-55to64kBtuh-15p0seer-8p2hspf * D08-NE-HVAC-airAC-PVAV-240to759kBtuh-10p8eer   Except for motel and education relocatable classroom building type with heat pumps, DEER prototypes for AC and Heat Pump measures were created using the 110to134kBtuh cooling capacity range. Variable Volume AC units were created using 240to759kBtuh. The DEER prototypes were modified to create Damper Leakage prototypes, simulating outside and return air damper leakage and exhaust re-entrainment:  Min Outside Air: Varies changed to 20%  Max Outside Air: 100% changed to 70%  Outside Air Control: Fixed changed to OA Temp  The base case methodology begins with Damper Leakage prototypes and alters the models to simulate the fault representing HVAC units in an as-found condition:  Fan Schedule: Varies changed to Hourly Report Schedule  The base case sets the Hourly Report Schedule to ON for all hours, resulting in 24 hours per day supply fan operation regardless of building occupancy.  Details on the modifications to the baseline and measure case models are provided in Section 2 of PGE3PHVC157 R3.  Peak demand calculations were calculated taking the average values of the hourly energy profiles from the models during the applicable DEER peak demand periods for each climate zone.  See of Section 2 of PGE3PHVC157 R3 for more details.  Adjusted calculations are found in Attachment 1. |
| **Section 3. Load Shapes** | DEER:HVAC\_Split-Package\_AC  DEER:HVAC\_Split-Package\_HP |
| **Section 4. Costs** |  |
| **Section 4.1 Base and Measure Costs** | Please refer to Attachment #1 Calculation Templates for detailed baseline and measure costs. Details of the changes are described below in the Costs section. |
| **Base Cost** | For all solution codes, the base case is the customer’s existing equipment; therefore, the base case cost is $0.00. |
| **Measure Cost** | For all solution codes:  Material: $0.00  Labor: $2.93/Ton  Total: $2.93/Ton |

**Savings and Calculation Methodology**

This short form made no changes to the adopted PGE savings.

**Costs**

This short form made no changes to the adopted PGE costs.

**Attachments:**

1. PGE3PHVC157.2\_A1 - 2019 Calculation Templates