Work Paper SCE17HC007

**Revision 1**

**Southern California Edison**

**High Efficiency Package Terminal Air Conditioners & Heat Pumps 24kBtu/h**

**(2 tons) and under**

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Measure Codes** | AC-21823 <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Non Res) DX Equipment  AC-70989 <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Common Area) DX Equipment  AC-89607 <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Dwelling Area) DX Equipment  AC-37854 <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Non Res) DX Equipment  AC-93045 <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Common Area) DX Equipment  AC-10964 <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Dwelling Area) DX Equipment  AC-88667 <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Res) DX Equipment  AC-84199 <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Res) DX Equipment |
| **Measure Description** | High Efficiency Package Terminal Air Conditioners & Heat Pumps 24kBtu/h (2 tons) and under |
| **Base Case Description** | Title 24 Packaged Terminal Air Conditioners and Packaged Terminal Heat Pumps – Minimum Efficiency Requirements |
| **Units** | Tons of Cooling Capacity |
| **Energy Savings** | Refer to Excel Calculation Attachment 1 |
| **Full Measure Cost ($/unit)** | Refer to Excel Calculation Attachment 1 |
| **Incremental Measure Cost ($/unit)** | Refer to Excel Calculation Attachment 1 |
| **Effective Useful Life** | 15 years for HVAC-PTAC, HVAC-PTHP, HV-ResAC, and HV-ResHP |
| **Measure Installation Type** | Replace on Burnout (ROB), New Construction (NEW) |
| **Net-to-Gross Ratio** | *NonRes-sAllmHVAC-Pkg*- 0.60, Res-sAll-mHVACPkg-dn>2 – 0.60 |
| **Important Comments** | This work paper has a complementary Ex Ante Database data set that will be provided in a separate submission to the California Public Utilities Commission (CPUC). |

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 12/14/2016 | John Rossi/TRC | -New calculation template for 2017 program year.  -This work paper is an update of SCE13HC007.3  -Added New Construction (NEW) installation type.  -Scaled down DEER savings for the NEW installation type  -Efficiencies and language updated based on 2016 Title 24 Code  -All (16) California Climate Zones included in calculation template. |
| 1 | 5/22/2018 | Joseph Ling/AESC | -Modified NTG ID per Draft Resolution E-4867  -Updated cost references to most recent amounts  -Updated measure costs based on adjustment factors and included discussion of adjustments made |

# Commission Staff and Cal TF Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rev** | **Party** | **Submittal Date** | **Comment Date** | **Comments** | **WP Developer Response** |
|  |  |  |  |  |  |
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|  |  |  |  |  |  |

Cal TF website: <http://www.caltf.org/>

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

This work paper details new construction (NEW) and replace on burnout (ROB) of package terminal air conditioning units (PTAC) or package terminal heat pumps (PTHP) that are through the wall, self-contained and less than or equal to 2 tons (<=24kBtu/h) with an EER that is 20% higher than the base case. The base case is a code compliant unit; Section 1.3 describes how to calculate the base case efficiency. Note that ductless mini-split air conditioners do not apply to this work paper.

PTACs & PTHPs are through-the-wall units usually less than or equal to 2 tons in capacity and are typically used to condition small areas that have wide swings in occupancy levels. As a result, they are most commonly used in hotels and motels where individual zone control is necessary. Please see the attached excel spreadsheet (Attachment 1) for the complete list of building types included in this work paper.

**Base, Standard, and Measure Cases**

|  |  |
| --- | --- |
| **Case** | **Description of Typical Scenario** |
| Measure | <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner / Heat Pump |
| Existing Condition | N/A |
| Code/Standard | Standard Efficient Package Terminal Air Conditioner / Heat Pump |
| Industry Standard Practice | N/A |

Measures and Codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure Codes** | | | | **Measure Name** |
| SCG | SDG&E | SCE | PG&E |
|  |  | AC-21823 |  | <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Non Res) DX Equipment |
|  |  | AC-70989 |  | <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Common Area) DX Equipment |
|  |  | AC-89607 |  | <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Dwelling Area) DX Equipment |
|  |  | AC-88667 |  | <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Res) DX Equipment |
|  |  | AC-37854 |  | <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Non Res) DX Equipment |
|  |  | AC-93045 |  | <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Common Area) DX Equipment |
|  |  | AC-10964 |  | <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Dwelling Area) DX Equipment |
|  |  | AC-84199 |  | <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Res) DX Equipment |

## 1.2 Technical Description

This measure requires the new construction (NEW) or replace on burnout (ROB) of package terminal air conditioning units (PTAC) or package terminal heat pumps (PTHP) that are through the wall, self-contained and less than or equal to 2 tons (<=24kBtu/h) with an EER that is 20% higher than the base case.

To be eligible for a rebate, the measure must meet or exceed the following measure minimum Energy Efficiency Ratio (EER) which exceeds the Title 24 Minimum (EER):

Measure and 2016 Title 24 (T24) EER

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Installation Type** | **Unit Capacity** | **T24 Minimum EER (AC)** | **T24 Minimum EER (HP)** | **Measure Minimum EER (AC)** | **Measure Minimum EER (HP)** |
| ROB | ≤ 7,000 Btu/hr | 9.41 | 9.31 | 11.29 | 11.17 |
| > 7,000 and ≤ 15,000 Btu/hr | 8.56 | 8.46 | 10.27 | 10.15 |
| >15,000 Btu/hr | 7.71 | 7.61 | 9.25 | 9.13 |
| NEW | ≤ 7,000 Btu/hr | 11.90 | 11.90 | 14.28 | 14.28 |
| > 7,000 and ≤ 15,000 Btu/hr | 10.70 | 10.70 | 12.84 | 12.84 |
| >15,000 Btu/hr | 9.50 | 9.50 | 11.40 | 11.40 |

## 1.3 Installation Types and Delivery Mechanisms

The program/install types for the above measures are:

* Replace on Burn-out (ROB)
* New Construction (NEW) – Only for Non-Residential applications

The delivery method that is available for these measures is:

* Financial Support - Down-Stream Incentive – Deemed
* Partnerships Financial Support - Down-Stream Incentive – Deemed
* Financial Support - Down-Stream Incentive – OBF

**Installation Type Descriptions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Installation Type** | **Savings** | | **Life** | |
| 1st Baseline (BL) | 2nd BL | 1st BL | 2nd BL |
| Replace on Burnout (ROB) | Above Code or Standard | N/A | EUL | N/A |
| New Construction (NEW) | Above Code or Standard | N/A | EUL | N/A |

A delivery mechanism is a delivery method paired with an incentive method. Delivery mechanisms are used by programs to obtain program participation and energy savings.

**Delivery Method Descriptions**

|  |  |
| --- | --- |
| **Delivery Method** | **Description** |
| Financial Support | The program motivates customers, through financial incentives such as rebates or low interest loans, to implement energy efficient measures or projects. |
| Partnership | The program implements projects through a partnership between the utility and an institutional, government, or community-based organization. |

**Incentive Method Descriptions**

|  |  |
| --- | --- |
| **Incentive Method** | **Description** |
| Down-Stream Incentive | The customer installs qualifying energy efficient equipment and submits an incentive application to the utility program. Upon application approval, the utility program pays an incentive to the customer. Such an incentive may be deemed or customized. |
| On-bill Finance – Loan (OBF) | The program offers financing for the cost of 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 Measure Parameters

### 1.4.1 DEER Data

The DEER READI Tool v2.4.7 database contains measure energy savings for Package Terminal AC Units and Heat Pumps. The DEER Measure ID D03-099 was used for Package Terminal AC units, and the DEER Measure ID D03-101 was used for Package Terminal Heat Pumps. DEER 2008 cost data was used to establish basis for the measure cost information, please refer to Section 4.0 for additional details.

DEER provided individual vintages along with multiple tiers of unit capacity ranges. After evaluation of program participation data, a single tier (7-15 kBtuh capacity) was determined to be used for the purpose of this work paper evaluation since the majority of program participation (implementation) occurred on this capacity tier. See Section 2 for more information.

DEER Difference Summary

|  |  |
| --- | --- |
| **DEER Item** | **Used for Work Paper?** |
| Modified DEER methodology | Yes |
| Scaled DEER measure | Yes |
| DEER Base Case | Yes |
| DEER Measure Case | Yes |
| DEER Building Types | Yes |
| DEER Operating Hours | Yes |
| DEER eQUEST Prototypes | Yes |
| DEER Version | DEER 2005 per READi v 2.4.7 Measure Definition |
| Reason for Deviation from DEER | Given assessment of program participation, the 7 kBtuh to 15 kBtuh equipment capacity measures were used for this work paper. Additionally, DEER savings were scaled down for new construction installation type to account for changes on the 2016 Title 24. |
| DEER Measure IDs Used | D03-099, D03-101 |

**Net-to-Gross Ratio**

The NTG values were obtained using the DEER READI tool and have been updated per Draft Resolution E-4867 which specifies a new NTGR ID for package HVAC measure types. The relevant NTG values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NTGR ID** | **Description** | **Sector** | **BldgType** | **Measure Delivery** | **NTGR** |
| NonRes-sAllmHVAC-Pkg | All package HVAC AC and HP replacements with downstream incentives | NR | Any | All | 0.60 |
| Res-sAll-mHVACPkg-dn | All package HVAC AC and HP replacements with downstream incentives | Res | Any | All | 0.60 |

**Spillage Rate**

Spillage rates are not tracked in work papers; they are tracked in an external document which will be supplied to the Commission Staff.

**Installation Rate**

The IR values were obtained using the DEER READI tool. The relevant IR values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **GSIA ID** | **Description** | **Sector** | **BldgType** | **ProgDelivID** | **GSIAValue** |
| Def-GSIA | Default GSIA values | Any | Any | Any | 1 |

**Effective and Remaining Useful Life**

The EUL values were obtained using the DEER READI tool. The relevant EUL values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** |
| HVAC-PTAC | Air Conditioners (packaged terminal AC) | Com | HVAC | 15 | N/A |
| HVAC-PTHP | Heat Pumps (packaged terminal) | Com | HVAC | 15 | N/A |
| HV-ResAC | High Efficiency Air Conditioner (package and split systems) | Res | HVAC | 15 | N/A |
| HV-ResHP | High Efficiency Heat Pump | Res | HVAC | 15 | N/A |

### 1.4.2 Codes and Standards Analysis

Title 24 2016 Minimum Efficiencies for PTAC and PTHP [496]



1. If the capacity (Cap) is less than 7,000 Btu/hr, use 7,000 Btu/hr for the capacity. If the capacity is >15,000 Btu/hr, use 15,000 Btu/hr for the capacity.
2. Replacement units (ROB) must be factory labeled as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEWLY CONSTRUCTED BUILDINGS." Replacement (ROB) efficiencies apply only to units with existing sleeves less than 16 inches high or less than 42 inch wide and having a cross-sectional area less than 670 square inches.
3. Applicable test procedure and reference year are provided under the definitions.

Code Summary

|  |  |  |
| --- | --- | --- |
| **Code** | **Reference** | **Effective Dates** |
| Title 24 (2016) | Table 110.2-E, Packaged Terminal Air Conditioners and Packaged Terminal Heat Pumps – Minimum Efficiency Requirements | January 1, 2017 |

## 1.5 EM&V, Market Potential, and Other Studies – Base Case and Measure Case Information

### 1.5.1 Non-DEER Study Review

### All references used in this work paper were from current or past DEER and T24.

**1.6 Data Quality and Future Data Needs**

N/A

# Section 2. Calculation Methodology

DEER measures were used to calculate the energy savings and demand reduction for the measures in this work paper. The DEER 2017 database provided data on Packaged Terminal Air Conditioners and Heat Pumps for the following building types: Lodging – Hotel and Lodging - Motel. The DEER impact values were last updated in 2014 as part of DEER 2005 v2.01. The savings for the Lodging - Motel building type were used for the Lodging - Motel building type as well as the Residential Multi-family (Common Area) and Single Family building type. The savings for Lodging - Hotel (Guest Rooms) was used for all other building types found in this work paper, including the Residential Multi-family (Dwelling Area) building type.

DEER Building Type Used for Measure Savings

|  |  |
| --- | --- |
| **Work Paper**  **Building Type** | **DEER Building Type used for Measure Savings** |
| Health/Medical - Nursing Home | Lodging – Hotel |
| Lodging - Hotel | Lodging – Hotel |
| Lodging - Guest Rooms | Lodging – Hotel |
| Lodging - Motel | Lodging - Motel |
| Manufacturing - Bio/Tech | Lodging – Hotel |
| Manufacturing - Light Industrial | Lodging – Hotel |
| Office – Large | Lodging – Hotel |
| Office – Small | Lodging – Hotel |
| Restaurant - Fast-Food | Lodging – Hotel |
| Retail – Small | Lodging – Hotel |
| Warehouse - Refrigerated | Lodging – Hotel |
| Residential Multi-family (Common) | Lodging - Motel |
| Residential Multi-family (Dwelling) | Lodging – Hotel |
| Residential Single Family | Lodging - Motel |

For non-DEER measures and/or measures that were scaled using DEER data, DEER provided data for the following unit capacity ranges for PTAC and PTHP units: <7 kBtuh, 7-15kBtuh, and >15kBtuh. The ROB and the NEW savings for this work paper are based on 7-15 kBtuh capacity range, since nearly all of the previous participation falls under this range, as detailed below.

**Installation data for PTAC/PTHP units**

|  |  |
| --- | --- |
| **Unit Capacity Ranges** | **% of Units Installed** |
| PTAC/PTHP  <7kBtuh | 5% |
| PTAC/PTHP  7-15kBtuh | 90% |
| PTAC/PTHP  >15kBtuh | 5% |

A survey of PTAC and PTHP unit installations at various hotels/motels was obtained. In this survey, individual hotels provided a breakdown of PTAC and PTHP unit capacity sizes that were installed at their facility over a period of 15 years. This survey was the only information available during the drafting of this work paper and was used to obtain the rough distribution of unit sizes shown in table above. The survey was not included in this work paper to maintain the confidentiality of the participants that were surveyed, but it is available from Southern California Edison upon request.

All ROB savings and NEW PTHP savings are taken directly from DEER while the NEW PTAC savings are based on scaled DEER data.

For NEW PTAC, the DEER savings were scaled down based on the more stringent 2016 Title 24 new construction EER requirements, documented in Section 1.4.2. Further, the scaling was estimated via building energy simulation [Attachment 4] using "Lodging" building type and CZ2010 weather, based on the difference in savings between the 2016 Title 24 Standards and DEER’s Standard Case. Based on this analysis, the NEW PTAC DEER data was scaled down 6.7% and 13.3% on energy (kWh) and demand (kW) savings respectively. Refer to the calculations file (Attachment 2), under the PTAC (NEW) Scalarfor additional details. For ROB savings, scaling of DEER data for adjusting ROB savings is not needed since DEER’s assumed standard’s efficiency is more stringent than that required by 2016 T24 for retrofits [See Attachments 5 and 6 for more details on the determination].

# Section 3. Load Shapes

The ideal load shape for net benefits estimates would represent the difference between the base case and measure case. The closest load shapes that are applicable to the measures in this work paper are listed in the table below.

Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| **Air Conditioner** | | |
| **Building Type** | **Load Shape** | **E3 Alternate Building Type** |
| Health/Medical - Nursing Home | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Lodging - Hotel | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Lodging - Guest Rooms | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Lodging - Motel | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Manufacturing - Bio/Tech | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Manufacturing - Light Industrial | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Office - Large | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Office - Small | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Restaurant - Fast-Food | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Retail - Small | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Warehouse - Refrigerated | DEER:HVAC\_Split-Package\_AC | NON\_RES |
| Residential Single Family | DEER: HVAC\_Eff\_AC | RES |
| Residential Multi-family | DEER: HVAC\_Eff\_AC | RES |
| **Heat Pump** | | |
| **Building Type** | **Load Shape** | **E3 Alternate Building Type** |
| Health/Medical - Nursing Home | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Lodging - Hotel | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Lodging - Guest Rooms | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Lodging - Motel | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Manufacturing - Bio/Tech | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Manufacturing - Light Industrial | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Office - Large | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Office - Small | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Restaurant - Fast-Food | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Retail - Small | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Warehouse - Refrigerated | DEER:HVAC\_Split-Package\_HP | NON\_RES |
| Residential Single Family | DEER: HVAC\_Eff\_HP | RES |
| Residential Multi-family | DEER: HVAC\_Eff\_HP | RES |

# Section 4. Costs

## 4.1 Base Case Cost

The base case costs were taken from DEER2008 and validated utilizing online retailers as a part of this update. In total (base and measure case combined), ten online retailer pricing were reviewed. See table below for the average reduction in base costs for both PTAC and PTHP units. Based on these findings, the DEER2008 costs were adjusted by the average difference determined. Please see Costs documentation (Attachment 3) for additional details.

The cost of a standard PTAC was determined by using the DEER cost case ID PTAC-7to15kBtuh-10p16eer, and then applying the climate zone cost factor from table HVAC50 (DEER READI Tool 2.4.7). The cost of a standard PTHP was determined by using the DEER cost case IDs PTHP-7to15kBtuh-9p96eer-2p91cop, and then applying the climate zone cost factor from table HVAC50. The baseline costs for the NEW installation were determined to be consistent with ROB, while acknowledging there are some minor differences in costs between the different efficiency units, the incremental costs would be approximately the same and is acceptable.

Base Case Material Cost

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measure Case | Solution Codes | Deer Cost ID | Measure Base Cost (DEER 2008) | Average Measure Base Cost (2018 Online Retailer) | % difference (DEER2008 vs. 2018 Online Retailer) | Adjusted Costs | Labor Cost | Total Cost | Units |
| High Efficiency PTAC Units | AC-21823  AC-88667  AC-70989  AC-89607 | PTAC-7to15kBtuh-12p19eer | $1,061.00 | $1,024.92 | -3% | $ 1,024.92 | $559.67 | $1,584.59 | Cooling Tons |
| High Efficiency PTHP Units | AC-37854  AC-84199  AC-93045  AC-10964 | PTHP-7to15kBtuh-11p95eer-3p49cop | $1,104.00 | $1,046.52 | -5% | $ 1,046.52 | $559.67 | $1,606.19 | Cooling Tons |

## 4.2 Measure Case Cost

The measure case costs were taken from DEER2008 and were validated utilizing online retailers as a part of this update. In total (base and measure case combined), ten online retailer spot checks were performed. See table below for the average reduction in measure costs for both PTAC and PTHP units. Based on these findings, the DEER2008 costs were adjusted by the average difference determined. Please see Costs documentation (Attachment 3) for additional details. The cost of a high efficiency PTAC was determined by using the cost case ID PTAC-7to15kBtuh-12p19eer, and then applying the climate zone cost factor from table HVAC50 (DEER READI Tool 2.4.7). The cost of a high efficiency PTHP was determined by using the cost case ID PTHP-7to15kBtuh-11p95eer-3p49cop, and then applying the climate zone cost factor from table HVAC50. The measure costs for the NEW installation type have been set equal to ROB for simplicity, while acknowledging there are differences in costs between the different efficiency units, the incremental costs would be approximately the same and is acceptable.

Measure Material Cost

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measure Case | Solution Codes | Deer Cost ID | Measure material Cost (DEER 2008) | Average Measure Material Cost (2018 Online Retailer) | % difference (DEER2008 vs. 2018 Online Retailer) | Adjusted Costs | Labor Cost | Total Cost | Units |
| High Efficiency PTAC Units | AC-21823  AC-88667  AC-70989  AC-89607 | PTAC-7to15kBtuh-12p19eer | $1,105 | $1,101.31 | 0% | $1,101.31 | $559.67 | $1,660.98 | Cooling Tons |
| High Efficiency PTHP Units | AC-37854  AC-84199  AC-93045  AC-10964 | PTHP-7to15kBtuh-11p95eer-3p49cop | $1,239 | $1,094.04 | -12% | $1,094.04 | $559.67 | $1,653.70 | Cooling Tons |

The labor hours used for base and measure case were taken from DEER2008. However, the labor rates used to estimate total labor dollars were updated from Section 4, Table 4-3, of the 2010-2012 WO017 Ex Ante Measure Cost Study Final Report [496], for the labor rate associated with small packaged heat pump installation - $70.78 per hour. RS Means 2011 and RS Means 2018 were used to determine the average labor rate increase to install a small packaged terminal unit. Labor costs were increased by 16% based on this analysis. Please refer to Attachment 3 for additional costs details.

## 4.3 Full and Incremental Measure Cost

**Full and Incremental Measure Cost Equations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| ROB | (MEC + MLC) – (BEC + BLC) | (MEC + MLC) – (BEC + BLC) | N/A |
| NEW |

MEC = Measure Equipment Cost; MLC = Measure Labor Cost

BEC = Base Case Equipment Cost; BLC = Base Case Labor Cost

**Full and Incremental Costs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Solution Code** | **Measure** | **Installation Type** | **Incremental IMC**  **[$/cooling tons]** | **Full Measure Cost**  **[$/cooling tons]** | |
| **1st Baseline** | **2nd Baseline** |
| AC-21823 | <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner DX Equipment | ROB, NEW | $76.39 | $76.39 | N/A |
| AC-88667 | <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Res) DX Equipment | ROB, NEW | $76.39 | $76.39 | N/A |
| AC-70989 | <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Common Area) DX Equipment | ROB, NEW | $76.39 | $76.39 | N/A |
| AC-89607 | <=24 kBtu/hr High Efficiency Package Terminal Air Conditioner (Dwelling Area) DX Equipment | ROB, NEW | $76.39 | $76.39 | N/A |
| AC-37854 | <=24 kBtu/hr High Efficiency Package Terminal Heat Pump DX Equipment | ROB, NEW | $47.52 | $47.52 | N/A |
| AC-84199 | <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Res) DX Equipment | ROB, NEW | $47.52 | $47.52 | N/A |
| AC-93045 | <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Common Area) DX Equipment | ROB, NEW | $47.52 | $47.52 | N/A |
| AC-10964 | <=24 kBtu/hr High Efficiency Package Terminal Heat Pump (Dwelling Area) DX Equipment | ROB, NEW | $47.52 | $47.52 | N/A |

# Attachments

1. SCE17HC007.1 A1 - Calculation Templates

2. SCE17HC007.1 A2 - Savings Calculations

3. SCE17HC007.1 A3 – Costs

4. SCE17HC007.1 A4 - BES Files.zip

5. SCE17HC007.1 A5 - DEER PTAC\_PTHP scaling - Parms Mtr

6. SCE17HC007.1 A6 - PTAC scaling 2

# References

1. References\_05092018\_135230.xlsx

[496]