Work Paper SCE13HC027

**Revision 2**

**Southern California Edison**

**Portable Room Air Conditioners**

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Measure Codes** | AC-70890 |
| **Measure Description** | Installation/replacement of standard efficiency portable room air conditioner with a more efficient unit. The measure is a 12,000 BTU/h portable room AC with a minimum EER of 11.9 |
| **Base Case Description** | The base case is a 12,000 BTU/h room air conditioner (room AC) with an average EER of 11.0 |
| **Units** | Unit |
| **Energy Savings** | Refer to Excel Calculation Attachment |
| **Full Measure Cost ($/unit)** | Refer to Excel Calculation Attachment |
| **Incremental Measure Cost ($/unit)** | Refer to Excel Calculation Attachment |
| **Effective Useful Life** | 9.0 (HV-RAC-ES) |
| **Measure Installation Type** | Replace on Burnout (ROB) |
| **Net-to-Gross Ratio** | 0.55 (Res-Default>2) |
| **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 | 03/29/2012 | James Gowen/Matrix | Updated work paper to new template |
| 1 | 04/11/2014 | Andres Fergadiotti/SCE | -Work paper updated for the reporting period, effective 7/1/14 – 12/31/14. |
| 2 | 01/28/2016 | Andres Fergadiotti/SCE | -New template update for 2016 program year  -WP effective from 1/1/2016 thru 12/31/2016  -No value modifications |

# Commission Staff and Cal TF Comments

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

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

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

This work paper details the E3 Calculator inputs for the purchase and installation of portable room air conditioners (portable room ACs). The base case for this measure is a 12,000 BTU/h room air conditioner (room AC) with an average EER of 11.0. The measure is a 12,000 BTU/h portable room AC with an average EER of at least 11.9. General manufacturer information and model description on Portable room AC for estimating measure impacts and cost can be found in Attachment 2.

**Base, Standard, and Measure Cases**

|  |  |
| --- | --- |
| **Case** | **Description of Typical Scenario** |
| Measure | High Efficient 12 kBtu/hr Portable Room Air Conditioner DX Equipment |
| Existing Condition | Standard kBtu/hr Portable Room Air Conditioner DX Equipment |
| Code/Standard | N/A |
| Industry Standard Practice | N/A |

Measures and Codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure Codes** | | | | **Measure Name** |
| SCG | SDG&E | SCE | PG&E |
| N/A | N/A | AC-70890 | N/A | High Efficient 12 kBtu/hr Portable Room Air Conditioner DX Equipment |

Eligibility requires replacement based on burnout (ROB) of an existing portable room air conditioner of 12,000 Btu/h with matching capacity but higher efficiency unit.

## 1.2 Technical Description

The measure consists of the installation of high efficient portable air conditioner delivering a cooling output of 12,000 Btu/h. Depending upon usage and heat gain characteristics in the space (room), generally a 12,000 Btu/h unit can provide sufficient air-conditioned for a 500 to 800 square foot space. Advance Portable Room AC technology may include multi-cooling speeds, humidification control, automatic restart, and/or self-evaporating technology.

## 1.3 Installation Types and Delivery Mechanisms

The delivery method is Financial Support – Downstream Incentive – Deemed.

The installation type is ROB.

**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 |

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. |

**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. |

## 1.4 Measure Parameters

### 1.4.1 DEER Data

This specific measure is not included in the Database for Energy Efficient Resources (DEER) Version 2014 [386]. Therefore, the DEER will not be used to determine energy savings and demand reduction estimates.

DEER Difference Summary

|  |  |
| --- | --- |
| **DEER Item** | **Used for Workpaper?** |
| Modified DEER methodology | No |
| Scaled DEER measure | No |
| DEER Base Case | No |
| DEER Measure Case | No |
| DEER Building Types | No |
| DEER Operating Hours | No |
| DEER eQUEST Prototypes | No |
| DEER Version | N/A |
| Reason for Deviation from DEER | DEER does not contain this type of measure |
| DEER Measure IDs Used | N/A |

**Net-to-Gross Ratio**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NTGR ID** | **Description** | **Sector** | **BldgType** | **Measure Delivery** | **NTGR** |
| Res-Default>2 | All other EEM with no evaluated NTGR; existing EEM with same delivery mechanism for more than 2 years | Res | Any | Any | 0.55 |

**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** |
| Res-RAC-SCE | Residential Room AC; Annual Installation Rate | Res | Any | NonUpStrm | 0.96 |

**Effective and Remaining Useful Life**

The EUL and RUL values were obtained using the DEER READI tool. DEER defines the RUL as 1/3 of the EUL value. The RUL value is only applicable to the first baseline period for an RET measure with an applicable code baseline. The relevant EUL and RUL values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** |
| HV-RAC-ES | Room AC - Energy Star | Res | HVAC | 9 | 3 |

### 1.4.2 Codes and Standards Analysis

There are no requirements defined in Title 20 – 2014 Appliance Efficiency Regulations [422] for portable room ACs, so there is no code impact. The baseline is assumed to be code compliant room ACs.

Code Summary

|  |  |  |
| --- | --- | --- |
| **Code** | **Reference** | **Effective Dates** |
| Title 20 (2014) | California’s Title 20 Appliance Efficiency Program Codes | May 2014 |

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

### 1.5.1 Non-DEER Study Review

The 2006-2008 impact study report for room ACs was used to obtain typical room AC operating hours in climate zones 6, 8, 9, and 10 [329].

## 1.6 Data Quality and Future Data Needs

N/A

# Section 2. Calculation Methodology

**Determination of operating hours**

Using annual cooling degree days, climate zone 10’s operating hours were scaled to determine operating hours for climate zones 13 through 15, and climate zone 6’s hours were scaled to find climate zone 16’s hours.

Example: Determining operation hours for climate zone 14

Annual cooling degree days for zone 14 = 1557

Annual cooling degree days for zone 10 = 1154

Total cooling hours for zone 10 = 631 hours

Normalized cooling hours for zone 10 = 631 hrs / 1154 CDD = 0.5468 hrs / CDD

Annual cooling hours for zone 14 = 0.5468 hrs / CDD x 1557 CDD = 851.4 hrs

**Energy Savings**

Equation 1 shows how the measure case demand (kW) was determined. Based on an average efficiency (EER) of six different portable room AC units of 11.0, the average measure case demand (kW) was estimated as 1.01 kW as shown in Attachment 2 - Savings Calculations Tab.

Similarly, the base case demand (kW) was estimated as 1.09 kW based on equipment efficiency (EER) in the order of 11.9 as shown in Attachment 2 - Savings Calculations Tab.

**Estimated kW demand of a 12,000btu/h portable AC:**

Equation 1

****

*KWdemandofAC = [(12000 / 11.9) / 1000] = 1.01 kW*

Equation 2 shows how the measure case kWh usage was determined, for climate zone 6. The kW demand was multiplied by the operational hours defined in the impact report.

Estimated energy usage of a 12,000btu/h portable AC in climate zone 6:

Equation 2

*EnergyUsageofAC = [1.01 x 225hrs] = 227.54 kWh*

Equation 3 shows how the kWh energy savings was determined, for climate zone 6. The measure case (portable room AC) kWh was subtracted from the base case (room AC) kWh.

**Estimated energy savings of a 12,000 btu/h portable AC in climate zone 6:**

Equation 3



*EnergySavings = 244.86 – 227.54*

*EnergySavings = 17.31 kWh*

**Demand Reduction**

Equation 4 shows how the peak demand reduction was determined, for climate zone 6. The measure case kW was subtracted from the base case kW.

**Estimated Demand Reduction of a 12,000 btu/h portable AC in CZ 6:**

Equation 4







Following table shows the annual energy savings (kWh) and peak demand reduction (kW) for a 12,000 BTU/h portable room AC vs. a room AC in climate zones 6, 8,9,10,13,14,15, and 16. Detailed energy savings and demand reductions can be seen in Attachment 2.

Portable air conditioner estimated annual Energy Savings (kWh) and estimated Peak Demand Savings (Climate Zone 6, 8, 9, 10, 13, 14, 15, and 16)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Climate Zone** | **Average Base case KW** | **Average Measure case KW** | **Average Base case kWh** | **Average Measure case kWh** | **Demand Reduction KW** | **Energy Savings kWh** |
| 6 | 1.09 | 1.01 | 244.86 | 227.54 | 0.08 | 17.31 |
| 8 | 1.09 | 1.01 | 402.65 | 374.18 | 0.08 | 28.47 |
| 9 | 1.09 | 1.01 | 568.07 | 527.90 | 0.08 | 40.17 |
| 10 | 1.09 | 1.01 | 686.69 | 638.13 | 0.08 | 48.55 |
| 13 | 1.09 | 1.01 | 686.69 | 638.13 | 0.08 | 48.55 |
| 14 | 1.09 | 1.01 | 926.10 | 860.62 | 0.08 | 65.48 |
| 15 | 1.09 | 1.01 | 896.72 | 833.31 | 0.08 | 63.40 |
| 16 | 1.09 | 1.01 | 487.54 | 453.06 | 0.08 | 32.45 |

# 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

|  |  |  |
| --- | --- | --- |
| **Building Type** | **Load Shape** | **E3 Alternate Building Type** |
| Residential – Single Family | New\_AC-Ret | Misc\_Commercial |
| Residential Mobile Home - Double-Wide | New\_AC-Ret | Misc\_Commercial |

# Section 4. Costs

Base Case and Measure Costs on the measure were estimated by using DEER 2008 and AC equipment manufacturer documentation. Since the measures are assumed to be installed as ROB, the installation cost differential between the base case and measure case is zero for the customer.

## 4.1 Base Case Cost

Base case costs are estimated by averaging retail market prices for several different models of 12,000 BTU/h room ACs. The base case cost is $513.67. Individual costs for each model can be found in Attachment 2.

## 4.2 Measure Case Cost

Measure case cost was estimated by analyzing cost documentation in DEER2008 for residential air-conditioning equipment (e.g., D08-RE-ResAC) as a function of SEER/EER. Based on this information, an incremental cost factor of 1.147 was estimated between base case and measure case approximating an estimated measure case cost of $588.70. Refer to Attachment 2 for details and supporting documentation.

## 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/NC |

MEC = Measure Equipment Cost; MLC = Measure Labor Cost

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

**Full and Incremental Costs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| AC-70890 | ROB | $75.03 | $75.03 | N/A |

# Attachments

1. 

2. 

# References



[329]

[422]

[386]