

Work Paper PGECO HVC126
Unitary Air-Cooled Commercial A/C and
H/P <65kBtu/h
Revision #7

Pacific Gas & Electric Company
Customer Energy Solutions

**Packaged and Split Air-
Cooled Commercial Air
Conditioner and Heat
Pump Units, less than 65k
Btu/h**

**Measure Codes: HV241, HV242, HV243, HV244, HV245, HV246, HV247, HV248, HV249,
HV250, HV251, HV252, HV253, HV254, HV255, HV256, HV257, HV258, HV259, HV260,
HV261, HV262, HV263, HV264, HV265, HV266, HV267, HV268, HV269, HV270, HV271,
HV272, HV273, HV274, HV275, HV276**

July 1, 2017

AT-A-GLANCE SUMMARY

Applicable Measure Codes:	HV241, HV242, HV243, HV244, HV245, HV246, HV247, HV248, HV249, HV250, HV251, HV252, HV253, HV254, HV255, HV256, HV257, HV258, HV259, HV260, HV261, HV262, HV263, HV264, HV265, HV266, HV267, HV268, HV269, HV270, HV271, HV272, HV273, HV274, HV275, HV276
Measure Description:	Air cooled air conditioning or heat pump units with cooling capacities less than 65 kBtuh, for use in non-residential buildings, meeting the minimum efficiency requirements listed in Table 2.
Energy Impact Common Units:	kW/ton, kWh/ton, therms/ton of cooling
Base Case Description:	Air cooled air conditioning or heat pump units with cooling capacities less than 65 kBtuh, for use in non-residential buildings, meeting the federal minimum efficiency standard of 14 SEER.
Base Case Energy Consumption:	Source: DEER2016 READi (Version 2.3.0)
Measure Energy Consumption:	Source: DEER2016 READi (Version 2.3.0)
Energy Savings (Base Case – Measure):	Source: DEER2016 READi (Version 2.3.0) Varies by climate zone
Costs Common Units:	\$/ton of cooling.
Base Case Equipment Cost (\$/unit):	Source: DEER2016 and Engineering Calculations. Varies depending on system capacity.
Measure Equipment Cost (\$/unit):	Source: DEER2016 and Engineering Calculations. Varies depending on system capacity.
Gross Measure Cost (\$/unit)	Source: DEER2016 and Engineering Calculations. Varies depending on system capacity.
Measure Incremental Cost (\$/unit):	Source: DEER2016 and Engineering Calculations. Varies depending on system capacity.
Effective Useful Life (years):	Source: DEER2016 15 years, based on Nonresidential “Air Conditioners/Heat Pumps (split and unitary)”
Measure Application Type:	Replace on Burnout (ROB)
Net-to-Gross Ratios:	Source: DEER2016. NTG = 0.75, NonRes-sAll-mHVAC-DX-up for “All package and split system AC & HP replacements.”
Important Comments:	PG&E is not doing early retirement. For measures HV264 and HV268 which are 18 SEER, savings claimed will be 17 SEER from DEER2016

DOCUMENT REVISION HISTORY

Revision #	Revision Date	Author (Affiliation)	Summary of Changes
0	5/16/2012	Alex MacCurdy/Elizabeth Joyce (Energy Solutions)	Updated to SCE Work Paper Template 2013 v0.1 Updated scaling factor calculation for Tiers 2, 3 and 4. Added Heat Pump Units
1	11/18/2013	Alfredo Gutierrez (SCE)	Updated the work paper with the following: <ul style="list-style-type: none"> New delivery early retirement delivery method which includes Added RET for all existing measures Savings and Costs for RET are actually RET-ROB values in order to prevent the HVAC Upstream program from double counting the savings
2	1/27/2014	Alfredo Gutierrez (SCE)	Added in the following building type to be consistent with the ED filed REV 0 of this work paper: <ul style="list-style-type: none"> Miscellaneous Commercial RET Measures have been separated into two new solution codes.
3	4/17/2014	Jason Wang (SCE)	<ul style="list-style-type: none"> Work paper updated for the reporting period, effective 7/1/14 – 12/31/14 Updated savings and scaling factors using DEER 2014 values Split measures into the <55 kBtuh and 55-64 kBtuh ranges Added SEER 14.5 HP measures (SCE13HC019 was merged into this work paper) Added SEER 18 AC and HP measures Added the Com building type for PG&E Added all building types available from DEER that were not already present in the work paper
4 (SCE) 5 (PG&E)	1/1/2015 1/27/2015	Jason Wang (SCE) Chris Li (PG&E)	Updated work paper for DEER 2015 measures and federal code 430.32: <ul style="list-style-type: none"> Most measures now using DEER savings directly; SEER 15, 16, 17, and 18 measures were added to DEER 2015. Removed SEER 14 AC, SEER 14 HP, and SEER 14.5 HP measures due to code and DEER direction. Created new capacity ranges to accommodate EER and two-speed fan requirements. These align with DEER measures. Used scaling of DEER measures to determine SEER 18 Packaged HP savings. Calculated To Code savings using DEER measures (RET savings minus ROB savings). Updated costs with values from WO017.
6	4/8/2016	Henry Liu (PG&E)	<ul style="list-style-type: none"> Format update. Updated NTG from DEER 2016. Revised savings for HV264 and HV268 18 SEER to claim DEER 17 SEER savings.
7	11/16/2017	Danielle Dragon, PE, CEM, CDSM (PG&E)	<ul style="list-style-type: none"> Updated savings values for DEER2017 (effective date 7/1/2017)

			<ul style="list-style-type: none">• Remove Early Retirement (SCE no longer supports)• Added midstream• Removed all non-COM building types• Used “Packaged Heat Pump <55kBtuh 17 SEER (13 EER)” savings for “Packaged Heat Pump <55kBtuh 18 SEER (14 EER)”• Used “Packaged Heat Pump 55to65kBtuh 17 SEER (13 EER)” savings for “Packaged Heat Pump 55to65kBtuh 18 SEER (14 EER)”
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SECTION 1: GENERAL MEASURE & BASELINE DATA

1.1 MEASURE DESCRIPTION & BACKGROUND

Measure Description: Air cooled air conditioning or heat pump units with cooling capacities less than 65 kBtuh, for use in non-residential buildings, meeting the minimum efficiency requirements listed in Table 2 below.

Base Case Description: Air cooled air conditioning or heat pump units with cooling capacities less than 65 kBtuh, for use in non-residential buildings, meeting the federal minimum efficiency standard of 14 SEER.

Table 1: Measures and Codes

Solution Code	Measure Code	Measure Name
AC-50375	HV241	<55kBtuh 15 SEER (12 EER) Packaged Air Conditioner
AC-81566	HV242	<55kBtuh 16 SEER (12.4 EER) Packaged Air Conditioner
AC-37735	HV243	<55kBtuh 17 SEER (13 EER) Packaged Air Conditioner
AC-31588	HV244	<55kBtuh 18 SEER (14 EER) Packaged Air Conditioner
AC-87532	HV245	55to65kBtuh 15 SEER (12 EER) Packaged Air Conditioner
AC-77878	HV246	55to65kBtuh 16 SEER (12.4 EER) Packaged Air Conditioner
AC-22408	HV247	55to65kBtuh 17 SEER (13 EER) Packaged Air Conditioner
AC-75087	HV248	55to65kBtuh 18 SEER (14 EER) Packaged Air Conditioner
AC-46105	HV249	<45kBtuh 15 SEER (12.5 EER) Split System Air Conditioner
AC-83486	HV250	<45kBtuh 16 SEER (13 EER) Split System Air Conditioner
AC-26490	HV251	<45kBtuh 17 SEER (13.5 EER) Split System Air Conditioner
AC-50319	HV252	<45kBtuh 18 SEER (14 EER) Split System Air Conditioner
AC-70613	HV253	45to55kBtuh 15 SEER (12.5 EER) Split System Air Conditioner
AC-97648	HV254	45to55kBtuh 16 SEER (13 EER) Split System Air Conditioner
AC-66543	HV255	45to55kBtuh 17 SEER (13.5 EER) Split System Air Conditioner
AC-96580	HV256	45to55kBtuh 18 SEER (14 EER) Split System Air Conditioner
AC-69747	HV257	55to65kBtuh 15 SEER (12.5 EER) Split System Air Conditioner
AC-86967	HV258	55to65kBtuh 16 SEER (13 EER) Split System Air Conditioner
AC-61866	HV259	55to65kBtuh 17 SEER (13.5 EER) Split System Air Conditioner
AC-87169	HV260	55to65kBtuh 18 SEER (14 EER) Split System Air Conditioner
AC-97980	HV261	<55kBtuh 15 SEER (12 EER) Packaged Heat Pump
AC-92105	HV262	<55kBtuh 16 SEER (12.4 EER) Packaged Heat Pump
AC-59729	HV263	<55kBtuh 17 SEER (13 EER) Packaged Heat Pump
AC-65475	HV264	<55kBtuh 18 SEER (14 EER) Packaged Heat Pump
AC-99784	HV265	55to65kBtuh 15 SEER (12 EER) Packaged Heat Pump
AC-60134	HV266	55to65kBtuh 16 SEER (12.4 EER) Packaged Heat Pump
AC-65806	HV267	55to65kBtuh 17 SEER (13 EER) Packaged Heat Pump
AC-62068	HV268	55to65kBtuh 18 SEER (14 EER) Packaged Heat Pump
AC-73283	HV269	<55kBtuh 15 SEER (12.5 EER) Split System Heat Pump
AC-89637	HV270	<55kBtuh 16 SEER (13 EER) Split System Heat Pump
AC-53855	HV271	<55kBtuh 17 SEER (13.5 EER) Split System Heat Pump

AC-61202	HV272	<55kBtuh 18 SEER (14 EER) Split System Heat Pump
AC-62602	HV273	55to65kBtuh 15 SEER (12.5 EER) Split System Heat Pump
AC-71681	HV274	55to65kBtuh 16 SEER (13 EER) Split System Heat Pump
AC-94444	HV275	55to65kBtuh 17 SEER (13.5 EER) Split System Heat Pump
AC-89435	HV276	55to65kBtuh 18 SEER (14 EER) Split System Heat Pump
AC-67740	N/A	<55kBtuh To Code Savings Portion Packaged Air Conditioner
AC-69545	N/A	55to65kBtuh To Code Savings Portion Packaged Air Conditioner
AC-50853	N/A	<45kBtuh To Code Savings Portion Split System Air Conditioner
AC-56930	N/A	45to55kBtuh To Code Savings Portion Split System Air Conditioner
AC-75420	N/A	55to65kBtuh To Code Savings Portion Split System Air Conditioner
AC-83228	N/A	<55kBtuh To Code Savings Portion Packaged Heat Pump
AC-73081	N/A	55to65kBtuh To Code Savings Portion Packaged Heat Pump
AC-53523	N/A	<55kBtuh To Code Savings Portion Split System Heat Pump
AC-98919	N/A	55to65kBtuh To Code Savings Portion Split System Heat Pump

Implementation Requirements

Not applicable as early retirement offering has been removed.

Documentation Requirements

Not applicable as early retirement offering has been removed.

Efficiency Requirements

The minimum tier efficiency requirements are listed in Table 2. Tier 1 specifications are derived from the Tier 2 CEE Commercial Unitary Air Conditioner Specifications. Tiers 2, 3 and 4 have been added to promote higher efficiency units offered by the HVAC industry.

Table 2: Minimum Efficiency Requirements

	Program Tier	Minimum SEER	Minimum EER
Packaged Air Conditioner	Code	14.0	11.6
	Tier 1	15.0	12.0
	Tier 2	16.0	12.4
	Tier 3	17.0	13.0
	Tier 4	18.0	14.0
Split System Air Conditioner	Code	14.0	12.0
	Tier 1	15.0	12.5
	Tier 2	16.0	13.0
	Tier 3	17.0	13.5
	Tier 4	18.0	14.0
Packaged Air Cooled Heat Pump	Code	14.0	11.6
	Tier 1	15.0	12.0
	Tier 2	16.0	12.4
	Tier 3	17.0	13.0
	Tier 4	18.0	14.0
Split System Air	Code	14.0	12.0

Cooled Heat Pump	Tier 1	15.0	12.5
	Tier 2	16.0	13.0
	Tier 3	17.0	13.5
	Tier 4	18.0	14.0

In order to qualify for the program, units must meet either the SEER or EER requirement; units are not required to meet both specifications.

Eligibility Requirements

- All unitary DX equipment is eligible. Central systems and DHW systems are not eligible.
- Replacement must be like for like: HP for HP; AC-only for AC-only.
- Retrofitted HVAC equipment must have cooling capacity (e.g., Btu/h) within +/- 5% of existing equipment OR contractor must provide a load calculation verifying that the new unit is sized correctly for the load.
- All non-residential building types and vintages are eligible for the upstream and midstream rebate.

1.2 TECHNICAL DESCRIPTION

A unitary system is an air conditioning system that cools one or a few spaces, in contrast to a centralized system where a chiller serves most or all of the building. Unitary systems use direct expansion, are usually factory designed, and are available as packaged or split systems for commercial use. A split system consists of an indoor unit (fan, cooling coil, heating elements, filter) connected by refrigerant piping to an outdoor unit (fan, compressor, condenser, expansion valve). A packaged system incorporates all the equipment into a single unit that is typically mounted on the roof. Heat pumps allow the refrigeration cycle to run in reverse and can therefore provide heating or cooling to the conditioned space.

1.3 APPLICATION TYPES AND DELIVERY MECHANISMS

See Appendices A and B for definitions of application types and delivery mechanisms.

The delivery method is Upstream Programs – Up-Stream Incentive and Mid-Stream Programs – Midstream Incentive. Incentives are provided to the HVAC equipment distributor, who provides site installation information for each unit.

The application type is Replace-on-Burnout (ROB).

1.4 MEASURE AND BASE CASE COST EFFECTIVENESS DATA

1.4.1 DEER Measure and Base Case Analysis

Most of the measures in this work paper are directly from DEER. DEER 2016 contains measures for up to 18 SEER packaged ACs, split system ACs, and split system HPs, and up to 17 SEER packaged HPs. 17 SEER savings were taken for 18 SEER packaged HPs (PG&E only).

Table 3: DEER Difference Summary

DEER Difference Summary Table	
Referenced versions of DEER and READI	DEER 2016, READI v2.3.0
Summary of deviation from DEER	Most measures are from DEER. SEER 18 Packaged HP measures are taken from SEER 17 measures in DEER. To Code measures are derived using SEER 15 measures.
DEER measures scaled?	No
DEER eQUEST prototypes used?	No
DEER operating hours used?	No

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.

Table 4: Net-to-Gross Ratio

NTGR ID	Description	Sector	BldgType	ProgDelivID	NTG
NonRes-sAll-mHVAC-DX-up	All package and split system AC & HP replacements	Com	Com	PreRebUp	0.75

Note: Direct install measures that are not hard-to-reach will use the default NTG value.

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.

Table 5: Installation Rate

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

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.

Technology Fields

The Technology Fields were obtained from the Ex Ante Database Specification. The relevant Use Category, Use Sub-category, Technology Group, and Technology Type values for the measures in this work paper are in the table below.

Table 6: Technology Fields

Classification	Value
Measure Case UseCategory	HVAC
Measure Case UseSubCats	Space Cooling, Space Heating and Cooling
Measure Case TechGroups	dX AC Equipment, dx HP Equipment

Measure Case TechTypes	SEER Rated Split System AC, SEER Rated Split System HP
Base Case TechGroups	dx AC Equipment, dx HP Equipment
Base Case TechTypes	SEER Rated Split System AC, SEER Rated Split System HP

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.

Table 7: EUL and RUL

EUL ID	Description	Sector	UseCategory	EUL (Years)	RUL (Years)
HVAC-airAC HVAC-airHP	Air Conditioners / Heat Pumps (split and unitary)	Com	HVAC	15	5

1.4.2 Codes and Standards Analysis

Code of Federal Regulations (10 CFR 430.32(c)):

Per Federal Register technical amendment to the Code of Federal Regulations [393], the SEER 14 standard will apply to conventional [single phase] central air conditioners and heat pumps manufactured on or after January 1, 2015:

(2) Central air conditioners and central air conditioning heat pumps manufactured on or after January 1, 2015, shall have a Seasonal Energy Efficiency Ratio and Heating Seasonal Performance Factor not less than:

Product class	Seasonal energy efficiency ratio (SEER)	Heating seasonal performance factor (HSPF)
(i) Split-system air conditioners	13	
(ii) Split-system heat pumps	14	8.2
(iii) Single-package air conditioners	14	
(iv) Single-package heat pumps	14	8.0
(v) Small-duct, high-velocity systems	12	7.2
(vi)(A) Space-constrained products—air conditioners	12	
(vi)(B) Space-constrained products—heat pumps	12	7.4

(3) In addition to meeting the applicable requirements in paragraph (c)(2) of this section, products in product class (i) of that paragraph (*i.e.*, split-system air conditioners) that are manufactured on or after January 1, 2015, and installed in the States of Alabama, Arkansas, Delaware, Florida, Georgia, Hawaii, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, or Virginia, or in the District of Columbia, shall have a Seasonal Energy Efficiency Ratio not less than 14.

(4) In addition to meeting the applicable requirements in paragraphs (c)(2) of this section, products in product classes (i) and (iii) of paragraph (c)(2) (*i.e.*, split-system air conditioners and single-package air conditioners) that are manufactured on or after January 1, 2015, and installed in the States of Arizona, California, Nevada, or New Mexico shall have a Seasonal Energy Efficiency Ratio not less than 14 and have an Energy Efficiency Ratio (at a standard rating of 95 °F dry bulb outdoor temperature) not less than the following:

Product class	Energy efficiency ratio (EER)
(i) Split-system rated cooling capacity less than 45,000 Btu/hr	12.2
(ii) Split-system rated cooling capacity equal to or greater than 45,000 Btu/hr	11.7
(iii) Single-package systems	11.0

California Title 20 2014:

Appliance Efficiency Regulations [422] under California Code of Regulations Title 20, Section 1605.1 (c) (1) states "The EER, SEER, COP, HSPF, and SCOP, as applicable, of all central air conditioners, including computer room air conditioners, shall be not less than the applicable values shown in Tables C-2, C-3, C-4, C-5, and C-6."

Table C-2
Standards for Single Phase Air-Cooled Air Conditioners with Cooling Capacity Less than 65,000 Btu per Hour and
Single Phase Air-Source Heat Pumps with Cooling Capacity Less than 65,000 Btu per Hour, Not Subject to EPart

<i>Appliance</i>	<i>Minimum Efficiency</i>					
	<i>Effective January 23, 2006</i>		<i>Effective January 1, 2015</i>			
	<i>Minimum SEER</i>	<i>Minimum HSPF</i>	<i>Minimum SEER</i>	<i>Minimum HSPF</i>	<i>Minimum EER</i>	<i>Average Off-Mode Power Consumption P_{w, off} (watts)</i>
Split system air conditioners with rated cooling capacity < 45,000 Btu/hour ¹	13.0	—	14.0	—	12.2	30
Split system air conditioners with rated cooling capacity ≥ 45,000 Btu/hour ¹			14.0	—	11.7	30
Split system heat pumps	13.0	7.7	14.0	8.2	—	33
Single package air conditioners ¹	13.0	—	14.0	—	11.0	30
Single package heat pumps	13.0	7.7	14.0	8.0	—	33
Space constrained air conditioners – split system	12.0		12.0	—	—	30
Space constrained heat pumps – split system	12.0	7.4	12.0	7.4	—	33
Space constrained air conditioners – single package	12.0		12.0	—	—	30
Space constrained heat pumps – single package	12.0	7.4	12.0	7.4	—	33
Small duct, high velocity air conditioner systems	13.0		13.0	—	—	30
Small duct, high velocity heat pump systems	13.0	7.7	13.0	7.7	—	30
¹ See 10 C.F.R. section 430.32(c) for less stringent federal standards applicable to these units that are manufactured on or after January 1, 2015 and installed in states other than Arizona, California, Nevada, or New Mexico						

California Title 24 2013:

Title 24 [355] does not address the measures in this work paper; it provides requirements for unitary AC and HP units ≥ 65k Btu/h.

Table 8: Code Summary

Code	Applicable Code Reference	Effective Dates
Code of Federal Regulations	10 CFR 430.32(c)(3), (5)	January 1, 2015
Title 20 (2014)	Section 1605.1(c)(1) Table C-2	January 1, 2015

1.4.3 Non-DEER Study Review

No Non-DEER studies were referenced in the work paper.

SECTION 2: CALCULATION METHODOLOGY

Of the 45 measures in this work paper, 34 are directly from DEER. Table 9 shows which measures have exact matches in DEER and which are calculated separately using existing DEER values.

Table 9: DEER Measures Used

Measure Code	Measure Name	DEER Measures Used
HV241	Packaged Air Conditioner <55kBtuh 15 SEER (12 EER)	NE-HVAC-airAC-Pkg-It55kBtuh-15p0seer
HV242	Packaged Air Conditioner <55kBtuh 16 SEER (12.4 EER)	NE-HVAC-airAC-Pkg-It55kBtuh-16p0seer
HV243	Packaged Air Conditioner <55kBtuh 17 SEER (13 EER)	NE-HVAC-airAC-Pkg-It55kBtuh-17p0seer
HV244	Packaged Air Conditioner <55kBtuh 18 SEER (14 EER)	NE-HVAC-airAC-Pkg-It55kBtuh-18p0seer
HV245	Packaged Air Conditioner 55to65kBtuh 15 SEER (12 EER)	NE-HVAC-airAC-Pkg-55to65kBtuh-15p0seer
HV246	Packaged Air Conditioner 55to65kBtuh 16 SEER (12.4 EER)	NE-HVAC-airAC-Pkg-55to65kBtuh-16p0seer
HV247	Packaged Air Conditioner 55to65kBtuh 17 SEER (13 EER)	NE-HVAC-airAC-Pkg-55to65kBtuh-17p0seer
HV248	Packaged Air Conditioner 55to65kBtuh 18 SEER (14 EER)	NE-HVAC-airAC-Pkg-55to65kBtuh-18p0seer
HV249	Split System Air Conditioner <45kBtuh 15 SEER (12.5 EER)	NE-HVAC-airAC-Split-It45kBtuh-15p0seer
HV250	Split System Air Conditioner <45kBtuh 16 SEER (13 EER)	NE-HVAC-airAC-Split-It45kBtuh-16p0seer
HV251	Split System Air Conditioner <45kBtuh 17 SEER (13.5 EER)	NE-HVAC-airAC-Split-It45kBtuh-17p0seer
HV252	Split System Air Conditioner <45kBtuh 18 SEER (14 EER)	NE-HVAC-airAC-Split-It45kBtuh-18p0seer
HV253	Split System Air Conditioner 45to55kBtuh 15 SEER (12.5 EER)	NE-HVAC-airAC-Split-45to55kBtuh-15p0seer
HV254	Split System Air Conditioner 45to55kBtuh 16 SEER (13 EER)	NE-HVAC-airAC-Split-45to55kBtuh-16p0seer
HV255	Split System Air Conditioner 45to55kBtuh 17 SEER (13.5 EER)	NE-HVAC-airAC-Split-45to55kBtuh-17p0seer
HV256	Split System Air Conditioner 45to55kBtuh 18 SEER (14 EER)	NE-HVAC-airAC-Split-45to55kBtuh-18p0seer
HV257	Split System Air Conditioner 55to65kBtuh 15 SEER (12.5 EER)	NE-HVAC-airAC-Split-55to65kBtuh-15p0seer
HV258	Split System Air Conditioner 55to65kBtuh 16 SEER (13 EER)	NE-HVAC-airAC-Split-55to65kBtuh-16p0seer
HV259	Split System Air Conditioner 55to65kBtuh 17 SEER (13.5 EER)	NE-HVAC-airAC-Split-55to65kBtuh-17p0seer
HV260	Split System Air Conditioner 55to65kBtuh 18 SEER (14 EER)	NE-HVAC-airAC-Split-55to65kBtuh-18p0seer
HV261	Packaged Heat Pump <55kBtuh 15 SEER (12 EER)	NE-HVAC-airHP-Pkg-It55kBtuh-15p0seer-8p2hspf
HV262	Packaged Heat Pump <55kBtuh 16 SEER (12.4 EER)	NE-HVAC-airHP-Pkg-It55kBtuh-16p0seer-8p5hspf
HV263	Packaged Heat Pump <55kBtuh 17 SEER (13 EER)	NE-HVAC-airHP-Pkg-It55kBtuh-17p0seer-9p0hspf
HV264	Packaged Heat Pump <55kBtuh 18 SEER (14 EER)	NE-HVAC-airHP-Pkg-It55kBtuh-17p0seer-9p0hspf
HV265	Packaged Heat Pump 55to65kBtuh 15 SEER (12 EER)	NE-HVAC-airHP-Pkg-55to65kBtuh-15p0seer-8p2hspf
HV266	Packaged Heat Pump 55to65kBtuh 16 SEER (12.4 EER)	NE-HVAC-airHP-Pkg-55to65kBtuh-16p0seer-

		8p5hspf
HV267	Packaged Heat Pump 55to65kBtuh 17 SEER (13 EER)	NE-HVAC-airHP-Pkg-55to65kBtuh-17p0seer-9p0hspf
HV268	Packaged Heat Pump 55to65kBtuh 18 SEER (14 EER)	NE-HVAC-airHP-Pkg-55to65kBtuh-17p0seer-9p0hspf
HV269	Split System Heat Pump <55kBtuh 15 SEER (12.5 EER)	NE-HVAC-airHP-Split-It55kBtuh-15p0seer-8p7hspf
HV270	Split System Heat Pump <55kBtuh 16 SEER (13 EER)	NE-HVAC-airHP-Split-It55kBtuh-16p0seer-9p0hspf
HV271	Split System Heat Pump <55kBtuh 17 SEER (13.5 EER)	NE-HVAC-airHP-Split-It55kBtuh-17p0seer-9p4hspf
HV272	Split System Heat Pump <55kBtuh 18 SEER (14 EER)	NE-HVAC-airHP-Split-It55kBtuh-18p0seer-9p7hspf
HV273	Split System Heat Pump 55to65kBtuh 15 SEER (12.5 EER)	NE-HVAC-airHP-Split-55to65kBtuh-15p0seer-8p7hspf
HV274	Split System Heat Pump 55to65kBtuh 16 SEER (13 EER)	NE-HVAC-airHP-Split-55to65kBtuh-16p0seer-9p0hspf
HV275	Split System Heat Pump 55to65kBtuh 17 SEER (13.5 EER)	NE-HVAC-airHP-Split-55to65kBtuh-17p0seer-9p4hspf
HV276	Split System Heat Pump 55to65kBtuh 18 SEER (14 EER)	NE-HVAC-airHP-Split-55to65kBtuh-18p0seer-9p7hspf
	<55kBtuh To Code Savings Portion Packaged Air Conditioner	Derived from NE-HVAC-airAC-Pkg-It55kBtuh-15p0seer
	55to65kBtuh To Code Savings Portion Packaged Air Conditioner	Derived from NE-HVAC-airAC-Pkg-55to65kBtuh-15p0seer
	<45kBtuh To Code Savings Portion Split System Air Conditioner	Derived from NE-HVAC-airAC-Split-It45kBtuh-15p0seer
	45to55kBtuh To Code Savings Portion Split System Air Conditioner	Derived from NE-HVAC-airAC-Split-45to55kBtuh-15p0seer
	55to65kBtuh To Code Savings Portion Split System Air Conditioner	Derived from NE-HVAC-airAC-Split-55to65kBtuh-15p0seer
	<55kBtuh To Code Savings Portion Packaged Heat Pump	Derived from NE-HVAC-airHP-Pkg-It55kBtuh-15p0seer-8p2hspf
	55to65kBtuh To Code Savings Portion Packaged Heat Pump	Derived from NE-HVAC-airHP-Pkg-55to65kBtuh-15p0seer-8p2hspf
	<55kBtuh To Code Savings Portion Split System Heat Pump	Derived from NE-HVAC-airHP-Split-It55kBtuh-15p0seer-8p7hspf
	55to65kBtuh To Code Savings Portion Split System Heat Pump	Derived from NE-HVAC-airHP-Split-55to65kBtuh-15p0seer-8p7hspf

Since DEER does not have measures for 18 SEER packaged heat pumps, those savings were taken directly out from DEER using the lower savings values of 17 SEER.

The two 18 SEER measures HV264 and HV268 are using the DEER IDs measure savings listed below:
 NE-HVAC-airHP-Pkg-It55kBtuh-17p0seer-9p0hspf
 NE-HVAC-airHP-Pkg-55to65kBtuh-17p0seer-9p0hspf

To Code Savings Portion Measures

The To Code Savings Portion measures in this work paper are the savings from retrofitting customer existing equipment (various SEER values) to 14 SEER code-compliant equipment. The savings were determined by subtracting the "AStdWB" savings from the "APreWB" savings for 15 SEER ACs and HPs. The result was the difference between customer existing equipment and 14 SEER equipment. Measures savings (ROB, NEW) are attributed to the Upstream and Midstream HVAC programs.

Example: <55kBtuh To Code Savings Portion Packaged Air Conditioner, SCE, Assembly, CZ 06

DEER savings:

EnergyImpactID	APreWBkWh	APreWBkW	APreWBtherm	AStdWBkWh	AStdWBkW	AStdWBtherm
NE-HVAC-airAC-Pkg-lt55kBtuh-15p0seer	560	0.293	-3.12	129	0.0454	-1.2

kWh Savings = 560 - 129 = **431 kWh**

kW Reduction = 0.293 - 0.0454 = **0.2476 kW**

therm Savings = -3.12 - (-1.2) = **-1.92 therms**

All savings values are listed in Attachment 1, and the calculations are in Attachment 2.

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.

Table 10: Building Types and Load Shapes

Building Type	E3 Alt. Building Type	Load Shape
Agricultural	NON_RES	DEER:HVAC_Split- Package_AC, DEER:HVAC_Split- Package_HP
Assembly		
Education - Primary School		
Education - Secondary School		
Education - Relocatable Classroom		
Education - Community College		
Education – University		
Food Store		
Grocery		
Health/Medical – Hospital		
Health/Medical - Nursing Home		
Health/Medical – Clinic		
Lodging – Hotel		
Manufacturing - Bio/Tech		
Manufacturing - Light Industrial		
Industrial		
Misc – Commercial		
Office – Large		
Office – Small		
Restaurant - Fast-Food		
Restaurant - Sit-Down		
Retail - Multistory Large		
Retail - Single-Story Large		
Retail – Small		
Storage – Conditioned		
Transportation - Communication - Utilities		
Warehouse – Refrigerated		
Com		

SECTION 4: BASE CASE & MEASURE COSTS

4.1 BASE CASE COST

The 2010–2012 WO017 Ex Ante Measure Cost Study [475] provided per-installation and per-unit equipment and labor costs for split and packaged AC units (13 and 14 SEER only) and HP units (13, 14, and 15 SEER only). These costs were first converted to per-ton costs and then linearly extrapolated to determine costs for up to 18 SEER units. Miscellaneous “non-equipment installation costs” costs were also provided but not used in this work paper.

All measures except the To Code measures use the 14 SEER costs as base case costs; see the following table. The To Code measures use the 13 SEER costs as base case costs.

Table 11: WO017 Baseline Cost Data, Per-ton

Description	Material Cost
Pkg AC SEER = 13.0 (< 55 kBtuh), EER = 11.06, Clg EIR = 0.2557, Supply Fan W/cfm = 0.379; no Econo; 1-spd Fan assumed 3 ton	\$1,012.79
Pkg AC SEER = 14.0 (< 55 kBtuh), EER = 12.04, Clg EIR = 0.2456, Supply Fan W/cfm = 0.306; no Econo; 1-spd Fan assumed 3 ton	\$1,133.38
Pkg AC SEER = 13.0 (55-64 kBtuh), EER = 11.06, Clg EIR = 0.2557, Supply Fan W/cfm = 0.379; no Econo; 2-spd Fan assumed 5 ton	\$762.89
Pkg AC SEER = 14.0 (55-64 kBtuh), EER = 12.04, Clg EIR = 0.2456, Supply Fan W/cfm = 0.306; no Econo; 2-spd Fan assumed 5 ton	\$835.25
Split AC SEER = 13.0 (< 55 kBtuh), EER = 11.06, Clg EIR = 0.2557, Supply Fan W/cfm = 0.379; no Econo; 1-spd Fan assumed 24,000 BtuH	\$468.67
Split AC SEER = 14.0 (< 55 kBtuh), EER = 12.04, Clg EIR = 0.2456, Supply Fan W/cfm = 0.306; no Econo; 1-spd Fan assumed 24,000 BtuH	\$606.86
Split AC SEER = 13.0 (55-64 kBtuh), EER = 11.06, Clg EIR = 0.2557, Supply Fan W/cfm = 0.379; no Econo; 2-spd Fan assumed 60,000 BtuH	\$386.20
Split AC SEER = 14.0 (55-64 kBtuh), EER = 12.04, Clg EIR = 0.2456, Supply Fan W/cfm = 0.306; no Econo; 2-spd Fan assumed 60,000BtuH - same as baseline	\$441.47
Pkg HP SEER = 13.0 (< 55 kBtuh), EER = 11.07, HSPF = 7.70, COP = 3.28; no Econo; 1-spd Fan assumed 36 MBH	\$1,109.03
Pkg HP SEER = 14.0 (< 55 kBtuh), EER = 11.6, HSPF = 8.00, COP = 3.52; no Econo; 1-spd Fan assumed 36 MBH	\$1,250.99
Pkg HP SEER = 13.0 (55-64 kBtuh), EER = 11.07, HSPF = 7.70, COP = 3.28; w/Econo; 2-spd Fan assumed 60 MBH	\$808.80
Pkg HP SEER = 14.0 (55-64 kBtuh), EER = 11.6, HSPF = 8.00, COP = 3.52; w/Econo; 2-spd Fan assumed 60 MBH	\$893.98
Split HP SEER = 13 assumed 36,000 BtuH	\$594.87

Split HP SEER = 14.0 (< 55 kBTUh), EER = 12.00, HSPF = 8.50, COP = 3.74; no Econo; 1-spd Fan assumed 36,000 BtuH	\$777.64
Split HP SEER = 13 assumed 59,000 BtuH	\$594.75
Split HP SEER = 14.0 (55-64 kBTUh) - Combined SEER 13 and SEER 14.5 hp assumed 59,000 BtuH	\$706.27

4.2 MEASURE CASE COST

Costs for 15, 16, 17, and 18 SEER ACs and 16, 17, and 18 SEER HPs were linearly extrapolated using SEER value as the independent variable, using costs from WO017.

Example: <55kBtuh 15 SEER (12 EER) Packaged Air Conditioner

$$\text{Equipment cost} = \$1,133.38 + (\$1,133.38 - \$1,012.79) = \$1,253.97$$

Table 12 shows a sample of costs extrapolated for packaged AC units <55 kBtuh:

Table 12: Sample WO017 and Extrapolated Measure Costs, Per-ton

Description	Packaged AC	Split System AC
Pkg AC SEER = 13.0 (< 55 kBtuh), EER = 11.06, Clg EIR = 0.2557, Supply Fan W/cfm = 0.379; no Econo; 1-spd Fan assumed 3 ton	\$1,012.79	\$891.21
Pkg AC SEER = 14.0 (< 55 kBTUh), EER = 12.04, Clg EIR = 0.2456, Supply Fan W/cfm = 0.306; no Econo; 1-spd Fan assumed 3 ton	\$1,133.38	\$891.21
Extrapolated: Pkg AC SEER = 15.0 (< 55 kBtuh)	\$1,253.97	\$891.21
Extrapolated: Pkg AC SEER = 16.0 (< 55 kBtuh)	\$1,374.56	\$891.21
Extrapolated: Pkg AC SEER = 17.0 (< 55 kBtuh)	\$1,495.15	\$891.21
Extrapolated: Pkg AC SEER = 18.0 (< 55 kBtuh)	\$1,615.74	\$891.21

The cost for the single phase 15 SEER air conditioners and heat pumps are the same as the three-phase 15 SEER AC and HP costs.

4.3 GROSS AND INCREMENTAL MEASURE COST

4.3.1 Incremental Measure Cost (IMC)

For ROB and NEW, the Incremental Measure Cost is used; see **Error! Reference source not found..**

For RET measures, the IMC is equal to \$0 in order to avoid double counting the costs.

All cost calculations are in Table 1213 and more details are in Attachment 3.

Table 13: Base Case Costs, Measure Costs and IMC Per-ton

Solution Code	Measure Code	Measure Name	Base Case Equipment Cost Source	Base Case Equipment Cost	Measure Equipment Cost Source	Measure Equipment Cost	IMC
AC-50375	HV241	<55kBtuh 15 SEER (12 EER) Packaged Air Conditioner	Pkg AC SEER = 14.0 (< 55 kBtuh)	\$1,133.38	Pkg AC SEER = 15.0 (< 55 kBtuh)	\$1,253.97	\$120.59
AC-81566	HV242	<55kBtuh 16 SEER (12.4 EER) Packaged Air Conditioner	Pkg AC SEER = 14.0 (< 55 kBtuh)	\$1,133.38	Pkg AC SEER = 16.0 (< 55 kBtuh)	\$1,374.56	\$241.18
AC-37735	HV243	<55kBtuh 17 SEER (13 EER) Packaged Air Conditioner	Pkg AC SEER = 14.0 (< 55 kBtuh)	\$1,133.38	Pkg AC SEER = 17.0 (< 55 kBtuh)	\$1,495.15	\$361.77
AC-31588	HV244	<55kBtuh 18 SEER (14 EER) Packaged Air Conditioner	Pkg AC SEER = 14.0 (< 55 kBtuh)	\$1,133.38	Pkg AC SEER = 18.0 (< 55 kBtuh)	\$1,615.74	\$482.36
AC-87532	HV245	55to65kBtuh 15 SEER (12 EER) Packaged Air Conditioner	Pkg AC SEER = 14.0 (55-64 kBtuh)	\$835.25	Pkg AC SEER = 15.0 (55-64 kBtuh)	\$907.60	\$72.35
AC-77878	HV246	55to65kBtuh 16 SEER (12.4 EER) Packaged Air Conditioner	Pkg AC SEER = 14.0 (55-64 kBtuh)	\$835.25	Pkg AC SEER = 16.0 (55-64 kBtuh)	\$979.96	\$144.71
AC-22408	HV247	55to65kBtuh 17 SEER (13 EER) Packaged Air Conditioner	Pkg AC SEER = 14.0 (55-64 kBtuh)	\$835.25	Pkg AC SEER = 17.0 (55-64 kBtuh)	\$1,052.31	\$217.06
AC-75087	HV248	55to65kBtuh 18 SEER (14 EER) Packaged Air Conditioner	Pkg AC SEER = 14.0 (55-64 kBtuh)	\$835.25	Pkg AC SEER = 18.0 (55-64 kBtuh)	\$1,124.66	\$289.41
AC-46105	HV249	<45kBtuh 15 SEER (12.5 EER) Split System Air Conditioner	Split AC SEER = 14.0 (< 55 kBTUH)	\$606.86	Split AC SEER = 15.0 (< 55 kBTUH)	\$745.05	\$138.19
AC-83486	HV250	<45kBtuh 16 SEER (13 EER) Split System Air Conditioner	Split AC SEER = 14.0 (< 55 kBTUH)	\$606.86	Split AC SEER = 16.0 (< 55 kBTUH)	\$883.24	\$276.38
AC-26490	HV251	<45kBtuh 17 SEER (13.5 EER) Split System Air Conditioner	Split AC SEER = 14.0 (< 55 kBTUH)	\$606.86	Split AC SEER = 17.0 (< 55 kBTUH)	\$1,021.43	\$414.57
AC-50319	HV252	<45kBtuh 18 SEER (14 EER) Split System Air Conditioner	Split AC SEER = 14.0 (< 55 kBTUH)	\$606.86	Split AC SEER = 18.0 (< 55 kBTUH)	\$1,159.62	\$552.76
AC-70613	HV253	45to55kBtuh 15 SEER (12.5 EER) Split System Air Conditioner	Split AC SEER = 14.0 (< 55 kBTUH)	\$606.86	Split AC SEER = 15.0 (< 55 kBTUH)	\$745.05	\$138.19
AC-97648	HV254	45to55kBtuh 16 SEER (13 EER) Split System Air Conditioner	Split AC SEER = 14.0 (< 55 kBTUH)	\$606.86	Split AC SEER = 16.0 (< 55 kBTUH)	\$883.24	\$276.38
AC-66543	HV255	45to55kBtuh 17 SEER (13.5 EER) Split System Air Conditioner	Split AC SEER = 14.0 (< 55 kBTUH)	\$606.86	Split AC SEER = 17.0 (< 55 kBTUH)	\$1,021.43	\$414.57

AC-96580	HV256	45to55kBtuh 18 SEER (14 EER) Split System Air Conditioner	Split AC SEER = 14.0 (< 55 kBTUh)	\$606.86	Split AC SEER = 18.0 (< 55 kBTUh)	\$1,159.62	\$552.76
AC-69747	HV257	55to65kBtuh 15 SEER (12.5 EER) Split System Air Conditioner	Split AC SEER = 14.0 (55-64 kBTUh)	\$441.47	Split AC SEER = 15.0 (55-64 kBTUh)	\$496.75	\$55.28
AC-86967	HV258	55to65kBtuh 16 SEER (13 EER) Split System Air Conditioner	Split AC SEER = 14.0 (55-64 kBTUh)	\$441.47	Split AC SEER = 16.0 (55-64 kBTUh)	\$552.02	\$110.55
AC-61866	HV259	55to65kBtuh 17 SEER (13.5 EER) Split System Air Conditioner	Split AC SEER = 14.0 (55-64 kBTUh)	\$441.47	Split AC SEER = 17.0 (55-64 kBTUh)	\$607.30	\$165.83
AC-87169	HV260	55to65kBtuh 18 SEER (14 EER) Split System Air Conditioner	Split AC SEER = 14.0 (55-64 kBTUh)	\$441.47	Split AC SEER = 18.0 (55-64 kBTUh)	\$662.58	\$221.10
AC-97980	HV261	<55kBtuh 15 SEER (12 EER) Packaged Heat Pump	Pkg HP SEER = 14.0 (< 55 kBTUh)	\$1,250.99	Pkg HP SEER = 15.0 (< 55 kBTUh)	\$1,392.95	\$141.96
AC-92105	HV262	<55kBtuh 16 SEER (12.4 EER) Packaged Heat Pump	Pkg HP SEER = 14.0 (< 55 kBTUh)	\$1,250.99	Pkg HP SEER = 16.0 (< 55 kBTUh)	\$1,534.92	\$283.93
AC-59729	HV263	<55kBtuh 17 SEER (13 EER) Packaged Heat Pump	Pkg HP SEER = 14.0 (< 55 kBTUh)	\$1,250.99	Pkg HP SEER = 17.0 (< 55 kBTUh)	\$1,676.88	\$425.89
AC-65475	HV264	<55kBtuh 18 SEER (14 EER) Packaged Heat Pump	Pkg HP SEER = 14.0 (< 55 kBTUh)	\$1,250.99	Pkg HP SEER = 18.0 (< 55 kBTUh)	\$1,818.84	\$567.85
AC-99784	HV265	55to65kBtuh 15 SEER (12 EER) Packaged Heat Pump	Pkg HP SEER = 14.0 (55-64 kBTUh)	\$893.98	Pkg HP SEER = 15.0 (55-64 kBTUh)	\$979.16	\$85.18
AC-60134	HV266	55to65kBtuh 16 SEER (12.4 EER) Packaged Heat Pump	Pkg HP SEER = 14.0 (55-64 kBTUh)	\$893.98	Pkg HP SEER = 16.0 (55-64 kBTUh)	\$1,064.33	\$170.36
AC-65806	HV267	55to65kBtuh 17 SEER (13 EER) Packaged Heat Pump	Pkg HP SEER = 14.0 (55-64 kBTUh)	\$893.98	Pkg HP SEER = 17.0 (55-64 kBTUh)	\$1,149.51	\$255.53
AC-62068	HV268	55to65kBtuh 18 SEER (14 EER) Packaged Heat Pump	Pkg HP SEER = 14.0 (55-64 kBTUh)	\$893.98	Pkg HP SEER = 18.0 (55-64 kBTUh)	\$1,234.69	\$340.71
AC-73283	HV269	<55kBtuh 15 SEER (12.5 EER) Split System Heat Pump	Split HP SEER = 14.0 (< 55 kBTUh)	\$777.64	Split HP SEER = 15.0 (< 55 kBTUh)	\$960.40	\$182.76
AC-89637	HV270	<55kBtuh 16 SEER (13 EER) Split System Heat Pump	Split HP SEER = 14.0 (< 55 kBTUh)	\$777.64	Split HP SEER = 16.0 (< 55 kBTUh)	\$1,143.16	\$365.53
AC-53855	HV271	<55kBtuh 17 SEER (13.5 EER) Split System Heat Pump	Split HP SEER = 14.0 (< 55 kBTUh)	\$777.64	Split HP SEER = 17.0 (< 55 kBTUh)	\$1,325.93	\$548.29

AC-61202	HV272	<55kBtuh 18 SEER (14 EER) Split System Heat Pump	Split HP SEER = 14.0 (< 55 kBTUh)	\$777.64	Split HP SEER = 18.0 (< 55 kBTUh)	\$1,508.69	\$731.05
AC-62602	HV273	55to65kBtuh 15 SEER (12.5 EER) Split System Heat Pump	Split HP SEER = 14.0 (55-64 kBTUh)	\$706.27	Split HP SEER = 15.0 (55-64 kBTUh)	\$817.78	\$111.52
AC-71681	HV274	55to65kBtuh 16 SEER (13 EER) Split System Heat Pump	Split HP SEER = 14.0 (55-64 kBTUh)	\$706.27	Split HP SEER = 16.0 (55-64 kBTUh)	\$929.30	\$223.03
AC-94444	HV275	55to65kBtuh 17 SEER (13.5 EER) Split System Heat Pump	Split HP SEER = 14.0 (55-64 kBTUh)	\$706.27	Split HP SEER = 17.0 (55-64 kBTUh)	\$1,040.82	\$334.55
AC-89435	HV276	55to65kBtuh 18 SEER (14 EER) Split System Heat Pump	Split HP SEER = 14.0 (55-64 kBTUh)	\$706.27	Split HP SEER = 18.0 (55-64 kBTUh)	\$1,152.33	\$446.07
AC-67740	N/A	<55kBtuh To Code Savings Portion Packaged Air Conditioner	Pkg AC SEER = 13.0 (< 55 kBtuh)	\$1,012.79	Pkg AC SEER = 14.0 (< 55 kBtuh)	\$1,133.38	\$0.00
AC-69545	N/A	55to65kBtuh To Code Savings Portion Packaged Air Conditioner	Pkg AC SEER = 13.0 (55-64 kBtuh)	\$762.89	Pkg AC SEER = 14.0 (55-64 kBtuh)	\$835.25	\$0.00
AC-50853	N/A	<45kBtuh To Code Savings Portion Split System Air Conditioner	Split AC SEER = 13.0 (< 55 kBTUh)	\$468.67	Split AC SEER = 14.0 (< 55 kBTUh)	\$606.86	\$0.00
AC-56930	N/A	45to55kBtuh To Code Savings Portion Split System Air Conditioner	Split AC SEER = 13.0 (< 55 kBTUh)	\$468.67	Split AC SEER = 14.0 (< 55 kBTUh)	\$606.86	\$0.00
AC-75420	N/A	55to65kBtuh To Code Savings Portion Split System Air Conditioner	Split HP SEER = 13.0 (55-64 kBTUh)	\$594.75	Split HP SEER = 14.0 (55-64 kBTUh)	\$706.27	\$0.00
AC-83228	N/A	<55kBtuh To Code Savings Portion Packaged Heat Pump	Pkg HP SEER = 13.0 (< 55 kBTUh)	\$1,109.03	Pkg HP SEER = 14.0 (< 55 kBTUh)	\$1,250.99	\$0.00
AC-73081	N/A	55to65kBtuh To Code Savings Portion Packaged Heat Pump	Pkg HP SEER = 13.0 (55-64 kBTUh)	\$808.80	Pkg HP SEER = 14.0 (55-64 kBTUh)	\$893.98	\$0.00
AC-53523	N/A	<55kBtuh To Code Savings Portion Split System Heat Pump	Split HP SEER = 13.0 (< 55 kBTUh)	\$594.87	Split HP SEER = 14.0 (< 55 kBTUh)	\$777.64	\$0.00
AC-98919	N/A	55to65kBtuh To Code Savings Portion Split System Heat Pump	Split HP SEER = 13.0 (55-64 kBTUh)	\$594.75	Split HP SEER = 14.0 (55-64 kBTUh)	\$706.27	\$0.00

ATTACHMENTS

Savings calculations are found in the accompanying calculation spreadsheet.

1. PGECO HVC126 R7 - Unitary ACHP under 65kBtuh.xlsx
2. Cost Calculations.xlsx

REFERENCES

- [355] 2013 Building Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24)
- [393] Code of Federal Regulations Title 10 - Energy
- [422] 2014 Appliance Efficiency Regulations (Title 20)
- [475] 2010–2012 WO017 Ex Ante Measure Cost Study Final Report

APPENDIX A: APPLICATION TYPES

This table compares the application types in SCE's systems with those in DEER.

SCE Application (Program) Type	DEER Application Type	Savings		Cost		Life	
		1 st Baseline (BL)	2 nd BL	1 st BL	2 nd BL	1 st BL	2 nd BL
New Construction (NEW)	New Construction (Nc)	Above Code or Standard	N/A	Incremental Cost	N/A	EUL	0
Replace on Burnout (ROB)	Replace on Burnout (Rob), Normal Replacement (NR)	Above Code or Standard	N/A	Incremental Cost	N/A	EUL	0

APPENDIX B: DELIVERY MECHANISMS

A delivery mechanism is a delivery method paired with an incentive method. PG&E's delivery methods include:

- Upstream Programs

The following table describes the incentive methods.

Incentive Method	Description
Up-Stream Buy Down, Up-Stream Incentive	The utility program offers buydowns and incentives to vendors (typically manufacturers and distributors), who then manufacture, stock, promote, lower prices on, and/or sell energy efficient equipment. There is some overlap between the mid-stream and up-stream approaches.