

HVAC - Commercial HVAC System Measures



AYAD AL-SHAIKH
APRIL 2019

HVAC Measure Breakdown

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- HVAC Measures (53 measures total)

- Commercial (29 measures total)

- Service / Quality Installation (6 measures)

- HVAC Units (12 measures)

- HVAC Controls (11 measures)

- Residential (24 measures total)

- Service (6 measures)

- HVAC Units (5 measures)

- HVAC Controls (5 measures)

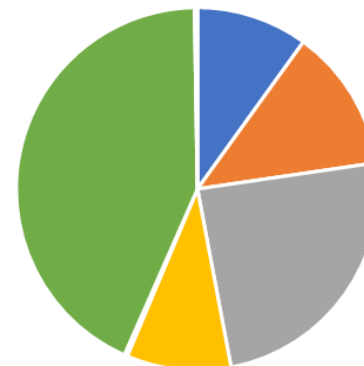
- Evaporative Units (4 measures)

- Gas Units (3 measures)

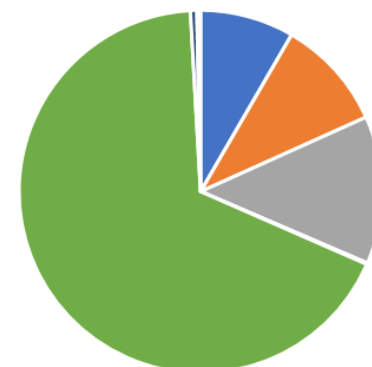
- Total Savings (2018, Q1-Q3)

- ✦ 63.4M kWh, 2.5M therms

IOU Claims Data: 2018, Q1-Q3:
Gross kWh



IOU Claims Data: 2018, Q1-Q3:
Gross Therms



Commercial HVAC Measures

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Service / Quality Installation (6 measures)

Ref No	Description							2018 (Q1-Q3)		
		Number of Units		First Year Gross kWh		First Year Gross Therm				
5.30	Refrigerant Charge, Commercial							5,562	247,572	840
5.31	Evaporator Coil Cleaning, Commercial							21,499	147,374	(7)
5.32	Condenser Coil Cleaning, Commercial							22,968	1,242,174	-
5.01	Economizer Controls, Commercial							5,016	344,322	(12)
5.02	Economizer Repair, Commercial							5,232	517,665	8,545
5.15	Supply Fan Controls, Commercial							9,174	3,773,278	154,966
5.05	Water-cooled Chiller	13,210	9,612,875	-	9,860	-	-	9,685	742,000	-
5.39	Air-cooled Packaged Chiller	8,739	4,211,173	-	13,939	3,159,548	-	2,363	178,896	-
5.03	Space Heating Boiler, Commercial	290,316	(61,230)	194,180	432,358	(90)	288,297	360,467	(63,626)	219,138
5.19	Furnace, Commercial				73	6,962	3,659	45	11,196	4,103
5.24	Unitary Air-Cooled Air Conditioner, Over 65 kBtu/h, Commercial	48,352	6,165,477	(6,910)	46,703	3,096,491	-	31,194	2,067,917	-
5.25	Unitary Air Cooled AC or Heat Pump, Under 65 kBtu/h, Commercial	19,270	4,178,238	(15,847)	15,026	2,605,029	(18,275)	12,480	4,050,967	(28,597)
5.26	Evaporative Condenser, Commercial	577	9,770	-	1,858	38,049	-	1,683	36,862	-
5.28	Ductless Air Conditioner, < 24 kBtu/h, Commercial	522	210,781	(12)						
5.53	Ductless Air Conditioner, Under 60 kBtu/hr	227	1,940,409	281,025						
5.56	Single Package Vertical Heat Pump, K-12 and Community Colleges							80	24,480	-
5.22	Variable Refrig Flow for HP or Heat Recovery System > 65kBtu/h, Com	7,622	6,707,935	85,901	29	6,462	14			
5.51	Water Source Heat Pump, Commercial	1,402	556,370	(72)	2,411	870,658	(152)	2,663	971,111	(168)
5.06	Demand Controlled Ventilation for Single Zone Packaged HVAC	10,122	1,019,973	113,100	11,536	1,138,104	167,514	5,044	340,241	76,408
5.49	Enhanced Ventilation for Pkg HVAC with Gas Heating or Packaged HP	7,855	5,112,333	41,004	12,442	7,651,626	317,884	4,966	3,450,032	111,024
5.41	VSD for HVAC Fan Controls, Commercial	3,813	4,224,925	(5,266)	6,716	6,911,865	(18,268)	2,467	3,836,290	(13,683)
5.44	Adaptive Climate Controller for Guest Room PTAC or PTHP	126	-	-	94	64,392	-	72	49,322	-
5.45	Energy Management System for Guest Room PTAC or PTHP	9,949	10,379,730	-	12,151	13,029,818	-	6,060	6,489,883	-
5.46	Programmable Communicating T-stat for Demand Response, Com	3,048	1,170,548	178,615	6,377	1,621,598	233,240	2,239	562,574	85,174
5.50	Cogged V-Belt for HVAC Fan, Commercial	20,237	381,719	-	28,158	635,744	-	1,811	25,793	-
5.16	Variable Speed Motor for Air Handler, Commercial	877	989,643	(1,229)						
5.21	HVAC Occupancy Sensor, Classroom	1,474	345,050	5,159						
5.14	VFD Retrofit for Central Plant System	4,158	9,677,289	(21)	2,960	6,772,088	-	270	573,113	-
5.07	VFD Demand Control System Retrofit to Parking Structure Exhaust Fan	539	1,587,184	-	162	886,648	-			
Totals:			85,610,000	1,050,000		63,640,000	1,160,000		29,620,000	620,000

Subsequent slides will be larger; broken up into 3 segment.

Visualize savings over three years; Note that savings decreasing.

Commercial HVAC Measures

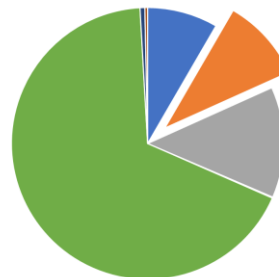
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No	Description	Modeled	Submittal	IOU Lead	Rigor	2018 (Q1-Q3)		
						Number of Units	First Year Gross kWh	First Year Gross Therm
5.05	Water-cooled Chiller	DEER	Jun	SCE	Medium	9,685	742,000	-
5.39	Air-cooled Packaged Chiller	DEER	Apr	SCE	Medium	2,363	178,896	-
5.03	Space Heating Boiler, Commercial	DEER / eQUEST	Jun	PG&E	Medium	360,467	(63,626)	219,138
5.19	Furnace, Commercial	Modified DEER	Jun	SCG	Low	45	11,196	4,103
5.24	Unitary Air-Cooled Air Conditioner, Over 65 kBtu/h, Commercial	DEER	Apr	PG&E	Low	31,194	2,067,917	-
5.25	Unitary Air Cooled AC or Heat Pump, Under 65 kBtu/h, Commercial	DEER	Apr	PG&E	Low	12,480	4,050,967	(28,597)
5.26	Evaporative Condenser, Commercial	DEER 2005	Jun	0	Low	1,683	36,862	-
5.28	Ductless Air Conditioner, < 24 kBtu/h, Commercial	Modified DEER	Jun	SCE	Low			
5.53	Ductless Air Conditioner, Under 60 kBtu/hr	Modified DEER	Jun	SCE	Medium			
5.22	Variable Refrig Flow for HP or Heat Recovery System > 65kBtu/h, Com	Energy Pro	Hold	PG&E/SCE	Medium			
5.51	Water Source Heat Pump, Commercial	DEER 2005	Aug	POU	Low	2,663	971,111	(168)
5.56	Single Package Vertical Heat Pump, K-12 and Community Colleges	eQUEST	Jun	PG&E/SCE	Low	80	24,480	-

IOU Claims Data: 2018, Q1-Q3:
Gross kWh



IOU Claims Data: 2018, Q1-Q3:
Gross Therms



Measure Consensus – 5.05 – Water-cooled Chiller



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● Offering

- ❑ Implementation: NR, **NC**
- ❑ Building Types: COM
- ❑ Climate zones: CZ01-16
- ❑ Norm Unit: Cap-Tons

● Stage 1 Issues

- ❑ DEER2020 updates: *Peak Period*, Measure App Type, Delivery Type, *Vintage (developed with vintage prototypes)*
- ❑ Recommend moving CZ13 to the PG&E value based upon weighted area
- ❑ Measure designed using CZ-savings without PA

● Measure Extension

- ❑ Add POUs
- ❑ Add PG&E, SDG&E

● Stage 2 Issues

- ❑ *Baseline requirements limit qualifying equipment; re-establish tiers.*
- ❑ *Review performance curves.*
- ❑ *Add labor cost*

		2016	2017	2018
PA	Technology Type	Sum of First Year Gross kWh	Sum of First Year Gross kWh	Sum of First Year Gross kWh
☐ SCE	Centrif	9,514,509	-	
	Screw	98,366	-	
	WtrCldCentChlr			742,000

Input Consensus – 5.05 – Water-cooled Chiller

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• Measure Permutations

		Measure Data Field			
Measure Data Field	Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	NR	No Value	RobNc	No Value	No Value
BldgType	COM	No Value	OfL,ECC,ESe,EUn,Hsp,Htl,MBT ,Nrs,OfS,Rt3	No Value	No Value
BldgVintage	Ex	No Value	Any	No Value	No Value
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05, CZ06,CZ07,CZ08,CZ09,CZ10, CZ11,CZ12,CZ13,CZ14,CZ15, CZ16	No Value	CZ06,CZ08,CZ09,CZ10,CZ13,CZ14, CZ15,CZ16	No Value	No Value
NormUnit	Cap-Tons	No Value	Cap-Tons	No Value	No Value
EUL ID	HVAC-Chlr	No Value	HVAC-Chlr	No Value	No Value
RUL ID	n/a	No Value	HVAC-Chlr	No Value	No Value
NTGR	Com-Default>2yrs	No Value	Com-Default>2yrs	No Value	No Value
DeliveryType	UpDeemed	No Value	PreRebUp	No Value	No Value
GSIA	Def-GSIA	No Value	Def-GSIA	No Value	No Value
Electric Load Shape	<i>(use Existing)</i>	No Value	SCE:NON_RES:DEER:HVAC_Chillers	No Value	No Value
Gas Load Shape	Annual	No Value	Annual	No Value	No Value
Sector	Com	No Value	Com	No Value	No Value
PA/POU	Any				
BldgHVAC	Any	No Value	Any	No Value	No Value
Use Category	HVAC	No Value	HVAC	No Value	No Value
SubUseCategory	SpaceCool	No Value	SpaceCool	No Value	No Value
TechGroup	Chiller	No Value	Chiller	No Value	No Value
TechType	Screw	No Value	Screw	No Value	No Value
Cost Adjustment Type	None	No Value	HVAC50	No Value	No Value
EnImpCalcType	Standard	No Value	Standard	No Value	No Value
MeasImpactType	Deem-DEER	No Value	Standard	No Value	No Value
MeasQualifierGroup	None	No Value	None	No Value	No Value

Measure Consensus – 5.39 – Air-cooled Packaged Chiller



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● Offering

- ❑ Implementation: NR, **NC**
- ❑ Building Types: COM
- ❑ Climate zones: 1-16
- ❑ Norm Unit: Cap-Tons

● Stage 1 Issues

- ❑ DEER2020 updates: *Peak Period*, Measure App Type, Delivery Type, *Vintage (developed with vintage prototypes)*
- ❑ Measure designed using CZ-savings without PA
- ❑ *Recommend moving CZ13 to the PG&E value based upon weighted area*

● Measure Extension

- ❑ Add POUs
- ❑ Add SDG&E

● Stage 2 Issues

- ❑ *Baseline requirements limit qualifying equipment; re-establish tiers.*
- ❑ *Review performance curves.*
- ❑ *Add labor cost*

		2016	2017	2018
		Sum of First	Sum of First	Sum of First
		Year Gross	Year Gross	Year Gross
PA	Technology Type	kWh	kWh	kWh
PGE	Screw	849,914	2,829,684	98,377
SCE	AirCldScrewChlr		329,864	80,519
	Screw	3,361,259	-	
		4,211,173	3,159,548	178,896

Input Consensus –

5.39 – Air-cooled Packaged Chiller

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- Measure Permutations

		Measure Data Field			
Measure Data Field	Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	NR,New	ROB,NC	RobNc	No Value	No Value
BldgType	Com	Com	ECC,ESe,EUn,Hsp,Htl,MBT,Nrs,OfL,OfS,Rt3	No Value	No Value
BldgVintage	Ex	Ex,New	Any	No Value	No Value
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06,CZ07,CZ08,CZ09,CZ10,CZ11,CZ12,CZ13,CZ14,CZ15,CZ16	CZ01,CZ02,CZ03,CZ04,CZ05,CZ11,CZ12,CZ13,CZ16,IOU	CZ06,CZ08,CZ09,CZ10,CZ13,CZ14,CZ15,CZ16	No Value	No Value
NormUnit	Cap-Tons	Cap-Tons	Cap-Tons	No Value	No Value
EUL ID	HVAC-Chlr	HVAC-Chlr	HVAC-Chlr	No Value	No Value
RUL ID	n/a	(blank)	HVAC-Chlr	No Value	No Value
NTGR	Com-Default>2yrs	Com-Default>2yrs	Com-Default>2yrs	No Value	No Value
DeliveryType	UpDeemed	PreRebUp	PreRebUp	No Value	No Value
GSIA	Com-AC-PGE Def-GSIA	Com-AC-PGE Def-GSIA	Def-GSIA	No Value	No Value
Electric Load Shape	<i>(use Existing)</i>	PGE:DEER:Com:HVAC_Chillers	SCE:NON_RES:DEER:HVAC_Chillers	No Value	No Value
Gas Load Shape	Annual	Annual	Annual	No Value	No Value
Sector	Com	Com	Com	No Value	No Value
PA/POU	Any				
BldgHVAC	cWtd	cWtd, Any	Any	No Value	No Value
Use Category	HVAC	HVAC	HVAC	No Value	No Value
SubUseCategory	SpaceCool	SpaceCool	SpaceCool	No Value	No Value
TechGroup	Chiller	Chiller	Chiller	No Value	No Value
TechType	Screw	Screw, AirCldScrewChlr	Screw	No Value	No Value
Cost Adjustment Type	None	None	HVAC50	No Value	No Value
EnImpCalcType	Standard	(blank)	Standard	No Value	No Value
MeasImpactType	Deem-DEER	IOU-Deemedj, DEER	Standard	No Value	No Value
MeasQualifierGroup	None	None	None	No Value	No Value

Measure Consensus –

5.03 – Space Heating Boiler, Commercial



● Offering

- ❑ Implementation: NR
- ❑ Building Types: COM, MFm
- ❑ Climate zones: All CA CZ
- ❑ Norm Unit: Cap-kBTUh

● Stage 1 Issues

- ❑ DEER2020 updates: *Peak Period*, Measure App Type, Delivery Type, *Vintage (developed with vintage prototypes)*
- ❑ *MultiFamily offerings are modeled in eQUEST*
- ❑ Consolidated available offerings and tiers; significant variation between IOUs

● Measure Extension

- ❑ Add SDG&E

● Stage 2 Issues

- ❑ *Confirm that MF offers are applicable/accurate.*
- ❑ *Efficiency is dependent upon part-load conditions*
- ❑ **Include evaluation results in updated measure**

Type	Capacity	Base Efficiency	Tier 1	Tier 2
			Measure Efficiency	Measure Efficiency
<i>Hot Water</i>	<i><300 kBtu/hr</i>	82% AFUE	84.5% AFUE	94% AFUE
<i>Hot Water</i>	<i><300 kBtu/hr (MFm)</i>	82% AFUE	84.5% AFUE	
<i>Hot Water</i>	<i>300 - 2,500 kBtu/hr</i>	80% TE	85% TE	94% TE
<i>Hot Water</i>	<i>>= 2,500 kBtu/hr</i>	80% TE	83% TE	94% TE
<i>Steam</i>	<i><300 kBtu/hr</i>	79% TE	82% AFUE	
<i>Steam</i>	<i>300 - 2,500 kBtu/hr</i>	79% TE	82% TE	
<i>Steam</i>	<i>>= 2,500 kBtu/hr</i>	79% TE	80% TE	

2018 Claims		Sum of First Year Gross Therm	
Building Type	PGE	SCG	
Assembly	3,106		
Commercial	61,041		
Education - Community College	7,921	1,567	
Education - Secondary School	3,645	6,418	
Education - University	7,226		
Grocery	228		
Health/Medical - Clinics			2,703
Health/Medical - Hospital	7,497		
Health/Medical - Nursing Home	1,509		
Lodging - Hotel	984	40,171	
Manufacturing Biotech	8,475		
Manufacturing Light Industrial	1,990		
Office - Large	45,518	488	
Office - Small	16,272		
Other Agricultural	968		
Residential Multi-family	857		
Retail - Small	555		
	167,792	51,346	

Measure Consensus -

5.03 – Space Heating Boilers



• Offering

- Workpaper (PGECO HVC101 R6, Jan 2017; WPSCG NRHC120206A R4, Mar 2014; WPSDGENRHC1061 R1, Sept 2016 (short form))
- Base Case:
 - ✦ **Space heating boilers** are pressure vessels that transfer heat to water for use primarily in space heating applications.
- Measure Case:
 - ✦ Energy efficient units often feature high-efficiency and/or low NOx burners, and typically have features such as forced air burners, relatively large heat exchange surfaces, and/or utilize heat recovery from stack gases.
 - ✦ High-efficiency gas-fired boilers, typically rated above 90% thermal efficiency, are commonly known as condensing boilers.
- Table of offerings needs review by IOUs. Some tiers did not line up between IOUs.

		Tier 1			Tier 2	
		Base Eff	Qual Eff	Measure Eff	Qual Eff	Measure Eff
Hot Water	<300	82 AFUE	≥ 84% AFUE	84.5% AFUE	≥ 90% AFUE	94% AFUE
	<300 (MFm)	82 AFUE	≥ 84.5% AFUE	84.5% AFUE		
	300 - 2,500	80%TE	≥ 83% TE	85% TE	≥ 90% TE	94% TE
	≥ 2,5000	80%TE	≥ 83% TE	85% TE	≥ 94% TE	94% TE
Steam	<300	79%TE	≥ 82% AFUE	82% AFUE		
	300 - 2,500	79%TE	≥ 81% TE	83% TE		
	≥ 2,5000		≥ 81% TE	83% TE		

Measure Consensus -

5.03 – Space Heating Boilers

- Savings

- MFm – Modified DEER Prototypes

- ✦ Energy savings for this building type was calculated using energy models in eQUEST. The energy models were based on DEER prototype buildings for each climate zone (CZ01-CZ16) over the following building vintages: 1975, 1985, 1996, 2003 and 2005.

		Base Eff	Tier 1 Qual Eff	Measure Eff	Tier 2 Qual Eff	Measure Eff
Hot Water	<300	82 AFUE	> 84% AFUE	84.5% AFUE	> 90% AFUE	94% AFUE
	<300 (MFm)	82 AFUE	≥ 84.5% AFUE	84.5% AFUE		
	300 - 2,500	80%TE	≥ 83% TE	85% TE	≥ 90% TE	94% TE
	≥ 2,5000	80%TE	≥ 83% TE	85% TE	≥ 94% TE	94% TE
Steam	<300	79%TE	≥ 82% AFUE	82% AFUE		
	300 - 2,500	79%TE	≥ 81% TE	83% TE		
	≥ 2,5000		≥ 81% TE	83% TE		

- Other Offerings are DEER Values

Measure Consensus -

5.03 – Space Heating Boilers

● Savings

□ MFm – Modified DEER Prototypes

- ✦ Energy savings for this building type was calculated using energy models in eQUEST. The energy models were based on DEER prototype buildings for each climate zone (CZ01-CZ16) over the following building vintages: 1975, 1985, 1996, 2003 and 2005.

eQUEST Boiler Input Summary Table

Measure	Case	TYPE (DOE2 Keyword Listed)	Boiler Efficiency (Thermal unless otherwise noted)	HEAT-INPUT- RATIO	CAPACITY-RATIO
HV015	Baseline	HW-BOILER-W/DRAFT	80%	1.25	1.0
	Measure	HW-BOILER-W/DRAFT	85%	1.1764	1.0
HV016	Baseline	HW-BOILER-W/DRAFT	80%	1.25	1.0
	Measure	HW-CONDENSING	94%	1.0638	1.0
HV018 ²	Baseline	HW-BOILER-W/DRAFT	80%	1.25	5.0
	Measure	HW-BOILER-W/DRAFT	83%	1.2048	5.0
HV019	Baseline	HW-BOILER-W/DRAFT	80%	1.25	5.0
	Measure	HW-CONDENSING	94%	1.0638	5.0
HV023	Baseline	STM-BOILER	79%	1.2658	1.0
	Measure	STM-BOILER	82%	1.2195	1.0
HV025	Baseline	STM-BOILER	79%	1.2658	5.0
	Measure	STM-BOILER	80%	1.25	5.0
H720 ³	Baseline	HW-BOILER-W/DRAFT	82% AFUE	1.2158	0.5
	Measure	HW-BOILER-W/DRAFT	84% AFUE	1.1904	0.5

Measure Consensus - 5.03 – Space Heating Boilers

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PA	Measure Description	2016			2017			2018		
		Sum of Number of Units	Sum of First Year Gross kWh	Sum of First Year Gross Therm	Sum of Number of Units	Sum of First Year Gross kWh	Sum of First Year Gross Therm	Sum of Number of Units	Sum of First Year Gross kWh	Sum of First Year Gross Therm
<input checked="" type="checkbox"/>	PGE Condensing Hot Water Heater, >2500 kBtUh, TE>94%				22,886	(11,213)	21,978	30,002	(15,814)	31,185
	Condensing Hot Water Heater, 300-2500 kBtUh, TE>94%				89,197	(49,564)	89,395	60,532	(31,109)	61,436
	Forced Draft Hot Water Heater, >2500 kBtUh, TE>83%				48,701	-	13,023	103,719	-	28,878
	Forced Draft Hot Water Heater, 300-2500 kBtUh, TE>85%				140,253	-	58,402	108,292	-	46,293
	Hot water boiler (> 2500 kBtuh, 83.0 Et, 85.0Ec, OA Reset from 140 to 165 F)	51,800	-	13,993						
	Hot water boiler (> 2500 kBtuh, 94.0 Et, condensing, OA reset from 140 to 165 F)				12,000	(6,792)	13,320			
	Hot water boiler (300-2500 kBtUh, 85.0% thermal efficiency, forced draft)	94,183	-	38,278	1,750	-	606			
	Hot water boiler (300-2500 kBtUh, 94.0% thermal efficiency, condensing)	53,636	(28,478)	57,814	12,199	(6,123)	12,621			
	Steam boiler (> 2500 kBtuh, 80.0 Et, OA Reset from 140 to 165 F)				4,185	-	387			
<input checked="" type="checkbox"/>	SCG SpaceHeatingBoilers-Steam-Large-(>=83%CE)							25,107	(17,801)	40,171
	SpaceHeatingBoilers-Steam-Medium-(>=83%CE)							4,082	-	449
	SpaceHeatingBoilers-Steam-Small-(>=82%AFUE)				300	-	21			
	SpaceHeatingBoilers-Water-Large-Tier1(>=85%CE)	48,372	(23,234)	57,691	7,040	-	2,769			
	SpaceHeatingBoilers-Water-MediumLarge-Tier2(>=90%CE)	12,048	(7,647)	17,310	63,332	73,879	69,843	11,995	1,098	8,130
	SpaceHeatingBoilers-Water-Medium-Tier1(>=85%CE)	6,399	(1,781)	5,079	29,165	-	5,164	15,040	-	2,399
	SpaceHeatingBoilers-Water-Small-Tier1(>=84%AFUE)	250	(91)	210	150	-	11	1,699	-	197
	SpaceHeatingBoilers-Water-Small-Tier2(>=90%AFUE)				1,200	(276)	756			
<input checked="" type="checkbox"/>	SDGE Heating - Space Heating Boilers - Large	23,628	-	3,804						
		290,316	(61,230)	194,180	432,358	(90)	288,297	360,467	(63,626)	219,138

Input Consensus

5.03 – Space Heating Boiler, Commercial

- Measure Permutations

Measure Data Field

Measure Data Field	Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	NR	ROB	No Value	No Value	ROB
BldgType	Com, MFm	MFm	No Value	No Value	Com
BldgVintage	Ex	Ex	No Value	No Value	Ex
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05, CZ06,CZ07,CZ08,CZ09,CZ10, CZ11,CZ12,CZ13,CZ14,CZ15, CZ16	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06, CZ07,CZ08,CZ09,CZ10,CZ11,CZ12, CZ13,CZ14,CZ15,CZ16	No Value	No Value	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06, CZ07,CZ08,CZ09,CZ10,CZ11,CZ12, CZ13,CZ14,CZ15,CZ16
NormUnit	Cap-kBTUh	Cap-kBTUh	No Value	No Value	Cap-kBTUh
EUL ID	HVAC-Blr	HVAC-Blr	No Value	No Value	HVAC-Blr
RUL ID	n/a	(blank)	No Value	No Value	No Value
NTGR	Com-Default>2yrs Res-Default>2yrs	Com-Default>2yrs	No Value	No Value	Com-Default>2yrs All-Default<=2yrs
DeliveryType	DnDeemDI DnDeemed UpDeemed	DirInstall PreRebDown PreRebUp	No Value	No Value	PreRebDown
GSIA	Def-GSIA	Def-GSIA	No Value	No Value	Def-GSIA
Electric Load Shape	<i>(use Existing)</i>	PGE:COMMERCIAL:3 = Commercial HVAC	No Value	No Value	SCG:NON_RES:DEER:Com:HVAC_ Split-Package_AC
Gas Load Shape	WinterOnly	Annual	No Value	No Value	WinterOnly
Sector	Com, Res	Any, Com	No Value	No Value	NonRes
PA/POU	Any				
BldgHVAC	cSVVG, rWtd	cSVVG	No Value	No Value	cWtd
Use Category	HVAC	HVAC	No Value	No Value	HVAC
SubUseCategory	SpaceHeat	SpaceHeat	No Value	No Value	SpaceHeat
TechGroup	WaterHtg_eq	WaterHtg_eq	No Value	No Value	WaterHtg_eq SteamHtg_eq SpaceHtg_eq
TechType	Boiler_Et	Boiler_Et	No Value	No Value	No value
Cost Adjustment Type	None	None	No Value	No Value	No value
EnImpCalcType	Standard	(blank)	No Value	No Value	Standard
MeasImpactType	Deem-DEER	IOU-Custom, DEER	No Value	No Value	Deemed
MeasQualifierGroup	None	(blank)	No Value	No Value	None

Measure Consensus – 5.19, Furnace, Commercial



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● Offering

- Implementation: NR, NC
- Building Types: (22 BTs)
 - ✦ Asm, COM, ECC, EPr, ERC, ESe, EUn, Gro, Hsp, Htl, MBT, MLI, Nrs, OfL, OfS, RFF, RSD, Rt3, RtL, RtS, SCn, WRf
- CZ01-16
- Norm Unit: Cap-kBTUH (*confirm with PG&E*)

● Stage 1 Issues

- DEER2020 updates: *Peak Period, Measure App Type, Delivery Type, Vintage (developed with vintage prototypes)*
- Agreement on Norm Unit of Capacity (PG&E was Each – assuming 80 kBTUh/furnace)

● Measure Extension

- Add SDG&E, SCG

● Stage 2 Issues

- *Methodology for electric fan savings should be updated; scaled from residential data*
 - ✦ **Fan savings may be included as a DEER measure**
- *Review documentation of the building load*
- *Offerings are limited by product availability; potentially increase in the future*

Name	kWh	kW	Therms
	PGE	PGE	PGE
High Efficiency Furnaces-Com	2,064	2.03	1,583

Measure Consensus –

5.19, High Efficiency Furnaces-Commercial

- **Base Case:**
 - Non-residential base case gas furnace meeting 2015 federal standard requirements of 81% AFUE for weatherized furnaces.
- **Measure Case:**
 - Central natural gas furnace rated at 95% AFUE, with or without a built-in variable speed motor (VSM), including ECM motors, for air handling.
- **Savings**
 - DEER savings (per Area-1kFP = 1000 ft² footprint)
 - No VSD Motor:
 - ✦ Claimed Savings (therms per each) = DEER Savings * NumUnits / MeasArea (th/ft²) * Connected Load * 80 kBTU/hr
 - Connected Load = data obtained from the CEUS website, that is, the average furnace capacity installed per surface area.
 - 80 kBTU/hr = estimated an average furnace input capacity based on the DOE Rules and Regulations Report
 - With VSD Motor:
 - ✦ Claimed Savings (therms per each) = Claimed Savings-No VSD Motor (th/each) – Ratio (Com/Res) * Res Therm Loss
 - Res Therm Loss = is the savings estimated from using a BPM motor from DOE2 models from the residential quality maintenance workpaper, PGECOHC139 R2)

Input Consensus – 5.19, Furnace, Commercial

- Measure Permutations

Measure Data Field	Measure Value	Measure Data Field			
		PG&E	SCE	SDG&E	SCG
MeasureAppType	NR, NC	NC,ROB	No Value	No Value	No Value
BldgType	Asm,Com,ECC,EPr,ERC,ESe,Gr o,Hsp,Htl,MBT,MLI,Nrs,Ofs,R FF,RSD,RtL,RtS,SCn,WRf	Asm,Com,ECC,EPr,ERC,ESe,G ro,Hsp,Htl,MBT,MLI,Nrs,Ofs, RFF,RSD,RtL,RtS,SCn,WRf	No Value	No Value	No Value
BldgVintage	Ex, New	Ex,New	No Value	No Value	No Value
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06, CZ07,CZ08,CZ09,CZ10,CZ11,CZ12, CZ13,CZ14,CZ15,CZ16	CZ01,CZ02,CZ03,CZ04,CZ05,CZ1 1,CZ12,CZ13,CZ16	No Value	No Value	No Value
NormUnit	Cap-kBTUh	Each	No Value	No Value	No Value
EUL ID	HVAC-Frnc	HVAC-Frnc	No Value	No Value	No Value
RUL ID	N/A	(blank)	No Value	No Value	No Value
NTGR	Com-Default>2yrs	Com-Default>2yrs	No Value	No Value	No Value
DeliveryType	DnDeemed	PreRebDown	No Value	No Value	No Value
GSIA	Def-GSIA	Def-GSIA	No Value	No Value	No Value
Electric Load Shape	<i>(use existing)</i>	PGE:COMMERCIAL:3 = Commercial HVAC	No Value	No Value	No Value
Gas Load Shape	WinterOnly	WinterOnly	No Value	No Value	No Value
Sector	Com	Com	No Value	No Value	No Value
PA/POU	Any				
BldgHVAC	cWtd	cWtd	No Value	No Value	No Value
Use Category	HVAC	HVAC	No Value	No Value	No Value
SubUseCategory	SpaceHeat	SpaceHeat	No Value	No Value	No Value
TechGroup	SpaceHtg_eq	SpaceHtg_eq	No Value	No Value	No Value
TechType	GasFurnace	GasFurnace	No Value	No Value	No Value
Cost Adjustment Type	None	None	No Value	No Value	No Value
EnImpCalcType	Standard	(blank)	No Value	No Value	No Value
MeasImpactType	Deem-WP, Deem-DEER	IOU-Deemed,DEER	No Value	No Value	No Value
MeasQualifierGroup	None	(blank),None	No Value	No Value	No Value

Measure Consensus –

5.24 – Unitary Air-Cooled Air Conditioner, Over 65 kBTU/h, Commercial



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● Offering

- ❑ Implementation: NR (PA/CZ based on size), NC (“any”)
- ❑ Building Types: **Com**
- ❑ Climate zones: 1-16
- ❑ Norm Unit: Cap-Tons
- ❑ Capacity Ranges / Efficiency Tiers
 - ✦ ≥5.4 to <11.3 tons; 4 tiers **plus to-code offering**
 - ✦ ≥11.3 to <20 tons; 3 tiers **plus to-code offering**
 - ✦ ≥20 to <63.3 tons; 3 tiers **plus to-code offering**
 - ✦ ≥63.3 tons; 3 tiers **plus to-code offering**

	2016	2017	2018
PA <input type="button" value="v"/>	Sum of First	Sum of First	Sum of First
PGE	629,634	2,063,445	1,086,988
SCE	5,201,099	897,092	964,532
SDGE	334,744	135,954	16,397
	6,165,477	3,096,491	2,067,917

● Stage 1 Issues

- ❑ DEER2020 updates: *Peak Period*, Measure App Type, Delivery Type, *Vintage (developed with vintage prototypes)*
- ❑ Agreement on using actual Building Type (not weighted COM average)

● Measure Extension

- ❑ Add POUs

● Stage 2 Issues

- ❑ *Ensure that performance curves are reasonable*
- ❑ *Investigate differences in efficiency levels between base and measure cases*
- ❑ *Include “any” PA for Ex vintage*

Measure Consensus – 5.24 – Unitary Air-Cooled Air Conditioner, Over 65 kBTU/h, Commercial

Count of E								Blc																				Grand Total				
PA	Type	Size	Clg Eff	Htg Eff	BldgHVAC	BldgVint	ecomizer	Asm	Com	ECC	EPr	ERC	ESe	EU	Gro	Hsp	Htl	MBT	MLI	Mtl	Nrs	Ofl	Ofs	RFF	RSD	Rt3	RtL	RtS	Scn	Wrf	Grand Total	
Any	airA	135to239k	11p5eer	(blank)	cDXGF	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
			12p0eer	(blank)	cDXGF	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
			12p5eer	(blank)	cDXGF	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
		240to759k	10p8eer	(blank)	cDXGF	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
					cPVVG	New	(blank)		16			16	16		16	16	16				16	16	16				16				160	
			11p5eer	(blank)	cDXGF	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
					cPVVG	New	(blank)		16			16	16		16	16	16				16	16	16				16				160	
			12p5eer	(blank)	cDXGF	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
					cPVVG	New	(blank)		16			16	16		16	16	16				16	16	16				16				160	
		65to134kB	11p5eer	(blank)	cDXGF	New	woutPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
							wPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
			12p0eer	(blank)	cDXGF	New	woutPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
							wPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
			12p5eer	(blank)	cDXGF	New	woutPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
							wPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
			13p0eer	(blank)	cDXGF	New	woutPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
							wPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	352
			10p2eer	(blank)	cPVVG	New	(blank)		16			16	16		16	16	16				16	16	16				16				160	
			11p0eer	(blank)	cPVVG	New	(blank)		16			16	16		16	16	16				16	16	16				16				160	
			12p0eer	(blank)	cPVVG	New	(blank)		16			16	16		16	16	16				16	16	16				16				160	
		airH	135to239k	11p5eer	3p2cop	cDXHP	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	304	
				12p0eer	3p2cop	cDXHP	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	304	
			240to759k	10p5eer	3p2cop	cDXHP	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	336	
				10p8eer	3p2cop	cDXHP	New	(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	336	
			65to134kB	11p5eer	3p4cop	cDXHP	New	wPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	336	
							(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	336	
			12p0eer	3p4cop	cDXHP	New	wPreEcono	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	336	
							(blank)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	336	
								242	560	308	242	242	308	308	242	308	308	306	242	242	308	308	308	242	242	308	240	242	242	154	6452	
								242	560	308	242	242	308	308	242	308	308	306	242	242	308	308	308	242	242	308	240	242	242	140	6438	
								242	560	308	242	242	308	308	242	308	308	306	242	242	308	308	308	242	242	308	240	242	242	140	6438	
								176	392	196	176	176	224	196	176	196	224	222	176	176	196	224	224	176	176	224	174	176	176	70	4522	

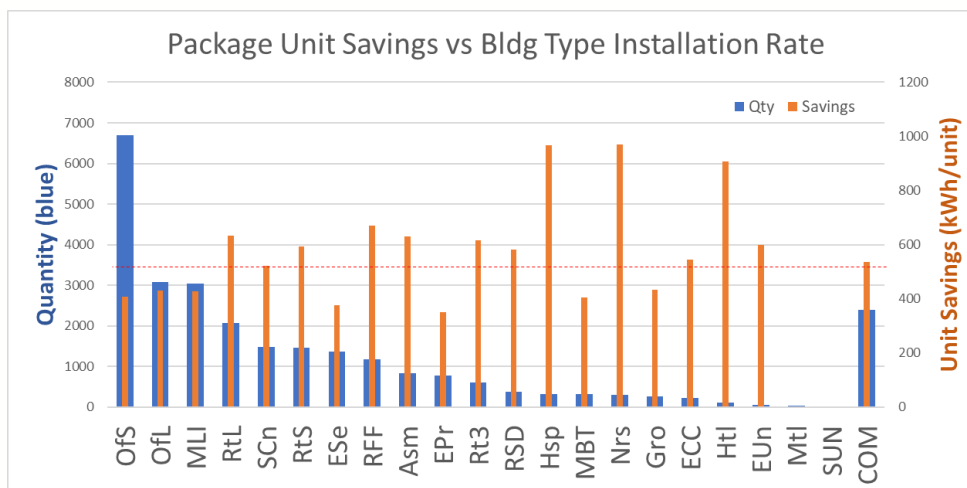
Measure Consensus – 5.24 – Unitary Air-Cooled Air Conditioner, Over 65 kBTU/h, Commercial



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● Savings Methodology (*not updated to latest values*)

- DEER savings are used directly
 - ✦ Agreement on using actual Building Type (not weighted COM average)
 - ✦ COM is currently used because of direction that should be certain what building type is
 - Recommend using actual building type versus IOU weighted average
 - Savings can vary significantly
 - Non-PA specific values are the goal for statewide measures
 - NOTE; 10% of PG&E claims use IOU
- Weighted value – claims quantity (dotted red line) is very similar to COM value (2017 data)



Input Consensus –

5.24 – Unitary Air-Cooled Air Conditioner, Over 65 kBTU/h, Commercial

• Measure Permutations

		Measure Data Field			
Measure Data Field	Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	NR,NC	ROB,NC	ER,RobNc	No Value	No Value
BldgType	Com	Com	Asm,ECC,EPr,ESe,EUn,Gro,Hsp, ,Htl,MBT,MLI,Mtl,Nrs,OfL,OfS, RFF,RSD,Rt3,RtL,RtS,SCn	No Value	No Value
BldgVintage	Ex,New	Ex,New	Any	No Value	No Value
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06, CZ07,CZ08,CZ09,CZ10,CZ11,CZ12, CZ13,CZ14,CZ15,CZ16	CZ01,CZ02,CZ03,CZ04,CZ05,CZ1 1,CZ12,CZ13,CZ16,IOU	CZ06,CZ08,CZ09,CZ10,CZ13,CZ14, CZ15,CZ16	No Value	No Value
NormUnit	Cap-Tons	Cap-Tons	Cap-Tons	No Value	No Value
EUL ID	HVAC-airAC	HVAC-airAC	HVAC-airAC	No Value	No Value
RUL ID	n/a	(blank)	HVAC-airAC	No Value	No Value
NTGR	NonRes-sAll-mHVAC-DX-up	NonRes-sAll-mHVAC-DX-up	NonRes-sAll-mHVAC-DX-up Com-Default>2yrs	No Value	No Value
DeliveryType	UpDeemed, DnDeemed	PreRebUp	PreRebUp, PreRebDown NonUpStrm	No Value	No Value
GSIA	Def-GSIA	Def-GSIA	Def-GSIA	No Value	No Value
Electric Load Shape	(use Existing)	PGE:DEER:Com:HVAC_Split- Package_AC	SCE:NON_RES:DEER:HVAC_Split- Package_AC	No Value	No Value
Gas Load Shape	Annual	Annual	Annual	No Value	No Value
Sector	Com	Com	Com	No Value	No Value
PA/POU					
BldgHVAC	cDXGF	cDXGF	Any	No Value	No Value
Use Category	HVAC	HVAC	HVAC	No Value	No Value
SubUseCategory	SpaceCool	SpaceCool	SpaceCool	No Value	No Value
TechGroup	dxAC equip	dxAC equip	dxAC equip	No Value	No Value
TechType	pkgEER	pkgEER	pkgEER	No Value	No Value
Cost Adjustment Type	None	HVAC50, None	HVAC50	No Value	No Value
EnImpCalcType	Standard	(blank)	Standard	No Value	No Value
MeasImpactType	Deem-DEER	DEER, NonDEER	Standard	No Value	No Value
MeasQualifierGroup	None	None	None	No Value	No Value

Measure Consensus –

5.25 – Unitary Air Cooled Air Conditioner or Heat Pump, Under 65 kBTU/h, Commercial

● Offering

- Implementation: NR, NC
- Building Types: **Com**
- Climate zones: 1-16, IOU
- Norm Unit: Cap-Tons
- Capacity Ranges / Efficiency Tiers
 - ✦ Packaged Air Conditioner
 - <55 kBTU/h; 4 tiers **plus to-code offering**
 - 55 to <65 kBTU/h; 4 tiers plus to-code offering
 - ✦ Split System Air Conditioner
 - <45 kBTU/h; 4 tiers plus to-code offering
 - 45 to <55 kBTU/h; 4 tiers plus to-code offering
 - 55 to <65 kBTU/h; 4 tiers plus to-code offering
 - ✦ Packaged Heat Pump
 - <55 kBTU/h; 4 tiers plus to-code offering
 - 55 to <65 kBTU/h; 4 tiers plus to-code offering
 - ✦ Split System Heat Pump
 - <55 kBTU/h; 4 tiers plus to-code offering
 - 55 to <65 kBTU/h; 4 tiers plus to-code offering

	2016	2017	2018
PA <input type="button" value="v"/>	Sum of First Year Gross kWh	Sum of First Year Gross kWh	Sum of First Year Gross kWh
PGE	1,089,519	1,462,095	2,266,520
SCE	2,634,952	828,607	1,768,113
SDGE	453,767	314,328	16,334
	4,178,238	2,605,029	4,050,967

● Stage 1 Issues

- DEER2020 updates: *Peak Period*, Measure App Type, Delivery Type, *Vintage (developed with vintage prototypes)*
- Agreement on using actual Building Type (not weighted COM average)

● Measure Extension

- Add POUs

● Stage 2 Issues

- *Ensure that performance curves are reasonable*
- *Investigate differences in efficiency levels between base and measure cases*

Measure Consensus -

5.25 – Unitary Air-Cooled A/C <65 kBTU/hr

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• Savings Methodology

□ Base case = Code

- ✦ Air cooled air conditioning or heat pump units with cooling capacities less than 65 kBTU/h, for use in non-residential buildings, meeting the federal minimum efficiency standard of 14 SEER.

□ Measure case

- ✦ Air cooled air conditioning or heat pump units with cooling capacities less than 65 kBTU/h, for use in non-residential buildings, meeting the minimum efficiency requirements
- ✦ Packaged A/C, Split System A/C, Packaged HP, Split System HP
- ✦ Like for like; within 5% of existing capacity

□ DEER savings are used directly

□ “To-Code” savings are calculated as:

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

Input Consensus –

5.25 – Unitary Air Cooled Air Conditioner or Heat Pump, Under 65 kBtu/h, Commercial

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- Measure Permutations

Measure Data Field	Measure Value	Measure Data Field			
		PG&E	SCE	SDG&E	SCG
MeasureAppType	NR, New	ROB	ER,RobNc	No Value	No Value
BldgType	Com	Asm,Com,ECC,EPr,ERC,ESe,EUn,Gro,Hsp,Htl,MBT,MLI,Nrs,OfL,OfS,OTR,RFF,RSD,Rt3,RtL,RtS,SCn,WRF	Asm,ECC,EPr,ERC,ESe,EUn,Gro,Hsp,Htl,MBT,MLI,Nrs,OfL,OfS,RFF,RSD,Rt3,RtL,RtS,SCnWRF	No Value	No Value
BldgVintage	Ex,New	Ex	Any	No Value	No Value
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06,CZ07,CZ08,CZ09,CZ10,CZ11,CZ12,CZ13,CZ14,CZ15,CZ16	CZ01,CZ02,CZ03,CZ04,CZ05,CZ11,CZ12,CZ13,CZ16,IOU	CZ06,CZ08,CZ09,CZ10,CZ13,CZ14,CZ15,CZ16	No Value	No Value
NormUnit	Cap-Tons	Cap-Tons	Cap-Tons	No Value	No Value
EUL ID	HVAC-airAC HVAC-airHP	HVAC-airAC HVAC-airHP	HVAC-airAC HVAC-airHP	No Value	No Value
RUL ID	n/a	(blank)	HVAC-airAC, HVAC-airHP	No Value	No Value
NTGR	NonRes-sAll-mHVAC-DX-up	NonRes-sAll-mHVAC-DX-up	NonRes-sAll-mHVAC-DX-up	No Value	No Value
DeliveryType	UpDeemed	PreRebUp	PreRebUp, NonUpStrm	No Value	No Value
GSIA	Def-GSIA	Def-GSIA	Def-GSIA	No Value	No Value
Electric Load Shape	(use Existing)	PGE:COMMERCIAL:3 = Commercial HVAC	SCE:NON_RES:DEER:HVAC_Split-Package_HP SCE:NON_RES:DEER:HVAC_Split-Package_AC	No Value	No Value
Gas Load Shape	WinterOnly	WinterOnly	Annual	No Value	No Value
Sector	Com	Com	Com	No Value	No Value
PA/POU	Any				
BldgHVAC	cDXGF, cDXHP	cDXHP	Any	No Value	No Value
Use Category	HVAC	HVAC	HVAC	No Value	No Value
SubUseCategory	SpaceCool HeatCool	SpaceCool HeatCool	SpaceCool HeatCool	No Value	No Value
TechGroup	dxAC equip dxHP equip	dxAC equip dxHP equip	dxAC equip dxHP equip	No Value	No Value
TechType	pkgSEER splTSEER	pkgSEER splTSEER	pkgSEER	No Value	No Value
Cost Adjustment Type	None	None	HVAC50	No Value	No Value
EnImpCalcType	Standard	(blank)	Standard	No Value	No Value
MeasImpactType	Deem-DEER	DEER, NonDEER	Standard	No Value	No Value
MeasQualifierGroup	None	(blank)	None	No Value	No Value

Measure Consensus

5.26 – Evaporative Condenser, Commercial



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Planned to sunset.

● Offering

- Implementation: NC, NR, and AR
- Building Types: Asm, ECC, EPr, ERC, ESe, Hsp, Htl, MBT, MLI, Nrs, OfS, RFF, RSD, Rtl, RSL, SOn, Com
- Norm Unit: Cap-tons

● Stage 1 Issues

- DEER 2020 updates: *Peak Period*, Measure App Type, Delivery Type, *Vintage (developed with vintage prototypes)*
 - ✦ Modeled measures through MASControl/DOE2.2
- Consider how valuable it is to keep this measure in the eTRM

● Measure Extension

- **Minimal claims in 2017 and 2018**

● Stage 2 Issues

- *Ensure that cost methodology is consistent*
- *Update program requirements*
- *Evaporative effectiveness can vary significantly between products*
- *Locations should be restricted for this measure to ensure benefits*
- *Review EIR and capacity curves for base and measure case*
- **Measure is based upon 2005 MASControl measure (D03-082 and D03-083) – potentially not available**

	2016	2017	2018
	Sum of First Year Gross kWh	Sum of First Year Gross kWh	Sum of First Year Gross kWh
PA <input type="text"/>			
PGE	9,770	38,049	36,862

Measure Consensus

5.23, Water Cooled AC and Residential AC with an Evaporative Condenser

• Savings

□ Offering (10 NonRes / 1 Res)

✦ Non-Residential: Evap-Cooled to Evap-Cooled

- < 5.4 ton (11.09 -> 14, 15, 16 SEER)*
- 5.4 up to 11.3 ton (10.1 -> 15 SEER)*
- 11.3 up to 20 ton (10.1 -> 14 SEER)*
- ≥ 20 ton (10.1 -> 13 SEER)*

✦ *To-Code Offering

✦ Non-Residential

○ Modeled measures

- H.E. Evap/Water-Cooled Pkg A/C <65kBTU (Measure ID: D03-082)
- H.E. Evap/Water-Cooled Pkg A/C ≥65kBTU (Measure ID: D03-083)

○ Scaled values

$$Savings_{Program} = Savings_{DEER} \times \frac{(MeasureEER_{Program} - BaseEER_{Program})}{(MeasureEER_{DEER} - BaseEER_{DEER})}$$

Table 11 DEER Measure Scaling Summary

Measure	Program Measure Efficiency	DEER Measure Efficiency	Title 20/24 Code Base Efficiency	DEER Code Base Efficiency
< 5.4 ton 14 EER Package/Split System Air Conditioner Condenser	14 EER	14 EER	12.1 EER	11.09 EER
< 5.4 ton 15 EER Package/Split System Air Conditioner Condenser	15 EER	14 EER	12.1 EER	11.09 EER
< 5.4 ton 16 EER Package/Split System Air Conditioner Condenser	16 EER	14 EER	12.1 EER	11.09 EER
5.4 up to 11.3 ton 14 EER Package/Split System Air Conditioner Condenser	14 EER	14 EER	11.5 EER	10.1 EER
11.3 up to 20 ton 14 EER Package/Split System Air Conditioner Condenser	14 EER	14 EER	11.0 EER	10.1 EER
≥ 20 ton 13 EER Package/Split System Air Conditioner Condenser	13 EER	14 EER	11.0 EER	10.1 EER

Input Consensus

5.26 – Evaporative Condenser, Commercial

• Measure Permutations

		Measure Data Field			
Measure Data Field	Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	NC,NR,AR	NC,ROB	ER,RobNc	No Value	No Value
BldgType	Asm,ECC,EPr,ERC,ESe,Hsp,Htl,MBT,MLI,Nrs,OfS,RFF,RSD,RtL,RtS,SCn,Com	Asm,ECC,EPr,ERC,ESe,EUn,Gro,Gst,Hsp,Htl,MBT,MLI,Mtl,Nrs,OfL,OfS,RFF,RSD,Rt3,RtL,RtS,SCn,WRF	Asm,ECC,EPr,ERC,ESe,Hsp,Htl,MBT,MLI,Nrs,OfS,RFF,RSD,RtL,RtS,SCn,Com	No Value	No Value
BldgVintage	Ex	Ex,New	No Value	No Value	No Value
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06,CZ07,CZ08,CZ09,CZ10,CZ11,CZ12,CZ13,CZ14,CZ15,CZ16	CZ01,CZ02,CZ03,CZ04,CZ05,CZ11,CZ12,CZ13,CZ16	No Value	No Value	No Value
NormUnit	Cap-Tons	Cap-Tons	No Value	No Value	No Value
EUL ID	HVAC-wtrAC	HVAC-wtrAC	No Value	No Value	No Value
RUL ID	HVAC-wtrAC	(blank)	No Value	No Value	No Value
NTGR	NonRes-sAll-mHVAC-DX-up	NonRes-sAll-mHVAC-DX-up	NonRes-sAll-mHVAC-DX-up, All-Default<=2yrs	No Value	No Value
DeliveryType	UpDeemed	PreRebUp	PreRebUp	No Value	No Value
GSIA	Def-GSIA	Def-GSIA	Def-GSIA,Res-AC-SCE	No Value	No Value
Electric Load Shape	<i>(use existing)</i>	PGE:COMMERCIAL:3 = Commercial HVAC	No Value	No Value	No Value
Gas Load Shape	Annual	Annual	No Value	No Value	No Value
Sector	Com	Com	Com,Res	No Value	No Value
PA/POU	Any				
BldgHVAC	cWtd	cWtd	No Value	No Value	No Value
Use Category	HVAC	HVAC	No Value	No Value	No Value
SubUseCategory	SpaceCool	SpaceCool	No Value	No Value	No Value
TechGroup	dxAC equip	dxAC equip	No Value	No Value	No Value
TechType	pkgSEER	pkgSEER	No Value	No Value	No Value
Cost Adjustment Type	None	None	No Value	No Value	No Value
EnImpCalcType	Standard	(blank)	No Value	No Value	No Value
MeasImpactType	Deem-WP	IOU-Deemed	No Value	No Value	No Value
MeasQualifierGroup	(blank)	(blank)	No Value	No Value	No Value

Measure Consensus – 5.28, Ductless Air Conditioner, < 24 kBTU/h, Commercial



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● Offering

- Implementation: NR
- Building Types: (22 BTs)
 - ✦ Asm, COM, ECC, EPr, ERC, ESe, EUn, Gro, Hsp, Htl, MBT, MLI, Nrs, OfL, OfS, RFF, RSD, Rt3, RtL, Rts, SD, VRF
- CZ01-16 (no savings for CZ07)
- Norm Unit: Cap-Tons

● Stage 1 Issues

- Measure status – currently on-hold with IOUs until issues resolved
- DEER2020 updates: *Peak Period*, Measure App Type, Delivery Type, *Vintage* (developed with vintage prototypes)

● Measure Extension

- POU only measure (documentation and cost-effectiveness issues)
- **No Claims in 2017 or 2018**

● Stage 2 Issues

- *Methodology needs updating before it can be used by IOUs*
 - ✦ *Disposition related to commercial VRF; difficult to address VRF and fuel switching concerns; IMC too high to be cost effective*
- *Cost data should be updated*
- *Climate zone 7 is missing from the permutation list*

Measure Consensus –

5.28, Ductless Air Conditioners under 24 kBTU/hr

- **Base Case:**
 - 14 SEER (Title 24), single phase, split system air conditioning unit in commercial applications under 24 kBTU/hr.
- **Measure Case:**
 - 16 and 19 SEER ductless mini-split air conditioning unit in commercial applications under 24 kBTU/hr.
- **Savings – From DEER**
 - NE-HVAC-airAC-Split-1t45kBTUh-16p0seer
 - NE-HVAC-airAC-Split-1t45kBTUh-18p0seer (scaled – ED recommendation)
 - ✦ Scaled to 19 SEER based upon Residential ratio that is applied to Commercial

SEER	Average Residential Savings (kWh/ton)	Average Residential Demand Reduction (kW/ton)	kWh Scaling Factor	kW Scaling Factor
18	49.83	0.05954	1	1
19	70.69	0.08168	1.41861	1.37194

- Recommend common climate zones like other package systems

Program Type	HVAC Vintage	Building Type	PA	Climate Zone
ROB	Ex	Any	SCE	CZ06, CZ08, CZ09, CZ10, CZ13, CZ14, CZ15, CZ16
			PGE	CZ01, CZ02, CZ03, CZ04, CZ05, CZ11, CZ12
			SDGE	CZ07

- ✦ Currently, climate zones are PA-independent
- No gas savings



Input Consensus –

5.28, Ductless Air Conditioner, < 24 kBTU/h, Commercial

• Measure Permutations

		Measure Data Field			
Measure Data Field	Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	NR	No Value	RobNc	No Value	ROB
BldgType	Asm,EPr,ERC,ESe,ECC,EUn,Gro,Hsp,Htl,MBT,MLI,Nrs,OfL,OfS,RFF,RSD,Rt3,RtLRtS,MIc	No Value	No Value	No Value	Asm,Cnc,Com,ECC,EPr,ERC,ESe,EUn,Gro,Hsp,Htl,MBT,MLI,Nrs,OfL,OfS,RFF,RSD,Rt3,RtLRtS,SCn
BldgVintage	Ex	No Value	No Value	No Value	Any
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06,CZ07,CZ08,CZ09,CZ10,CZ11,CZ12,CZ13,CZ14,CZ15,CZ16	No Value	No Value	No Value	CZ06,CZ08,CZ09,CZ10,CZ13,CZ14,CZ15,CZ16
NormUnit	Cap-Ton	No Value	No Value	No Value	Cap-Tons
EUL ID	HVAC-airAC	No Value	HVAC-airAC	No Value	HVAC-airHP
RUL ID	N/A	No Value	HVAC-airAC	No Value	No Value
NTGR	NonRes-sAll-mHVAC-DX-up	No Value	Res-Default>2 Res-sSF-mHPes Res-sSF-mACgt16-dn NonRes-sAll-mHVAC-DX-up	No Value	Com-Default>2yrs
DeliveryType	DnDeemed, UpDeemed	No Value	PreRebDown, PreRebUp	No Value	PreRebDown
GSIA	Def-GSIA	No Value	Res-AC-SCE, Def-GSIA	No Value	No Value
Electric Load Shape	<i>(use existing)</i>	No Value	No Value	No Value	No Value
Gas Load Shape	Annual	No Value	No Value	No Value	SummerOnly
Sector	Com	No Value	Res, Com	No Value	No Value
PA/POU	Any				
BldgHVAC	Any	No Value	No Value	No Value	Any
Use Category	HVAC	No Value	No Value	No Value	HVAC
SubUseCategory	HeatCool	No Value	SpaceCool	No Value	HeatCool
TechGroup	dxAC_equip	No Value	dxAC_equip	No Value	dxHP_equip
TechType	spltSEER	No Value	No Value	No Value	spltSEER
Cost Adjustment Type	None	No Value	No Value	No Value	No value
EnImpCalcType	Standard	No Value	Standard	No Value	Standard
MeasImpactType	Deem-WP	No Value	Standard	No Value	Deemed
MeasQualifierGroup	None	No Value	None	No Value	None

Input Consensus – 5.53, Ductless Air Conditioner, Under 60 kBTU/hr

Medium

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Planned to sunset.

● Offering

- Implementation: NR
- Building Types: (22 BTs)
 - ✦ Asm, COM, ECC, EPr, ERC, ESe, EUn, Gro, Hsp, Htl, MBT, MLI, Nrs, OfL, OfS, RFF, RSD, Rt3, RtL, Rts, SD, VRF
- CZ01-16 (no savings for CZ07)
- Norm Unit: Cap-Tons

● Stage 1 Issues

- Measure status – currently on-hold with IOUs until issues resolved
- DEER2020 updates: *Peak Period*, Measure App Type, Delivery Type, *Vintage (developed with vintage prototypes)*

● Measure Extension

- POU only measure (documentation and cost-effectiveness issues)
- **No Claims in 2017 or 2018**

● Stage 2 Issues

- *Methodology needs updating before it can be used by IOUs*
 - ✦ *Disposition related to commercial VRF; difficult to address VRF and fuel switching concerns; IMC too high to be cost effective*
- *Climate zone 7 is missing from the permutation list*
- *Update savings support data and cost data*

Measure Consensus –

5.53, Ductless Air Conditioners under 60 kBTU/hr

- Base Case:
 - Commercial: 14 SEER (Title 24), single phase, split system heat pump unit.
 - Residential: 14 SEER (Title 24), single phase, split system AC or heat pump unit.
- Measure Case:
 - Commercial: Ductless mini-split or multi-split heat pump unit.
 - Residential: Ductless mini-split or multi-split AC or heat pump unit.
- Savings
 - Assumptions:
 - ✦ A high efficiency split system AC will provide similar electrical cooling savings to a ductless AC with an equivalent SEER rating.
 - ✦ A high efficiency split system HP will provide similar electric cooling and heating savings to a ductless HP with an equivalent SEER rating.
 - ✦ A mini-split system will provide similar savings and demand reduction to an equivalently sized and rated multi-split system.
 - ✦ The DEER residential AC measures are used to scale the commercial measures. In accordance with ED's recommendation provided in SCE Workpaper Review 2011 [C], it is assumed that the ratio of savings and demand reduction from residential units is the same as it is for commercial units.

Input Consensus – 5.53, Ductless Air Conditioner, Under 60 kBTU/hr

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• Measure Permutations

Measure Data Field	Measure Value	Measure Data Field			
		PG&E	SCE	SDG&E	SCG
MeasureAppType	NR	No Value		No Value	No Value
BldgType	Asm, EPr, ERC, ESe, ECC, EUn, Gro, Hsp, Htl, MBT, MLI, Nrs, OfL, OfS, RFF, RSD, Rt3, RTL, RtS, MiC, SFm, MFm, Dmo	No Value		No Value	No Value
BldgVintage	Ex	No Value		No Value	No Value
BldgLoc	CZ01, CZ02, CZ03, CZ04, CZ05, CZ06, CZ07, CZ08, CZ09, CZ10, CZ11, CZ12, CZ13, CZ14, CZ15, CZ16	No Value		No Value	No Value
NormUnit	Cap-Ton	No Value		No Value	No Value
EUL ID	HVAC-airAC	No Value		No Value	No Value
RUL ID	N/A	No Value		No Value	No Value
NTGR	NonRes-sAll-mHVAC-DX-up	No Value		No Value	No Value
DeliveryType	DnDeemed, UpDeemed	No Value		No Value	No Value
GSIA	Def-GSIA	No Value		No Value	No Value
Electric Load Shape	<i>(use existing)</i>	No Value		No Value	No Value
Gas Load Shape	Annual	No Value		No Value	No Value
Sector	Res, Com	No Value		No Value	No Value
PA/POU	Any	No Value		No Value	No Value
BldgHVAC	rWtd, cWtd	No Value		No Value	No Value
Use Category	HVAC	No Value		No Value	No Value
SubUseCategory	HeatCool	No Value		No Value	No Value
TechGroup	dxAC_equip dxHP_equip	No Value		No Value	No Value
TechType	spltSEER	No Value		No Value	No Value
Cost Adjustment Type	None	No Value		No Value	No Value
EnImpCalcType	Standard	No Value		No Value	No Value
MeasImpactType	Deem-WP	No Value		No Value	No Value
MeasQualifierGroup	None	No Value		No Value	No Value

Measure Consensus –

5.22 – Variable Refrigerant Flow for Heat Pump or Heat Recovery System > 65kBTU/h, Commercial

Medium

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Measure on Hold

- Offering

- Implementation: NR
- Building Types: ESe, OfS, OfL
- Climate zones: 1-16
- Norm Unit: Cap-Tons

- Stage 1 Issues

- DEER2020 updates: *Peak Period*, Measure App Type, Delivery Type, *Vintage (developed with vintage prototypes)*
- Measure status – currently on-hold with IOUs until issues resolved

- Measure Extension

- POU only measure (documentation and cost-effectiveness issues)
- **No Claims in 2017 or 2018**

- Stage 2 Issues

- *Measure is pending adoption by IOUs*
- ***Cost methodology needs updating***
- ***Free-ridership concerns***
- *Has fuel switching concerns*

Measure Consensus -

5.22 – Variable Refrigerant Flow - NonRes

35

● Offering

□ PGECOHC142 R1, Jan 2016

✦ Base Case

- S287 and S289 replace existing rooftop packaged air conditioners and heat pumps
- S288 and S290 replace existing VAV HVAC equipment

✦ Measure Case

- Variable Refrigerant Flow units with or without heat recovery, <80 tons

□ SCE13HC036 R1, Mar 2016

✦ Base Case

- Single-zone Packaged DX Air Conditioners with gas heating
- Multi-zone Packaged DX Variable Air Volume (VAV) Air Conditioners with gas heating

✦ Measure Case

- ≥ 65 kBtu/hr Variable Refrigerant Flow Heat Pump DX Equipment
- ≥ 65 kBtu/hr Variable Refrigerant Flow Heat Recovery DX Equipment

Input Consensus –

5.22 – Variable Refrigerant Flow for Heat Pump or Heat Recovery System > 65kBTU/h Commercial

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- Measure Permutations

		Measure Data Field			
Measure Data Field	Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	NR	ROB	RobNc	No Value	No Value
BldgType	ESe,OfS,OfL	ESe,OfS,OfL	OfL,OfS	No Value	No Value
BldgVintage	Ex	Ex	Any	No Value	No Value
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06, CZ07,CZ08,CZ09,CZ10,CZ11,CZ12, CZ13,CZ14,CZ15,CZ16	CZ01,CZ02,CZ03,CZ04,CZ05,CZ1 1,CZ12,CZ13,CZ16	CZ06,CZ08,CZ09,CZ10,CZ13,CZ14,C Z15,CZ16	No Value	No Value
NormUnit	Cap-Tons	Cap-Tons	Cap-Tons	No Value	No Value
EUL ID	HVAC-airHP	HVAC-airHP	HVAC-airHP	No Value	No Value
RUL ID	n/a	(blank)	HVAC-airHP	No Value	No Value
NTGR	NonRes-sAll-mHVAC-DX-up	NonRes-sAll-mHVAC-DX-up	NonRes-sAll-mHVAC-DX-up	No Value	No Value
DeliveryType	UpDeemed	PreRebUp	PreRebUp	No Value	No Value
GSIA	Def-GSIA	Com-AC-PGE	Def-GSIA	No Value	No Value
Electric Load Shape	<i>(use Existing)</i>	PGE:COMMERCIAL:3 = Commercial HVAC	SCE:Large_Office:New_AC- Ret,SCE:Small_Office:New_AC-Ret	No Value	No Value
Gas Load Shape	Annual	Annual	Annual	No Value	No Value
Sector	Com	Com	Com	No Value	No Value
PA/POU	POU				
BldgHVAC	cWtd	cWtd	Any	No Value	No Value
Use Category	HVAC	HVAC	HVAC	No Value	No Value
SubUseCategory	HeatCool	HeatCool	SpaceCool	No Value	No Value
TechGroup	dxHP_equip	dxHP_equip	dxHP_equip	No Value	No Value
TechType	spltSEER	spltSEER	pkgEER	No Value	No Value
Cost Adjustment Type	None	None	HVAC50	No Value	No Value
EnImpCalcType	Standard	(blank)	Standard	No Value	No Value
MeasImpactType	Deem-WP	NonDEER	Standard	No Value	No Value
MeasQualifierGroup	None	(blank)	None	No Value	No Value

Measure Consensus - 5.51 – Water Source Heat Pumps



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Planned to sunset

- Offering
 - Workpapers (two methodologies are consistent)
 - ✦ SCE13HC048 R5, Sept 2015; PGECO HVC162 R3, Jan 2016

Solution Code	Measure Code	Measure Name	Measure EER	Measure kW/ton	Code EER	Code kW/ton	Scaling Factor	kWh Savings
AC-61742	HB4	<65kBtu/hr 14.0 EER Water-Source Heat Pump	14.0	0.857	12.0	1.000	1.00	75,158
AC-70694	HB5	<65kBtu/hr 15.0 EER Water-Source Heat Pump	15.0	0.800	12.0	1.000	1.40	25,045
AC-80912	HB6	<65kBtu/hr 16.0 EER Water-Source Heat Pump	16.0	0.750	12.0	1.000	1.75	237,589
AC-57464	HV233	<65kBtu/hr 17.0 EER Water-Source Heat Pump	17.0	0.706	12.0	1.000	2.06	157,264
AC-73817	HV234	<65kBtu/hr 18.0 EER Water-Source Heat Pump	18.0	0.667	12.0	1.000	2.33	19,541
AC-29674	HB7	65-135 kBtu/hr 14.0 EER Water-Source Heat Pump	14.0	0.857	12.0	1.000	1.00	1,619
AC-88035	HV235	65-135 kBtu/hr 15.0 EER Water-Source Heat Pump	15.0	0.800	12.0	1.000	1.40	5,912
AC-58661	HV236	65-135 kBtu/hr 16.0 EER Water-Source Heat Pump	16.0	0.750	12.0	1.000	1.75	
AC-96782	HV237	65-135 kBtu/hr 17.0 EER Water-Source Heat Pump	17.0	0.706	12.0	1.000	2.06	
AC-55861	HV238	65-135 kBtu/hr 18.0 EER Water-Source Heat Pump	18.0	0.667	12.0	1.000	2.33	
AC-98021	HB8	135-240 kBtu/hr 14.0 EER Water-Source Heat Pump	14.0	0.857	12.3	0.976	0.83	7,406
AC-78624	HV239	135-240 kBtu/hr 15.0 EER Water-Source Heat Pump	15.0	0.800	12.3	0.976	1.23	
AC-10953	HB9	>240 kBtu/hr 13.0 EER Water-Source Heat Pump	13.0	0.923	12.2	0.984	0.42	
AC-73615	HV240	>240 kBtu/hr 14.0 EER Water-Source Heat Pump	14.0	0.857	12.2	0.984	0.89	
AC-89140	N/A	<65kBtu/hr To Code Savings Portion Water-Source Heat Pump					1.00	
AC-98263	N/A	65-135 kBtu/hr To Code Savings Portion Water-Source Heat Pump					1.00	
AC-51802	N/A	135-240 kBtu/hr To Code Savings Portion Water-Source Heat Pump					1.00	
AC-77978	N/A	>240 kBtu/hr To Code Savings Portion Water-Source Heat Pump					1.00	
		DEER: WLHP system with 14.0 EER / 4.6 COP replacing T24 minimum	14.0	0.857	12.0	1.000	1	

- Stage 2
 - Savings based upon DEER 2005 values (D03-069)
 - Cost effectiveness issues

Measure Consensus

5.56 Single Package Vertical Heat Pump

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● Offering

- ❑ Implementation: NR, AR
- ❑ Building Types: ERC (relocatable classroom)
 - ✦ K-12 and Community Colleges
- ❑ Climate zones: CZ01-CZ16
- ❑ Norm Unit: Cap-Tons
- ❑ Offerings include: 7 offerings
 - ✦ EER / COP: 10, 11, 11.5 EER
 - ✦ Economizer / DCV Option
 - ✦ NR / AR

EER	COP	Economizer and DCV	Measure Application Type
<i>11 EER</i>	<i>3.25 COP</i>	<i>No Econ or DCV</i>	<i>NR</i>
<i>11 EER</i>	<i>3.25 COP</i>	<i>Econ, DCV</i>	<i>NR</i>
<i>11.5 EER</i>	<i>3.25 COP</i>	<i>Econ, DCV</i>	<i>NR</i>
<i>10 EER</i>	<i>3.00 COP</i>	<i>No Econ or DCV</i>	<i>AR</i>
<i>10 EER</i>	<i>3.00 COP</i>	<i>Econ, DCV</i>	<i>AR</i>
<i>11 EER</i>	<i>3.25 COP</i>	<i>Econ, DCV</i>	<i>AR</i>
<i>11.5 EER</i>	<i>3.25 COP</i>	<i>Econ, DCV</i>	<i>AR</i>

● Stage 1 Issues

- ❑ *Must update savings using the latest building prototypes and new Peak Period*
- ❑ *Savings from Q3 2018 (PG&E <25,000 kWh)*

● Measure Extension

- ❑ Add POU's, SCE and SDG&E

● Stage 2 Issues

- ❑ *SCE evaluating adding heat recovery option; baseline efficiency likely to change.*

Measure Consensus – 5.56, Single Package Vertical Heat Pump



- **Base Case:**
 - Existing standard efficiency single package vertical air-cooled heat pump (SPVHP).
- **Measure Case:**
 - High efficiency (above code) single package vertical air-cooled heat pump with the option of included air-side economizer and demand control ventilation (DCV) controls.
- **Savings (*updated models in 2018*)**
 - eQUEST / MASControl v3.00.28
 - Tech ID D08-NE-HVAC-airHP-Pkg-55to64kBtuh-15p0seer-8p2hspf with a 2007 vintage
 - Keyword changes to simulate no ducts, no return fan, PTAC system, less than or equal to 90% occupancy, and tiered efficiency levels:

Measure Base Case and Proposed Tier Levels for Normal Replacement Installation Type

Option	Base Case (Title 24 2016)	Tier 0	Tier 1	Tier 2
Cooling mode efficiency	10.00 EER (0.288 EIR)	11.00 EER (0.258 EIR)	11.00 EER (0.258 EIR)	11.50 EER (0.245)
Heating mode efficiency	3.00 COP (0.304 EIR)	3.25 COP (0.278 EIR)	3.25 COP (0.278 EIR)	3.25 COP (0.278 EIR)
Economizer	No	No	Yes	Yes
DCV	No	No	Yes	Yes

Measure Base Case and Proposed Tier Levels for Accelerated Replacement Installation Type

Option	Base Case	Tier 0 (Title 24 2016)	Tier 1	Tier 2	Tier 3
Cooling mode efficiency	9.00 EER (0.324 EIR)	10.00 EER (0.288 EIR)	10.00 EER (0.288 EIR)	11.0 EER (0.258 EIR)	11.5 EER (0.245 EIR)
Heating mode efficiency	3.00 COP (0.304 EIR)	3.00 COP (0.304 EIR)	3.00 COP (0.304 EIR)	3.25 COP (0.278 EIR)	3.25 COP (0.278 EIR)
Economizer	No	No	Yes	Yes	Yes
DCV	No	No	Yes	Yes	Yes

Blue text = Changing and first time that it

Italics text = Item that has not been comp

Measure Consensus

5.56 Single Package Vertical Heat Pump

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- Measure Permutations

Measure Data Field	Measure Value	Measure Data Field			
		PG&E	SCE	SDG&E	SCG
MeasureAppType	AR, NR	AR, NR			
BldgType	ERC	ERC			
BldgVintage	Ex	Ex			
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06, CZ07,CZ08,CZ09,CZ10,CZ11,CZ12, CZ13,CZ14,CZ15,CZ16	CZ01,CZ02,CZ03,CZ04,CZ05,CZ06, CZ07,CZ08,CZ09,CZ10,CZ11,CZ12, CZ13,CZ14,CZ15,CZ16			
NormUnit	Cap-Tons	Cap-Tons			
EUL ID	HVAC-PTHP	HVAC-PTHP			
RUL ID	HVAC-PTHP	HVAC-PTHP			
NTGR	K-12School-ComCollege	K-12School-ComCollege			
DeliveryType	DnDeemed	DnDeemed			
GSIA	Def-GSIA	Def-GSIA			
Electric Load Shape	<i>DEER:Com:HVAC_Split-</i>	DEER:Com:HVAC_Split-Package_HP			
Gas Load Shape	Annual	Annual			
Sector	Com	Com			
PA/POU	Any	Any			
BldgHVAC	cDXHP	cDXHP			
Use Category	HVAC	HVAC			
SubUseCategory	HeatCool	HeatCool			
TechGroup	dxHP_equip	dxHP_equip			
TechType	pkgEER	pkgEER			
Cost Adjustment Type	None	None			
EnImpCalcType	Standard	Standard			