Subcommittee Process

AYAD AL-SHAIKH

APRIL 2017

Agenda

- Review goals and expected outcomes
  - Ayad Al-Shaikh, 20 min
- Provide an overview of the energy savings for this category
  - Ayad Al-Shaikh, 10 min
- Review and discuss each of the "Cross Cutting" issues
  - All, 30 min
  - Are there additional issues that should be added to the discussion?
- Review and discuss each "Measure Specific" issue
  - All, 60 min
- Accept recommendations on who should be included on the Cal TF Subcommittee for this measure grouping, both internal and external.
  - All, 10 min

Subcommittee Overview

- Goals
  - Address Measures at a higher level (by category) to:
    - Identify and address all **cross-cutting category issues** that are technical or policy related.
    - React to **Measure specific issues** that arise during the consolidation process.
    - Separate issues into 2017 / 2018 **issue solution path** to set expectations correctly
  - Create a **communication channel** for category stakeholders to stay informed or participate in a more focused manner.

Subcommittee Overview

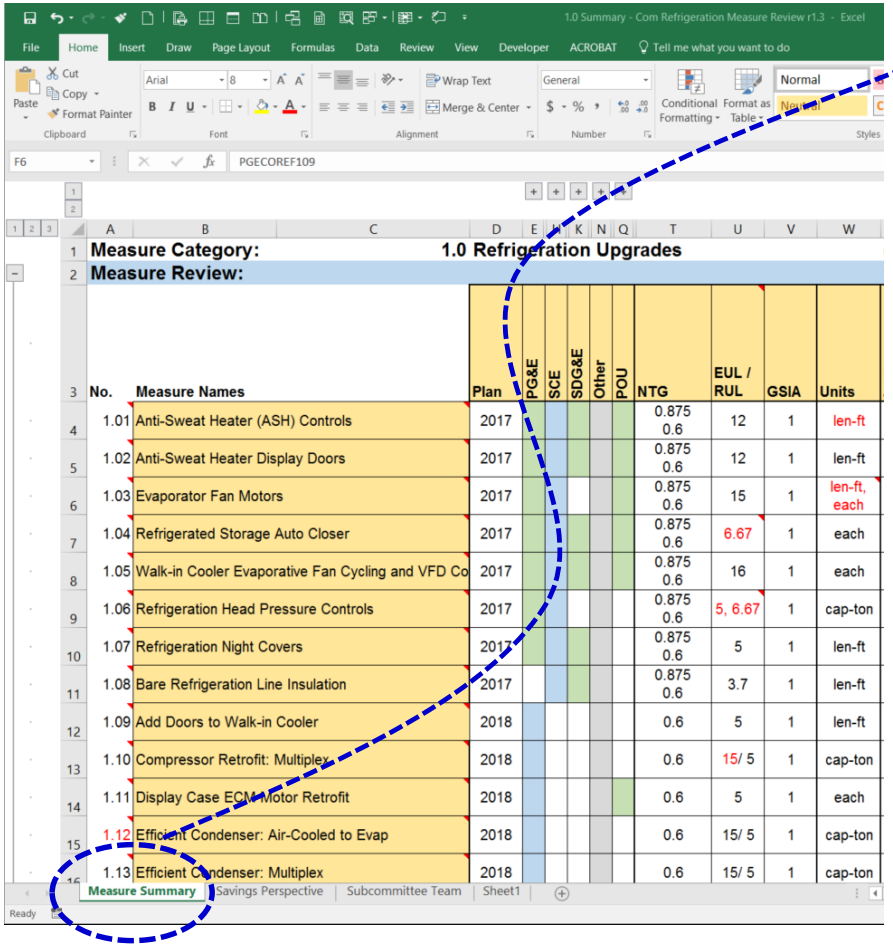
CALIFORNIA TECHNICAL FORUM

- Initial Expectations
  - Cal TF Staff:
    - Creates **summary documentation** one week prior to meeting.
    - Provide **access to detailed documentation** if desired (through a DropBox link).
    - Share **common results** between Subcommittees.
  - Subcommittee Members:
    - Read through **summary documentation** prior to meeting.
    - Formulate **opinions on issues** identified.
    - Raise **other concerns** that should be looked at in further detail (offline).
- Meeting #1 – Specifically for IOU/POU representatives

Subcommittee Materials

- Category Summary File
  - Measure Review
  - Cross-Cutting Issues
  - Measure-Specific Issues
- Category Savings Perspective
- Subcommittee Team List
- Library of Workpapers

Category Summary File



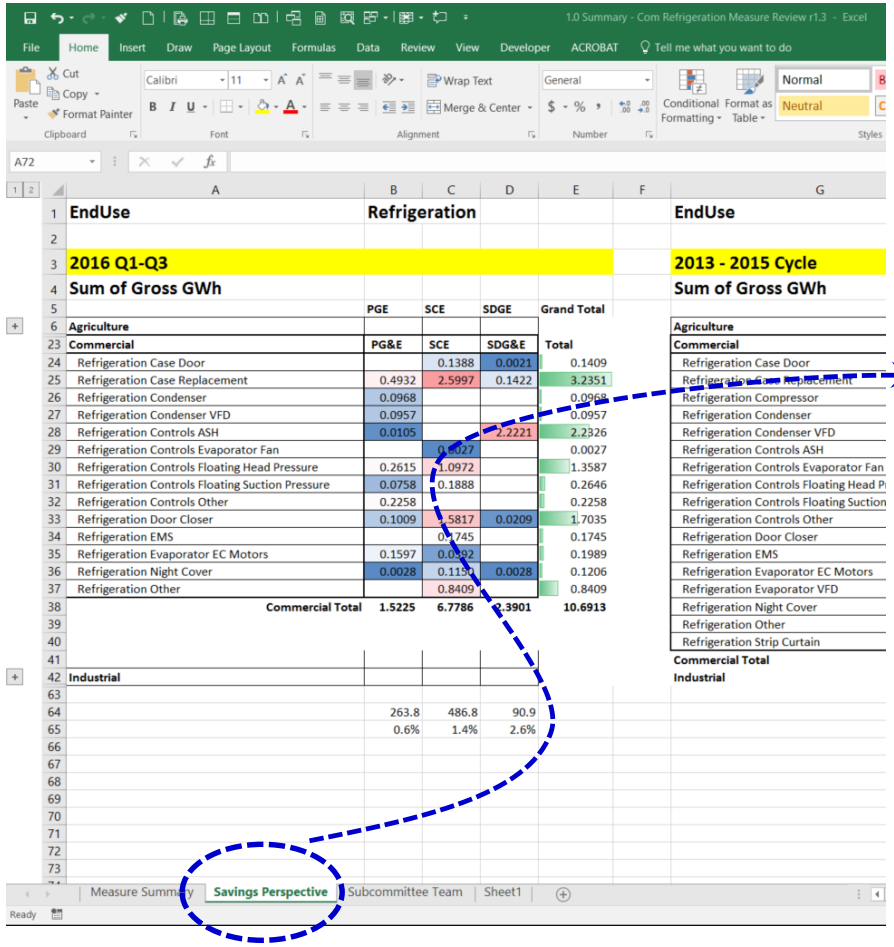
Measure Category: 1.0 Refrigeration Upgrades

Measure Review:

No.	Measure Names	Plan	PG&E	SCE	SDG&E	Other	POU	NTG	EUL / RUL	GSIA	Units
1.01	Anti-Sweat Heater (ASH) Controls	2017						0.875 0.6	12	1	len-ft
1.02	Anti-Sweat Heater Display Doors	2017						0.875 0.6	12	1	len-ft
1.03	Evaporator Fan Motors	2017						0.875 0.6	15	1	len-ft, each
1.04	Refrigerated Storage Auto Closer	2017						0.875 0.6	6.67	1	each
1.05	Walk-in Cooler Evaporative Fan Cycling and VFD Co	2017						0.875 0.6	16	1	each
1.06	Refrigeration Head Pressure Controls	2017						0.875 0.6	5, 6.67	1	cap-ton
1.07	Refrigeration Night Covers	2017						0.875 0.6	5	1	len-ft
1.08	Bare Refrigeration Line Insulation	2017						0.875 0.6	3.7	1	len-ft
1.09	Add Doors to Walk-in Cooler	2018						0.6	5	1	len-ft
1.10	Compressor Retrofit: Multiplex	2018						0.6	15/ 5	1	cap-ton
1.11	Display Case ECM Motor Retrofit	2018						0.6	5	1	each
1.12	Efficient Condenser: Air-Cooled to Evap	2018						0.6	15/ 5	1	cap-ton
1.13	Efficient Condenser: Multiplex	2018						0.6	15/ 5	1	cap-ton

- Category Summary File
  - Measure Review
  - Cross-Cutting Issues
  - Measure-Specific Issues
- Category Savings Perspective
- Subcommittee Team List

Category Summary File



EndUse	Refrigeration			
2016 Q1-Q3				
Sum of Gross GWh				
	PGE	SCE	SDGE	Grand Total
Agriculture				
Commercial	PG&E	SCE	SDG&E	Total
Refrigeration Case Door		0.1388	0.0021	0.1409
Refrigeration Case Replacement	0.4932	2.5997	0.1422	3.2351
Refrigeration Condenser	0.0968			0.0968
Refrigeration Condenser VFD	0.0957			0.0957
Refrigeration Controls ASH	0.0105		2.2221	2.2326
Refrigeration Controls Evaporator Fan		0.0027		0.0027
Refrigeration Controls Floating Head Pressure	0.2615	1.0972		1.3587
Refrigeration Controls Floating Suction Pressure	0.0758	0.1888		0.2646
Refrigeration Controls Other	0.2258			0.2258
Refrigeration Door Closer	0.1009	1.5817	0.0209	1.7035
Refrigeration EMS		0.1745		0.1745
Refrigeration Evaporator EC Motors	0.1597	0.0392		0.1989
Refrigeration Night Cover	0.0028	0.1150	0.0028	0.1206
Refrigeration Other		0.8409		0.8409
Commercial Total	1.5225	6.7786	2.3901	10.6913
Industrial				
	263.8	486.8	90.9	
	0.6%	1.4%	2.6%	

EndUse
2013 - 2015 Cycle
Sum of Gross GWh
Agriculture
Commercial
Refrigeration Case Door
Refrigeration Case Replacement
Refrigeration Compressor
Refrigeration Condenser
Refrigeration Condenser VFD
Refrigeration Controls ASH
Refrigeration Controls Evaporator Fan
Refrigeration Controls Floating Head P
Refrigeration Controls Floating Suction
Refrigeration Controls Other
Refrigeration Door Closer
Refrigeration EMS
Refrigeration Evaporator EC Motors
Refrigeration Evaporator VFD
Refrigeration Night Cover
Refrigeration Other
Refrigeration Strip Curtain
Commercial Total
Industrial

- Category Summary File
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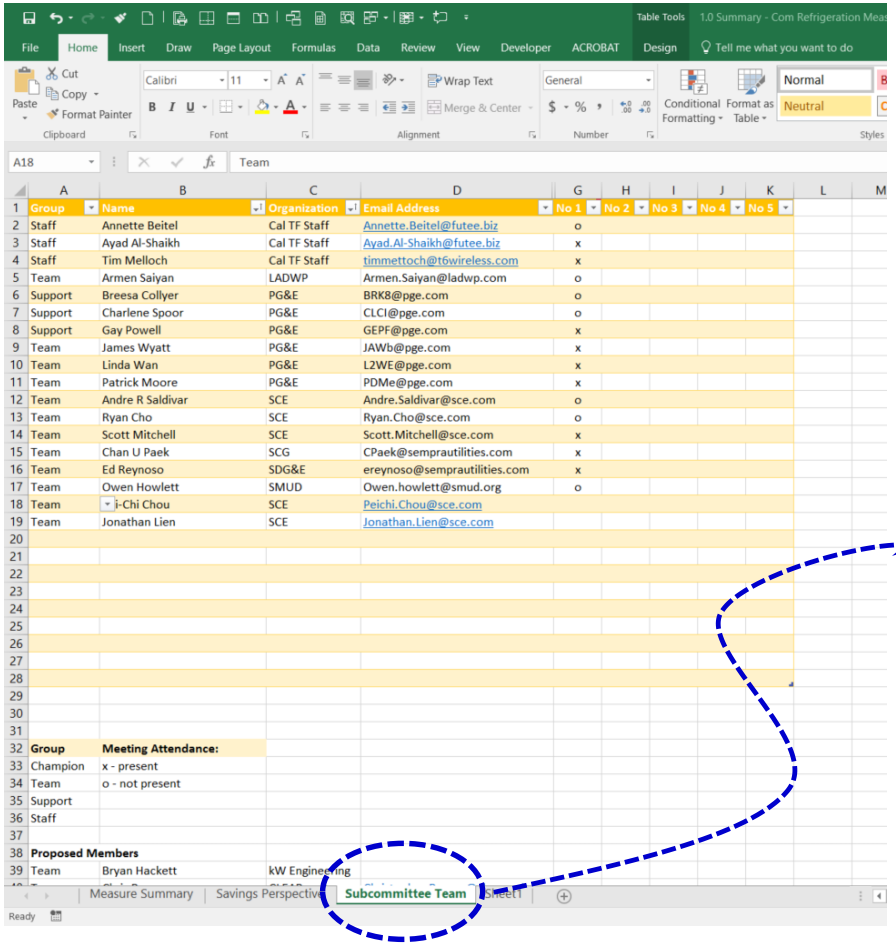
Category Summary File



Group	Name	Organization	Email Address	No 1	No 2	No 3	No 4	No 5
Staff	Annette Beitel	Cal TF Staff	Annette.Beitel@futee.biz	o				
Staff	Ayad Al-Shaikh	Cal TF Staff	Ayad.Al-Shaikh@futee.biz	x				
Staff	Tim Melloch	Cal TF Staff	timmettoch@t6wireless.com	x				
Team	Armen Saiyan	LADWP	Armen.Saiyan@ladwp.com	o				
Support	Breesa Collyer	PG&E	BRK8@pge.com	o				
Support	Charlene Spoor	PG&E	CLCI@pge.com	o				
Support	Gay Powell	PG&E	GEPF@pge.com	x				
Team	James Wyatt	PG&E	JAWb@pge.com	x				
Team	Linda Wan	PG&E	L2WE@pge.com	x				
Team	Patrick Moore	PG&E	PDMe@pge.com	x				
Team	Andre R Saldivar	SCE	Andre.Saldivar@sce.com	o				
Team	Ryan Cho	SCE	Ryan.Cho@sce.com	o				
Team	Scott Mitchell	SCE	Scott.Mitchell@sce.com	x				
Team	Chan U Paek	SCG	CPaek@semprautilities.com	x				
Team	Ed Reynoso	SDG&E	ereynoso@semprautilities.com	x				
Team	Owen Howlett	SMUD	Owen.howlett@smud.org	o				
Team	Ji-Chi Chou	SCE	Peichi.Chou@sce.com					
Team	Jonathan Lien	SCE	Jonathan.Lien@sce.com					

Group	Meeting Attendance:
Champion	x - present
Team	o - not present
Support	
Staff	

Proposed Members

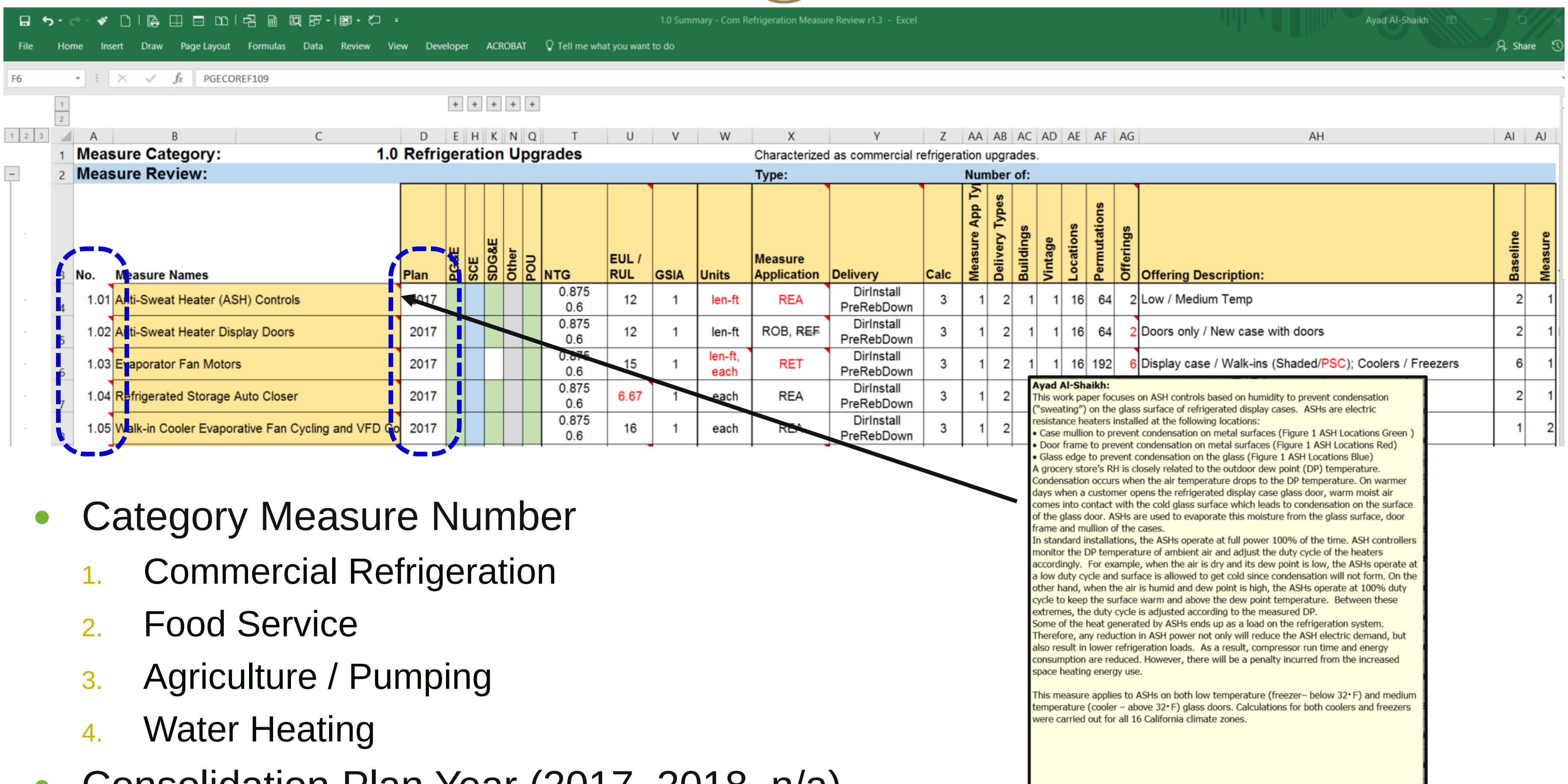
Team	Bryan Hackett	kW Engineering

Measure Summary | Savings Perspective | Subcommittee Team | Sheet1

Ready

- Category Summary File
  - Measure Review
  - Cross-Cutting Issues
  - Measure-Specific Issues
- Category Savings Perspective
- Subcommittee Team List

Category Summary File



1.0 Summary - Com Refrigeration Measure Review r1.3 - Excel

F6 PGECOREF109

Measure Category: 1.0 Refrigeration Upgrades — Characterized as commercial refrigeration upgrades.

Measure Review: Type: Number of:

No.	Measure Names	Plan	PG&E	SCE	SDG&E	Other	POU	NTG	EUL / RUL	GSIA	Units	Measure Application	Delivery	Calc	Measure App Ty	Delivery Types	Buildings	Vintage	Locations	Permutations	Offerings	Offering Description:	Baseline	Measure
1.01	Anti-Sweat Heater (ASH) Controls	2017						0.875 0.6	12	1	len-ft	REA	DirInstall PreRebDown	3	1	2	1	1	16	64	2	Low / Medium Temp	2	1
1.02	Anti-Sweat Heater Display Doors	2017						0.875 0.6	12	1	len-ft	ROB, ~~REF~~	DirInstall PreRebDown	3	1	2	1	1	16	64	2	Doors only / New case with doors	2	1
1.03	Evaporator Fan Motors	2017						0.875 0.6	15	1	len-ft, each	RET	DirInstall PreRebDown	3	1	2	1	1	16	192	6	Display case / Walk-ins (Shaded/PSC); Coolers / Freezers	6	1
1.04	Refrigerated Storage Auto Closer	2017						0.875 0.6	6.67	1	each	REA	DirInstall PreRebDown	3	1	2							2	1
1.05	Walk-in Cooler Evaporative Fan Cycling and VFD Co	2017						0.875 0.6	16	1	each	REA	DirInstall PreRebDown	3	1	2							1	2

Ayad Al-Shaikh:
This work paper focuses on ASH controls based on humidity to prevent condensation ("sweating") on the glass surface of refrigerated display cases. ASHs are electric resistance heaters installed at the following locations:

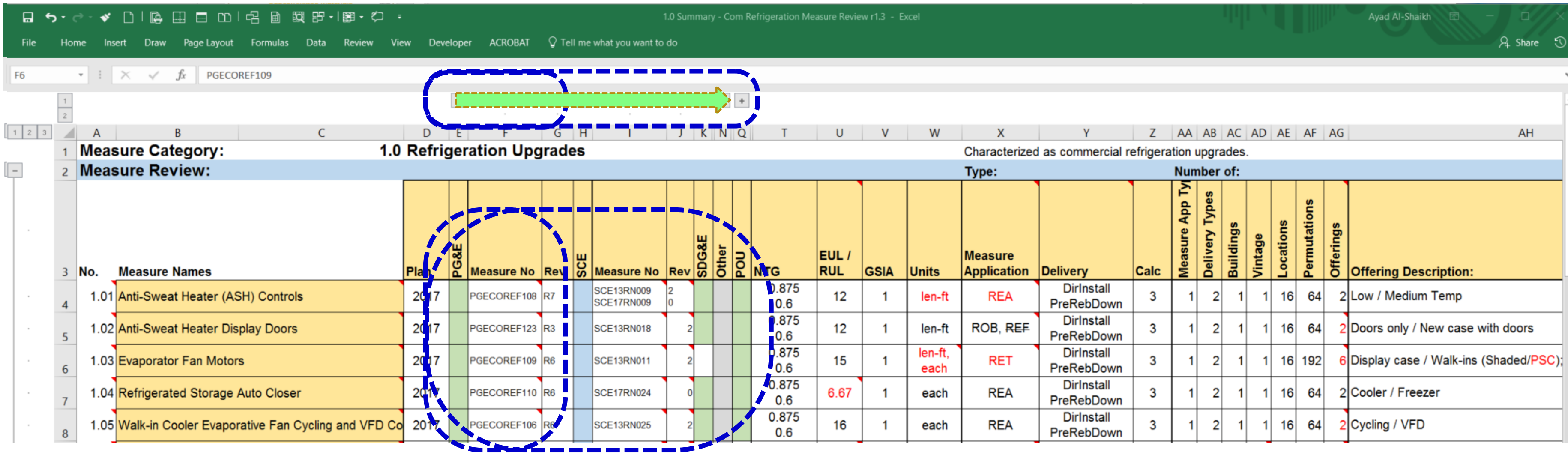
- Case mullion to prevent condensation on metal surfaces (Figure 1 ASH Locations Green)
- Door frame to prevent condensation on metal surfaces (Figure 1 ASH Locations Red)
- Glass edge to prevent condensation on the glass (Figure 1 ASH Locations Blue)

A grocery store's RH is closely related to the outdoor dew point (DP) temperature. Condensation occurs when the air temperature drops to the DP temperature. On warmer days when a customer opens the refrigerated display case glass door, warm moist air comes into contact with the cold glass surface which leads to condensation on the surface of the glass door. ASHs are used to evaporate this moisture from the glass surface, door frame and mullion of the cases.
In standard installations, the ASHs operate at full power 100% of the time. ASH controllers monitor the DP temperature of ambient air and adjust the duty cycle of the heaters accordingly. For example, when the air is dry and its dew point is low, the ASHs operate at a low duty cycle and surface is allowed to get cold since condensation will not form. On the other hand, when the air is humid and dew point is high, the ASHs operate at 100% duty cycle to keep the surface warm and above the dew point temperature. Between these extremes, the duty cycle is adjusted according to the measured DP.
Some of the heat generated by ASHs ends up as a load on the refrigeration system. Therefore, any reduction in ASH power not only will reduce the ASH electric demand, but also result in lower refrigeration loads. As a result, compressor run time and energy consumption are reduced. However, there will be a penalty incurred from the increased space heating energy use.

This measure applies to ASHs on both low temperature (freezer– below 32・F) and medium temperature (cooler – above 32・F) glass doors. Calculations for both coolers and freezers were carried out for all 16 California climate zones.

- Category Measure Number
  1. Commercial Refrigeration
  2. Food Service
  3. Agriculture / Pumping
  4. Water Heating
- Consolidation Plan Year (2017, 2018, n/a)
- Note: Comments available to give workpaper "Technical Description"

Category Summary File



F6 PGECOREF109

Measure Category: 1.0 Refrigeration Upgrades

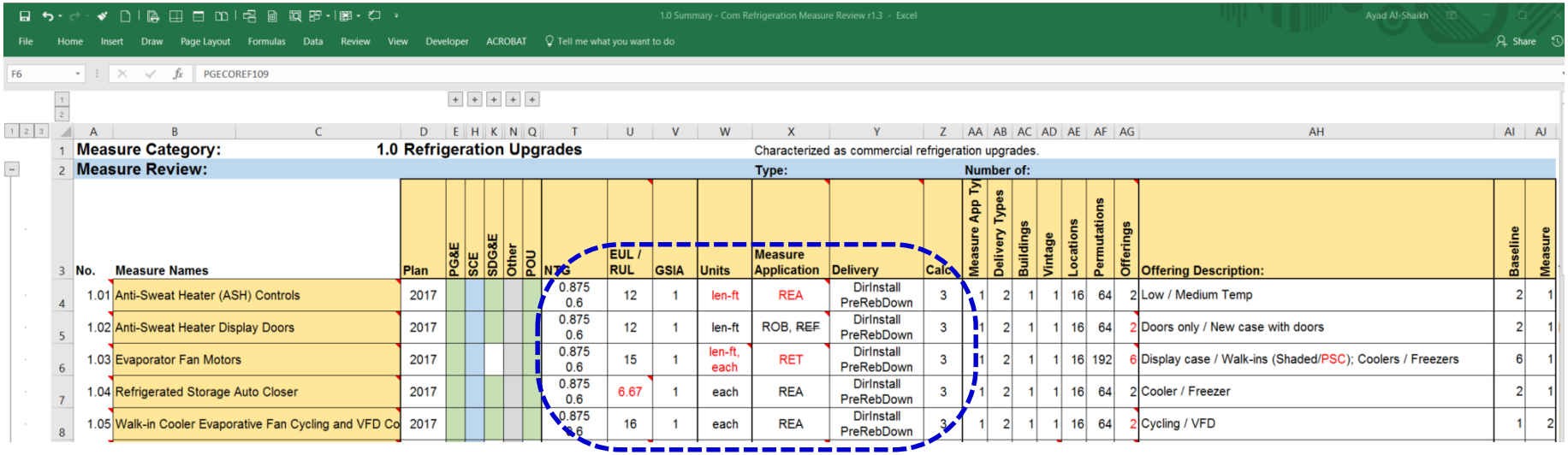
Characterized as commercial refrigeration upgrades.

Measure Review: Type: Number of:

No.	Measure Names	Pla	PG&E	Measure No	Rev	SCE	Measure No	Rev	SDG&E	Other	POU	NTG	EUL / RUL	GSIA	Units	Measure Application	Delivery	Calc	Measure App Ty	Delivery Types	Buildings	Vintage	Locations	Permutations	Offerings	Offering Description:
1.01	Anti-Sweat Heater (ASH) Controls	2017		PGECOREF108	R7		SCE13RN009 SCE17RN009	2 0				0.875 0.6	12	1	len-ft	REA	DirInstall PreRebDown	3	1	2	1	1	16	64	2	Low / Medium Temp
1.02	Anti-Sweat Heater Display Doors	2017		PGECOREF123	R3		SCE13RN018	2				0.875 0.6	12	1	len-ft	ROB, ~~REF~~	DirInstall PreRebDown	3	1	2	1	1	16	64	2	Doors only / New case with doors
1.03	Evaporator Fan Motors	2017		PGECOREF109	R6		SCE13RN011	2				0.875 0.6	15	1	len-ft, each	RET	DirInstall PreRebDown	3	1	2	1	1	16	192	6	Display case / Walk-ins (Shaded/PSC);
1.04	Refrigerated Storage Auto Closer	2017		PGECOREF110	R6		SCE17RN024	0				0.875 0.6	6.67	1	each	REA	DirInstall PreRebDown	3	1	2	1	1	16	64	2	Cooler / Freezer
1.05	Walk-in Cooler Evaporative Fan Cycling and VFD Co	2017		PGECOREF106	R6		SCE13RN025	2				0.875 0.6	16	1	each	REA	DirInstall PreRebDown	3	1	2	1	1	16	64	2	Cycling / VFD

- Workpaper Details
  - **Green** Shading designates the lead workpaper that is referenced
  - **Blue** Shading designates that a workpaper exists in the library
  - **Red** Shading designates that the workpaper exists, but we don't have a copy (yet)
  - Groups can be opened to show workpaper number and current revision
    - For POUs, this shows the reference within the CA TRM, if applicable.

Category Summary File



	A	B	C	D	E	H	K	N	Q	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1	**Measure Category:**			**1.0 Refrigeration Upgrades**										Characterized as commercial refrigeration upgrades.												
2	**Measure Review:**													**Type:**			**Number of:**									
3	**No.**	**Measure Names**		**Plan**	**PG&E**	**SCE**	**SDG&E**	**Other**	**POU**	**NTG**	**EUL / RUL**	**GSIA**	**Units**	**Measure Application**	**Delivery**	**Calc**	**Measure App Ty**	**Delivery Types**	**Buildings**	**Vintage**	**Locations**	**Permutations**	**Offerings**	**Offering Description:**	**Baseline**	**Measure**
4	1.01	Anti-Sweat Heater (ASH) Controls		2017						0.875 0.6	12	1	len-ft	REA	DirInstall PreRebDown	3	1	2	1	1	16	64	2	Low / Medium Temp	2	1
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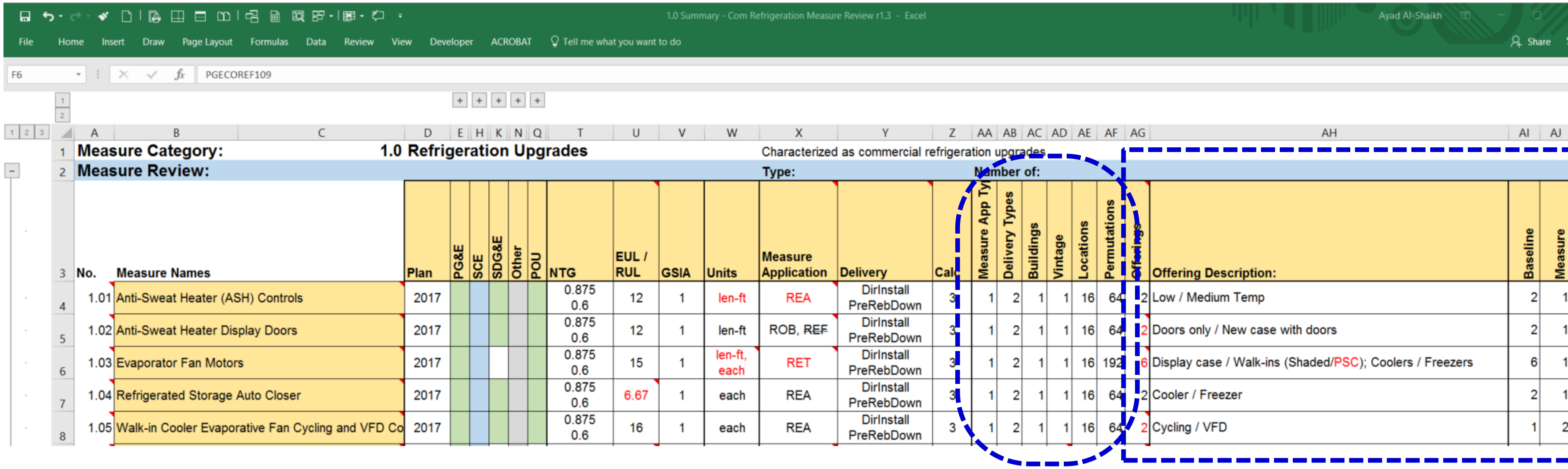
8	1.05	Walk-in Cooler Evaporative Fan Cycling and VFD Co		2017						0.875 0.6	16	1	each	REA	DirInstall PreRebDown	3	1	2	1	1	16	64	2	Cycling / VFD	1	2

- Measure Characteristics Comparison
  - Net to Gross (NTG)
  - Effective Useful Life / Remaining Useful Life (EUL/RUL)
  - Gross Savings and Installation Adjustment (GSIA…similar to IR)
  - Units
  - Measure Application Type (ER, NC, RC, REA, RET, ROB, or ROBNC)
  - Delivery Type
  - Calculation Type (1=simple calculation; 2=complex calculation; 3=modeled result)
- Note: Red values indicate some type of discrepancy between workpapers

Category Summary File



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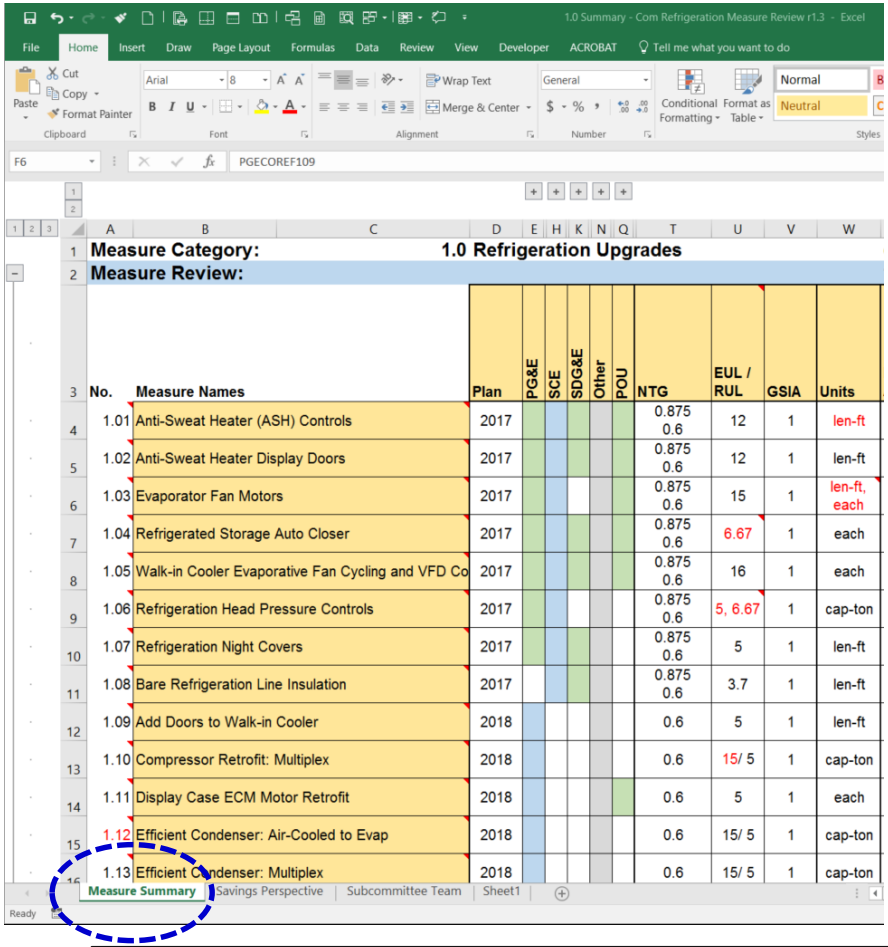
- Permutations
  - Building Type (26 types, Res, Com, Any)
  - Vintage
  - Location (16 Climate Zones or IOU)
- Offerings

Category Summary File



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1.13	Efficient Condenser: Multiplex	2018						0.6	15/ 5	1	cap-ton

- Category Summary File
  - Measure Review
  - Cross-Cutting Issues
    - **Intent**: Higher level concern that effects multiple Measures
      - Policy Issues
      - Technical Issues
      - Technical Questions
      - Etc…
  - Measure-Specific Issues
    - **Intent**: Detailed issue that needs resolution before consolidation.

Note: Some Cross-Cutting issues are turning out to be Global Issues.

Category Groups

- Agriculture / Pumps
- Appliance or Plug Load
- Building Envelope
- Food Service
- HVAC / Motors
- Lighting
- Miscellaneous
- Pools
- Process
- Commercial Refrigeration
- Water Heating

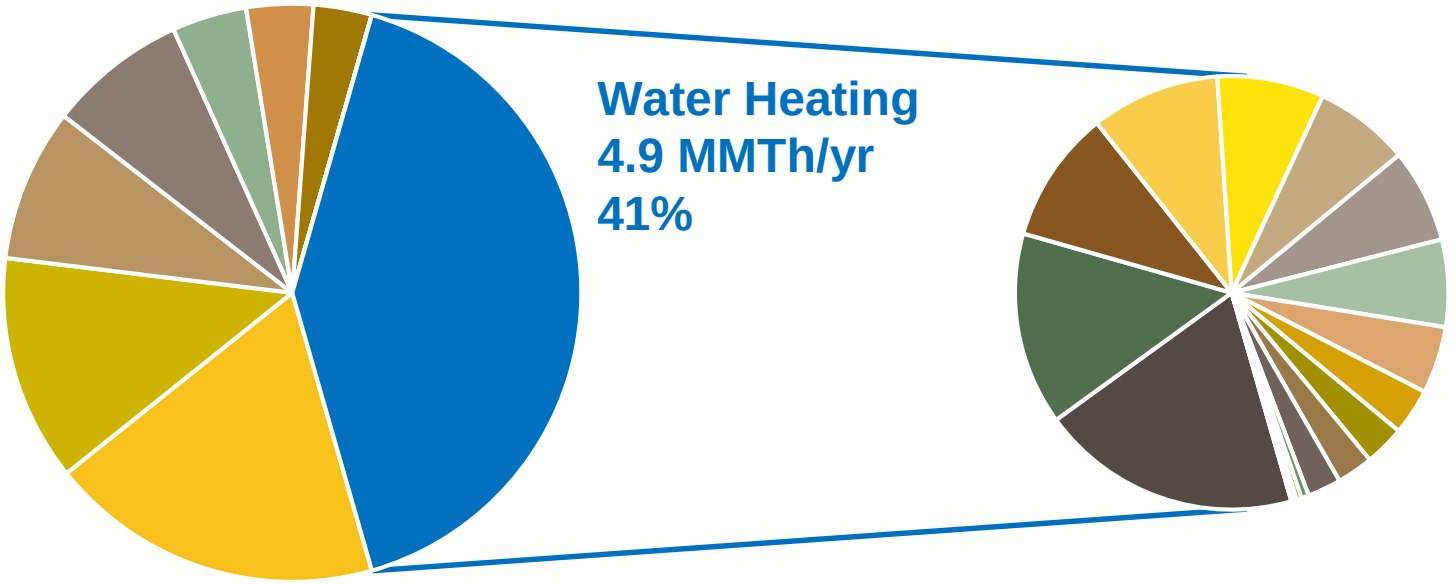
Summary Overview

- This is the first step in “Measure Consolidation”.
- Included:
  - Reviewing 2017 active measure (workpaper and TRM)
  - Scanning savings for variation trends
  - Reviewing cost methodology
  - Identifying if supporting documentation exists
  - Reviewing Measure Application, Delivery Type(s), and Calc Type
  - Identifying Permutation differences
  - Identifying Savings parameter differences
    - NTG, EUL/RUL, GSIA, Unit
- Not Included:
  - Reviewing sunset measures / old workpapers (*some exceptions*)
  - Analyzing savings variation by permutation (in detail)
  - Reviewing cost documentation
  - Reviewing supporting documentation
  - Reviewing cost-effectiveness

Example – Water Heating Category

- Savings Perspective

2016 CA Gas Savings (therms/yr)
(Total = 12MMTh/yr, not including negative Lighting effects)

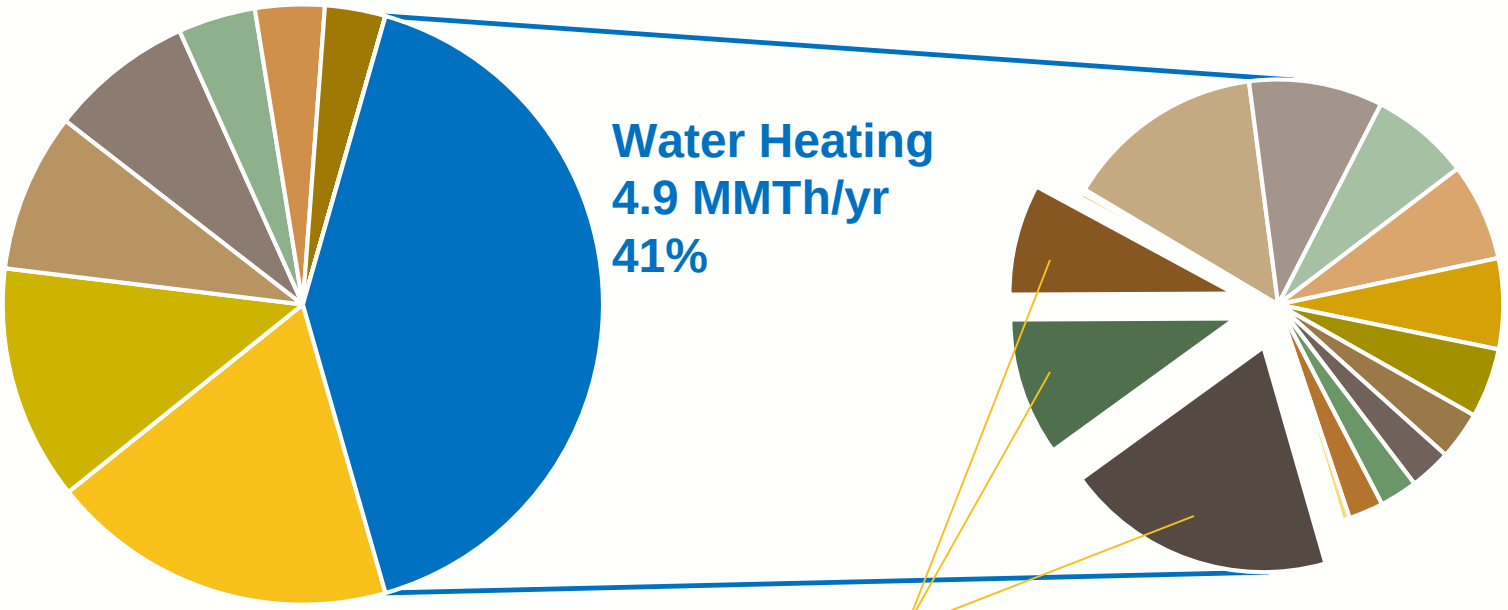


Note: Water Heating has a large mix of Measures that contribute to the full savings.

Water Heating Category Deemed Savings

- Savings Perspective

2016 CA Gas Savings (therms/yr)
(Total = 12MMTh/yr, not including negative Lighting effects)



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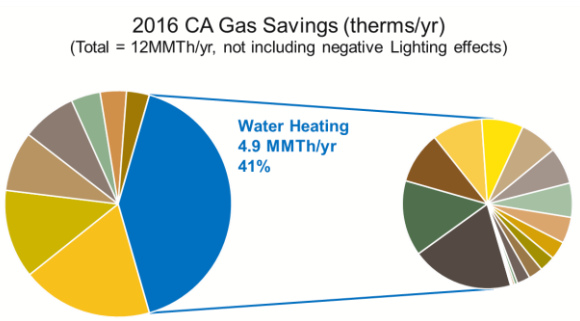
Water Heating Category Deemed Savings



- Savings Perspective: 2016

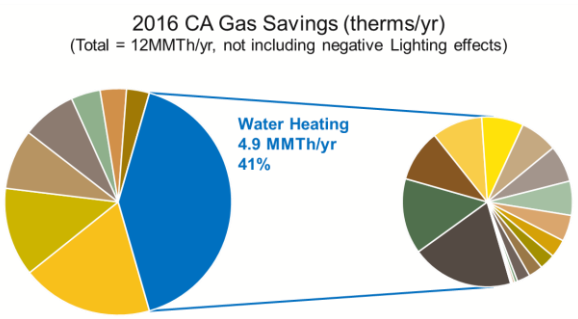
Ref No	Name	Units Installed	Total Energy (kWh/yr)	Total Energy (therm/yr)	Unit Savings (therm/yr)
6.01	Faucet Aerator and Low Flow Showerhead	18,822	42,306	18,852	1.00
6.02	Faucet Aerators for Bathroom/Kitchen Sinks in Residential Buildings	232,384	30	397,107	1.71
6.03	Low-Flow Showerheads	83,141	0	493,980	5.94
6.04	Temperature-Initiated Shower Flow Restriction Valve w/&w/o LFS	8,637	0	13,461	1.56
6.06	Therm Savings Kit	139,674	0	971,101	6.95
6.07	High Efficiency DHW Boiler (>75 kBTU/h)	394,267	33,809	717,657	1.82
6.08	Process Boiler	253,183	0	124,580	0.49
6.09	MF Central Boiler Tankless Water Heater	18,395	0	28,089	1.53
6.10	Tankless Single-Family & Multi-Family Applications	107,221	43,398	355,913	3.32
6.12	Tankless Water Heater (Non-Res)	32,928	(16,629)	135,539	4.12
6.13	Tankless Water Heater (Res)	3,752	(4,947)	149,792	39.92
6.15	Heat Pump Water Heater	506	842,354	0	-
6.16	MF Central Storage Water Heater	5,798	0	6,389	1.10
6.17	Storage Water Heater (Non-Res)	205,301	0	324,740	1.58
6.18	Storage Water Heater (Res)	13,322	0	249,446	18.72
6.20	Demand Control for Centralized Water Heater Recirculation Pump	16,089	440,908	349,389	21.72
6.24	Hot Water Line Insulation Electric/Gas	42,935	0	479,896	11.18
6.25	Tank Insulation	18,179	0	172,202	9.47
Grand Total		**1,594,703**	**1,399,584**	**4,988,132**	

Flow Restrictors

Water Heaters

- Note: Unit savings represents an average savings.

Example
Water Heating Category

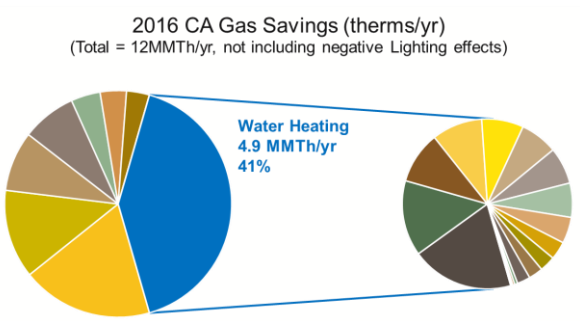


- Savings Perspective: 2016

Ref No	Name	PGE	SCE	SCG	SDGE	Units Installed	Total Energy (therm/yr)
6.01	Faucet Aerator and Low Flow Showerhead	16,860	1,890			18,822	18,852
6.02	Faucet Aerators for Bathroom/Kitchen Sinks in Residential Buildings			392,554	2,443	232,384	397,107
6.03	Low-Flow Showerheads			460,150	33,830	83,141	493,980
6.04	Temperature-Initiated Shower Flow Restriction Valve w/&w/o LFS			2,494	10,967	8,637	13,461
6.06	Therm Savings Kit			416,636	554,464	139,674	971,101
6.07	High Efficiency DHW Boiler (>75 kBTU/h)	536,274		181,383		394,267	717,657
6.08	Process Boiler			124,580		253,183	124,580
6.09	MF Central Boiler Tankless Water Heater			28,089		18,395	28,089
6.10	Tankless Single-Family & Multi-Family Applications	355,913				107,221	355,913
6.12	Tankless Water Heater (Non-Res)			135,539		32,928	135,539
6.13	Tankless Water Heater (Res)	56,011		93,781		3,752	149,792
6.15	Heat Pump Water Heater	0	0		0	506	0
6.16	MF Central Storage Water Heater	522		5,867		5,798	6,389
6.17	Storage Water Heater (Non-Res)	274,574		45,175	4,990	205,301	324,740
6.18	Storage Water Heater (Res)			228,941	20,505	13,322	249,446
6.20	Demand Control for Centralized Water Heater Recirculation Pump			349,389		16,089	349,389
6.24	Hot Water Line Insulation Electric/Gas			479,896		42,935	479,896
6.25	Tank Insulation			172,202		18,179	172,202
Grand Total		**1,240,154**	**1,890**	**3,116,677**	**627,200**	**1,594,703**	**4,988,132**

- Note: Red shading is “higher” / Blue shading is “lower”

Water Heating Category Deemed Savings



- Savings Perspective: 2016

Ref No	Name	Units Installed	Total Energy (kWh/yr)	Total Energy (therm/yr)	Unit Savings (therm/yr)
6.01	Faucet Aerator and Low Flow Showerhead	18,822	42,306	18,852	1.00
6.02	Faucet Aerators for Bathroom/Kitchen Sinks in Residential Buildings	232,384	30	397,107	1.71
6.03	Low-Flow Showerheads	83,141	0	493,980	5.94
6.04	Temperature-Initiated Shower Flow Restriction Valve w/&w/o LFS	8,637	0	13,461	1.56
6.06	Therm Savings Kit	139,674	0	971,101	6.95
6.07	High Efficiency DHW Boiler (>75 kBTU/h)	394,267	33,809	717,657	1.82
6.08	Process Boiler	253,183	0	124,580	0.49
6.09	MF Central Boiler Tankless Water Heater	18,395	0	28,089	1.53
6.10	Tankless Single-Family & Multi-Family Applications	107,221	43,398	355,913	3.32
6.12	Tankless Water Heater (Non-Res)	32,928	(16,629)	135,539	4.12
6.13	Tankless Water Heater (Res)	3,752	(4,947)	149,792	39.92
6.15	Heat Pump Water Heater	506	842,354	0	-
6.16	MF Central Storage Water Heater	5,798	0	6,389	1.10
6.17	Storage Water Heater (Non-Res)	205,301	0	324,740	1.58
6.18	Storage Water Heater (Res)	13,322	0	249,446	18.72
6.20	Demand Control for Centralized Water Heater Recirculation Pump	16,089	440,908	349,389	21.72
6.24	Hot Water Line Insulation Electric/Gas	42,935	0	479,896	11.18
6.25	Tank Insulation	18,179	0	172,202	9.47
Grand Total		**1,594,703**	**1,399,584**	**4,988,132**	

Flow Restrictors

Water Heaters

- Note: Unit savings represents an average savings.

Questions