Overview Subcommittee Process

CALIFORNIA
TECHNICAL FORUM

AYAD AL-SHAIKH & ANNETTE BEITEL

APRIL 2017

Agenda

- Measure Consolidation Strategic Plan - Update
- Measure Consolidation - Flow Chart
- Measures and Measure Data
  - Statewide Measure List
- Data Used to Understand the Measures
  - Workpapers
  - EEStat / CEDARs
  - Ex Ante Tables
  - What else are we missing…
- Power of the Data
- Subcommittee Expectation

Questions / Comments?

Measure Consolidation Strategic Plan

- Create updated Statewide Measure List (2017)
  - Gather all active (2017) IOU workpapers
  - Review POU TRM
  - Identify DEER Measures being used that do not have IOU workpapers (13)
  - Identify overlapping workpapers
- Prioritize measures for 2017
  - Cal TF meeting (Dec 2017)
- Identify measures that will still be offered in 2018
  - IOU / POU multiple rounds of input
- Result
  - List of Measures for 2017 eTRM review/placement
  - List of Measures for 2018 eTRM review/placement
  - Statewide Measure List that will be updated on a monthly basis
- Big Caveat
  - How will existing conditions baseline policy change the list of retired measures?
  - Changes to code?
  - New dispositions?

Measure Consolidation Strategic Plan

- Consolidation Process
  - Phase 1
    - Use Workpapers to identify differences between Measure Offerings (ie, Measure Application Type, Delivery Type, Offerings).
  - Phase 2
    - Use Ex Ante Measure tables to create Pivot Tables that can compare Measure Permutation differences (ie, savings, cost).
  - Phase 3
    - Reconvene subcommittee if additional discrepancies arise once Measures are in the eTRM template.

Result: Category Groups for eTRM

- 2017 Categories (61 of 75)
  1. Refrigeration
  2. Food Service
  3. Agriculture / Pumps
  4. Water Heating
  5. Appliance or Plug Load
- 2018 Categories (9 of 75)
  - HVAC / Motors
  - Lighting
  - Building Envelope
  - Miscellaneous
  - Pools
  - Process

Category Groups for eTRM
(Number of Measures – 2017 / 2018)

1. Commercial Refrigeration (12 / 9)
2. Food Service (14 / 1)
3. Agriculture / Pumps (5 / 1)
4. Water Heating (17 / 9)
5. Appliance or Plug Load (13 / 15)
6. Lighting (3 / 28)
7. HVAC / Motors (2 / 65)
8. Building Envelope (0 / 4)
9. Miscellaneous (1 / 6)
10. Pools (1 / 5)
11. Process (2 / 12)

70 Measures in 2017 (so far); **155** Measures in 2018
This list does not take into account measures that are being developed.

Measure Consolidation Process

Cal TF Staff

1. Identify Measures
3. Identify WP & POU TRM
4. Identify Sources

- Statewide Measure List

Cal TF Staff

8. Identify WP Differences & Issues
7. Complete Overlapping WP Template

- Workpapers
- CEDARS Data
- Ex Ante Tables

- Excel Summaries
- Pivot Tables
- Decks Summarizing Measures & Tables

IOU/POU Tech Staff

11. Identify Other Potential Issues
12. Challenges to Developing Statewide Measure

- IOU/POU Pre-Subcommittee Meeting

Back for additional consultation, if needed

Subcommittee

2. Subcommittee Formation
9. Address Issues Identified
6. Assess If Data is Sufficient
17. Subcommittee Measure Recommendations
16. Assess Measure Future

Full TF

19. CalTF Peer Review / Affirmation

Cal TF Staff

14,20. Populate Draft & Final eTRM Template and Upload into Repository

CPUC Staff

21. CPUC Approval of Measures and Repository

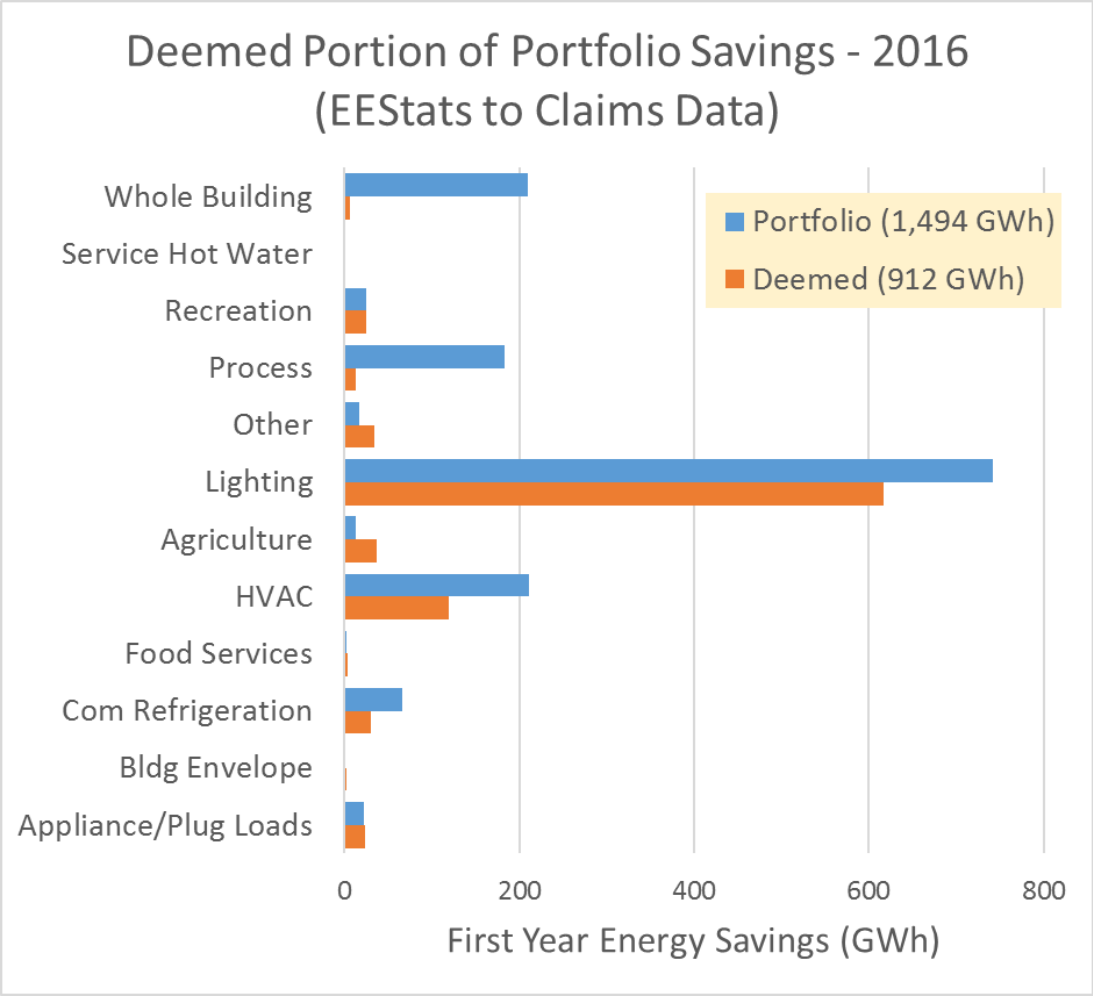
Cal TF Staff

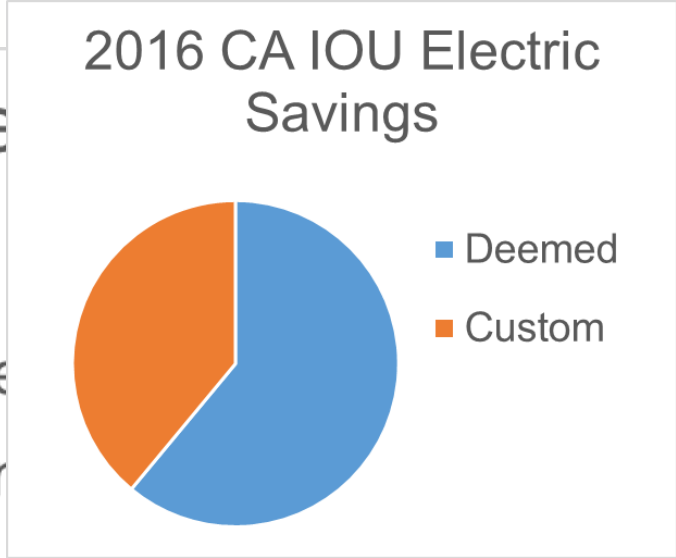
5. Gather / Analyze Sources
10. Compare to Values in Other TRMs (if needed)

13. CPUC Consultation
18. Obtain CPUC Staff Feedback

*Note: Numbers refer to steps in TPP#6.

General Observations
Portfolio vs Deemed Savings - Electric



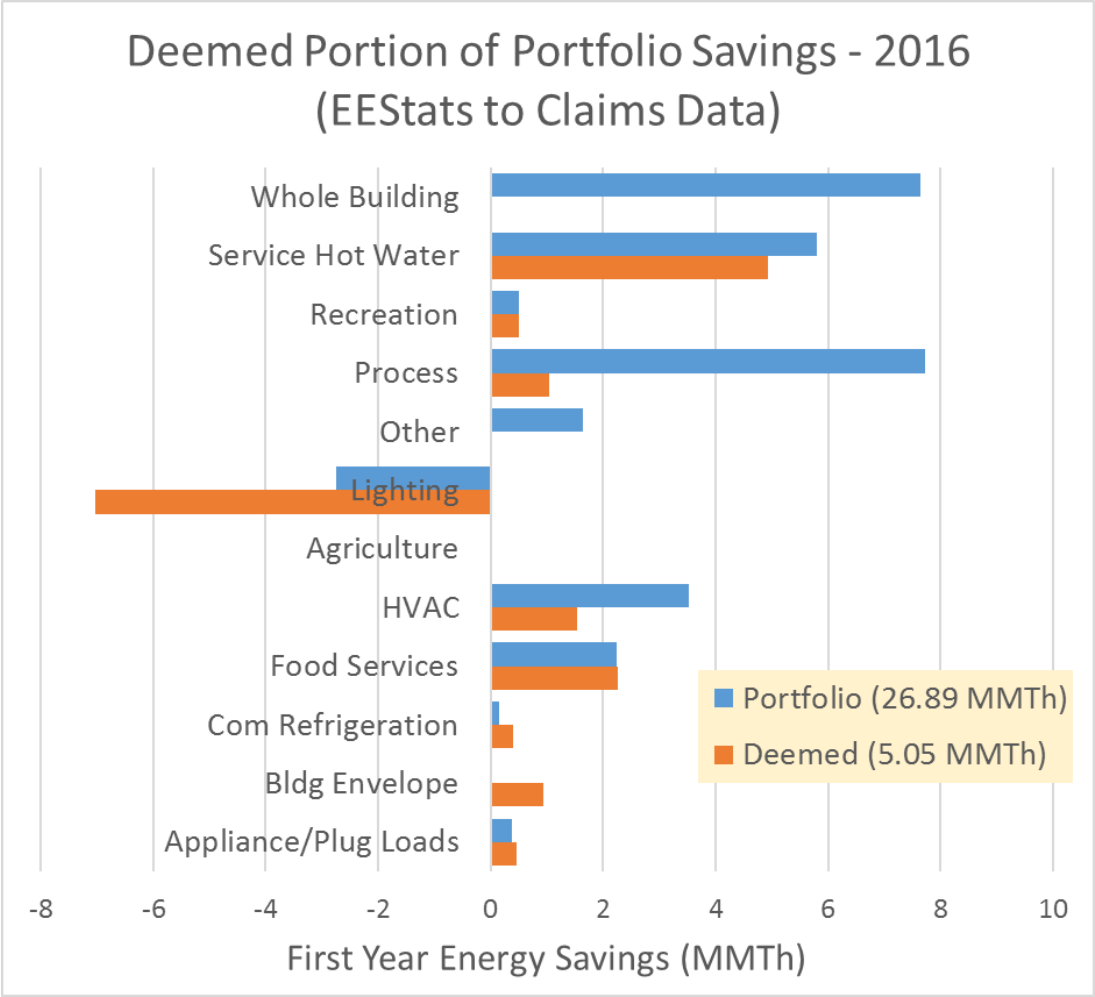


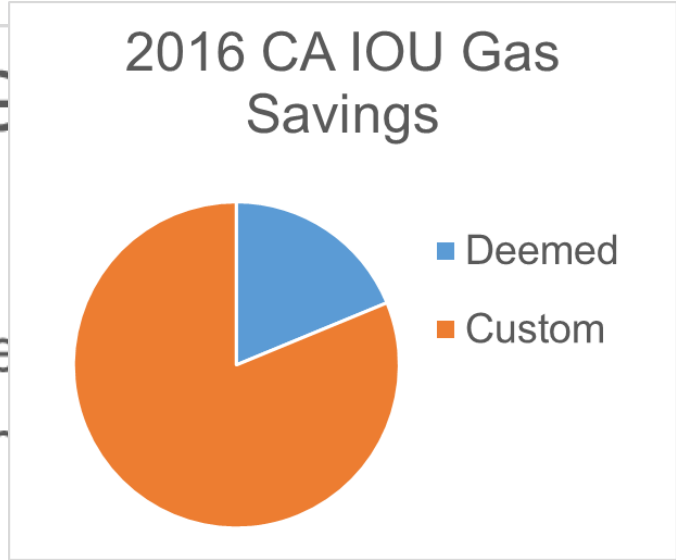
Note: Categories do not align between EEStats and Claims data. (Portfolio should always be greater than Deemed.)

Deemed Portfolio Savings - 2016

Category	Energy (kWh/yr)	Demand (kW)
Lighting	68% (616,618,770)	51% (106,440)
HVAC / Motors	13%	24%
Agr / Pumps	5%	12%
Whole Building	4%	6%
Appl or Plug Load	3%	2%
Com Refrigeration	3%	2%
Pools	3%	2%
Food Service	0.4%	0%
Bldg Envelope	0.2%	1%
Water Heating	0.2%	0%
	911,794,869	208,227

General Observations
Portfolio vs Deemed Savings - Gas





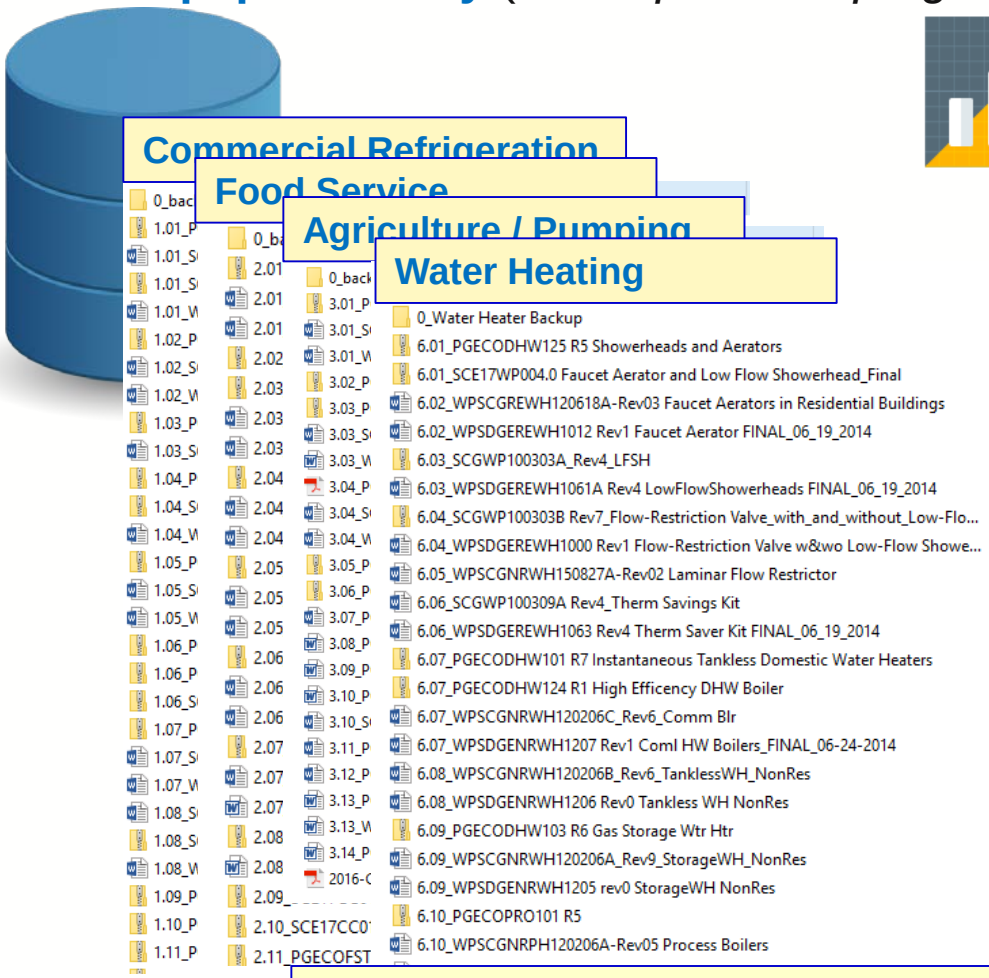
Note: Categories do not align between EEStats and Claims data. (Portfolio should always be greater than Deemed.)

Deemed Portfolio Savings - 2016

Category	Energy (kWh/yr)	Demand (kW)	Energy (therms/yr)
Lighting	68% (616,618,770)	51% (106,440)	-139%
HVAC / Motors	13%	24%	31% (1)
Agr / Pumps	5%	12%	0%
Whole Building	4%	6%	0%
Appl or Plug Load	3%	2%	9%
Com Refrigeration	3%	2%	8%
Pools	3%	2%	10%
Food Service	0.4%	0%	46% (2,2)
Bldg Envelope	0.2%	1%	19%
Water Heating	0.2%	0%	117% (5,900,737)
	911,794,869	208,227	5,048,002

Data Used to Understand the Measures

1. Workpaper Library (*development in progress*)



CALIFORNIA ENERGY EFFICIENCY STATISTICS

2. EE Stats: 2016 Portfolio Savings

- PA, Program
- End-Use, Sub-End-Use
- Climate Zone, Zip Code

3. CEDARS: 2016 Deemed Savings

- Workpaper
- Offering

4. Ex Ante Measure Tables:

- Impact -> Permutations
- Measure
- Implementation
- Measure Cost

5. Are we missing anything that should be included?

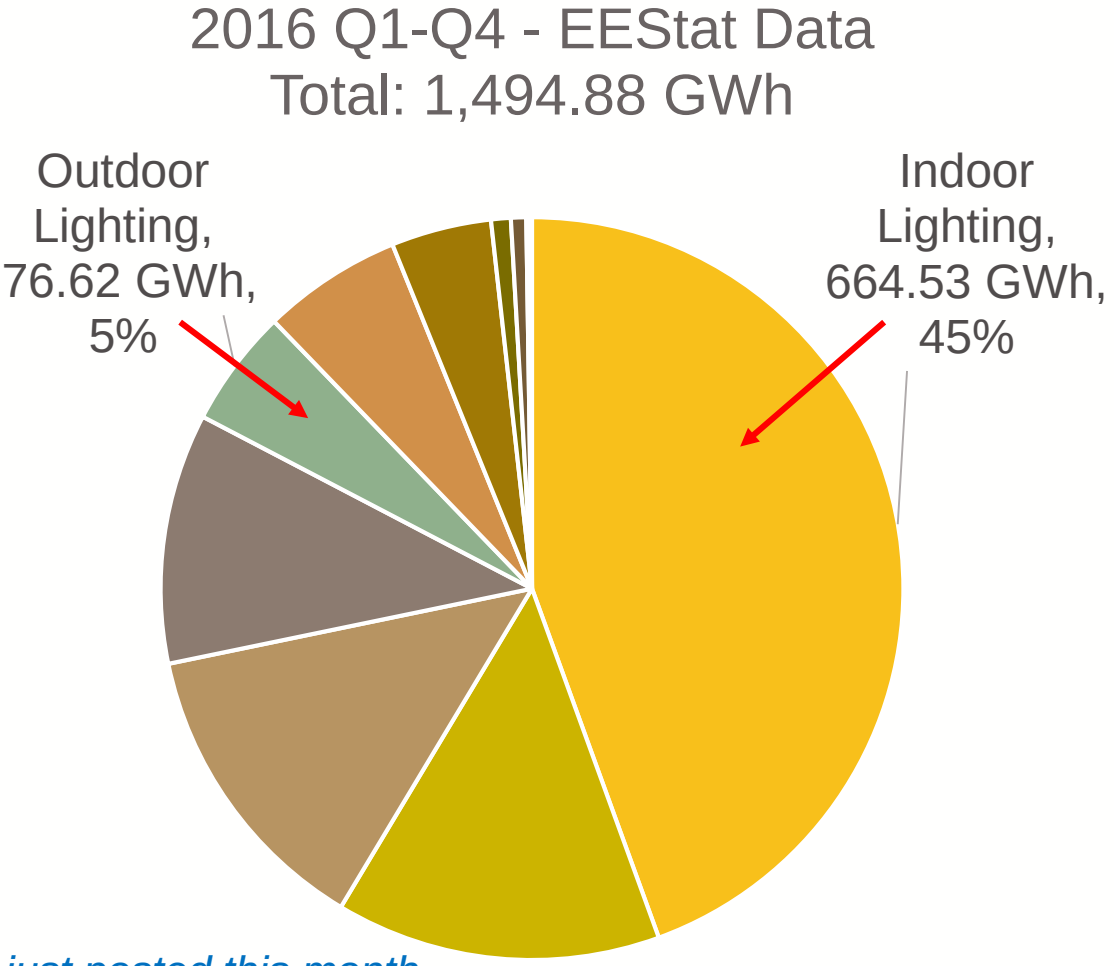
Power of Data

- Reviewed data sources to identify values and differences for measure consolidation process.

  BUT…

- In reviewing data, found that it had value in measure consolidation process beyond identifying similarities and differences across measures AND beyond measure consolidation process
  - Identifying HIMs (high impact measures) for greater focus
  - Use data to maintain savings accuracy
  - Shows opportunities for a statewide approach

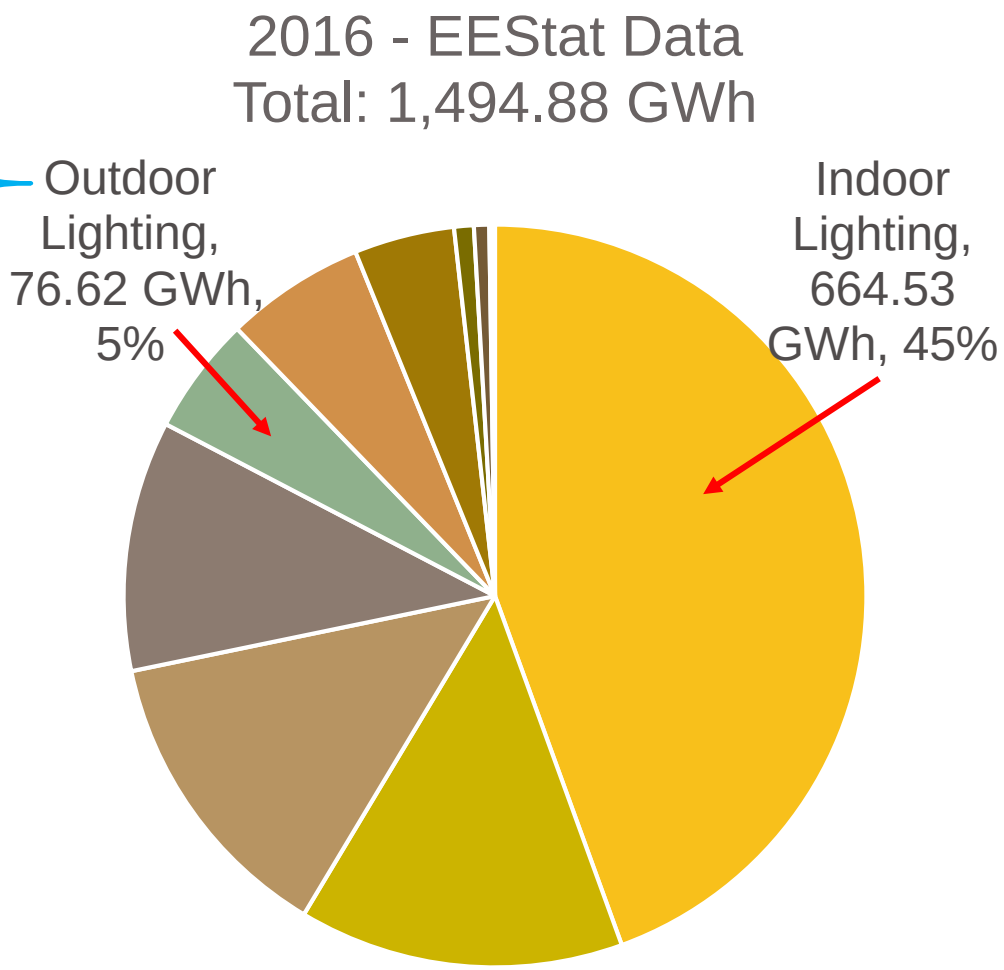
Example: “Power of Data” for Lighting



2016 Q1-Q4 IOU data just posted this month.

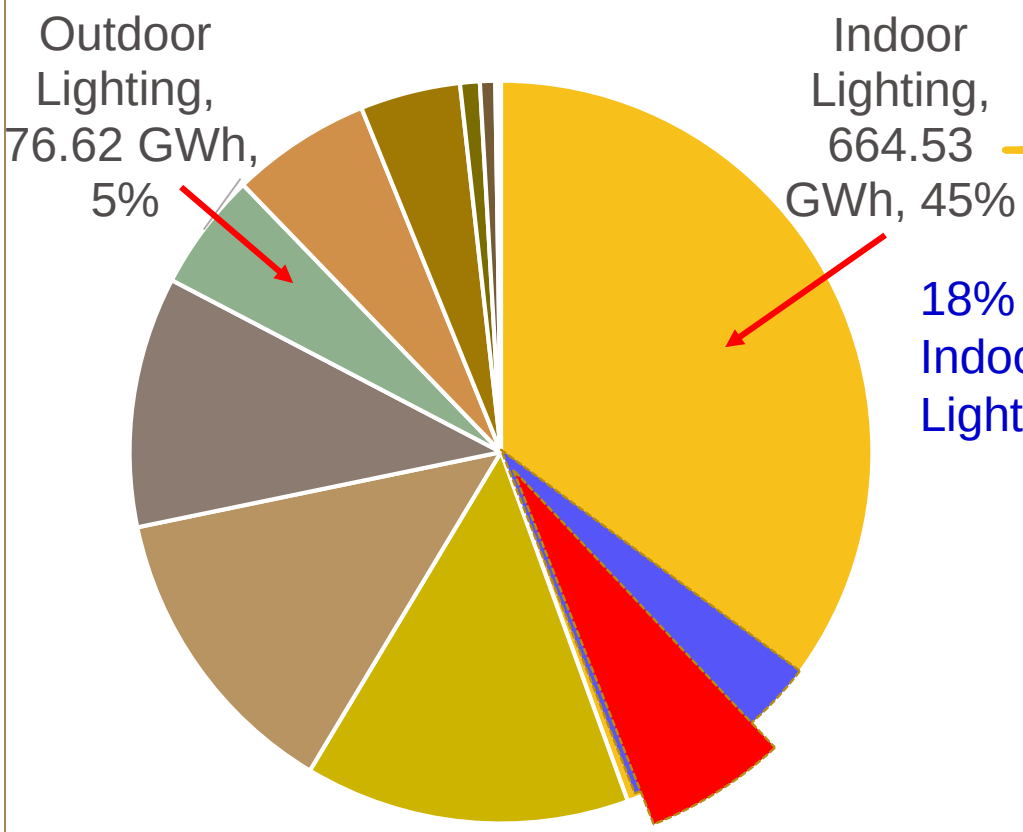
Outdoor Lighting - HIMs

Outdoor Lighting	
Codes And Standards Title 24	1.14
Lighting Outdoor CFL Basic	0.03
Lighting Outdoor CFL Fixture	2.98
Lighting Outdoor CFL Other	0.00
Lighting Outdoor CFL Reflector	0.04
Lighting Outdoor Controls Other	0.36
Lighting Outdoor HID	0.08
Lighting Outdoor Induction	0.33
Lighting Outdoor LED Fixture	51.04
Lighting Outdoor LED Lamp	0.24
Lighting Outdoor LED Other	11.37
Lighting Outdoor LED Streetlight	7.47
Lighting Outdoor Linear Fluorescent	0.03
Lighting Outdoor Other	1.50
Whole Building Retrofit	0.00
Outdoor Lighting Total	**76.62**



Indoor Lighting - HIMs

2016 - EEStat Data
Total: 1,494.88 GWh

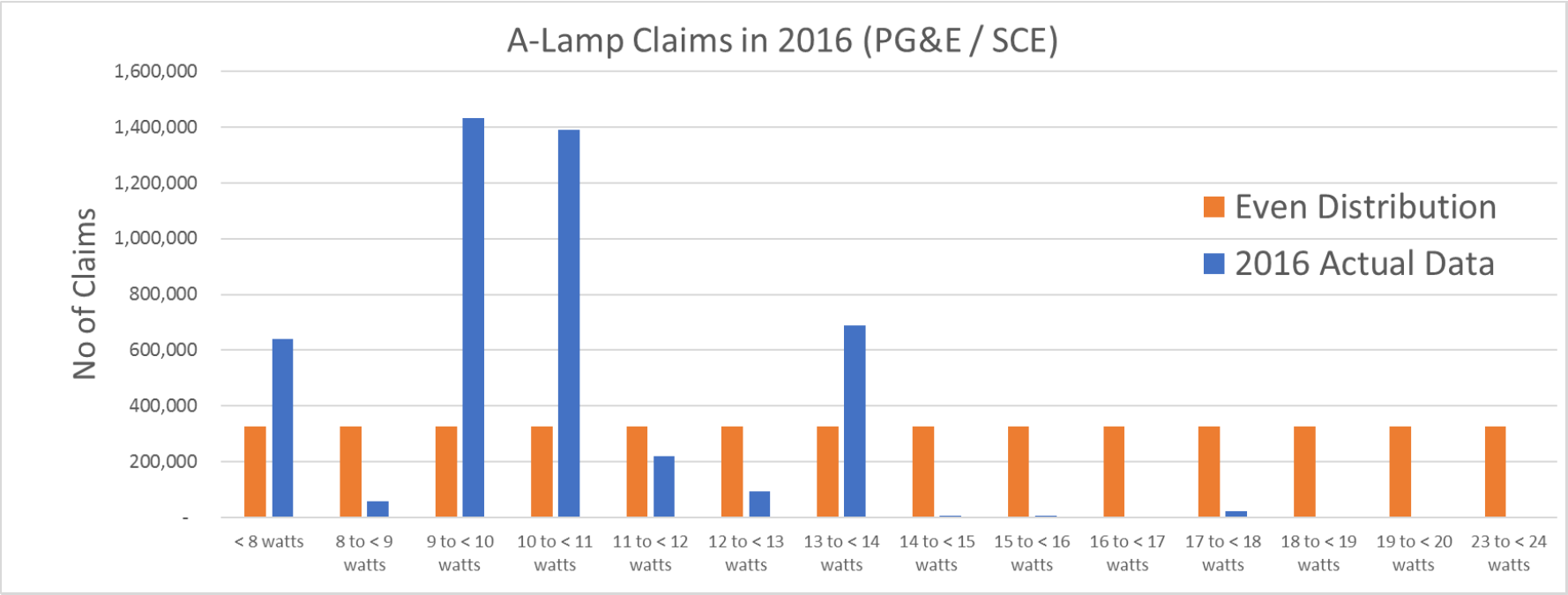


18% of Indoor Lighting

LED A-Lamps (82 GWh)
66% of Indoor LED Lamps

Indoor Lighting	
Lighting Indoor CFL > 30 Watts	2.58
Lighting Indoor CFL 3 Way	13.54
Lighting Indoor CFL A Lamp	31.46
Lighting Indoor CFL Basic	138.87
Lighting Indoor CFL Fixture	1.76
Lighting Indoor CFL Globe	0.00
Lighting Indoor CFL Other	0.00
Lighting Indoor CFL Reflector	4.65
Lighting Indoor Controls Daylighting	0.17
Lighting Indoor Controls Other	1.40
Lighting Indoor Controls Wall Or Ceiling	1.30
Lighting Indoor Fixture Integrated Occu	0.17
Lighting Indoor HID	0.18
Lighting Indoor High Bay Fluorescent	2.21
Lighting Indoor Induction	0.02
Lighting Indoor LED Fixture	125.80
Lighting Indoor LED Lamp	123.43
Lighting Indoor LED Night Light	0.20
Lighting Indoor LED Other	19.97
Lighting Indoor LED Reflector Lamp	124.17
Lighting Indoor LED Signage	0.13
Lighting Indoor Linear Fluorescent	42.10
Lighting Indoor Linear Fluorescent Dela	3.96
Lighting Indoor Other	26.09
Lighting Outdoor LED Fixture	0.03
Lighting Outdoor LED Streetlight	0.28
Other	-
Retrocommissioning Lighting	0.06
Indoor Lighting Total	**664.53**

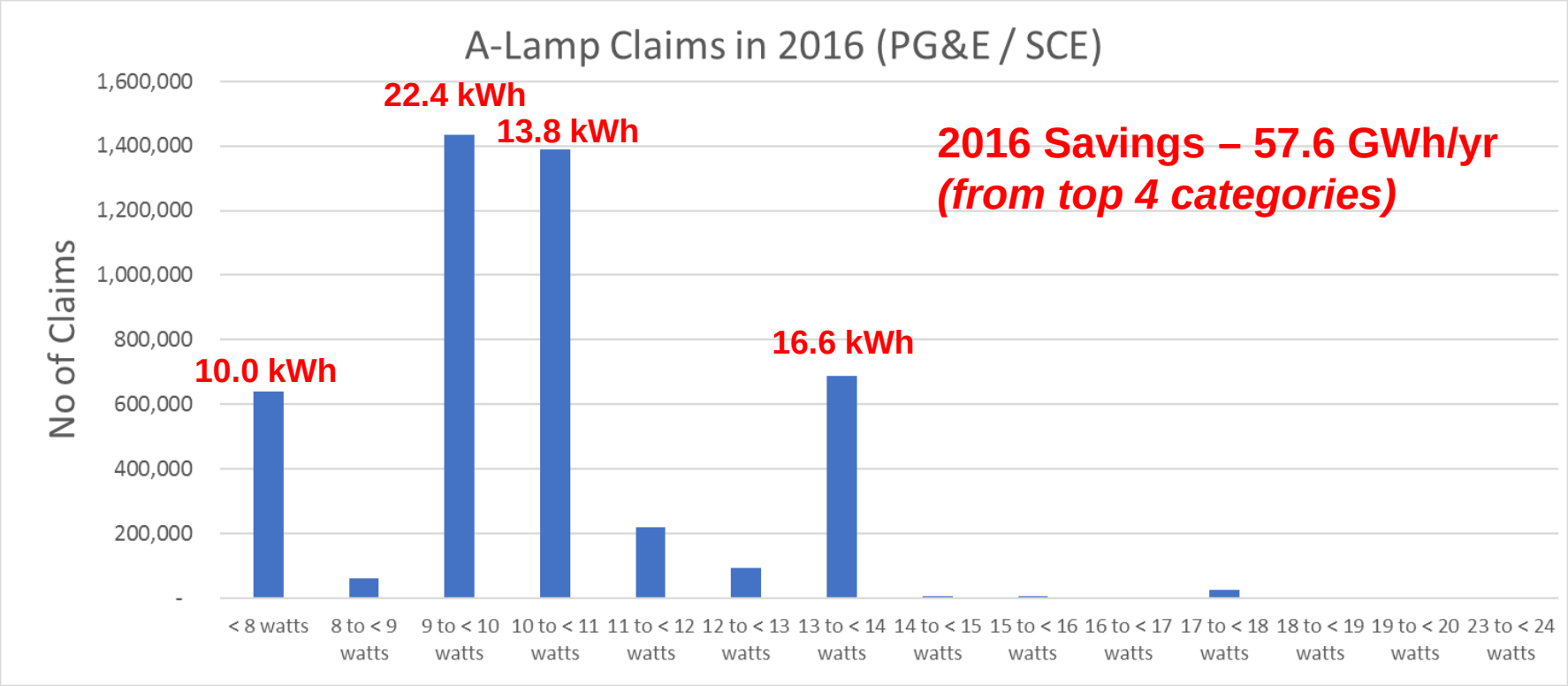
CEDARs / Claims Data Helps Maintain Savings Accuracy



2016 Savings – 82.4 GWh/yr (all A-Lamps)

Confirm that the distribution is not even;
1-Watt bins provide great value to keep savings accurate.

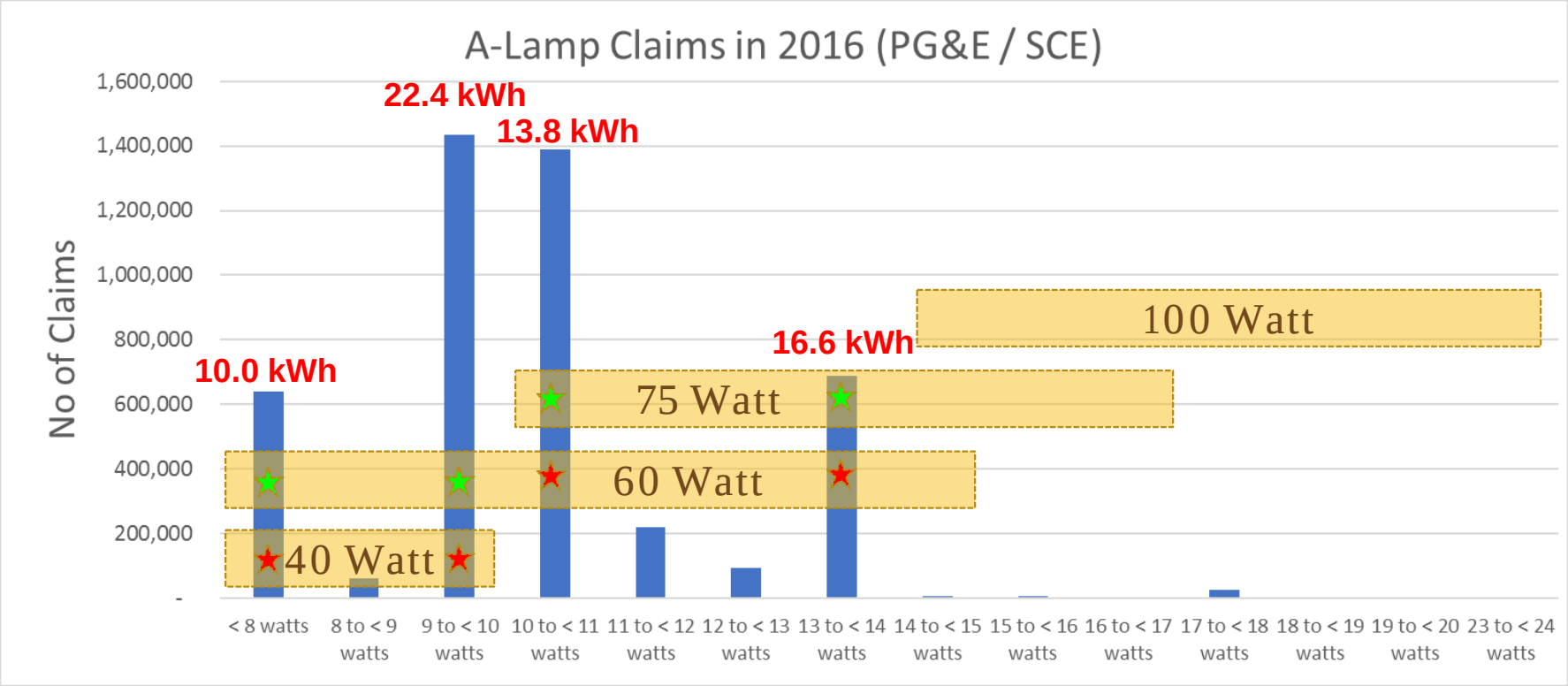
CEDARs / Claims Data Helps Maintain Savings Accuracy



2016 Savings – 82.4 GWh/yr (all A-Lamps)

2016 Savings – 57.6 GWh/yr (top 4 categories)

CEDARs / Claims Data Helps Maintain Savings Accuracy



2016 Savings – 82.4 GWh/yr (all A-Lamps) / 57.6 GWh/yr (top 4 categories)

Unapproved 2017 Range in Top 4 Categories (same quantities)

★ - From ~70 GWh/yr

★ - To ~125 GWh/yr

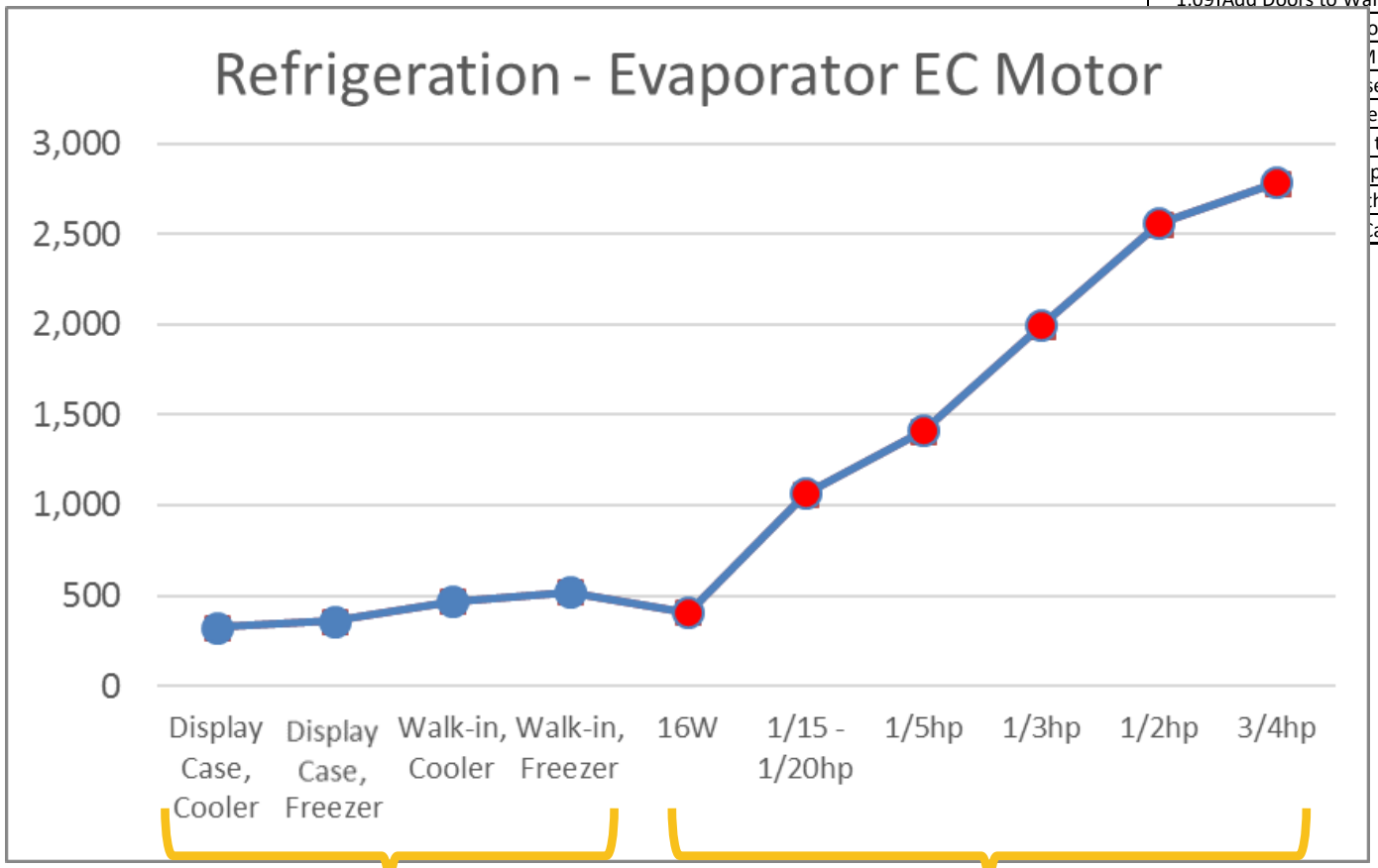
Values are not so important; Range is critical. Potentially, twice the savings from correct baseline.

Power of Data

- What about:
  - How to characterize a measure?
    - Based upon variables that show sensitivity.
    - Example of EC Motor offerings: Application (Freezer/Cooler) vs Rated Motor HP
  - How many permutation are needed?
    - All permutations within 10% of each other.
    - Example of insignificant variation by climate zone from the EC Motor

How Data Can Influence Offerings

Ref No	Name	Total No of Units	Energy (kWh/yr)
1.01	Anti-Sweat Heater (ASH) Controls	21,570	5,022,366
1.02	Anti-Sweat Heater Display Doors	2,424	1,539,951
1.03	Evaporator Fan Motors	1,397	524,845
1.04	Refrigerated Storage Auto Closer	1,760	3,731,458
1.05	Walk-in Cooler Evaporative Fan Cycling an	1,854	1,285,285
1.06	Refrigeration Head Pressure Controls	3,330	2,429,104
1.07	Refrigeration Night Covers	4,134	153,634
1.08	Bare Refrigeration Line Insulation	1,028	42,398
1.09	Add Doors to Walk-in Cooler	433	304,913
	ofit: Multiplex	54	191,502
	M Motor Retrofit	1,023	722,109
	ser: Multiplex	350	197,666
	essure - Single Compresso	214	101,384
	to Reach-In	269	850,046
	pen Case Retrofit	1,771	215,188
	h Doors	4,012	4,896,771
	Case Doors	5,433	2,575,884
			24,784,503



IOU Approach

POU Approach

How Data Can Influence Offerings

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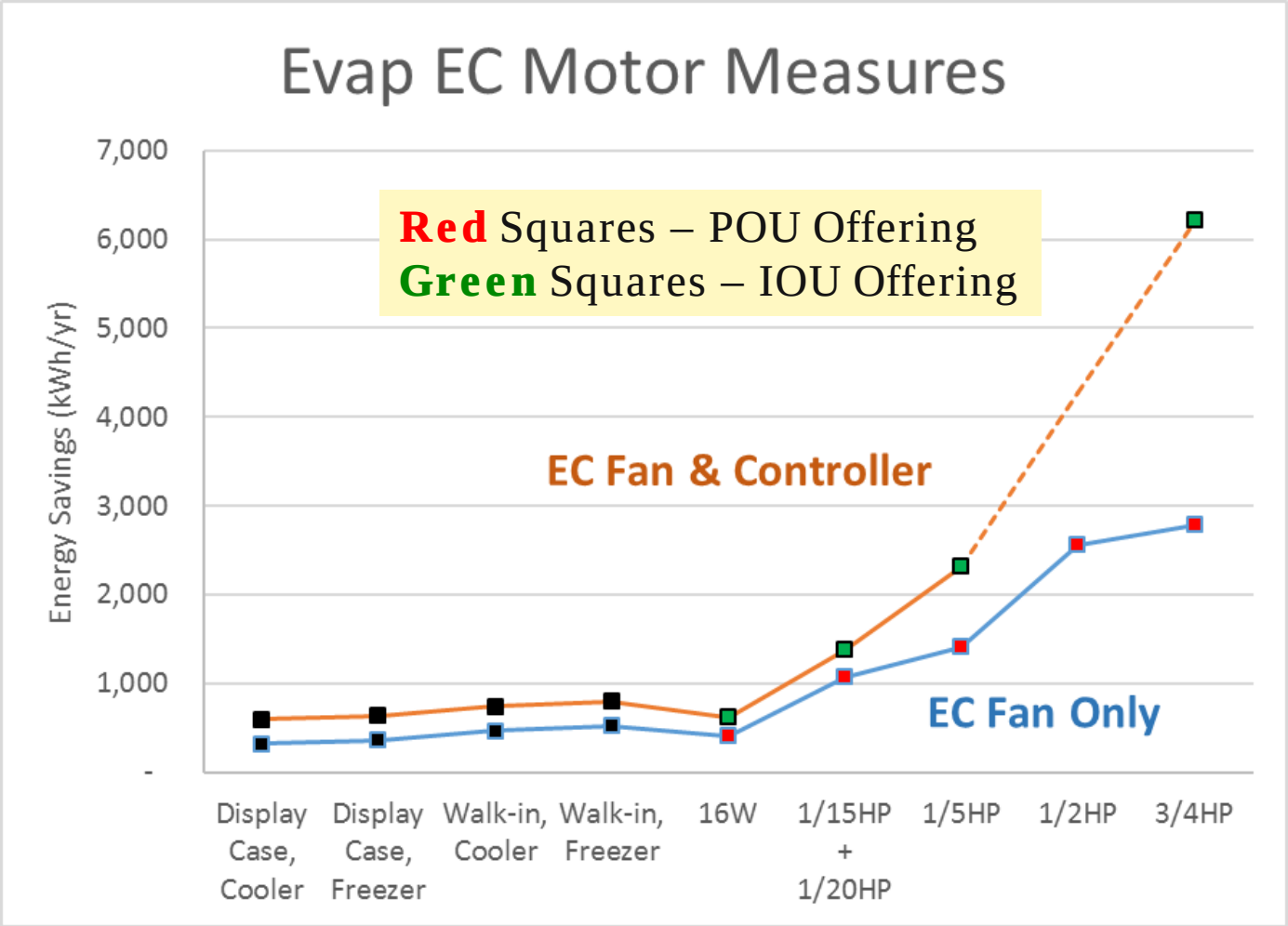

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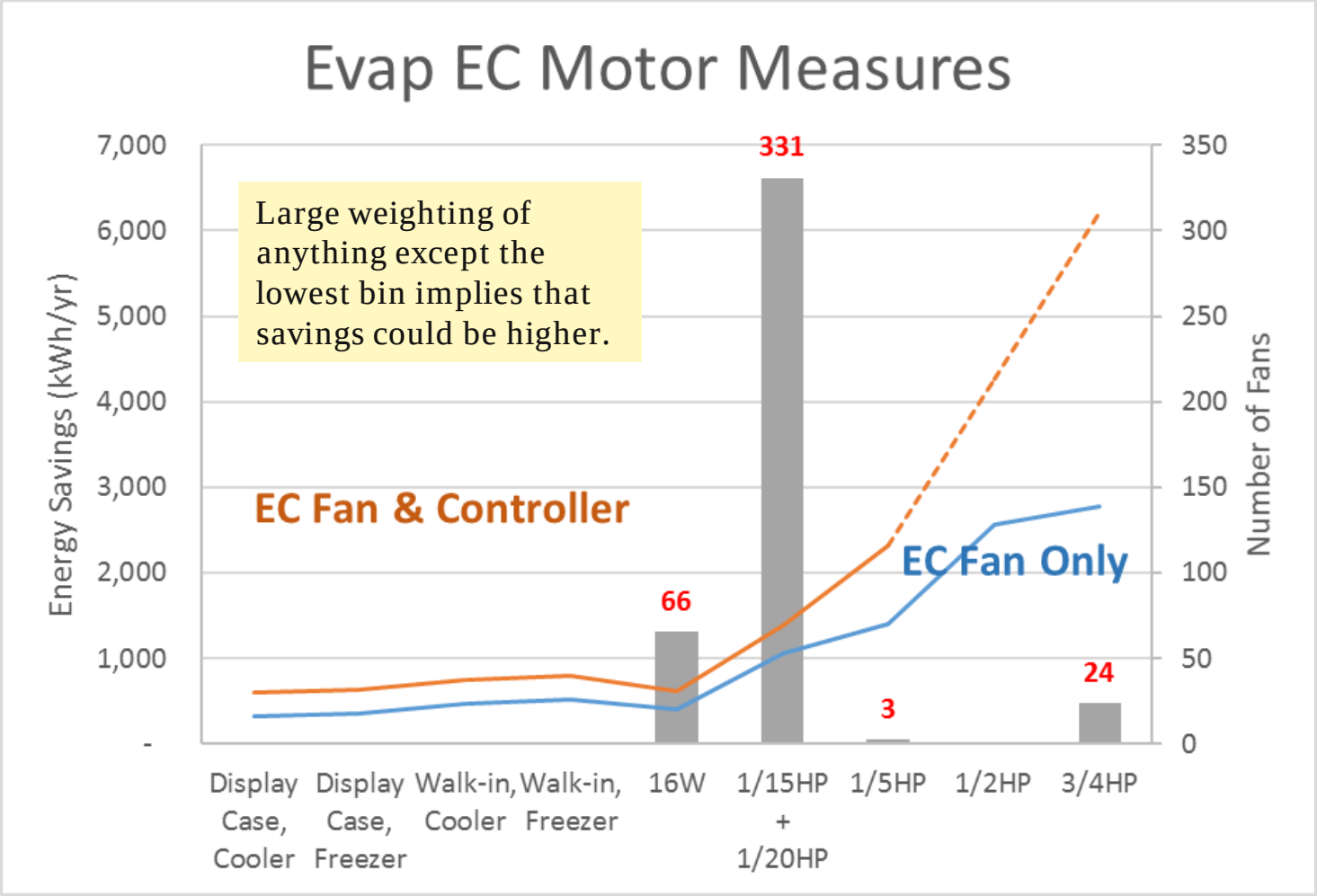


Limit Permutations

Type	REF																												
																						1st Baseline		2nd Baseline					
																						Energy (kWh)	Std Dev (kWh)	Energy (kWh)	Std Dev (kWh)				
UseSubCatego	TechGroup	TechType	WP_No	WP name	WP_R	Measure Code	Offer Description	Norm Unit	MeasAp	NTG	EUL	RUL	GSIA	Delivery	No of Permutations	Average of APreWB kWh	StdDev of APreWB kWh	Average of AStdWB kWh	StdDev of AStdWB kWh										
Equipment	Ref_Storage	HorDisp	PGECOREF109	Evap Fan Motor	R6	R145	Display Case Cooler Evaporator	Each	ROB	0.6	15	5	1	Any	9	-	-	324.6	3.4										
						R176	Display Case Freezer	Each	ROB	0.6	15	5	1	Any	9	-	-	357.5	3.5										
														Any	9		-	465.9	4.9										
														Any	9		-	519.1	14.3										
																	-	416.8	80.4										

Offer Description	No of Permutations	2nd Baseline Energy (kWh) Average of AStdWB kWh	2nd Baseline Std Dev (kWh) StdDev of AStdWB kWh
Display Case Cooler Evaporator	9	324.6	3.4
Display Case Freezer Evaporator	9	357.5	3.5
Walk-in Cooler Evaporator	9	465.9	4.9
Walk-in Freezer Evaporator	9	519.1	14.3

In this case, Permutation are due to Climate Zone. However, variation between CZ's is only 1-3%.

If other parameters (like motor HP or hours of use) vary savings more significantly, consolidation is valuable.

Re-Ask: Are we missing anything that should be included?

Subcommittee Expectation

- Goals for this First Phase
  - Address Measures at a higher level (by category) to:
    - Identify and make recommendations on 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.

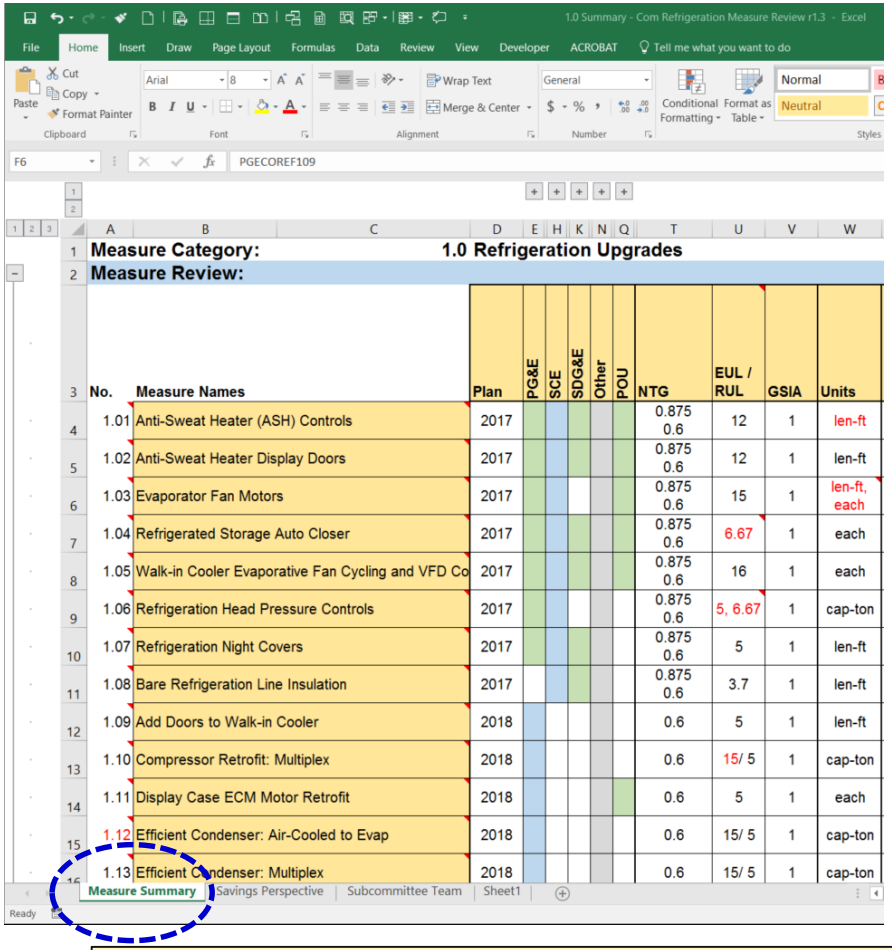
Subcommittee Expectation

- Initial Expectations
  - Cal TF Staff:
    - Creates **summary documentation** prior to meeting.
    - Creates **measure comparison pivot tables** prior to meeting.
    - Provide **access to detailed documentation** if desired
    - Share **common results** between Subcommittees.
  - Subcommittee Members:
    - Read through **summary documentation** prior to meeting.
    - Formulate **opinions on issues** identified prior to the meeting.
    - Raise **other concerns** that should be looked at in further detail.

Subcommittee Materials

- Category Summary File
  - Measure Review
  - Cross-Cutting Issues
  - Measure-Specific Issues
- Category Savings Perspective
- Subcommittee Team List
- Library of Workpapers (*in progress*)
- Ex Ante Data Pivot Tables (*in progress*)

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
    - **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.

Global Issue Discussion

- EUL definition for an REA Measure
- Cost methodology best practices
- Peak period will be changing
- Interactive Effects clarity

Question: What other “Global Issues” need to be addressed that cut across multiple Measure categories?

Category Presentations

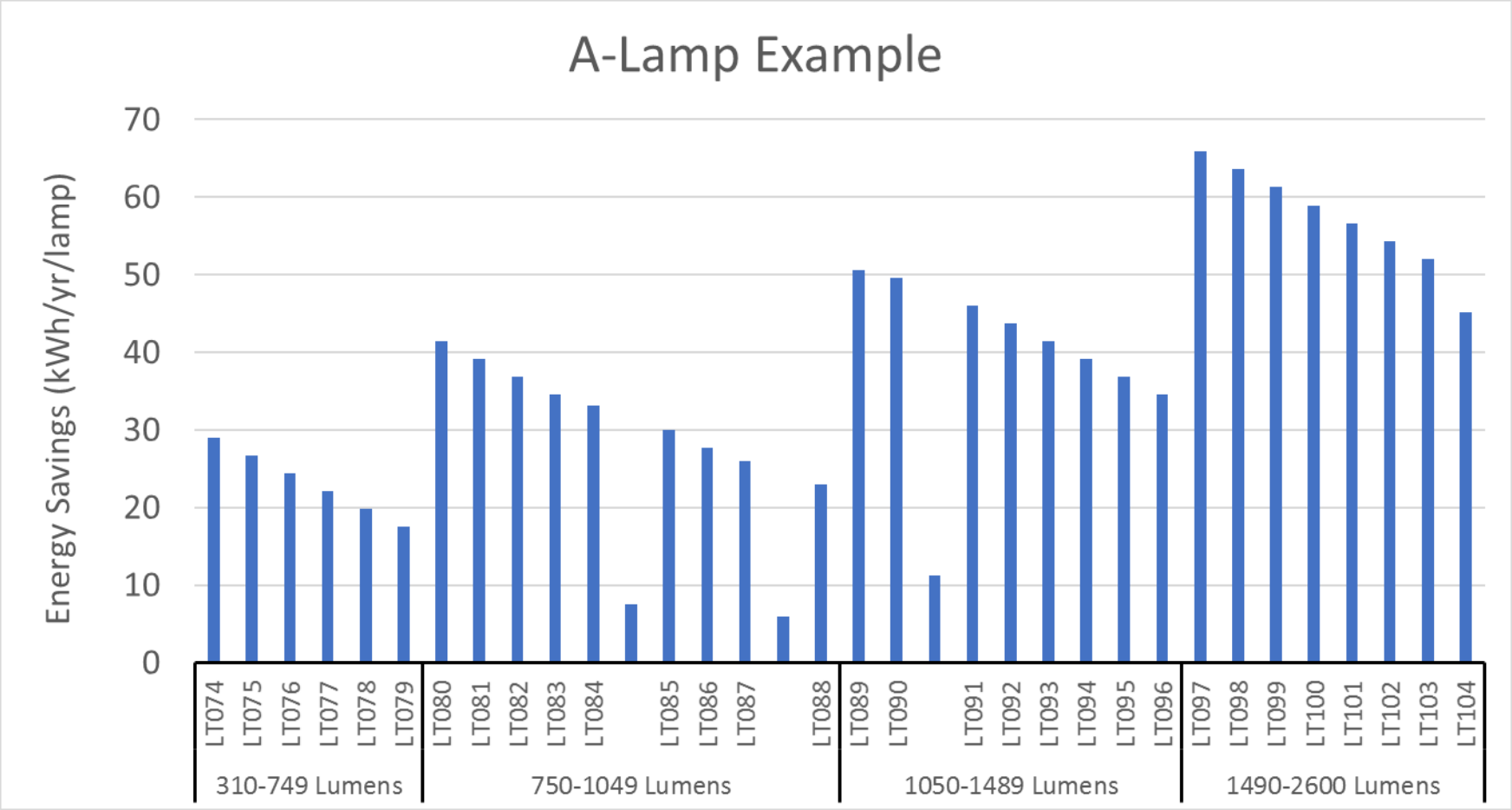
1. Commercial Refrigeration
   - Addressing offering or permutation differences and issues
2. Water Heating
   - Address categorization, offerings/tiers, and baseline efficiencies
   - Measure application type agreement
3. Agriculture / Pumps
   - Dispositions / evaluation adjustments
4. Food Service
   - Assumption agreement

Questions

Back-up Slides

- A-Lamp Propose (savings and isolumen bins)
- EUL of REA detail
- Summary File review

Lighting Back-Up



EUL Definition for an REA Measure

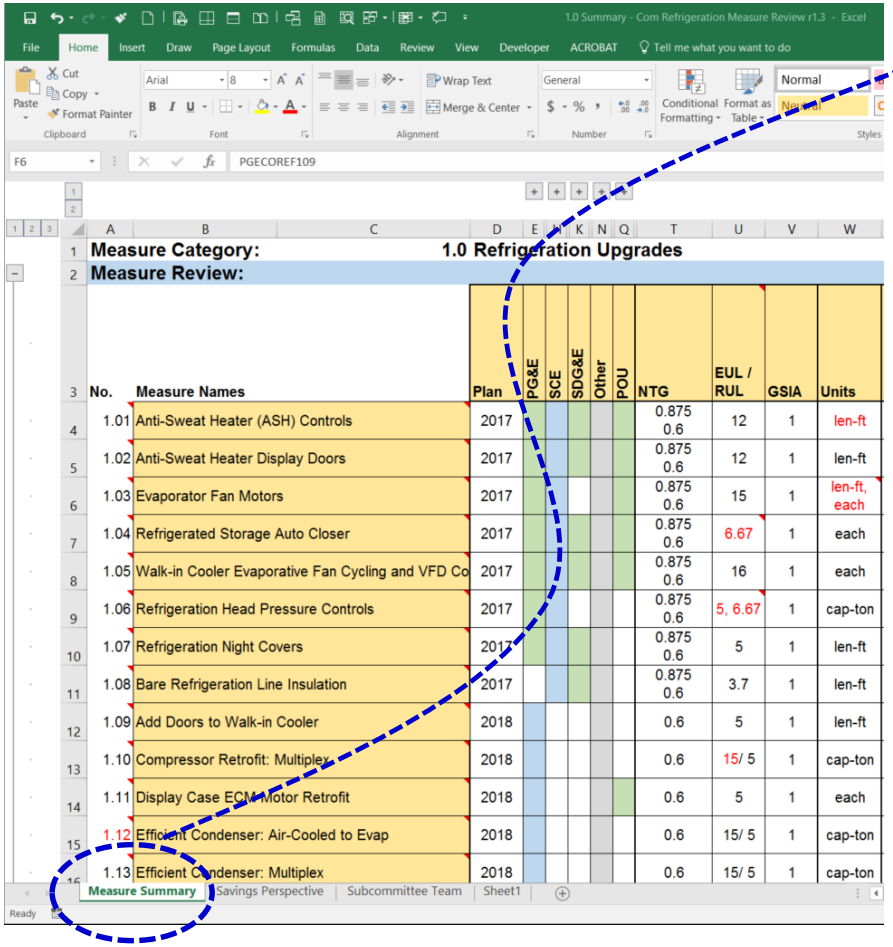
- Restated in Resolution E-4807.

Effective Useful Life (EUL) adjustments:

In their comments SDG&E requests that the Commission reject the Commission staff proposed adjustments measure EUL values in their claims.[72] Commission staff agrees with some of the SDG&E comments but disagrees with others. In general, Commission staff disagrees with SDG&E that there is a lack of clarity in the direction or timing relative to the EUL allowed to be claimed for REA measures. The guidance document covering REA measures was developed jointly by Commission staff and the IOUs and was first distributed in draft form to all IOUs in January of 2013 with the first final "living" document published for public distribution in July of 2014.[73] In that document the REA section provides that "The EUL of REA measures is capped at the RUL of the equipment being retrofitted. This means that REA measures utilize the RUL of the pre-existing equipment up to and not to exceed the EUL for the REA measure." From

- Originally from the 2013 document, "Early Retirement Using Preponderance of Evidence"
  - Minimum of EUL of REA Measure OR RUL of retrofit equipment

Category Summary File



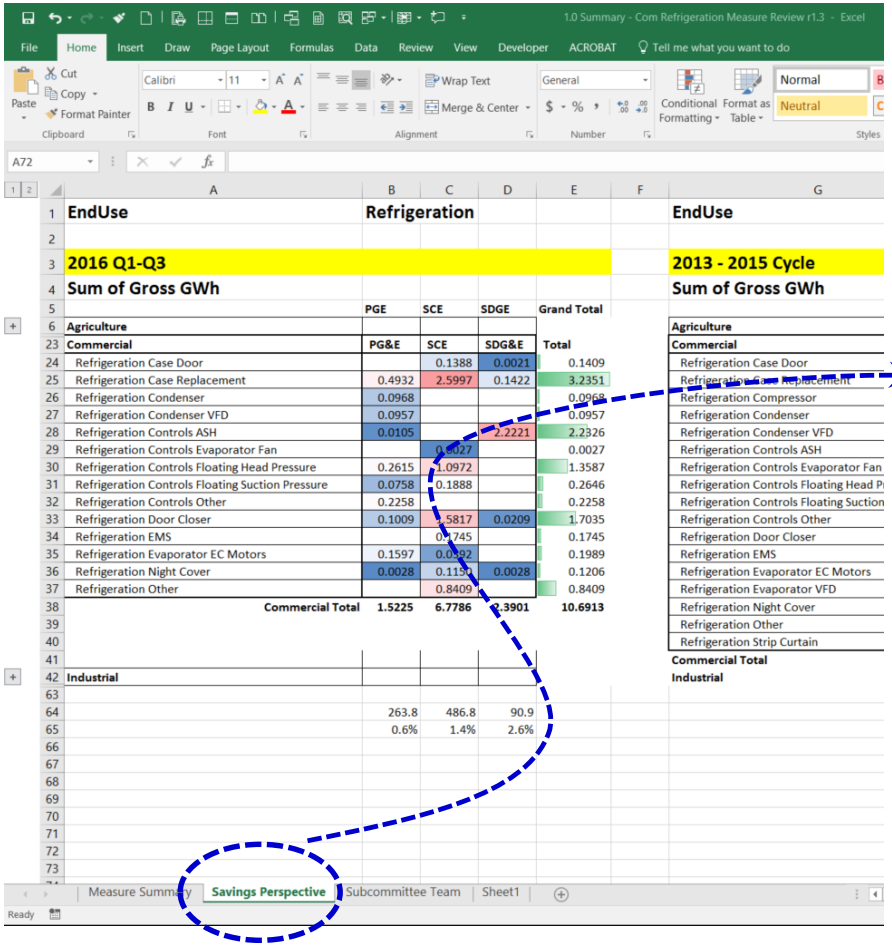
Measure Category: 1.0 Refrigeration Upgrades

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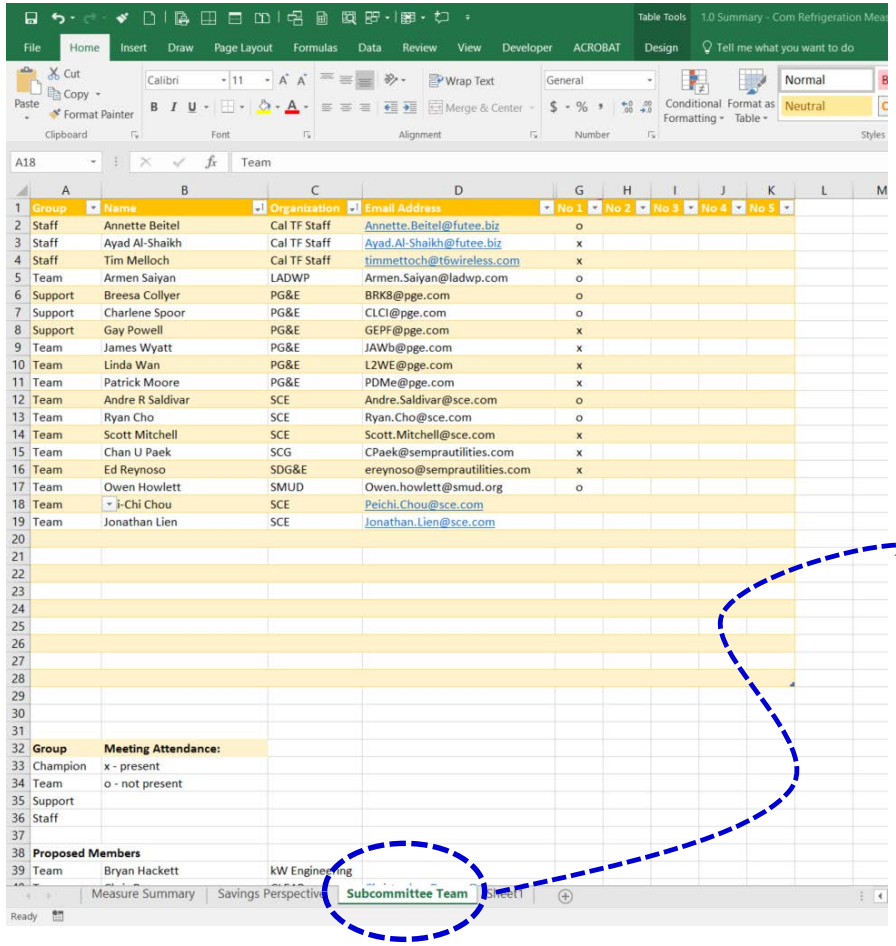
Category Summary File



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	j-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

- 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

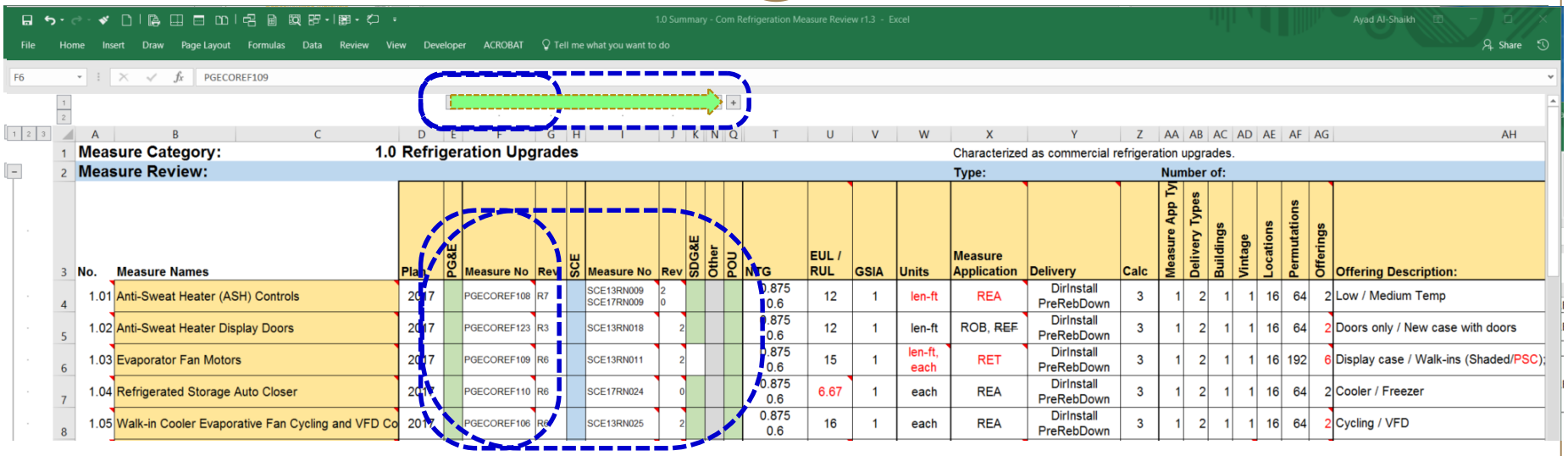
Ayad Al-Shaikh:
This work paper focuses on ASH controls based on humidity to prevent condensation ("sweating") on the glass surface of refrigerated display cases. ASHs are electric resistance heaters installed at the following locations:
- Case mullion to prevent condensation on metal surfaces (Figure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



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	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	R4		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

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
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- 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

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

F6 PGECOREF109

Measure Category: **1.0 Refrigeration Upgrades** Characterized as commercial refrigeration upgrades

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