

Appliance / Plug Load Cal TF Tier 1 Presentation



CALIFORNIA

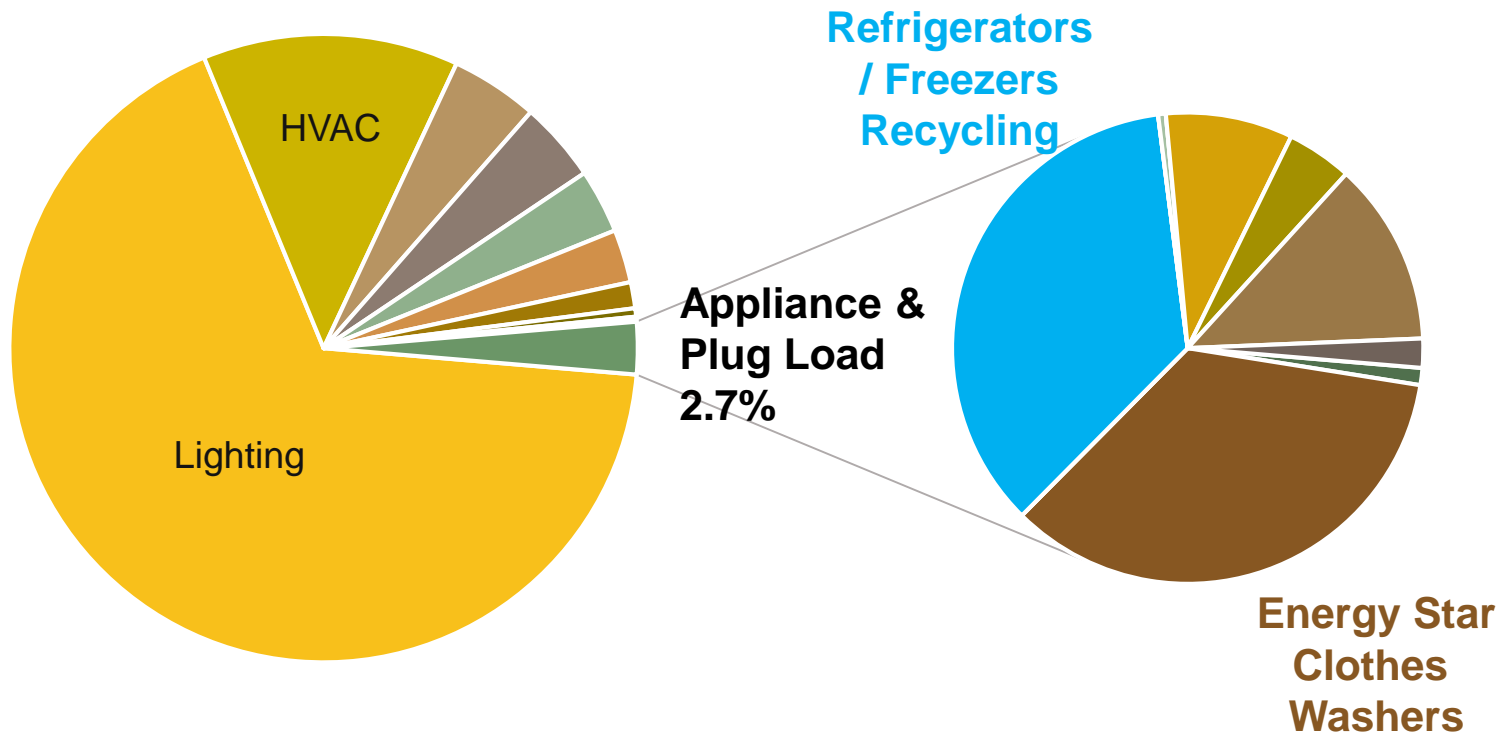
TECHNICAL FORUM

**ROGER BAKER
AYAD AL-SHAikh
NOVEMBER 2017**

Appliance / Plug Load Savings

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2016 CA Deemed Electric Savings (Total = 912 GWh/yr)

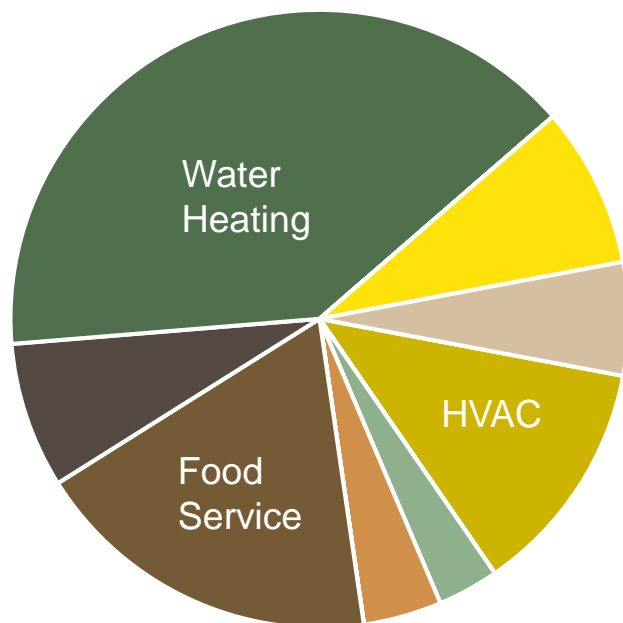


* Data Source: 2016 CA IOU claims data.

Appliance / Plug Load Savings

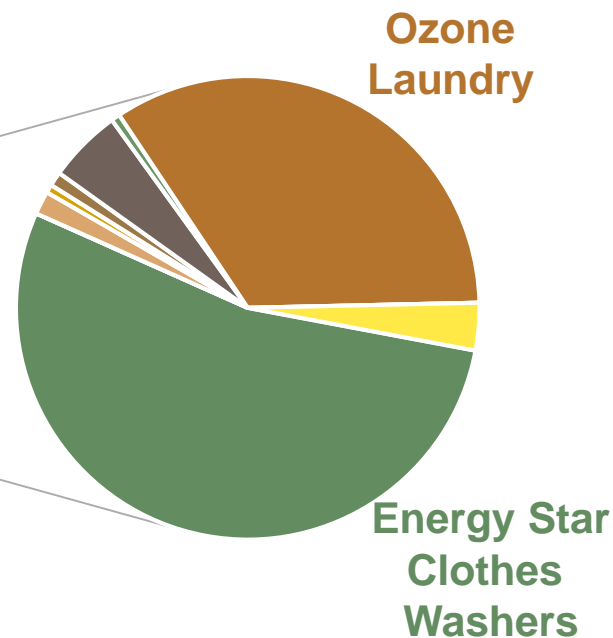
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2016 CA Deemed Gas Savings
(Total = 12 MMTh/yr – without penalty)



(Lighting Penalty Removed)

**Appliance &
Plug Loads
5.6%**



(Refrigerator-Freezer /
Power Strip Penalty Removed)

* Data Source: 2016 CA IOU claims data.

Appliance and Plug Load




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- Active Measures in the Appliance / Plug Load category
 - ✦ Smart Power Strips
 - ✦ Tier 2 Advanced Power Strips
 - ✦ Power Management Software for Networked Computers
 - ✦ ENERGY STAR Refrigerator
 - ✦ Refrigerator and Freezer Recycling*
 - ✦ ENERGY STAR Clothes Washer
 - ✦ Retail Products Platform
 - ✦ ENERGY STAR Clothes Dryer
 - ✦ Ozone Laundry Non-residential
 - ✦ Residential ENERGY STAR Dishwasher
 - ✦ Vending and Beverage Merchandise Controller
- (* 2018 measure)

Appliance and Plug Load

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No.	Measure Names	Plan	PG&E	SCE	SDG&E	SCG	POU
7.01	Energy Star Refrigerator	2017					
7.02	Smart/Connected Refrigerator	2018					
7.03	Refrigerator and Freezer Recycling	2018					
7.04	Energy Star Clothes Dryers	2017					
7.05	Energy Star Clothes Washers	2017					
7.06	Cold Water Default Clothes Washer	N/A					
7.07	Non Res High Efficiency Clothes Washer in MF Properties	No Votes					
7.08	Clothes Washer Recycling	No Votes					
7.09	Ozone Laundry Nonresidential	2017					
7.10	Res Ozone Laundry	2017					
7.11	Industrial CO2 Laundry	No Votes					
7.12	Residential Energy Star Dishwasher	2018					
7.13	Under Counter Type Commercial Dishwasher	2018					
7.14	Retail Products Platform	2017					
7.15	Power Management Software for Networked Computers	2017					
7.16	Smart Power Strips	2017					
7.17	Tier 2 Advanced Power Strip	2017					
7.18	Vending and Beverage Merchandise Controller	2017					

 Lead Workpaper
 Support Workpaper
 Missing Workpaper

Appliance and Plug Load

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No.	Measure Names	Plan	PG&E	SCE	SDG&E	SCG	POU
7.01	Energy Star Refrigerator	2017					
7.02	Smart/Connected Refrigerator	2018					
7.03	Refrigerator and Freezer Recycling	2018					
7.04	Energy Star Clothes Dryers	2017					
7.05	Energy Star Clothes Washers	2017					
7.06	Cold Water Default Clothes Washer	Sunset					
7.07	Non Res High Efficiency Clothes Washer in MF Properties	No Votes					
7.08	Clothes Washer Recycling	No Votes					
7.09	Ozone Laundry Nonresidential	2017					
7.10	Res Ozone Laundry	2017					
7.11	Industrial CO2 Laundry	No Votes					
7.12	Residential Energy Star Dishwasher	2018					
7.13	Under Counter Type Commercial Dishwasher	2018					
7.14	Retail Products Platform	2017					
7.14a	Room Air Conditioners	Added as part of RPP					
7.14b	Room Air Cleaners	Added as part of RPP					
7.15	Power Management Software for Networked Computers	2017					
7.16	Smart / Advanced Power Strips	2017					
7.17	Tier 2 Advanced Power Strip	Consolidated					
7.18	Vending and Beverage Merchandise Controller	2017					

	Lead Workpaper
	Support Workpaper
	Missing Workpaper

Measure Consensus

7.01 – ENERGY STAR Refrigerator

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- Offering
 - ❑ Two tiers - ENERGY STAR qualified, and ENERGY STAR Most Efficient
- Stage 1 Issues
 - ❑ DEER methodology uses DOE UEC for base and efficient models
 - ❑ Then applies a “DEER Basis Factor” to savings
 - ✦ Reflects complex energy interactions between refrigerator and its environment
 - Refrigerator impacts HVAC energy use
 - Refrigerator performance varies by external temperature
 - ✦ Varies by climate zone and residential building type
 - ✦ Values used in work papers range from 0.64 to 1.45, average value = 0.94
- Measure Extension
 - ❑ Measure exists in POU TRM
 - ❑ Incorporates HVAC Interactive effects
 - ❑ Does not incorporate refrigerator performance factor
- Stage 2 Issues
 - ❑ *Address DEER Basis factor with EAR team*

Blue text = First time that item is mentioned
Italics text = Item that has not been completed

7.01 – ENERGY STAR Refrigerator

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- Refrigerator TRM Review

State	Uses DOE Test Method	Applies Adjustment to Unit Savings	Comment
Connecticut	Yes	No	
Hawaii	Yes	No	
Maine	Yes	Yes	98.8% factor based on in situ metering versus DOE calculation study
Massachusetts	Yes	No	
Minnesota	Yes	No	
New York	Yes	Yes	If old refrigerator not recycled, applies 80% “Market Effects” factor to savings
Pennsylvania	Yes	No	
Rhode Island	Yes	No	
Texas	Yes	No	
Vermont	Yes	No	
Illinois	Yes	No	

Measure Consensus

7.03 –Refrigerator Recycling

- Offering
 - Pick up and recycling of operable refrigerators and freezers
- Stage 1 Issues
 - IOUs have discontinued the program
 - ✦ Determined that market has transformed
 - ✦ Program is no longer cost effective
 - ✦ This could be tied to requirement that recycling be coupled with new refrigerator rebate
- Measure Extension
 - POUs still offer program
- Stage 2 Issues
 - *Continue research into market design, particularly decoupling recycling from new refrigerator purchase*

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- Offering
 - Two tiers – ENERGY STAR, ENERGY STAR Most Efficient
- Stage 1 Issues
 - Measure is part of RPP
 - Emerging Technology Award Clothes Dryer had unfavorable disposition by Staff in original RPP workpaper
 - ✦ Was replaced with ENERGY STAR Most Efficient Tier
- Measure Extension
 - POU TRM contains Heat Pump Clothes Dryer only
- Stage 2 Issues
 - *Address with EAR team derivation of interactive effects*
 - ✦ *DEER team provides sensible and latent factors for appliances*
 - ✦ *Unsure how this addresses location of dryer, or treatment of interaction*
 - *Latent heat is usually removed by air conditioning system, but does not fully displace space heating*

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Measure Consensus

7.05 – ENERGY STAR Clothes Washer

- Offering
 - Two tiers – ENERGY STAR and ENERGY STAR Most Efficient
- Stage 1 Issues
 - EAR disposition for clothes washer recycling raised concerns regarding use of USDOE wash cycle values
 - ✦ Disposition discussed values from RASS and SCE metering study
 - ✦ Same disposition acknowledged DEER relies on DOE methods for residential clothes washers to ensure consistent treatment of base case (Federal standard) and efficient case UEC
 - ✦ This same logic should be extensible to non-residential clothes washers subject to DOE methods
 - Measure savings attributable to clothes washers under DOE methods actually consist of water heating and dryer savings
 - ✦ DOE assumes all end uses are electric
 - ✦ Need to parse out savings value and convert to natural gas savings based on appropriate saturation values from RASS
- Measure Extension
 - POU TRM has clothes washers
- Stage 2 Issues
 - *Address interactive effects with EAR team, given multiple affected end uses and washer/dryer locations*

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7.05 – Energy Star Clothes Washers

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- RASS Summary by IOU

		Gas WH	Electric WH
PG&E	Gas Dryer	40%	0%
SCE		72%	0%
SDG&E		66%	1%
SCG		78%	0%
PG&E	Electric Dryer	58%	2%
SCE		21%	7%
SDG&E		31%	1%
SCG		21%	1%

Source: Clothes Washers Calculations_R6.xls (PG&E)

- Offering
 - ❑ Ozone system is add-on to existing commercial clothes washing machines
 - ❑ Reduces hot water requirement, partially displaces detergents and bleach requirements
 - ❑ Can reduce number of rinse cycles needed
- Stage 1 Issues
 - ❑ Certain values not available due to lack of data
 - ✦ Ozone generator energy use
 - ✦ Hot water pumping savings
 - ✦ Clothes dryer impacts (if any)
 - ✦ Washer energy savings (due to reduced rinse requirements)
- Measure Extension
 - ❑ Would be available to POU, not in POU TRM today
- Stage 2 Issues
 - ❑ *Conduct additional evaluation to assess ancillary savings/impacts*

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- Offering

- Three tiers under consideration, including ENERGY STAR qualified, ENERGY STAR Most Efficient, and “≤199 kWh” (SCG work paper)

- Stage 1 Issues

- Unable to verify DEER measure determination
 - ✦ SCG work paper interpolates between 260 kWh and 180 kWh standard-size
 - ✦ No 180 kWh models exist in market
- Dishwasher savings from DOE largely inure to water heater
 - ✦ Machine energy use often increases while hot water use decreases

- Measure Extension

- POU TRM has Dishwasher measure
- Savings based on ENERGY STAR Calculator

- Stage 2 Issues

- *Address DEER measure savings derivation with EAR team*

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7.12 – ENERGY STAR Residential Dishwasher

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- Standard-size Dishwasher Consumption

Level	Energy Use (kWh/yr)	Water Use (gal/cyc)	Standby Power (W)	Per Cycle Energy Use Component		
				Total (kWh/cyc)	Water Heating (kWh/cyc)	Machine + Drying (kWh/cyc)
Baseline	307	5.00	0.0	1.43	0.82	0.61
1	295	4.25	0.5	1.35	0.70	0.65
2	280	3.50	0.5	1.28	0.58	0.70
3	234	3.10	0.5	1.07	0.51	0.56
4	180	2.22	0.5	0.82	0.37	0.45
TSD inputs						
Cycles per Year		215				
Standby Hours		8,551	hr/yr			
Csp(water)		0.0024	kWh/gal-F			
T(rise)		70	F			
Eff(water heater,elec)		102%	issue with TSD assumption			

Recreated from Table 7.2.3 of TSD

Measure Consensus

7.14 – Retail Products Platform

- Offering
 - ❑ Variety of ENERGY STAR products are incented at the retailer level by participating retailers on multi-jurisdictional level
 - ❑ Offerings include Freezers, Clothes Washers and Dryers, Room Air Conditioners, Room Air Cleaners, Refrigerators, Dehumidifiers (2018)
 - ❑ Offerings are updated annually
 - ❑ Two tiers generally available: ENERGY STAR and ENERGY STAR Most Efficient
- Stage 1 Issues
 - ❑ RPP is a platform that combines measure offerings with a delivery mechanism
 - ❑ Need to deconstruct into measures while preserving the unique aspects of RPP
- Measure Extension
 - ❑ Some measures already in POU TRM, any that are not will be designed to accommodate POU use
 - ❑ RPP itself, as a delivery platform, can be adopted by POU irrespective of eTRM
- Stage 2 Issues
 - ❑ *Measure updates will occur annually for RPP; agile process needed to incorporate this in timely manner*

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- Offering
 - ❑ Controllers are add-on to existing equipment, including refrigerated beverage machines, snack machines, and refrigerated beverage coolers
- Stage 1 Issues
 - ❑ Work papers rely on DEER savings hours = 4 hours/day.
 - ❑ Equates to 16.7% annual energy savings of controlled load
 - ❑ This value does not comport with any other jurisdictional TRM
 - ✦ Annual savings closer to 86%
 - ✦ No evaluation or monitoring done in CA to support current value
 - ❑ No interactive savings, assumes all savings occur when building unoccupied
- Measure Extension
 - ❑ POU measure exists, relies on higher savings percent
- Stage 2 Issues
 - ❑ *Evaluation research should inform an updated hours of savings, as well as potential interactive impacts*

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- Offering

- Centralized power management control system for networked desktop computers and monitors in offices, schools

- Stage 1 Issues

- Prior evaluation recommends first-year energy savings be decayed to reflect technological advances
 - ✦ Current work paper uses 5% decay value
 - ✦ Alternatively, evaluation recommends utilities update UEC value annually (using primary data collection), but this could prove costly
 - ✦ This measure probably has a shrinking window of opportunity due to advances in embedded PC power management, increased use of laptops and thin-clients
- Attempt to “collapse” interactive effects from 16 climate zones to one statewide value

- Stage 2 Issues

- *Determine whether to sunset this measure altogether in next 3-5 years*

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- Offering

- Smart Strips (Tier 1) – shuts power off to designated devices when “master” device is shut off
- Advanced Power Strips (Tier 2) – uses multiple sensor methods and algorithms to shut off devices when non-use is detected

- Stage 1 Issues

- Looking to consolidate both categories of power strips
- Develop savings methodology that is based on feature sets
 - ✦ Permits savings determination for control methods that are either newly on market or don't exist today
 - Bluetooth
 - Networked control
 - Geo-fencing

- Stage 2 Issues

- *Develop appropriate estimation/documentation methodology for emerging control methods*

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Next Steps

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- Affirmation of this category January 25, 2018
- Any questions, feedback, or issues, please reach out!
 - Roger Baker (Roger.Baker@futee.biz)
 - Ayad Al-Shaikh (Ayad.AlShaikh@futee.biz)

Thank You!

Appendix

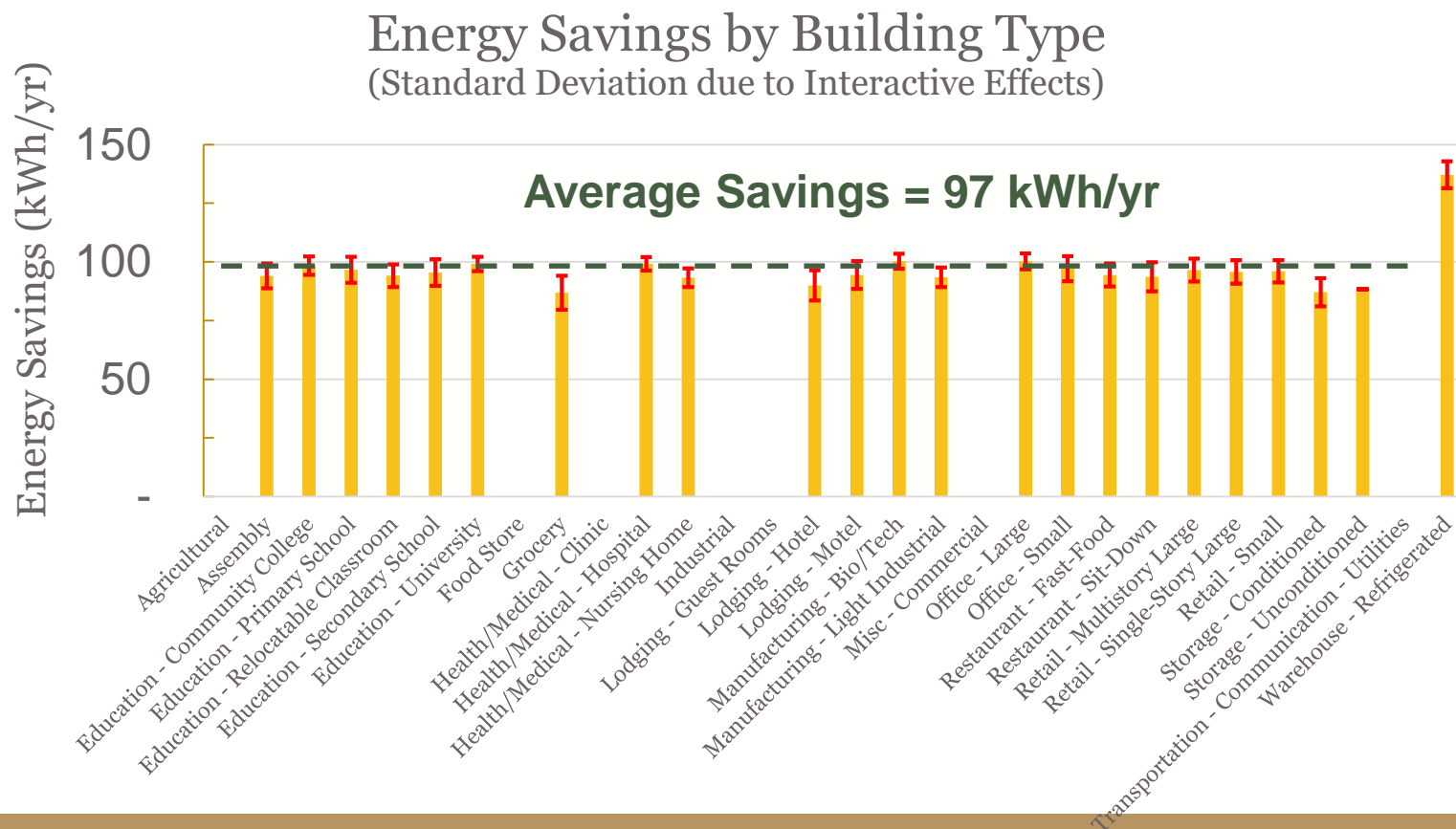
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Measure Specific Issue

7.15 – Networked PC Power Management

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- Examine parameters that effect savings:
 - Climate Zone/Interactive Effects (vary by CZ and PA), Bldg Type



Measure Specific Issue

7.15 – Networked PC Power Management

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- Base IOU savings currently sourced from this data set which has a variation that is much larger

CPM Energy Savings – Source Data

