Lighting and Water Heating
Cal TF Tier 2 Presentation

CALIFORNIA
TECHNICAL FORUM

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Lighting and Water Heating Measure Affirmation

"Cal TF affirms the subcommittee recommendations regarding 'Stage 1 Issues' for Lighting and Water Heating Measures."

- 4.48 LED in Walk-in Coolers & Freezers
- 6.19 – DHW Loop Temp Control
- *(Hold)* 6.18b Demand Control for Centralized Water Heater Recirculation Pump

Measure Consensus
4.48 LED in Walk-in Coolers & Freezers

- Offering (WPs Reviewed: PGE3PLTG171R2)
  - Replacing fluorescent and incandescent lighting systems in refrigerated areas of a grocery store with LED luminaires
  - *Ten iterations of the measure to account for the range of existing lighting technologies and the impact of case temperature (i.e. cooler/freezer) on refrigeration system efficiency*
    - *32W to 24W, 60W to 38W, 75W to 38W, 100W to 38W, 220W to 80W*
    - *Each wattage analyzed separately for cooler or freezer savings to account for refrigeration system efficiency*
  - Building Types: Grocery
  - Measure Application Type: ROB (replace-on-burnout)/ NR (normal replacement)
  - Vintage: Ex (Note: Not New)
  - Climate Zone: CZ01 – CZ16
  - Delivery: PreRebDown

Black text = Current state of the consolidated measure
Blue text = Changing and / or first time item is mentioned
Italics text = Item that has not been completed

Measure Consensus
4.48 LED in Walk-in Coolers & Freezers

- Stage 1 Issues
  - Measure didn't report savings in 2017 Q1-Q3. Confirmed to be moving forward.
  - *Text methodology for indirect savings does not match Ex Ante values in Rev.2.*
    - *The Rev.1 workpaper described savings linked to the refrigeration efficiencies that are documented in DOE2.2 (grocery prototype model).*
    - ~~*The Rev.2 savings are calculated in the more traditional manner of using the interactive effects table. Because gas savings are included in this table, it seems unlikely that interactive effects are specific to walk-in coolers.*~~
  - EUL ID is correct, but confirm approach:
    - 50,000 hrs/yr @ 4,710 hrs/uyr (Grocery) = 10.6 yrs
    - EUL ID has 16 yrs
    - Measure should claim the lessor of these values
  - Change NormUnit from Each to Fixture
    - Workpaper use "luminaires"

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Measure Consensus
4.48 LED in Walk-in Coolers & Freezers

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- Measure Extension
  - Added measure for POUs (electric measure)
- Stage 2 Issues
  - *Calculation: Review hours of use, interactive effects*
  - *Cost: Review variation due to CZ/Delivery/Offering, methodology for keeping costs up-to-date*
  - *Baseline: Existing conditions opportunity, document baselines*
  - *Permutation collapse*

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Input Consensus - 4.48 LED in Walk-in Coolers & Freezers

- Measure Permutations

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
BldgType	Gro	Gro	No Value	No Value	No Value
BldgVintage	Any	Any	No Value	No Value	No Value
BldgLoc	Any	Any	No Value	No Value	No Value
BldgHVAC	cWtd	cWtd	No Value	No Value	No Value

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	ROB	ROB	No Value	No Value	No Value
NormUnit	Fixture	Each	No Value	No Value	No Value
EUL ID	GrocDisp-FixtLtg-LED	GrocDisp-FixtLtg-LED	No Value	No Value	No Value
NTGR	Com-Default>2yrs	Com-Default>2yrs	No Value	No Value	No Value
DeliveryType	PreRebDown	PreRebDown	No Value	No Value	No Value
GSIA	Com-LED-PGE	Com-LED-PGE	No Value	No Value	No Value

Measure Consensus
6.17/6.19 – DHW Loop Temp Control

- Offering
  - MF ~~and Lodging Only~~; Gas Only
  - Existing Buildings with Gas Water Heating
  - Implementation: Retrofit Add-On (REA/AOE), PreRebDown
- Stage 1 Issues
  - No expected climate zone (CZ) variation
  - ~~Use PG&E methodology~~
  - Modify savings from PG&E approach (based on RASS usage and simple equation with assumed reduced loop temperature)
    - SCG used eQUEST models (not available or reviewed), SCGWP100315A, Rev1
    - Test case for transition from eQUEST to Open Studio
- Measure Extension
  - Added measure for POUs (gas measure)
- Stage 2 Issues
  - *Expand to other commercial building types – hospitals, offices, etc.*
    - *Expected Q3-Q4, 2018*

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6.19 - DHW Loop Temp Control, MFm

- 6.19 - DHW Loop Temp Control, MFm – Methodology
  - SCGWP100315A, Rev1

Table 2: DHW Draw Profile

Hourly Demand Profile						
Hour	Typical Weekday		Typical Saturday		Typical Sunday	
	Load (%)	time fired (min)	Load (%)	time fired (min)	Load (%)	time fired (min)
Mdnt -1 AM	5.00	3.00	8.04	4.82	8.06	4.84
1 - 2 AM	5.00	3.00	5.36	3.22	5.37	3.22
2 - 3 AM	5.00	3.00	5.00	3.00	5.00	3.00
3 - 4 AM	5.00	3.00	5.00	3.00	5.00	3.00
4 - 5 AM	5.00	3.00	5.00	3.00	5.00	3.00
5 - 6 AM	20.00	12.00	5.00	3.00	5.00	3.00
6 - 7 AM	80.00	48.00	5.73	3.44	5.00	3.00
7 - 8 AM	70.25	42.15	11.54	6.92	5.36	3.22
8 - 9 AM	50.00	30.00	26.63	15.98	8.92	5.35
9 - 10 AM	40.25	24.15	46.51	27.91	19.56	11.74
10 - 11 AM	20.00	12.00	47.14	28.28	26.91	16.15
11 - Noon	20.00	12.00	32.56	19.54	22.74	13.64
Noon - 1PM	20.00	12.00	31.55	18.93	30.26	18.16
1 - 2 PM	29.75	17.85	46.81	28.09	43.32	25.99
2 - 3 PM	50.00	30.00	75.51	45.31	56.75	34.05
3 - 4 PM	50.00	30.00	71.54	42.92	64.55	38.73
4 - 5 PM	70.25	42.15	68.71	41.23	46.94	28.16
5 - 6 PM	70.25	42.15	63.08	37.85	33.68	20.21
6 - 7 PM	40.25	24.15	55.11	33.07	25.32	15.19
7 - 8 PM	40.25	24.15	46.65	27.99	20.65	12.39
8 - 9 PM	20.00	12.00	38.15	22.89	19.95	11.97
9 - 10 PM	20.00	12.00	29.75	17.85	19.95	11.97
10 - 11 PM	10.25	6.15	21.78	13.07	19.02	11.41
11 - Mdnt	10.25	6.15	13.84	8.30	13.54	8.12
	31.5%	454.1 minutes	31.9%	459.6 minutes	21.5%	309.5 minutes
	7.57 hrs/day		7.66 hrs/day		5.16 hrs/day	
	37.84 hrs/wk		7.66 hrs/wk		5.16 hrs/wk	
	50.7 hrs/wk					
	Annual EFLH = 2641 hrs/yr					

Input Consensus
6.17/6.19 – DHW Loop Temp Control

- Measure Permutations

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
BldgType	MFm	MFm,Htl	No Value	MFm	No Value
BldgVintage	Ex	Ex	No Value	Ex	No Value
BldgLoc	Any	Any	No Value	CZ06,CZ07,CZ08,CZ10,CZ14,CZ15	No Value
BldgHVAC	cWtd	rWtd cWtd	No Value	Any	No Value

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	REA	REA	No Value	RET	No Value
NormUnit	Household	Each	No Value	Household	No Value
EUL ID	SHW-EMS	SHW-EMS	No Value	WtrHt-HtPmp	No Value
RUL ID	Motors-pump	No Value	No Value	No Value	No Value
NTGR	Res-Default>2yrs	Com-Default>2yrs Res-Default>2	No Value	Res-Default>2	No Value
DeliveryType	PreRebDown	PreRebDown	No Value	PreRebDown	No Value
GSIA	Def-GSIA	Def-GSIA	No Value	No Value	No Value

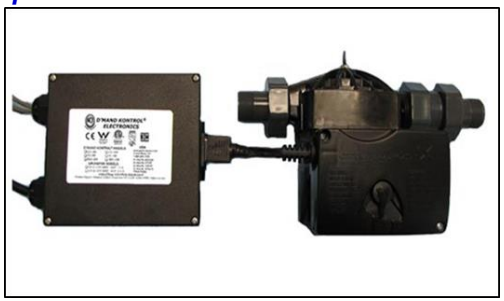
Lighting and Water Heating Measure Affirmation

"Cal TF affirms the subcommittee recommendations regarding 'Stage 1 Issues' for Lighting and Water Heating Measures."

- 4.48 LED in Walk-in Coolers & Freezers
- 6.19 – DHW Loop Temp Control
- (*Hold*) 6.18b Demand Control for Centralized Water Heater Recirculation Pump

Measure Consensus
6.18b – DHW Pump Demand Control

- Offering
  - MF and Com Bldgs; Existing Buildings with Central Water Heater
    - EUD = University Dorm
    - Htl = Hotel
    - Mtl = Motel
    - Nrs = Health/Medial – Nursing Home
  - Gas-reduced operation; electric from pump only
  - Implementation: Early Retirement (ER) / Accelerated Replacement (AR);
    - Direct Install (DI) and PreRebDown
- Stage 1 Issues
  - Consider the treatment of MFm-Common Area as “commercial”, but still keep as “Res”
    - Recommended to submit updated NTG and EUL that are Res (for MFm)
  - Measure update (next slide); uses MFm prototype models
  - *Cost Methodology update (next slide); from updated PG&E approach*
- Measure Extension
  - Added measure for POUs
- Stage 2 Issues
  - *Commercial methodology matches MFm approach*



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6.18a - Demand Control for Central Water Heaters - Methodology

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Workpaper	Old ODE MF Workpaper	New **Multifamily** Recirc Pump Control Workpaper	New **Commercial** Recirc Pump Control Workpaper (Campus Housing)
Baseline consumption	Baseline consumption taken from measurements of a specific subset of buildings; small sample size	Baseline consumption taken from DEER models that take into account building information and characteristics of the entire sector (operation hours, load shapes, etc, # recirc loops, floor area).	Baseline consumption taken from DEER models that take into account building information and characteristics of the entire sector (operation hours, load shapes, etc, # recirc loops, floor area). Baseline consumption in these models is less than what is estimated consumption in the field
Savings basis	Savings calculated from measuring boiler operation hours (on and off times) • Decreased pump run time • Decreased water heater run time	Savings derived from DEER eQUEST models (preferred methodology of the Energy Division); estimates difference in energy consumption from maintaining lower loop temperature thus less heat loss in recirculation loop	Savings derived from DEER eQUEST models (preferred methodology of the Energy Division); estimates difference in energy consumption from maintaining lower loop temperature thus less heat loss in recirculation loop
Building characteristics	Differentiates savings between high rise (3+ floors) and low rise (up to 3 floors) • Low rise: 23 therms/dwelling • High rise: 14 therms/dwelling	No differentiation between high and low rise. Building size and unit size are important variables (correlate to size of recirculation loop). Model representative of 4 story, 24 dwelling unit building (Average floor area per unit = 1200 sq. ft) • 13.54 therms/dwelling	Building size and unit size are important variables that were refined using Benningfield campus housing data and DEER model numbers (Average floor area per unit = 511 sq. ft) • 5.73 therms/dwelling
Technology	Only includes on/off technology	Includes on/off, VFD, and other technologies that use hot water loop temperature as a single-controlled variable	Includes on/off, VFD, and other technologies that use hot water loop temperature as a single-controlled variable

6.18a - Demand Control for Central Water Heaters - Cost

- PGECODHW126, R2

Measure Description	MeasAppType	Base Case Cost ($/unit)	MatlCost ($/unit)	LaborCost ($/unit)	Incremental/Full Measure Cost ($/unit)
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER LR 5 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER HR 20 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER LR 10 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER HR 25 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER LR 15 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER HR 30 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER LR 20 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER HR 35 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER LR 25 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER HR 40 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER LR 30 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER HR 45 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER LR 35 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER HR 50 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32
DEMD CNTL RECIRC PMP GAS CENTR WATER HEATER LR 40 UNITS	REA	$ -	$ 1,632.40	$ 117.92	$ 1,750.32

- Same cost – per building
  - Based upon current product quotes from vendor

Input Consensus
6.18b – MF DHW Pump Control

- Measure Permutations

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
BldgType	MFm, EUD, Htl, Mtl, Nrs	No Value	No Value	No Value	MFm, EUD, Htl, Mtl, Nrs
BldgVintage	Any	No Value	No Value	No Value	Any
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05, CZ06,CZ07,CZ08,CZ09,CZ10, CZ11,CZ12,CZ13,CZ14,CZ15, CZ16, IOU	No Value	No Value	No Value	CZ01,CZ02,CZ03,CZ04, CZ05,CZ06,CZ07,CZ08, CZ09,CZ10,CZ11,CZ12, CZ13,CZ14,CZ15,CZ16
BldgHVAC	cWtd	No Value	No Value	No Value	rWtd cWtd

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	REA	No Value	No Value	No Value	REA
NormUnit	Household	No Value	No Value	No Value	Household
EUL ID	WtrHt-Timeclock	No Value	No Value	No Value	WtrHt-Timeclock
RUL ID	Motors-pump	No Value	No Value	No Value	No Value
NTGR	Com-Default>2	No Value	No Value	No Value	Res-Default>2 Com-Default>2
DeliveryType	DirInstall	No Value	No Value	No Value	DirInstall
GSIA	Def-GSIA	No Value	No Value	No Value	No Value