Water Heating Subcommittee Consolidation and Offerings

CALIFORNIA
TECHNICAL FORUM

AL LUTZ
AYAD AL-SHAIKH
NOVEMBER 2, 2017
MEETING # 3

Subcommittee Timeline

CALIFORNIA TECHNICAL FORUM

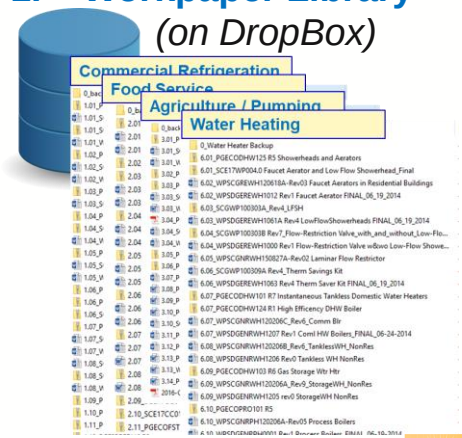
	29-May	5-Jun	12-Jun	19-Jun	26-Jun	3-Jul	10-Jul	17-Jul	24-Jul	31-Jul	7-Aug	14-Aug	21-Aug	28-Aug	4-Sep	11-Sep	18-Sep	25-Sep	2-Oct	9-Oct	16-Oct	23-Oct	30-Oct	6-Nov	13-Nov	20-Nov	27-Nov	4-Dec	11-Dec	18-Dec	25-Dec	1-Jan	8-Jan	15-Jan	22-Jan	2017	2018
Cal TF Meeting				6/22					7/27									9/28				10/26			11/15-16				12/14						1/25		
Governance / TPP																																				
Commercial Refrigeration																		1							2										tbd	20	0
Food Service																		1				2													tbd	15	0
Agriculture / Pumps											T0 TC											1			2										tbd	5	1
Lighting																	T0	TC							1				2						tbd	11	42
HVAC																									1				2						tbd	2	50
Water Heating														T0 TC											1										2	22	0
Appliance or Plug Load														T0 TC											1				2						tbd	10	12
Building Envelope																																				0	4
Pools																						1													2	1	5
Process																																				0	7
Miscellaneous																						1			2										tbd	2	4
Low Income Measures																																					

May change number of measures in 2017 (attrition) & 2018 (delayed and new)

Green numbers = Number of Measures; **Blue** numbers: **1**=First Review / **2** = Affirmation.

Subcommittee Process

1. Workpaper Library *(on DropBox)*



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. New Data

Subcommittee Process

Cal TF Members
IOU Representatives
CPUC Representatives
POU Representatives
Industry Experts

Consolidated Text Files

Consolidated Data Files

Where Are We Today - Water Heating

- General Agreement on Measure Structure and Offerings
- Valuable measure for eTRM – be inclusive
  - Process Boilers (Custom treatment)? Proceed!
- Smaller Measures – Should any move to 2018?
  - HW Thermostatic Valves
  - Tank Insulation
  - Central Storage Water Heater
  - Direct Contact Water Heaters
- Additions of Measures
  - Commercial Aerators (ED passed through)
  - Commercial Showerheads (SCG in progress)
  - Timeclock Pump Control (SCG WP in progress) –

Possible Discussion in Cal TF meeting Nov. 16

Goals – Water Heating

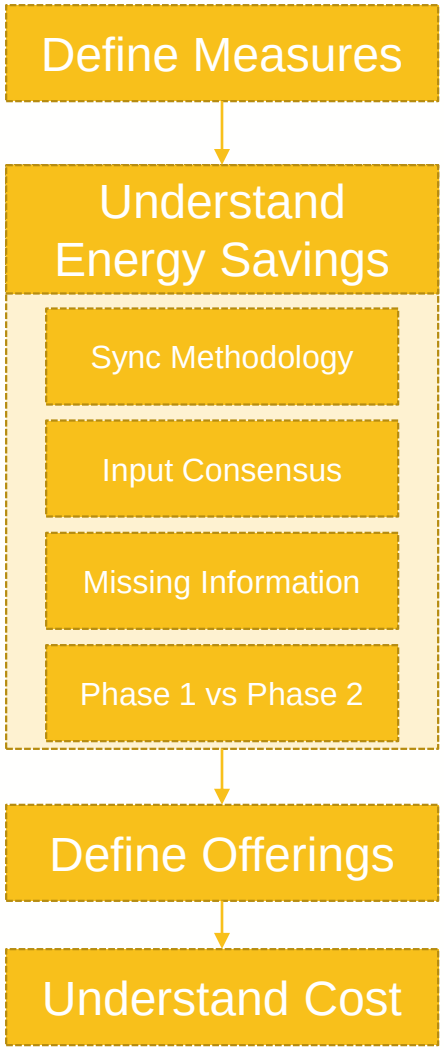
- Final Goal – about 20 eTRM measures by January!
- Goals for Today
  - Consensus on Outstanding issues on three completed measures
  - Continue to Describe the Control and Insulation Offerings
  - *Moving forward with HW heater and Boiler measures*

Revisiting Monthly Goals – Water Heating

- Goals for October 2017
  - Full Data and Text Consolidation Files and Data Spec Sheets for:
    - Faucet Aerators (SF/MF)
    - LF Showerheads(SF/MF)
    - Laminar Flow Restrictors (HealthCare)

- Included Today – Savings and Costs (Need consensus to finalize)

Water Heating Consolidation Overview



- **Defining Measures – Making Progress**
  - Flow Changes **– OK**
  - Boiler / Heater Efficiencies **– OK**
  - Controls **– SCOPE**
  - Insulation**– SCOPE**
- Input consensus needed
  - Permutation / Implementation fields
  - **Offerings – OK (exc. controls and insulation)**
  - **Cost**
  - **Savings**
- Missing information and Additional Measures:
  - DEER / Other inputs – any uncertain?

Define SWH / DHW Measures
Original Measure List

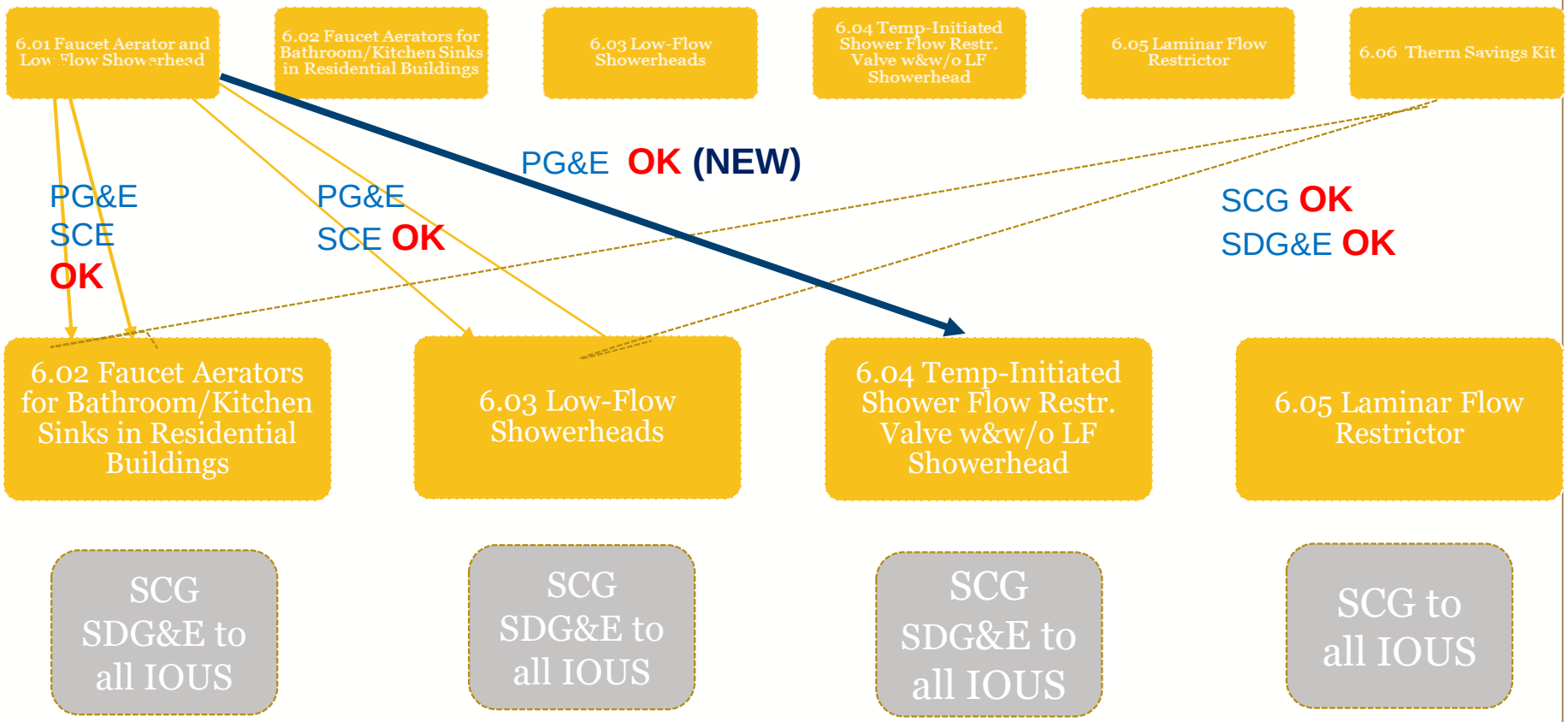
No.		Measure Names	Plan	PG&E	SCE	SDG&E	SCG	POU
6.01	Flow	Faucet Aerator and Low Flow Showerhead	2017					
6.02		Faucet Aerators for Bathroom/Kitchen Sinks in Residential Buildings	2017					
6.03		Low-Flow Showerheads	2017					
6.04		Temp-Initiated Shower Flow Restr. Valve w&w/o LF Showerhead	2018					
6.05		Laminar Flow Restrictor	2017					
6.06		Therm Savings Kit	2018					
6.07	Water Heaters	Boiler, Commercial	2017					
6.08		Tankless, Commercial	2017					
6.09		Storage Water Heater, Commercial	2017					
6.10		Boiler, Process	2017					
6.11		Direct Contact Water Heater, Process	2017					
6.12		Boiler, Multi-Family	2017					
6.13		Central Storage Water Heater, MF	2017					
6.14		Storage Water Heater, Residential	2017					
6.15		Tankless, Residential	2017					
6.16		Heat Pump Water Heater	2017					
6.17	Controls	Commercial Boiler Water Heating Control System	2018					
6.18		Demand Control for Centralized Water Heater Recirculation Pump	2017					
6.19		Multifamily DHW RCx, Training, and Boiler Reset Controller	2017					
6.20	Insul.	MF Central Recirc System Pipewrap	2018					
6.21		Hot Water Line Insulation Electric/Gas	2017					
6.22		Tank Insulation	n/a					
6.23	New	Faucet Aerators for Bathroom/Kitchen Sinks, Commercial	n/a					
6.24		Low-Flow Showerheads, Commercial	n/a					
6.25		Recirculation Pump Time Clocks	2017					

Removed 6.01 and 6.06 – Combined offerings

Lower Priority 6.11, 6.13, 6.17, 6.19, 6.20 – Minimal savings and uptake – May be sunsetting some?

Lead Workpaper
Supporting Workpaper

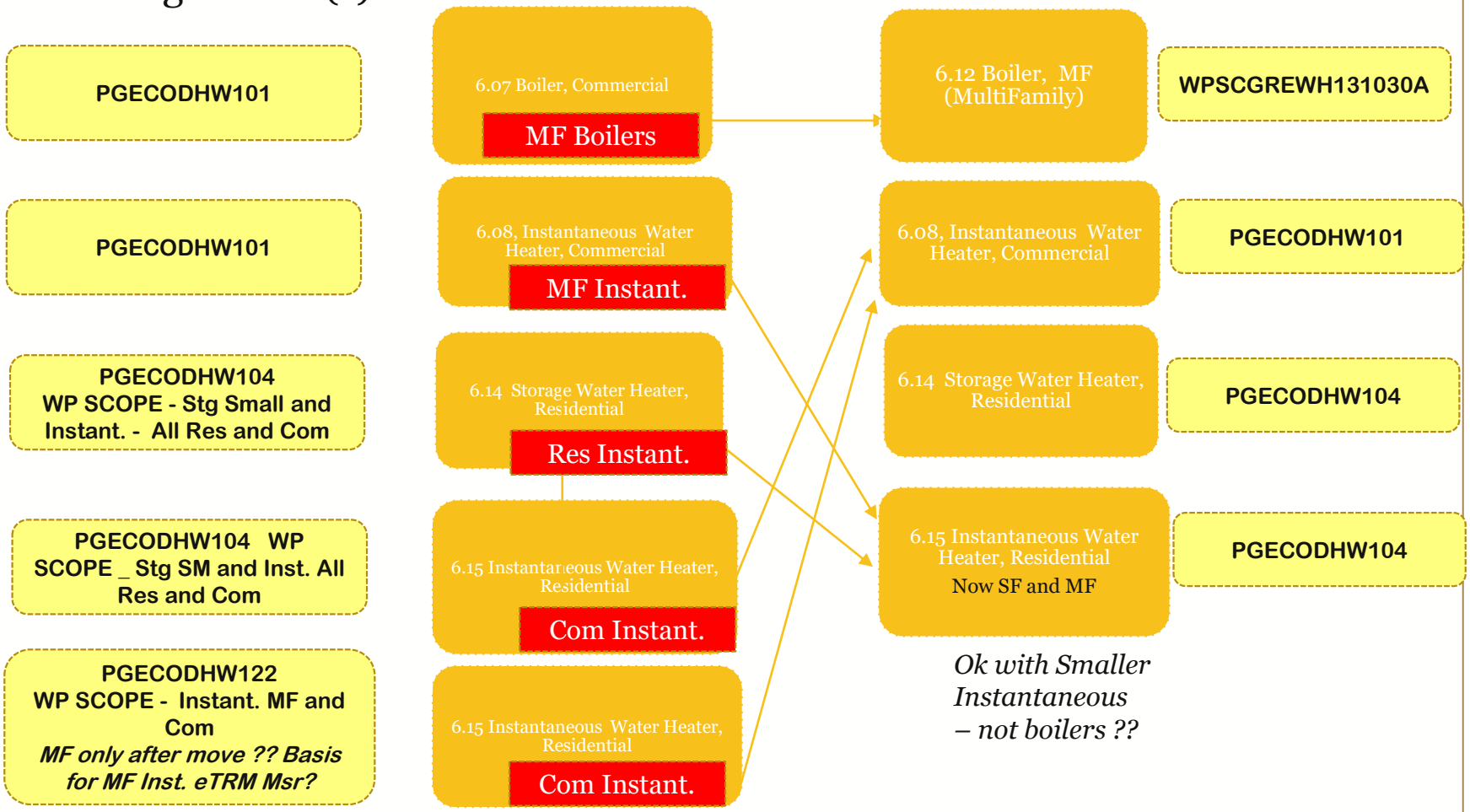
6.01 thru 6.06 – Flow Restriction Measure-Possible Consolidation



Includes POUs!

PG&E WP Component Movement 6.07, 6.08, 6.12, 6.14 and 6.15

Lead Assigned WP(s)



SHW / DHW Measures
Representative Measure Savings Claims

CALIFORNIA TECHNICAL FORUM

No.	Name	Sum of NumUnits	Energy (kWh/yr)	Demand (kW)	Energy (therms/yr)
6.01	Faucet Aerator and Low Flow Showerhead	18,822	42,306	4.25	18,852
6.02	Faucet Aerators for Bathroom/Kitchen Sinks in Residential Buildings	232,384	30	0.00	397,107
6.03	Low-Flow Showerheads	83,141	0	0.00	493,980
6.04	Temp-Initiated Shower Flow Restr. Valve w&w/o LF Showerhead	8,637	0	0.00	13,461
6.06	Therm Savings Kit	139,674	0	0.00	971,101
6.07	Boiler, Commercial	394,267	33,809	0.94	717,657
6.08	Tankless, Commercial	32,928	(16,629)	0.03	135,539
6.09	Storage Water Heater, Commercial	205,301	0	0.00	324,740
6.10	Boiler, Process	419,761	0	0.00	484,035
6.12	Boiler, Multi-Family	18,395	0	0.00	28,089
6.13	Central Storage Water Heater, MF	5,798	0	0.00	6,389
6.14	Storage Water Heater, Residential	14,980	18,354	1.79	305,457
6.15	Tankless, Residential	109,485	38,451	12.51	449,694
6.16	Heat Pump Water Heater	506	842,354	181.61	0
6.18	Demand Control for Centralized Water Heater Recirculation Pump	16,089	440,908	48.97	349,389
6.21	Hot Water Line Insulation Electric/Gas	64,080	0	0.00	1,024,128
6.22	Tank Insulation	18,707	0	0.00	186,005
Grand Total		**1,782,954**	**1,399,584**	**250.10**	**5,905,622**

Representative as claims track to IOU WPs – not all proposed eTRM numbers included. May also have had zero claims in 2016.

Define SWH / DHW Measures

Offerings

- Flow Reduction
- Pipe Insulation
- Heaters
- Controls

Lead Workpaper
Supporting Workpaper

Measure Consensus
6.02 – LF Aerators

- Offering
  - Kitchens and Lavatories, Residential (SF and MF), electric and gas,1.5 and 1.8 gpm for kitchens; 0.5, 1.0 and 1.2 gpm for lavatories, Retrofit Add on (REA/AOE) / EUL, Direct Install (Typical)
- Stage 1 Issues
  - Harmonize on base flow of 2.2 gpm
  - Agree on Climate Zone Factors for consistency
  - Agree on kW savings determination used in 2013 CPUC disposition (11% factor)
  - Agree on Costs ($7.28 material, $7.73 labor)
- Measure Extension
  - Added Electric offerings to all IOUs
- Stage 2 Issues
  - *Add embedded cost of energy in water by climate zone*
  - *Data collection on pre-existing aerators and flows to determine retrofit type and baseline flow*
  - *Non-DI cost adjustment*

Weather Adjustments – Flow Reduction

		Groundwater / Make Up Water Temperatures				
	LFR Workpaper	LFR Workpaper				
Climate Zone	Temperature (°F)	CZ Adjustment Factor	Disposition Adjustment Factor	Percentage change (+%,-%)	GW temps using disposition factor	GW temps using disposition factor
1	*51.38*	*1.33*	1.08	25%	61.54	63.71
2	*57.29*	*1.19*	1.08	11%	61.76	63.91
3	*57.05*	*1.19*	1.06	14%	62.71	64.82
4	*59.51*	*1.13*	1.02	11%	64.20	66.24
5	*55.83*	*1.22*	1.05	18%	63.03	65.13
6	*61.75*	*1.08*	0.99	9%	65.27	67.25
7	*62.55*	*1.06*	0.97	9%	66.22	68.16
8	*63.74*	*1.03*	0.94	9%	67.39	69.28
9	*63.82*	*1.03*	0.96	7%	66.65	68.57
10	*64.15*	*1.02*	0.95	7%	67.07	68.97
11	*63.19*	*1.04*	0.99	6%	65.58	67.56
12	*60.88*	*1.10*	1.02	8%	64.31	66.34
13	*64.10*	*1.02*	0.95	7%	66.97	68.87
14	*62.67*	*1.06*	1.01	5%	64.73	66.75
15	*75.47*	*0.74*	0.80	-5%	73.24	74.84
16	*51.75*	*1.32*	1.13	19%	59.74	61.99
Notes		MW 106F / MU 65F Base			Showerheads MW 106F / MU 65F Base	Arerators - MU ~67 F (SCG/SDG&E data?)

Costs – 6.02 Low Flow Aerators

- Measure cost $7.73 – three cost quotes from 2016 online retailer (SCE).
- Labor cost $7.28 -DEER 2008 assumptions of 7.2 mins (0.12 hr) with 2016 RSMeans ($64.40) average national plumber labor rate ($64.40/hr)
- Total Measure cost = $15.00
- PG&E -$10.44 for base costs, $13.24 for measure costs (including labor).
- SDG&E - measure cost of $13.24 from DEER
  - 6.54 for materials and $6.70 for labor
- SCG WP measure costs - 2013 program cycle negotiated 3rd party contractor installation costs.
  - The gross measure cost is $7.99 for Kitchen Aerators and $5.43 for Bathroom Aerators (including labor).
- Need more source detail.

Measure Consensus
6.03 – LF Showerheads

- Offering
  - Residential (SF and MF), 0.5, 1.0, 1.5, 1.6 and 1.7 gpm; Electric and Gas; Replace on Burnout (ROB/NR) / NC/NEW or ER; Direct Install (Typical)
- Stage 1 Issues
  - Add NC to all IOUs
  - Agree on Climate Zone Factors
  - Agree on kW savings determination used in 2013 CPUC disposition (11% factor)
  - Agree on Costs - Base from DEER ($14.32), others from WO017 ($18.50 Measure Cost, $15.47 Labor Cost)
- Measure Extension
  - Add Electric offerings to all IOUs
- Stage 2 Issues
  - *Add embedded cost of energy in water by climate zone*
  - *Data collection on pre-existing showerheads to determine baseline flow*
  - *Update for required flow by CA T20 code (7/1/2018) for ROB/NC measures*

Measure Consensus
6.05 – Laminar Flow Restrictors (LFRs)

- Offering
  - Healthcare, 1.5 and 1.8 gpm for kitchens; 0.5, 1.0 and 1.2 gpm for lavatories and kitchens: 0.5 gpm (only) for public lavatories; Gas only; Retrofit Add on (REA/AOE), Direct Install and PreRebDown
- Stage 1 Issues
  - Agree on Climate Zone Factors / Groundwater Temps used in Workpaper
  - Savings factor of 0.7 not supported (reduces baseline flow and savings from survey data)
  - Mixed water temp of 106 F, efficiency at 77% for consistency
  - Agree on Costs ($14.27 direct install / $7.27 PreRebDown – excl. labor) Sources?
- Measure Extension
  - Added to all IOUs / POUs
- Stage 2 Issues
  - *Add embedded cost of energy in water by climate zone*
  - *Data collection on more types of facilities (nursing homes, medical office buildings, clinics to determine base flows*

6.01 thru 6.06 – Flow Restriction Measures

- Resolving Issues
  - Any reason to separate MF in Measures? NO – separate values for most savings inputs
    - Collapse SF and MF? NO – Greater than 10% difference.
- Climate Zone Differences (+/- 15%) permutations – Per CPUC ED Disposition – Leave in calculations
  - How to incorporate CZ factors – based on dishwasher usage per 2013 CPUC disposition
  - 6.05 – LFR WP used CZ GW / MU water temperatures
    - ED passed though WP
  - Recommendation – use GW temperatures – revise as needed
    - More transparent
- Claiming Savings
  - SCE claims only electric savings for the % market share electric for flow reduction measures – presumably the gas savings can be claimed by gas utilities – is this more accurate?

6.01 thru 6.06 – Flow Restriction Offerings – 6.02 Aerator Summary Table

Aerators	PG&E	SCE	SDG&E	SCG	Recommended Value
Base Flow	2.2	**1.91**	2.2	2.2	2.2 fixed
Measure EE gpm Lavatory	0.5	1.0	1.0	0.5 / 1.0 / 1.5	0.5, 1.0, 1.2 (code)
Measure EE gpm Kitchen	--	--	1.5	1.5	1.5
Electric Savings	X	X			X
Gas Savings	X		X	X	X
Baseline Type	ROB	REA / RET?	RET	REA	REA/AOE**
EUL	10	3.33*	3.33*	6.67**	6.67**
RUL	na	na	6.67 (1st = 2nd period savings)	0	0
SF / MF Different Savings	?	?	X	X	X

** RET = 1/3 of aerator EUL = 1/3 x 10 = 3.33 years)*

*** REA with 20 year life of faucet (1/3 x 20 = 6.67 years EUL)*

Both are consistent with Direct Install (DI) Delivery Type

6.01 thru 6.06 – Flow Restriction Offerings – 6.03 LF Showerhead Summary Table

LF Showerheads	PG&E	SCE	SDG&E	SCG	Recommended Value
Base Flow	**2.5 or greater**	2.25	2.25	2.0 ROB/New 2.25/1.8 RET	2.0 ROB/New **2.25**/1.8 RET
Measure EE gpm	1.6 / 2.0	1.5	1.5. / 1.6 / 1.7	1.0/1.25/1.5/1.6/1.7	1.0/1.25/1.5/1.6/ 1.7
Notes	2/22/2013 CPUC disposition for savings	Electric DHW penetration of 7% applied to gross savings		Custom Savings Methodology	
Electric Savings	X	X			X
Gas Savings	X		X	X	X
Baseline Type	ROB	**REA** / RET?	RET/ROB/NEW	REA/ROB/RET/New	ER / New
EUL	10	3.33*	10	10 / 3.33*	10 / 3.33*
RUL	na	na	--	0 / 6.67	0 / 6.67
SF / MF Different Savings	?	?	X	X (~10% difference)	X

Code - Showerheads – 2.0 gpm (7/1/16) and 1.8 gpm (7/1/18)

** RET = 1/3 of Showerhead EUL = 1/3 x 10 = 3.33 years)*

Is ROB and NEW consistent with Direct Install (DI) Delivery Type ?

6.04 Temp-Initiated Shower Flow Restriction Valve (TSV) with and without LF Showerhead

- Delivery Mechanism - Direct Install (all IOUs)
  - PG&E allows Pre Rebate Down
    - PG&E still offers? Only with LF showerhead?
  - SCG / SDG&E DI MF, UpReb SF downstream rebate
    - Recommendation – allow all above delivery types – GSIA and NTGR values change (adds permutations)
- Climate Zone Differences (+/- 15%) permutations – Per CPUC ED Disposition – Leave in calculations
- SCG uses Tub Spout Bypass Factor of 80% in GSIA
- Breakout LF Showerheads from TRV – TRV with existing or LF showerhead (installed at the same time)

6.01 thru 6.06 – Flow Restriction Offerings – 6.04 TSV w/wo LF Showerhead Summary

LF Showerheads	PG&E	SCE	SDG&E	SCG	Recommended Value
Base Flow	2.5 or greater		2.25	2.25 ROB/New 2.25/1.8 RET	2.25 ROB/2.0 New 2.25/1.8 RET
Measure EE gpm	1.6		1.5. / 1.6 / 1.7	1.0/1.25/1.5/1.6/1.7	1.0/1.25/1.5/1.6/ 1.7
Notes	CPUC disposition for savings - Combined WP			Valve only and Valve+ Swhd – **No Tankless Applications**	
Electric Savings	X				X
Gas Savings	X		X	X	X
Baseline Type	ROB		RET/ROB/NEW	REA – TSV only **ROB/RET/New – TSV + Swhd**	ER / New
EUL	10		10	10 / 3.33*	10 / 3.33*
RUL	na		--	0 / 6.67	0 / 6.67
SF / MF Different Savings	?		X	X (~10% difference)	X

Is ROB and NEW consistent with Direct Install (DI) Delivery Type ?

6.01 thru 6.06 – Flow Restriction Offerings – 6.04 Laminar Flow Restrictor Summary Table

Aerators	PG&E	SCE	SDG&E	SCG	Recommended Value
Base Flow				2.7	2.7
Measure EE gpm Lavatory				0.5 / 1.0 / 1.5 / 2.2	0.5, 1.0, 1.2 (code)
Measure EE gpm Kitchen				0.5 / 1.0 / 1.5 / 2.2	0.5 / 1.0 / 1.5 / (1.8 – code)
Electric Savings					X
Gas Savings				X	X
Baseline Type				REA	REA/AOE**
EUL				6.67**	6.67**
RUL				0	0
Bldg Types – Different Savings				YES	YES

*** REA with 20 year life of faucet (1/3 x 20 = 6.67 years EUL)*

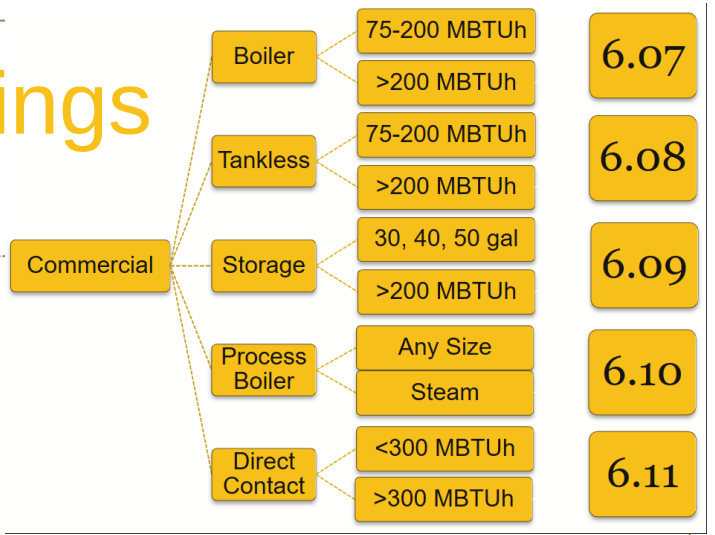
Is this WP yet CPUC approved? – Yes – passed through
Is a 20 year faucet life appropriate? Could it be higher?

6.07 thru 6.16 – Hot Water Heaters and Boilers

- 6.07 Boiler, Commercial
- 6.08 Tankless, Commercial
- 6.09 Storage Water Heater, Commercial
- 6.10 Boiler, Process
- 6.11 Direct Contact Water Heater, Process
- 6.12 Boiler, Multi-Family
- 6.13 Central Storage Water Heater, MF
- 6.14 Storage Water Heater, Residential
- 6.15 Tankless, Residential
- 6.16 Heat Pump Water Heater

Commercial Hot Water Offerings

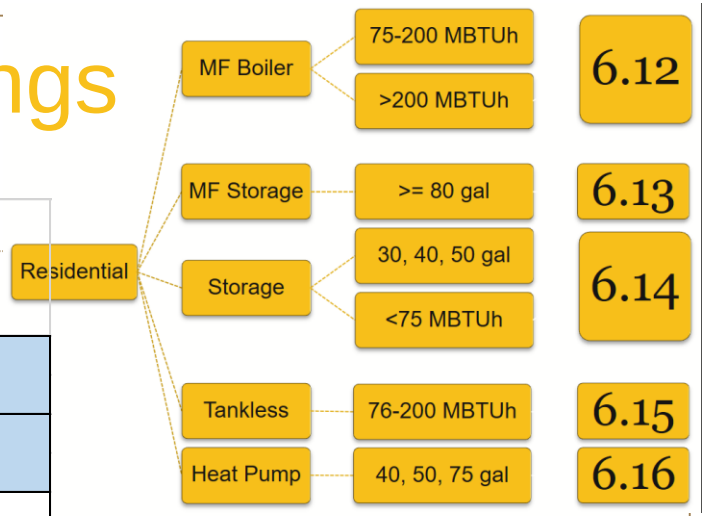
No.	PG&E	SCG	SDG&E	SCE	Commercial	Capacity	Efficiency
6.07	x				Comm Boiler	Small (>75MBTU/h)	>90% TE
6.07		x	x			Small/Med (<=200MBTU/h)	>=84% EF
6.07		x	x				>=90% EF
6.07		x	x			Large (>200MBTU/h)	>=84% TE
6.07		x	x				>=90% TE
6.07	x						>=85% TE
6.07	x						>=90% TE
6.08		x			Comm Tankless	Small/Med (<=200MBTU/h)	>=82% EF
6.08			x				>=80% EF
6.08		x	x				>=90% EF
6.08		x	x			Large (>200MBTU/h)	>=80% TE
6.08		x	x				>=90% TE
6.09		x			Comm Storage	Small, 30g (<=75MBTU/h)	>=70% EF
6.09		x				40 gal	>=67% EF
6.09		x				50 gal	>=67% EF
6.09			x			Small, 30g (<=75MBTU/h)	>=67% EF
6.09			x			40 gal	>=65% EF
6.09			x			50 gal	>=64% EF
6.09			x			60 gal	>=62% EF
6.09			x			75 gal	>=59% EF
6.09		x	x			Large (>75MBTU/h)	>=83% TE
6.09	x	x	x				>=90% TE
6.10	x	x	x		Process Boiler	(<20,000MBTU/h)	>=85% CE / >=83% TE
6.10		x	x			(<20,000MBTU/h)	>=90% CE / >=88% TE
6.10	x	x	x			Steam	>83% CE
6.11	x		x		Direct Contact	<300MBTU/h	>= 88% AFUE
6.11	x		x			>300MBTU/h	>=90% TE



- Com Boiler, Large Tier 1,
  - Min efficiency
- Tankless, Small Tier 1
  - Min efficiency
- Storage,
  - Small offerings (#, %EF)
  - Large Tier 1
- Process Boiler
  - Tier 2 Offering for HW
- Direct Contact
  - Tier 2 min efficiency
  - SCG offers through Proc Boiler

Residential Hot Water Offerings

	PG&E	SCG	SDG&E	SCE	Residential	Capacity	Efficiency
6.12	x				MF Boiler	Small (>75MBTU/h)	>=84% TE
6.12	x					Small (75-200MBTU/h)	>=90% TE
6.12		x				Large (>200MBTU/h)	>=84% TE
6.12	x	x					>=90% TE
6.13		x			MF Storage	>80 Gal (>75MBTU/h)	>=83% TE
6.13		x					>=90% TE
6.13	x						>=82% TE
(claim)			x		Res Storage	30 Gal	EF (0.65-0.69)
(claim)			x			40 Gal	EF (0.65-0.66)
(claim)			x			40 Gal	EF (0.67-0.69)
(claim)			x			40 Gal	EF (0.70+)
(claim)			x			50 Gal	EF (0.67-0.69)
(claim)			x			50 Gal	EF (0.70+)
(claim)		x				30, 40, 50 Gal	>=62% EF
(claim)		x				30, 40, 50 Gal	>=67% EF
6.14	x					Small (<75MBTU/h)	>=.67 EF
6.15	x				Res Tankless	Small (<200MBTU/h)	>=85% EF
6.15		x					>=90% EF
6.15		x				Small (76-200MBTU/h)	>=82% EF
6.15		x					>=92% EF
6.15	x						>=90% TE
6.15	x					Large (>200MBTU/h)	>=90% TE
6.16	x		x	x	Heat Pump	40 gal	EF=2.0
6.16	?		x			50 gal	EF=2.0
6.16	?		x			75 gal	EF=2.0



- MF separated out
  - PG&E: 11 yrs (Str WtrHtr)
  - SCG: 15 yr (WtrHt-Com)
- MF Storage
  - Min Efficiency
- Res Storage
  - Number of Offerings
- Res Tankless
  - Small, Tier 2 min efficiency
  - Confirm offering (yellow)

6.07 to 6.16 – Hot Water Heaters / Boilers

HEATERS ONLY - Storage (6.09 Commercial, 6.14 Residential)

eTRM No.	PG&E	SCG	SDG&E	SCE	Measure	Capacity	Measure Efficiency	Base Efficiency
6.09		x			Comm Storage	Small, 30g (<=75MBTU/h)	>=70% EF	.63 EF
6.09		x				40 gal	>=67% EF	.615 EF
6.09		x				50 gal	>=67% EF	.6 EF
6.09			x			Small, 30g (<=75MBTU/h)	>=67% EF	.61 EF
6.09			x			40 gal	>=65% EF	.59 EF
6.09			x			50 gal	>=64% EF	.58 EF
6.09			x			60 gal	>=62% EF	.56 EF
6.09			x			75 gal	>=59% EF	.53 EF
6.09		x	x			Large (>75MBTU/h)	>=83% TE	80% TE
6.09	x	x	x				>=90% TE	80% TE
6.14			x		Res Storage	30 Gal	EF (0.65-0.69)	
6.14			x			40 Gal	EF (0.65-0.66)	
6.14			x			40 Gal	EF (0.67-0.69)	
6.14			x			40 Gal	EF (0.70+)	
6.14			x			50 Gal	EF (0.67-0.69)	
6.14			x			50 Gal	EF (0.70+)	
6.14		x				30, 40, 50 Gal	>=62% EF	
6.14		x				30, 40, 50 Gal	>=67% EF	
6.14	x					Small (<75MBTU/h)	>=0.67 EF	0.59/0.57/0.56 EF (HA58)

Yellow Highlighting indicates recommended values

60 and 75 gallon tanks subject to new federal rulings for UEF – Effic. TBD

6.07 to 6.16 – Hot Water Heaters / Boilers

HEATERS ONLY - Storage (6.09 Commercial, 6.14 Residential)

- Storage Water Heaters - No tankless (moved PG&E WP Component) - WPs for (PG&E, SCG, SDG&E)
  - Res includes MF – OK? Yes based on smaller in unit equipment
  - ROB and NC for SCG Commercial Large only – All NC and ROB ?
  - SCG extends past Commercial - Extend to all C,I &A?
- Interim – use updated base efficiencies and highest measure efficiencies – pushing the market
  - Baseline efficiency = Code – convert EF to UEF until UEF available
  - Measure efficiency – convert EF to UEF
- Other
  - Delivery – PreRebDown, DI for MF (PG&E?), mid and upstream options – Allow all?
  - Electric savings SDG&E Res only – extend?

6.07 to 6.16 – Hot Water Heaters / Boilers

HEATERS ONLY - Heat Pump Water Heater (6.16)

eTRM #	PG&E	SCG	SDG&E	SCE	Technology	Capacity	Measure Efficiency	Base Efficiency (RET)	Recom. Efficiency (ROBNC)
6.16			x		Heat Pump WH	40 gal (min.)	EF=2.0	.92 EF el res st tank only	EF = 0.95
6.16			x			50 gal	EF=2.0	.90 EF el res st tank only	EF = 0.95
6.16			x			60 gal	EF=2.0	.89 EF el res st tank only	EF = 1.99
6.16			x			75 gal (and up)	EF=2.0	.87 EF el res st tank only	EF = 1.97
6.16	x					40 gal (min.)	EF=2.0	.88 EF el res st tank only	
6.16	x					50 gal	EF=2.0	.88 EF el res st tank only	
6.16	x					60 gal	EF=2.0	.87 EF el res st tank only	
6.16	x					75 gal (and up)	EF=2.0	.87 EF el res st tank only	
6.16	x		x	x		40 gal (min.)	EF=2.0	EF = 0.948 (new T20)	

Note – Recommended efficiencies are for a ROB / NEW (NC) baseline
If RET/ER, Efficiencies based on older T20 requirements (e.g,, PG&E workpapers) seem appropriate for the first 1/3 of 20 year EUL period.

6.07 to 6.16 – Hot Water Heaters / Boilers

HEATERS ONLY - Heat Pump Water Heater (6.16)

- Heat Pump Water Heater – Electric Only
  - 2 WPs for Residential (SCE, SDG&E), 1 Workpaper for Residential and Residential Sized units in Commercial Applications (PG&E)
    - EXPAND TO ALL C&I and AG? How do we deal with HOU / profile?
  - Use market baseline (what is available in the CA market) or code?
    - ENERGY STAR referenced in WPs, requires EF = 2.0 minimum
    - Allow for higher EF tiers?
  - All ROB offerings – some NC also. Include NC for all ???
  - Include RET / ER baseline? Adds permutations.
  - Interim – use updated base efficiencies and highest measure efficiencies – pushing the market
    - Baseline efficiency = Code – convert EF to UEF until UEF available
    - Measure efficiency – convert EF to UEF

6.07 to 6.16 – Hot Water Heaters / Boilers

HEATERS ONLY - Instantaneous (6.08, 6.15)

eTRM #	PG&E	SCG	SDG&E	SCE	Technology	Capacity	Measure Efficiency	Base Efficiency
6.08		x			Comm Tankless	Small/Med (<=200MBTU/h)	>=82% EF	0.615
6.08			x				>=80% EF	0.565
6.08		x	x				>=90% EF	0.615 / 0.565
6.08		x	x			Large (>200MBTU/h)	>=80% TE	0.80 TE
	x						>=84% TE	0.80 TE
6.08	x	x	x				>=90% TE	0.80 TE
6.15	x				Res Tankless	Small (<200MBTU/h)	>=84% EF	
6.15		x			SCG SF & MF		>=90% EF	
6.15		x				Small (<200MBTU/h)	>=82% EF	0.615
6.15		x					>=92% EF	0.615
6.15	x						>=90% TE	
6.15	x					Large (>200MBTU/h)	>=90% TE	

Yellow Highlight – recommended value
Red Highlight – value to be updated or not used

Offering – 2 Tiers – 85%EF and 95%EF – Res and Com – Large and Small

6.07 to 6.16 – Hot Water Heaters / Boilers

HEATERS ONLY - Instantaneous (6.08, 6.15)

Consolidate on Instantaneous vs. tankless and < 210,000 btuh - conform with codes

- No SCE workpapers and No SDG&E residential – limited electric saving potential. No electric calcs. Gas Measure Only?
- PG&E Commercial WP CONTAINS Multi-Family – Moved to 6.15
  - Smaller instantaneous units are more like residential
  - Potential new measure for MF large units >210,000 btuh
    - Potentially move to and expand existing eTRM measure for MF Boiler (6.12)
- Interim – use updated base efficiencies and higher measure efficiencies – pushing the market
  - Baseline efficiency = Code – convert EF to UEF until UEF available
  - Measure efficiency – convert EF to UEF
- Other
  - Delivery – PreRebDown, DI for MF (PG&E?), mid and upstream options – Allow all?
  - ROB and NC for SCG Commercial Large only – All NC and ROB ?
  - Does and RET/ER option exist, especially for MF DI?

6.07 to 6.16 – Hot Water Heaters / Boilers

BOILERS – Commercial and MF (6.07, 6.12, 6.13)

eTRM #	PG&E	SCG	SDG&E	SCE	Technology	Capacity	Measure Efficiency	Base Efficiency
6.07	x				Comm Boiler	Small (>75MBTU/h)	>90% TE	80% TE
6.07		x	x			Small/Med (<=200MBTU/h)	>=84% EF	0.82 / 0.80 EF
6.07		x	x				>=90% EF	0.82 / 0.80 EF
6.07		x	x			Large (>200MBTU/h)	>=84% TE	80% TE
6.07		x	x				>=90% TE	80% TE
6.07	x						>=85% TE	80% TE
6.07	x						>=90% TE	80% TE
6.12	x				MF Boiler	Small (75-200 MBTU/h)	>=84% TE	80% TE
6.12	x					Small (75-200 MBTU/h)	>=90% TE	80% TE
6.12		x				Large (>200MBTU/h)	>=84% TE	80% TE
6.12	x	x					>=90% TE	80% TE
6.13		x			MF Storage & Boiler	>80 Gal (>75MBTU/h)	**>=82% TE**	80% TE
6.13		x					>=90% TE	80% TE
6.13	x					>80 Gal (H150 only)	>=82% / 83% TE	80% TE

Yellow Highlight – recommended value

Red Highlight – value to be updated or not used

6.13 - 82% from 83% per SCG comments on availability / PG&E sunsetting (Code H150)

6.07 to 6.16 – Hot Water Heaters / Boilers

BOILERS – Commercial and MF (6.07, 6.12, 6.13)

- Overlap with Instantaneous (Collapse Boilers and Small Instantaneous - NO).
  - Big measures and different sizes – EF/UEF or TE apply?
  - **BOILERS ARE > 300 kbtuh and <1250 kbtuh AND >4 kbtuh / gal. storage**
- SDG&E MF seems to be not covered
- PG&E COMMERCIAL WP (6.07) CONTAINS MF – Move to 6.12
  - MF has different use profile than other commercial (but all types differ)

- Interim – use updated base efficiencies and higher measure efficiencies – pushing the market
  - Baseline efficiency = Code – convert EF to UEF until UEF available
  - Measure efficiency – convert EF to UEF
- Other
  - Delivery – PreRebDown, PreRebUp - Allow all?
  - ROB and NC for SCG Commercial Large only – All NC and ROB ?
  - Discussion Does any RET/ER option exist, especially for Condensing Boilers?
  - 85% for condensing boiler in DEER?

6.07 to 6.16 – Hot Water Heaters / Boilers

PROCESS ONLY (6.10 and 6.11)

Process Boilers

Direct Contact Water Heaters

eTRM #	PG&E	SCG	SDG&E	SCE	Technology	Capacity	Measure Efficiency	Base Efficiency
6.10	x	x	x		Process Boiler	(<20,000MBTU/h)	>=83% TE	80% TE
6.10	x	x	x			Steam	>83% CE	82% CE *
6.11	x		x		Direct Contact	<300MBTU/h	>= 88% AFUE	80% TE
6.11	x		x			>300MBTU/h	>=90% TE	80% TE

Yellow Highlight – recommended value

Red Highlight – value to be updated or not used

NAICS 11, 21, 31, 32, 33, 8123 -- extend to any process ?

** 82 CE (T20 - TE = 79%, 77% w/nat. draft) --- Need two categories*

General rule – Thermal Efficiency (TE) Combustion Efficiency (CE) – 2%

6.07 to 6.16 – Hot Water Heaters / Boilers

PROCESS ONLY (6.10 and 6.11)

- 3 WPs Process Boilers (PG&E, SCG, SDG&E) – Large Savings
- 2 WPs Direct Contact Water Heaters (PG&E, SDG&E) Uptake?

- Lots of usage variability – INCLUDE IN DEEMED?
  - OK if conservative (to capture market) ???
  - Include with instantaneous heaters and boilers (commercial, industrial and ag)?
- Are all installations really process? Offerings and workpaper open to lots of commercial building types.

6.17 thru 6.22 – Hot Water Controls, Insulation and Training

6.17 Commercial Boiler Water Heating Control System	6.17 Commercial Boiler Water Heating Control System	Any claims? PG&E offers
6.18 Demand Control for Centralized Water Heater Recirculation Pump	6.18 Demand Control for Centralized Water Heater Recirculation Pump	
6.19 Multifamily DHW RCx, Training, and Boiler Reset Controller	*6.19 Multifamily DHW Boiler Reset Controller (NEW)*	Ok – SCHG reworked WP this year ; SDG&E notes minimal uptake
6.20 MF Central Recirc System Pipewrap	~~6.20 MF Central Recirc System Pipewrap~~	? No Claims? SDGE and SCG SCG – no rebates
6.21 Hot Water Line Insulation Electric/Gas	6.21 Hot Water Line Insulation Electric/Gas	
6.22 Tank Insulation	6.22 Tank Insulation	? No conflict – PG&E and SCG claims

6.17 to 6.19 – Controls

DHW Pump and Boiler Controls

- 6.17 – DHW Controls – 1 WP (PG&E)
  - MF and lodging
  - Temperature reset – Gas savings
  - IS PG&E still offering?
- **6.18 – Demand Control for Recirc. Pump – 4 WPs (PG&E, SCE, SCG, SDG&E)**
  - Based on HW returning temperature and demand
  - MFm only – existing buildings
  - ONE ISSUE – SDG&E calculates savings a bit differently than other IOUs
  - SDG&E DI only (others DI and PreRebDown)?
  - Leave in eTRM **– extend to lodging, hospitals, nursing homes, large offices, etc.**
- 6.19 – MF Boiler Reset Controller – 2 WPs (SCG lead, SDG&E)
  - Could interact with 6.181/2

6.20 to 6.22 – Insulation

DHW Insulation

- 6.20 MF Central Recirc System Pipewrap – 1 WP (SDG&E)
  - MF only
  - Only SDG&E offering?
  - No Climate Zone Dependency (CZ)
  - SCG Combines with 6.21 (same HOU and DHW service)

6.20 to 6.22 – Insulation

DHW Insulation

- **6.21 Hot Water Line Insulation Electric/Gas - 3 WPs (PG&E, SCG, SDG&E)**
  - Climate Zone Dependency
  - Commercial Only
  - Modify WP approach – e.g., remove steam from SDG&E WP for hot water pipe insulation
  - Include MF Recirc Systems, Ag/Ind., SF & MF first 6 feet of Supply Lines ???
  - Verify Electric Savings – extend to SCE / POUs?
  - ALL IOUs - PreRebDown (No DI?)
  - ALL IOUs – REA/AOE measure – SDG&E states this applies to damaged insulation – R4818?
  - All – 1 inch insulation on ½ - 4 " pipe OK?
- 6.22 Tank Insulation – 2 WPs (PG&E, SCG, SDG&E)
  - Are most DHW tanks already insulated? Is this above code insulation?
  - OK for now?
  - No IOU/POU votes for moving in 2017 or 2018 to eTRM Note – about 3% of therm savings

6.01 thru 6.22 – Hot Water Measures

- Remaining Issues – Cross Cutting
  - Be inclusive - include multiple offerings (efficiency tiers)
    - Expand Commercial to Agricultural and Industrial where relevant
    - Expand NR/ROB measures to include NEW/NC where possible
    - Consider AR/ER baseline types for several measures (Instantaneous heaters, damaged insulation, HPWHs, etc.) in light of R.4818 / B 802
  - Addressing embodied energy in water – water reduction given for some measures - varies by location – Stage 2? SDG&E workpaper?
  - Partial exclusion (or total) when buildings have functional solar water heaters?

6.01 thru 6.22 – Hot Water Measures
Other New Measures

- Any way to include combination (space/water heating boilers? Enough of a market for deemed treatment?
  - Res NZE? CO2 HPWHs? GHGs
- Other Technologies
  - Table top water heaters
  - Grid enabled water heaters
  - Desuperheaters
  - DR for Electric Water Heaters – (Grid enabled?)
  - Gas/electric fuel switching? HPWHs – Any Others?
  - 3 prong test and all GHG impacts (leaks, fuel mix, etc.)
- Recommendation – Phase 2 (2018)

6.01 thru 6.22 – Hot Water Measures

NEXT MEETING DATE

Questions?

Next Steps?