Water Heating Subcommittee Consolidation and Offerings

CALIFORNIA
TECHNICAL FORUM

AL LUTZ
AYAD AL-SHAIKH
OCTOBER 19, 2017
MEETING # 2

Subcommittee Timeline

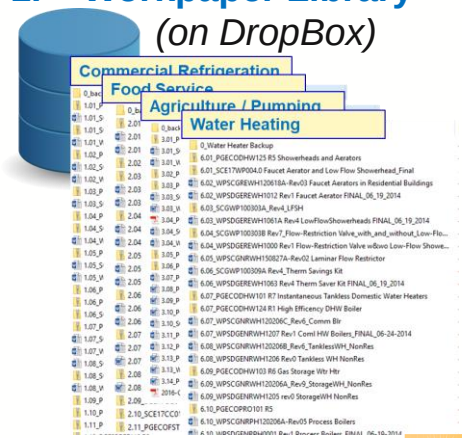
CALIFORNIA TECHNICAL FORUM

	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																																					

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

Goals – Water Heating

- Final Goals - eTRM measures – Consolidated Text and Data Files

- Goals for Today
  - Describe the Offerings – THIS MEETING
  - Decision on Separation and Consolidation (and Overlap) – LAST MEETING - *Structure*
  - Additions or Deletions of Measure
    - Process Boilers (Custom treatment)? - LEAVE IN eTRM
    - HW Thermostatic Valves, Tank Insulation – Small measures? - LEAVE IN eTRM
    - Other measures that need to be included – Commercial Aerators (ED Passed through) and Showerheads (SCG in progress). Timeclock Pump Control?
    - *Leave above WP supported measures in – be inclusive, do NOT leave savings on the table*
  - Agree on Measure Structure and Offerings

Interim Monthly Goals – Water Heating

- Goals for October 2017
  - Full Data and Text Consolidation Files and Data Spec Sheets for:
    - Faucet Aerators
    - LF Showerheads
    - Laminar Flow Restrictors

- Not Included Today – Savings and Costs (except for above – time permitting)

SubCommittee Members - remove

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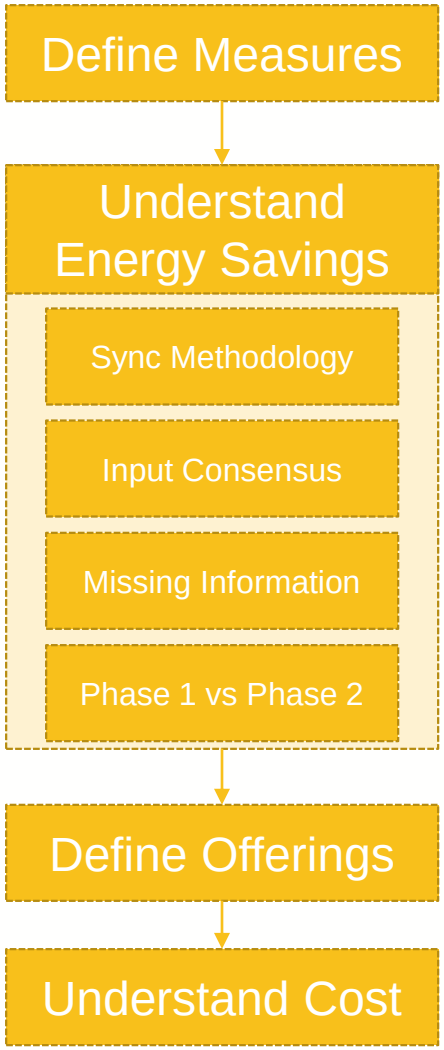
Water Heating Consolidation Overview



- **Defining Measures – Making Progress**
  - Flow Changes
  - Boiler / Heater Efficiencies
  - Controls
  - Insulation
- Input consensus needed
  - Permutation / Implementation fields
  - **Offerings**
  - Cost
- Missing information and Additional Measures:
  - Building vintage savings permutations – any?
  - DEER inputs – any uncertain?
  - DR for Electric Water Heaters – (Grid enabled?)
  - Gas/electric fuel switching? 3 prong test and all GHG impacts (leaks, fuel mix, etc.) – HPWHs? Others?
    - Beyond Scope of Deemed Measures?
    - Phase 2 ?

Define SWH / DHW Measures
Original Measure List

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

Lead Workpaper
Supporting Workpaper

SHW / DHW Measures
Representative Measure Savings Claims

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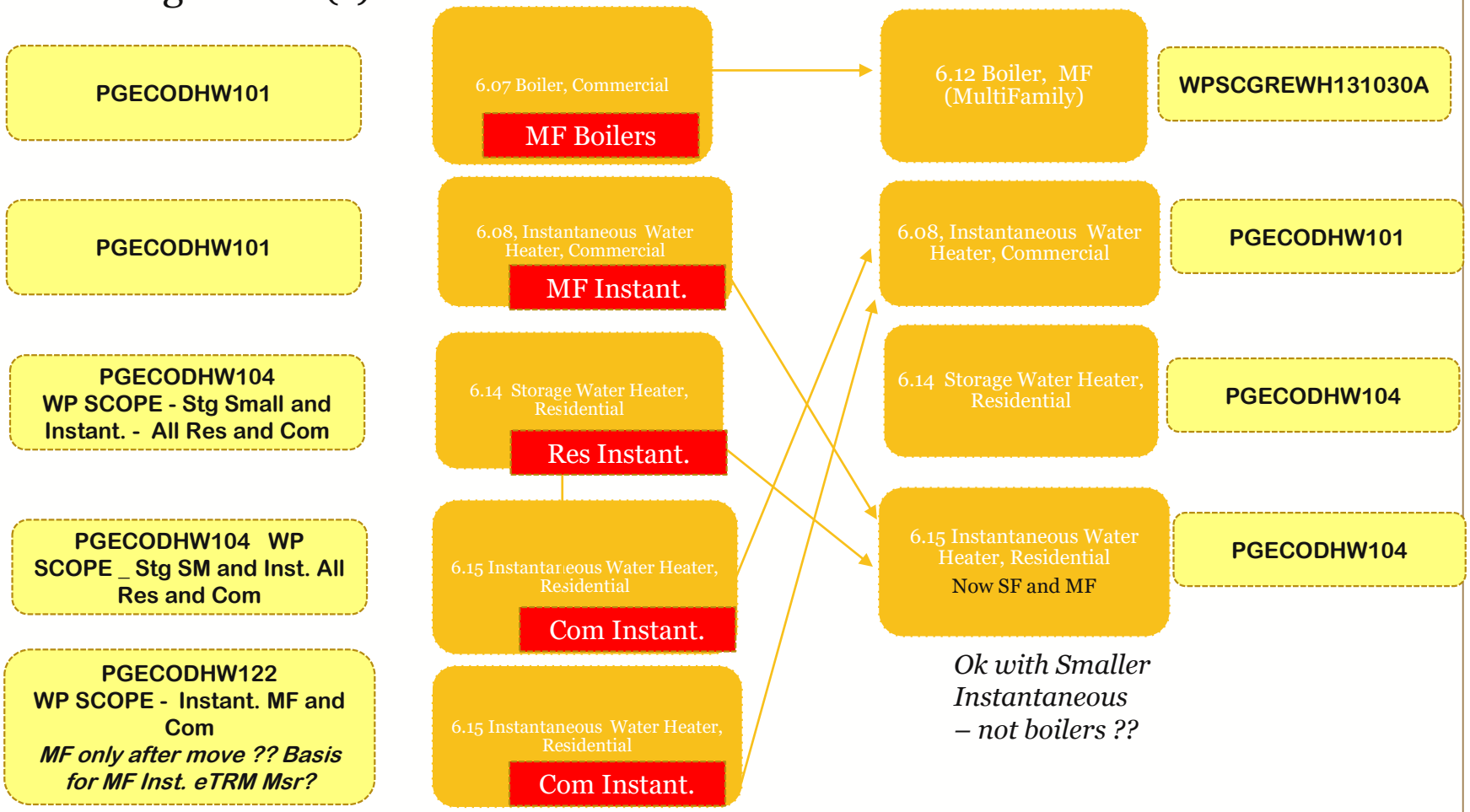
No.	Name	Sum of NumUnits	Energy (kWh/yr)	Demand (kW)	Energy (therms/yr)
6.01	Faucet Aerator and Low Flow Showerhead	18,822	42,306	4.25	18,852
6.02	Faucet Aerators for Bathroom/Kitchen Sinks in Residential Buildings	232,384	30	0.00	397,107
6.03	Low-Flow Showerheads	83,141	0	0.00	493,980
6.04	Temp-Initiated 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.

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

Lead Assigned WP(s)



Define SWH / DHW Measures

Offerings

- Flow Reduction
- Pipe Insulation
- Heaters
- Controls

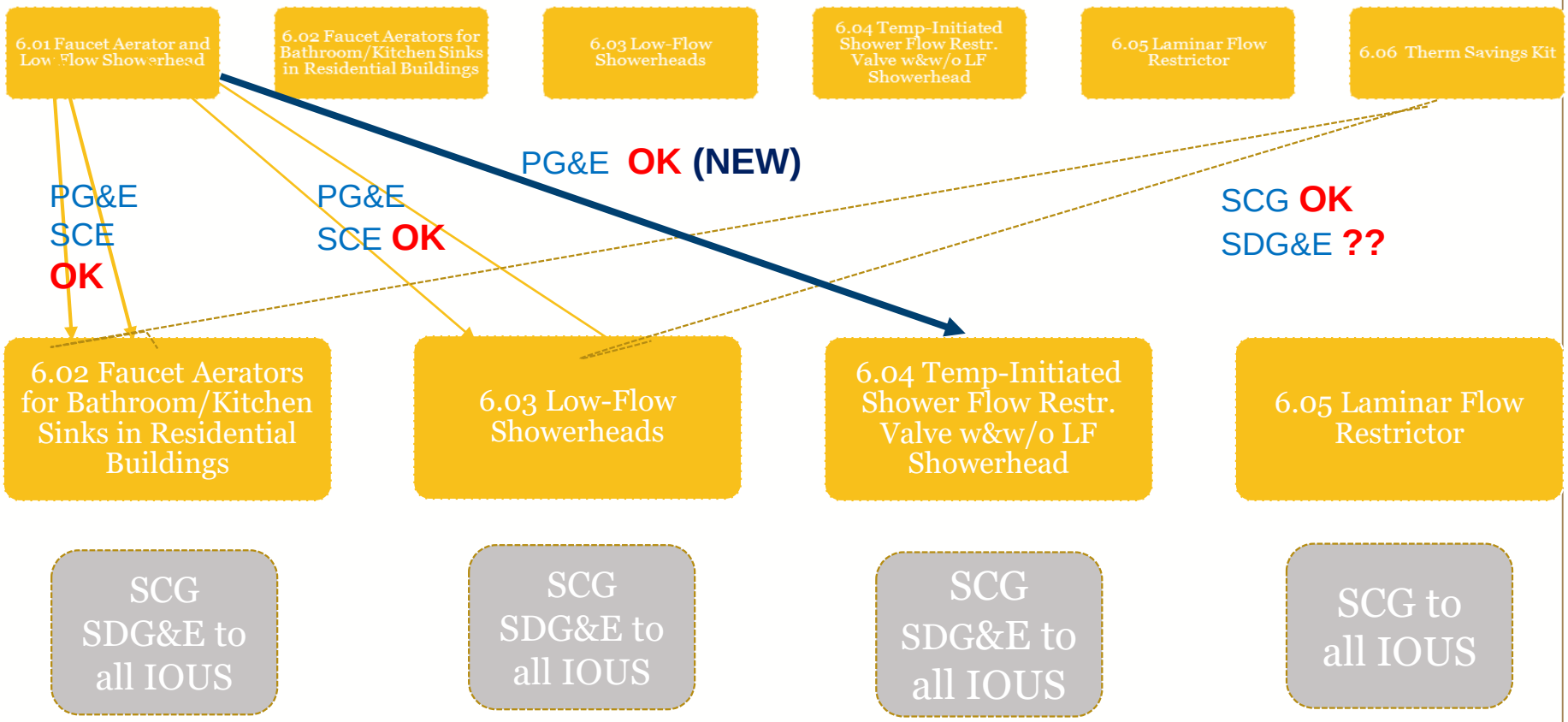
Lead Workpaper
Supporting Workpaper

6.01 thru 6.06 – Flow Restriction / Water Reduction Measures

- Offerings
  - All residential except 6.05 – laminar flow restrictors
  - Includes MF and sometimes DMo – double wide mobile home OK?
  - Mix of Direct Install (DI) and Some Up and Downstream Rebate (affects GSIA/GRR and NTG – utility and program specific? Prescribe list of values in eTRM?)

- Ex Ante Measure Tables
  - Building Type
    - SFm, MFm, Dmo (no permutations – except by number in household – SF and MF)
    - 6.05 – Hospital, Clinics, Nursing Home **(limited permutations?)**
  - Building Vintage (no permutations - ANY)
    - Any
  - Building **Location** **(multiple permutations)**
    - Any (varies for some IOUs by climate zone)
  - Building HVAC (no permutations)
    - Any (or Res-weighted rWtd)

6.01 thru 6.06 – Flow Restriction Measure-Possible Consolidation



Includes POUs!

6.01 thru 6.06 – Flow Restriction Measures

- Resolving Issues
  - Collapse to only Aerators and Showerheads? IOUs can offer combinations tracking back to eTRM values – Generally OK – checking with SDG&E
    - Addresses problems with Baseline Type (ER/RET or ROB vs. REA for aerators)
  - Allow multiple measure efficiencies – incl. all code compliant effic. values ?? (YES?)
  - Any reason to separate MF? NO
  - Include Climate Zone Variation (+/- 15% maximum)? YES
  - Consensus on Delivery Type – changes GSIA and NTG values – DI and School distribution and downstream???
  - Addressing embodied energy in water – water reduction given for some measures - varies by location – Phase 2?
  - Add Commercial measures for aerators and showerheads YES – when approved
    - Many building types / permutations – Separate eTRM measures?? YES
  - Keep Temp Initiated Thermostatic Valve in eTRM? YES

6.01 thru 6.06 – Flow Restriction Offerings – 6.02 Aerators

- Residential – SF, MFm, DMo (recommended)
  - PGE offers to Residential, SCG to SF and MFm
- Building Type – EX (existing) and ANY (EX recommended)
- Delivery Mechanism - Direct Install
  - SCG school distribution may be considered a type of downstream rebate
  - PG&E also allows 3P and core upstream
    - Recommendation – allow all – GSIA and NTGR values change (adds permutations)
- Climate Zone Differences (+/- 15%) permutations – Per CPUC ED Disposition – Leave in calculations
- Code changes
  - Lavatory Faucets (non-public) – 1.5 gpm (9/1/15) and 1.2 gpm (1/1/16)
    - No longer offer 1.5 gpm as measure efficiency
  - Kitchen Faucets – 1.8 gpm with 2.2 gpm intermittent (1/1/16)
  - Public Lavatories – 0.5 gpm (1/1/16)
- Base flow in gallons per minute (gpm) – 2.2 gpm
  - SCG excludes 1.5 gpm faucets, base flow should not be over 2.2 gpm
  - PG&E base flow is 2.2 gpm or greater

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 ?)
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**
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 Showerheads

- Residential – SF, MFm, DMo (recommended)
  - PGE offers to Residential, SCG to SF and MFm
- Building Type – EX (existing) and ANY (EX recommended)
- Delivery Mechanism - Direct Install (all IOUs)
  - PG&E & SCE allow Pre Rebate Down
  - SCE lists non upstream
  - 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
- Code changes
  - Showerheads – 2.0 gpm (7/1/16) and 1.8 gpm (7/1/18)
    - IF RET / ER, should have two baselines with base flow of 1.8 gpm for 2nd savings period

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	RET / 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

** 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

- Residential – SF, MFm, DMo (recommended)
  - PG&E offers to Residential, SCG to SF and MFm
- Building Type – EX (existing) and ANY (EX recommended)
- 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
- Code changes
  - Showerheads – 2.0 gpm (7/1/16) and 1.8 gpm (7/1/18)
    - IF RET / ER, should have two baselines with base flow of 1.8 gpm for 2nd savings period

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	RET / 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 – 6.05 Laminar Flow Restrictors

- Commercial – Hospitals, Clinics, Nursing Homes (recommended)
- Building Type – EX (existing) and ANY (EX recommended)
- Delivery Mechanism – DI and PreRebDown
  - Recommendation – allow both – GSIA and NTGR values change (adds permutations)
- Climate Zone Differences (+/- 15%) permutations – Per CPUC ED Disposition – Leave in calculations
- Code changes – Does new code affect these buildings? Nothing excludes.
  - Lavatory Faucets (non-public) – 1.5 gpm (9/1/15) and 1.2 gpm (1/1/16)
    - No longer offer 1.5 gpm as measure efficiency
  - Kitchen Faucets – 1.8 gpm with 2.2 gpm intermittent (1/1/16)
  - Public Lavatories – 0.5 gpm (1/1/16)

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 ?)
Measure EE gpm Kitchen				0.5 / 1.0 / 1.5 / 2.2	0.5 / 1.0 / 1.5 / (1.8?)
Electric Savings					X
Gas Savings				X	X
Baseline Type				REA	REA**
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?

Is a 20 year faucet life appropriate?

6.01 thru 6.06 – Flow Restriction Offerings – 6.06 Therm Savings Kits

A Few Notes

- Now included in Aerators and Faucets (6.02 and 6.03) - Pending SDG&E input
- SCG school distribution may be considered a type of downstream rebate: SDG&E direct mail and upstream
- SF only - on request
- REA for SCG and RET for SDG&E
  - Mix of showerhead and aerators

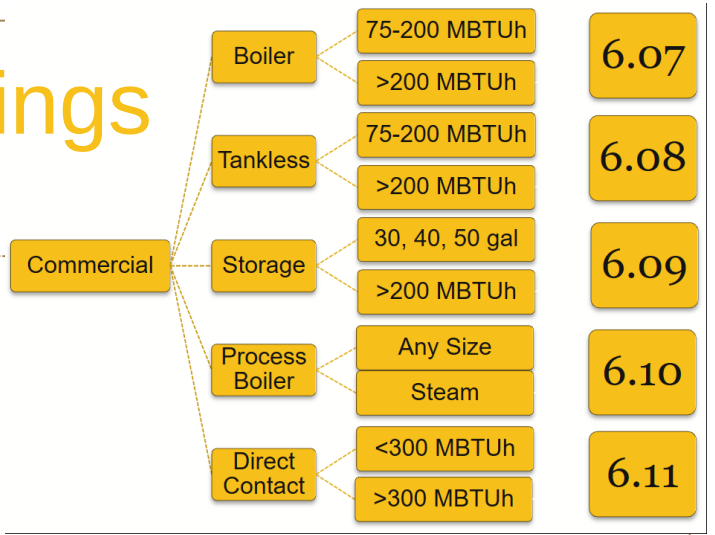
Cleaner treatment to separate technologies

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

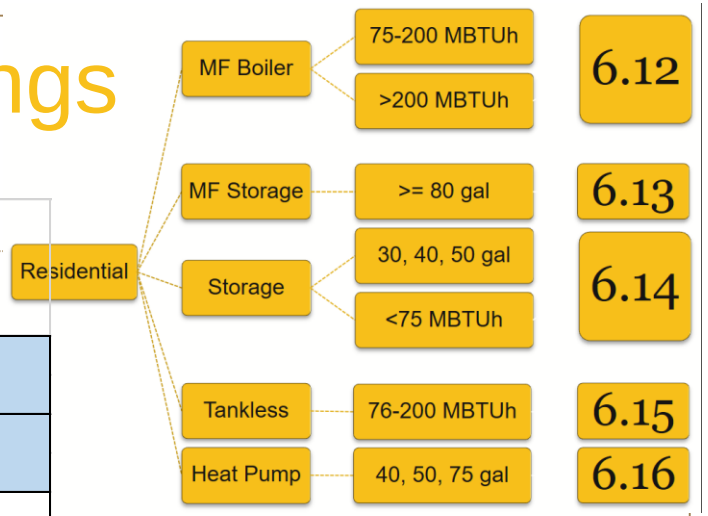
No.	PG&E	SCG	SDG&E	SCE	Commercial	Capacity	Efficiency
6.07	x				Comm Boiler	Small (>75MBTU/h)	>90% TE
6.07		x	x			Small/Med (<=200MBTU/h)	>=84% EF
6.07		x	x				>=90% EF
6.07		x	x			Large (>200MBTU/h)	>=84% TE
6.07		x	x				>=90% TE
6.07	x						>=85% TE
6.07	x						>=90% TE
6.08		x			Comm Tankless	Small/Med (<=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)	>=83% 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

6.07 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?
- COMPLETE AND COLLAPSE TABLE

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) --- Nedd 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?
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 and Boiler Reset Controller (NEW)*	? RCx Measure Only? Any claims?
6.20 MF Central Recirc System Pipewrap	~~6.20 MF Central Recirc System Pipewrap~~	? No Claims?
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
  - 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
  - ONLY 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 6.18
  - SDG&E includes RCx and Training components (Difficult to quantify savings)
  - Modify or remove?

6.20 to 6.22 – Insulation

DHW Pump and Boiler Controls

- 6.20 MF Central Recirc System Pipewrap – 1 WP (SDG&E)
  - MF only
  - SCG not offering? SDG&E offering?
  - No Climate Zone Dependency (CZ)
  - Possibly Combine with 6.21
- **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
  - Include MF Recirc Systems, Ag/Ind., SF & MF first 6 feet of Supply Lines ???
  - Verify Electric Savings – extend to SCE?
  - ALL IOUs - PreRebDown (No DI?)
  - ALL IOUs – REA measure – SDG&E starts can be damaged insulation – remove?
  - 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 combination??

6.01 thru 6.22 – Hot Water Measures

- Remaining Issues – Cross Cutting
  - Be inclusive - include multiple offerings (efficiency tiers) and end use markets as possible to increase relevance and use, and capture opportunities
    - Expand Commercial to Agricultural and Industrial where relevant
    - Expand ROB measures to include NC where possible.
    - Consider RET / ER baseline types for several measures (Inst. htrs, damaged insulation, etc.) in light of AB 802
  - Any preferred delivery method when not consistent across IOUs? Expand to all?
  - Partial exclusion (or total) when buildings have functional solar water heaters?
- 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
  - Commercial Aerators

6.01 thru 6.22 – Hot Water Measures

Questions?

Next Steps?