Process Subcommittee Meeting #3

CALIFORNIA
TECHNICAL FORUM

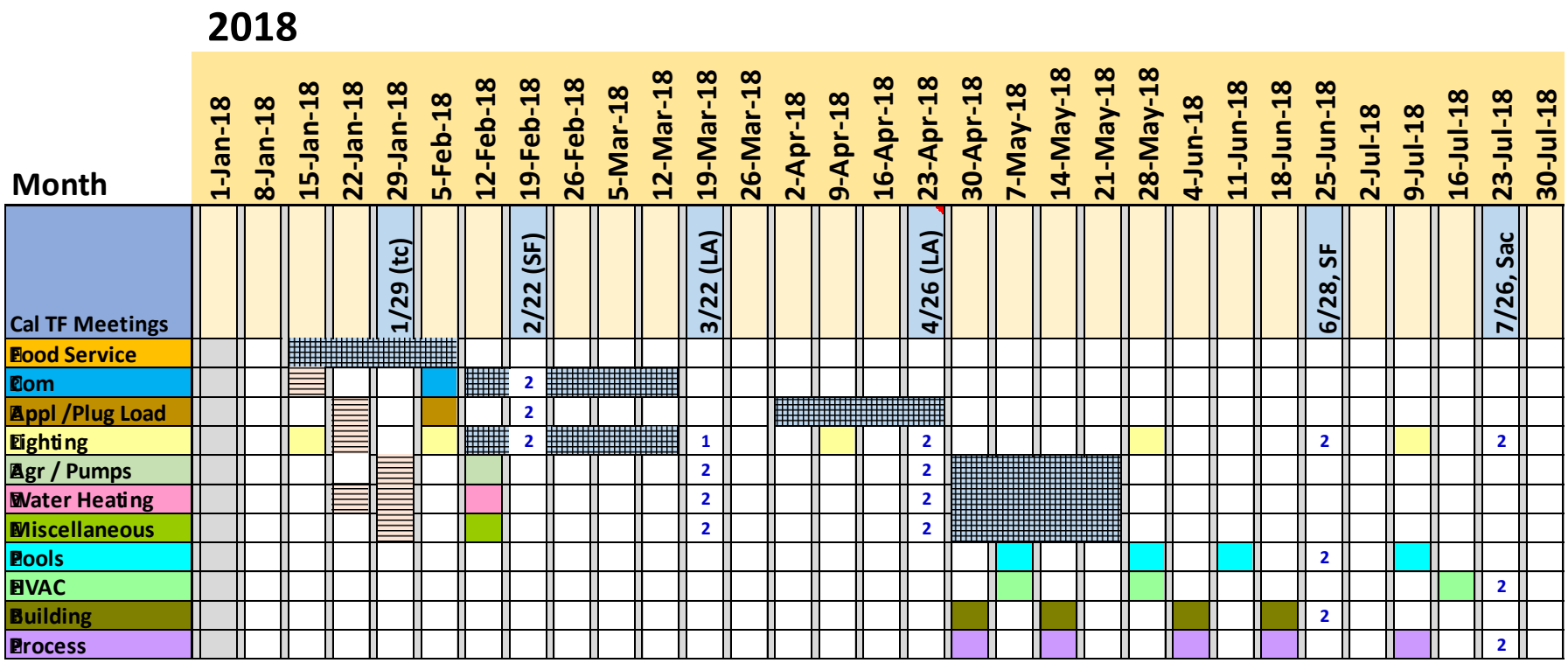
AYAD AL-SHAIKH

JUNE 2018

Agenda

- Measure Re-Review
  - 10.01 - Industrial Blower Replacing Air Compressor
    - Question: ER measure application type
  - 10.08 - Commercial Steam Traps
    - Cost – potentially outdated
  - 10.02 - Air Compressor VFD Retrofit
    - Cost
    - Questions: Savings hours & Interactive effects
  - 10.05 - Glycol Pump Motor VFD
    - Cost
    - (waiting on some information)
  - 10.10 - Circulating Block Heater
    - Cost
    - Savings for other climate zones

2018 Schedule



Process Measure Status (Source – 2017 Q1-Q3, IOU Claims Data)

CALIFORNIA TECHNICAL FORUM

Ref No	Description	kWh	kW	Therms	Comment
10.02	Air Compressor VFD Retrofit	-	-	-	Reclassify at ROBNC; consider expansion of measure for "to-code".
10.05	Glycol Pump Motor VFD	145,917	-	-	Requesting additional support data.
10.08	Commercial Steam Traps	-	-	8,806	Entension to PG&E. Confirm not additional disposition issues.
10.10	Circulating Block Heater	43,753	5.46	-	Reclassify as a midstream delivery.
10.12	Process, Head Pressure Controls	-	-	-	**Question:** Is there a group that supports this measure?
10.13	Process, Suction Pressure Controls	-	-	-	**Question:** Is there a group that supports this measure?
10.09	Venturi/GEM Steam Trap	-	-	-	**Question/On Hold:** Does a workpaper exist for this yet?
10.01	Industrial Blower Replacing Air Compressor	42,104	27.45	-	**On Hold**; Installation Type issue leading to negative IMC.
10.14	Process Fan VFD - Ag Ventilation	-	-	-	**On Hold**; No workpaper available yet. Expected Q4 2018.
10.03	Cycling Air Dryers for Compressed Air Systems	-	-	-	**On Hold**; no votes
10.04	Electronic Zero Air Loss Condensate Drains for Compressed Air Systems	-	-	-	**On Hold**; no votes
10.06	Process Fan VSD	2,491,161	1,436.70	-	**Sunset** due to disposition; Measure was designed too broadly.
10.07	Motor Upgrade	-	-	-	**On Hold**; no votes
10.11	Boiler Cleaning	-	-	-	**On Hold**; no votes

Measure Consensus - 10.08 Commercial Steam Traps

- Offering
  - SCG workpaper (SCGWP100310A, R9 – Aug 2011) – minimal savings in 2017
    - Short Forms (WPSDGENRWH0010, Rev2 – Oct 2016)
  - Existing system
    - Commercial steam trap, 12-24 hrs/day
    - Replacement of steam trap that has failed in either leaking or blow-through mode (ie, not blocked)
  - Proposed system
    - New steam trap or new steam trap "capsule"
  - Gas only
  - Build Types:
    - Large educational facilities, correctional facilities, general medical hospitals, surgical hospitals, agricultural facilities, industrial launderers, tele-production and other postproduction services, and transportation equipment suppliers
- Stage 1 Issues
  - Offering:
    - Changing Installation Type to ROB (consistent with SDG&E Short Form)
  - Energy Savings
    - Review 2011 Disposition values to ensure reasonable
      - Confirm that there is consensus / agreement with the "Adjustment Factors"
    - 2016 Disposition seems to refer specifically to Industrial Steam Traps – Get feedback from team
  - *Cost – based upon survey data*
- Measure Extension
  - PG&E is planning to adopt this Measure.

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Measure Consensus - 10.08 Commercial Steam Traps

- Offering
  - *Cost*
  - *SCG: Based upon a weighted average of cost for various categories (>15 psig):*
    - *Vendor conversations (Enbridge, 2005)*
    - *Enbridge Survey*
  - *SDG&E: $233.00 ($77.78 – materials + average DI contract labor)*

Type of Steam Trap		Pressure (psig)						
	15	30	75	125	150	180	200	250
Float & Thermostatic								
3/4 inch	$127	$150	$203	$207	$454	$454	$454	---
1 1/2 inch	$258	$314	$352	$352	---	---	---	---
Average	***$193***	***$232***	***$278***	***$280***	***$454***	***$454***	***$454***	---
Other								
Inverted bucket	$82	$82	$82	$82	$105	$105	$105	$105
1/2 inch thermodynamic	$185	$185	$185	$185	$185	$185	$185	$185
3/4 inch thermodynamic	$235	$235	$235	$235	$235	$235	$235	$235
Average	***$167***	***$167***	***$167***	***$167***	***$175***	***$175***	***$175***	***$175***
Average	$180	$200	$222	$223	$315	$315	$315	$175

Parameters		Pressure (psig)						
	15	30	75	125	150	180	200	250
Number of Leaking Traps	1,539	171	235	264	54	0	2	26
Total Replacement Cost	$276,892	$34,143	$52,268	$58,982	$16,983	$0	$629	$4,550
Average Cost per Trap	**$180**	**$223**						

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Measure Consensus - 10.08 Commercial Steam Traps

- Savings

Parameter	Value
Average steam trap inlet pressure (psig)	35.5
Average heat of evaporation of steam produced (Btu/lb)	924
Average installed boiler efficiency	80%
Boiler energy required to replace lost steam (Btu/lb)	1,155
Annual operating hours	4,380
Average percentage of leaking & blow-thru steam traps	16%
Average leak rate (lb/hr per trap rebated)	13.6
Annual gas savings (therms/year per trap rebated)	687

Measure Description	Gross per Trap Savings (th/yr)
Steam Trap Replacement – Large Commercial 12-24 hr/day [A]	687
Combined Adjustment Factor (CAF)	21.4%
Failed Adjustment Factor (FAF)	81%
Steam Trap Replacement – Large Commercial 12-24 hr/day	**119**

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Measure Consensus - 10.08 Commercial Steam Traps

- Savings
  - Savings factors
    - Pressure factor - The inlet pressure of a steam trap is greatly reduced due to the effect of a control valve which is between the steam line pressure and the steam trap.
    - Load factor - The hours that the trap is leaking steam are often less than the steam system operating hours.

Service	Population (%) *	Load Factor (%) **	Pressure Factor (%) *	Combined Factor (%)
Line	25%	32%	100%	8.0%
Load	75%	32%	56%	13.4%
Combined Adjustment Factor (CAF) for Line and Load Traps				**21.4%**

* Disposition value

** Conservative value based on the range of operation from Process Boiler workpaper

    - Failed Adjustment Factor - Steam traps that were replaced within this program but were mistakenly identified as meeting the failure eligibility requirements, i.e., instead of being failing open (leaking or blowing through), the trap was failed closed (blocked).
      - From SoCal study: 27.7% failed open; 6.3% failed closed.
      - Therefore, Failed Adj Factor = 27.7 / (27.7+6.3) = **81%**

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Input Consensus - 10.08 Commercial Steam Traps

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
BldgType	Com	No Value	No Value	Com	Com
BldgVintage	Any	No Value	No Value	Ex	Any
BldgLoc	Any	No Value	No Value	Any	IOU
BldgHVAC	Any	No Value	No Value	Any	Any

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	ROB	No Value	No Value	ROB	RET
NormUnit	Each	No Value	No Value	Each	Each
EUL ID	PrcHt-StmTrp	No Value	No Value	HVAC-StmTrp	PrcHt-StmTrp
RUL ID	n/a	No Value	No Value	No Value	No Value
NTGR	NonRes-sAll-mStmTrp-dn	No Value	No Value	Com-Default>2yrs	NonRes-sAll-mStmTrp-dn
DeliveryType	PreRebDown	No Value	No Value	PreRebDown	PreRebDown
GSIA	No Value	No Value	No Value	No Value	No Value

Confirm these are the correct choice.

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Measure Consensus - 10.02 Air Compressor VFD

- Offering
  - SCE workpaper (SCE17PR005.0 – Nov 2016) – no savings in 2017
    - SDG&E workpaper (WPSDGENRPR0001, Rev 0 – Aug 2014) – no savings in 2017
  - Existing system
    - Rotary screw compressor using load/unload controls with rated capacity between 5 and 25 HP
    - When multiple compressors are included in the base case, the base case operates as a trim compressor
  - Proposed system
    - Install an air compressor with a VFD
  - Electric only
  - Compressor ranges: 5 to 15 HP, 15 to 25 HP
  - Build Type: (*include: Ag, Clinic, Industrial, Misc Commercial, Transportation – Communication – Utilities*)
    - Health/Medical – Hospital; Manufacturing - Bio/Tech; Manufacturing - Light Industrial; Retail - Single-Story Large; Office – small

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Measure Consensus - 10.02 Air Compressor VFD

- Stage 1 Issues
  - Offering:
    - Reclassify this Measure as ROBNC because a new air compressor would be required; load/unload components are fundamentally different. (This was an REA measure.)
    - Delivery channel may be moved to Midstream – Confirm if downstream should be removed?
  - Savings
    - Calculated using AIRMaster+ modeling
    - Savings scaled based upon DEER building type hours, two approaches:
      - "Any" vs Building Specific
      - DEER hours likely need to be updated
    - Interactive effects – should they be included?
  - *Cost*
    - *Material cost – web search (Load/Unload Screw Compressor vs VSD Screw)*
    - *Labor cost - RS Means 2016*
- Stage 2 Issues
  - *Consider "to code" measure for >25 hp.*
    - *Need an example measure*
    - *What are the sensitive parameters that should be considered*

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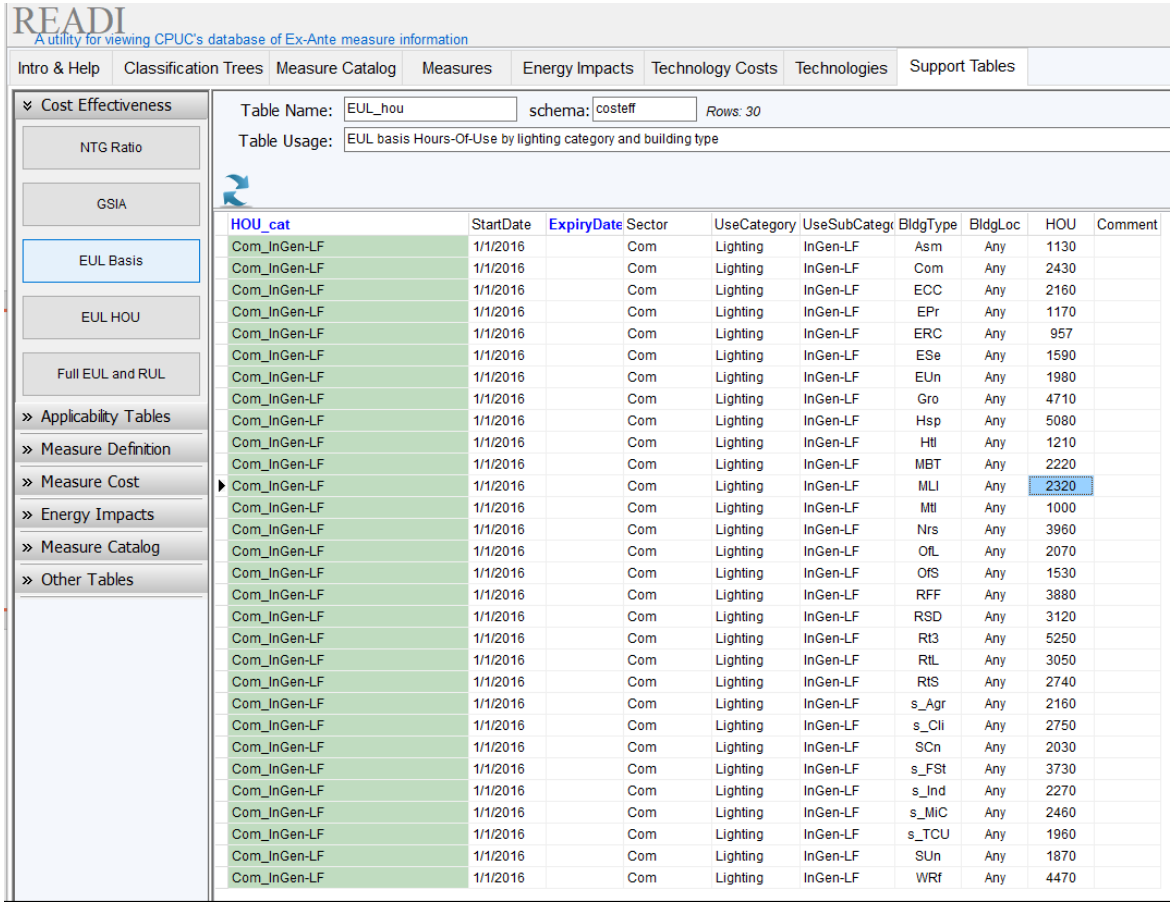
Measure Consensus - 10.02 Air Compressor VFD

- Stage 1 Issues
  - Savings
    - Savings scaled based upon DEER building type hours, two approaches:
      - "Any" building type: 2,920 hrs/yr (Manufacturing-Light Industrial, tied to lighting – Com-Indoor-LF), hours now 2,320 hrs/yr (maybe updated in DEER)
      - COM 2,430 hrs/yr
      - Hsp 5,080 hrs/yr
      - MBT 2,220 hrs/yr
      - MLI 2,320 hrs/yr
      - RtL 3,050 hrs/yr



HOU_cat	StartDate	ExpiryDate	Sector	UseCategory	UseSubCateg	BldgType	BldgLoc	HOU	Comment
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	Asm	Any	1130	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	Com	Any	2430	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	ECC	Any	2160	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	EPr	Any	1170	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	ERC	Any	957	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	ESe	Any	1590	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	EUn	Any	1980	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	Gro	Any	4710	
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Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	Htl	Any	1210	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	MBT	Any	2220	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	MLI	Any	2320	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	Mtl	Any	1000	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	Nrs	Any	3960	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	OfL	Any	2070	
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Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	RSD	Any	3120	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	Rt3	Any	5250	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	RtL	Any	3050	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	RtS	Any	2740	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	s_Agr	Any	2160	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	s_Cli	Any	2750	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	SCn	Any	2030	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	s_FSt	Any	3730	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	s_Ind	Any	2270	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	s_MiC	Any	2460	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	s_TCU	Any	1960	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	SUn	Any	1870	
Com_InGen-LF	1/1/2016		Com	Lighting	InGen-LF	WRf	Any	4470	

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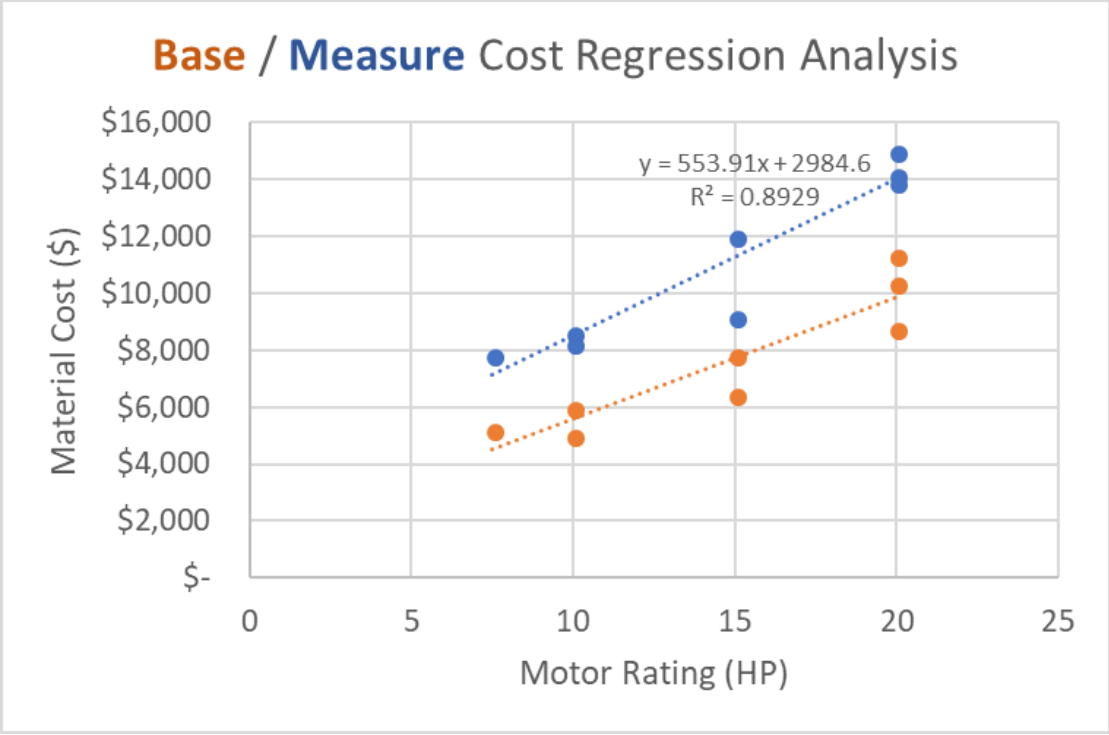
Measure Consensus - 10.02 Air Compressor VFD

- Stage 1 Issues
  - *Cost*
    - *Material cost – web search (Load/Unload Screw Compressor vs VSD Screw)*
    - *Labor cost - RS Means 2016*



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Input Consensus - 10.02 Air Compressor VFD

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
BldgType	Any,Hsp,MBT,MLI,OfS,RtL	No Value	Any,Hsp,MBT,MLI,OfS,RtL	Com,Hsp,MBT,MLI,RtL	No Value
BldgVintage	Any	No Value	Any	Ex	No Value
BldgLoc	Any	No Value	Any,CZ06,CZ08,CZ09,CZ10,CZ13,CZ14,CZ15,CZ16	CZ06,CZ07,CZ08,CZ10,CZ14,CZ15	No Value
BldgHVAC	Any	No Value	Any	Any	No Value

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	ROBNC	No Value	REA,RobNc	No Value	No Value
NormUnit	Rated-HP	No Value	Rated-HP	Rated-HP	No Value
EUL ID	CompAir-Screw-VSD	No Value	CompAir-Screw-VSD	HVAC-VSDSupFan	No Value
RUL ID	CompAir-Screw-VSD	No Value	CompAir-Screw-VSD	No value	No Value
NTGR	Com-Default>2yrs Ind-Default>2yrs Ag-Default>2yrs	No Value	Com-Default>2yrs Ind-Default>2yrs	No Value	No Value
DeliveryType	PreRebDown	No Value	PreRebDown	No Value	No Value
GSIA	Def-GSIA	No Value	Def-GSIA	No Value	No Value

Any additional Building Types – note that there is no variation of savings
- Recommend removing Any OR removing other building types.

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Measure Consensus - 10.05 Winery Glycol Pump VFD

- Offering
  - PG&E workpaper (PGE3PRO108, R2) – minimal savings in 2017
  - Existing system
    - Constant speed glycol pump for process cooling in a winery
  - Proposed system
    - VFD controls required
    - Not applicable for back-up pumps
  - Electric only
  - Pump sizes: 3, 5, 7.5, 10, 15, 20, and 25 HP
  - Build Type:
    - Wineries

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Measure Consensus - 10.05 Winery Glycol Pump VFD

- Stage 1 Issues
  - Offering:
    - Decided not to consider for other building types.
  - Savings
    - Based upon typical winery project data
    - Should savings be normalized to “per HP” to be more consistent with other measures?
      - Variation exists because motor efficiency changes with rated HP.
      - Both savings (5-10%) and cost (50-100%) vary at lower HP range.
      - Recommend leaving as separate HP offerings.
    - *Follow-up questions:*
      - *Does data exist to document the speed that pumps were running at for lower load period?*
      - *Is there a recommendation on how the typical winery system relates to the Closed Loop System Guidance Document.*
  - *Cost –*
    - RS Means 2016 (material, labor and mark-up)
- Stage 2 Issues
  - *Are there other closed loop cooling systems that could be characterized?*

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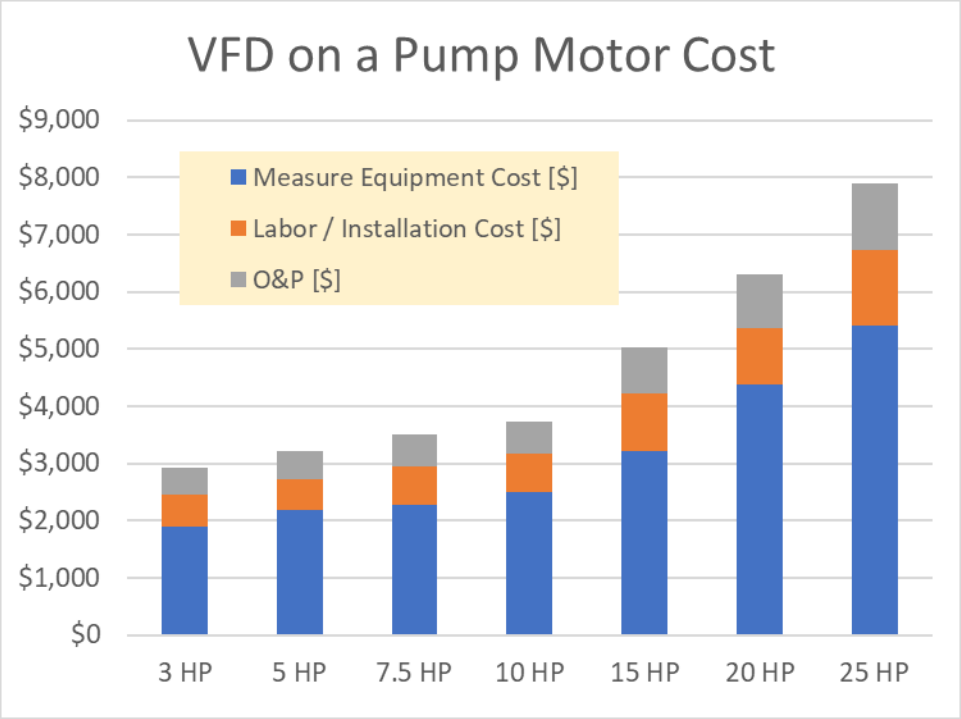
Measure Consensus - 10.05 Winery Glycol Pump VFD

- Stage 1 Issues
  - *Cost –*
    - RS Means 2016 (material, labor and mark-up)



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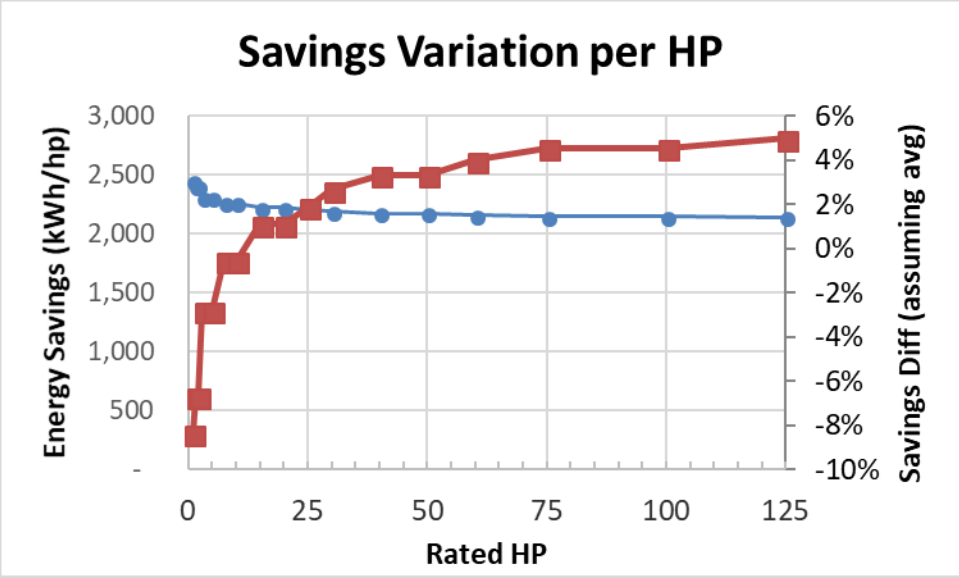
Measure Consensus - 10.05 Winery Glycol Pump VFD

- Stage 1 Issues
  - Savings
    - Based upon typical winery project data
    - Should savings be normalized to “per HP” to be more consistent with other measures?
      - Variation exists because motor efficiency changes with rated HP.



HP	Baseline Eff	Measure Eff
1	82.5%	82.5%
1.5	84.0%	84.0%
2	84.0%	84.0%
3	87.5%	87.5%
5	87.5%	87.5%
7.5	89.5%	89.5%
10	89.5%	89.5%
15	91.0%	91.0%
20	91.0%	91.0%
25	91.7%	91.7%
30	92.4%	92.4%
40	93.0%	93.0%
50	93.0%	93.0%
60	93.6%	93.6%
75	94.1%	94.1%
100	94.1%	94.1%
125	94.5%	94.5%

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Measure Consensus - 10.05 Winery Glycol Pump VFD

- Savings Methodology

Description	Base	Measure	Source
Rated HP	3 – 25 HP	3 – 25 HP	Typical rated HP values for glycol pumps
Motor Efficiency (%)	Varies with rated HP	Varies with rated HP	EPAct 1992 values, Subtype II, Enclosed, 4-pole, 1800 rpm (Statewide manual, App C)
Motor Load (%)	80%	80%	Typical Load
Operating Hours (hrs/yr)	8,413 (a)	1,773 (100%) 6,639 (70%)	(a) Average value from 19 projects; (b) Total hours match base case; reduced speed operating hours from 19 projects.

- Typical proposed motor load taken from 18 typical winery sites
  - 70% speed represents average speed plus one standard deviation to be conservative since significant variation exists from site to site
- Proposed power uses affinity relationships
  - Uses exponent reduced to 2
  - Power (measure) = Power (base) * (70% / 100%)$^{2.0}$

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Input Consensus - 10.05 Winery Glycol Pump VFD

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
BldgType	MLI	MLI	No Value	No Value	No Value
BldgVintage	Ex	Ex	No Value	No Value	No Value
BldgLoc	Any	Any	No Value	No Value	No Value
BldgHVAC	cUnc	cUnc	No Value	No Value	No Value

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	REA	REA	No Value	No Value	No Value
NormUnit	Each	Each	No Value	No Value	No Value
EUL ID	HVAC-VSD-pump	HVAC-VSD-pump	No Value	No Value	No Value
RUL ID	Motors-Pump (1/3 of pump EUL)	HVAC-VSD-pump	No Value	No Value	No Value
NTGR	Ind-Default>2yrs	Ind-Default>2yrs	No Value	No Value	No Value
DeliveryType	PreRebDown	PreRebDown	No Value	No Value	No Value
GSIA	Def-GSIA	Def-GSIA	No Value	No Value	No Value

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Measure Consensus - 10.10 Circulating Block Heater

- Offering
  - SCE workpaper (SCE13HC055, R0 – Sept 2014) – minimal savings in 2017
    - Short Forms (WPSDGENRWH0010, Rev2 – Oct 2016) – no savings for SDG&E or PG&E
  - Existing system
    - Thermo-siphon heater on a back-up diesel generator
  - Proposed system
    - Circulating block heater, which includes a circulating pump and electric heater assembly
  - Electric only
  - 4 Sizes of Generators; Under-Sized/Properly-Size Existing Heaters; ROB / NC
    - Does not vary by Building Type or ROB / NEW
- Stage 1 Issues
  - CalTF reviewed measure (from 2014)
  - Savings
    - Only SCE Climate Zones included
      - Savings vary by "Yearly Average Temperature" – Is it legitimate to extend the result to other Climate Zones simply by calculating the appropriate "Yearly Average Temperature"?
  - *Cost – Only one cost source (SCE workpaper)*

Measure Consensus - 10.10 Circulating Block Heater

- Stage 1 Issues
  - *Cost – Only one cost source (SCE workpaper)*
    - *Is there additional cost data for "undersized" vs "properly sized" heaters?*
    - *Base case data from equipment manufacturers*
      - *Cost of two thermo siphon heaters*
    - *Measure case data from equipment manufacturers*
    - *Labor costs from SCE customized program*

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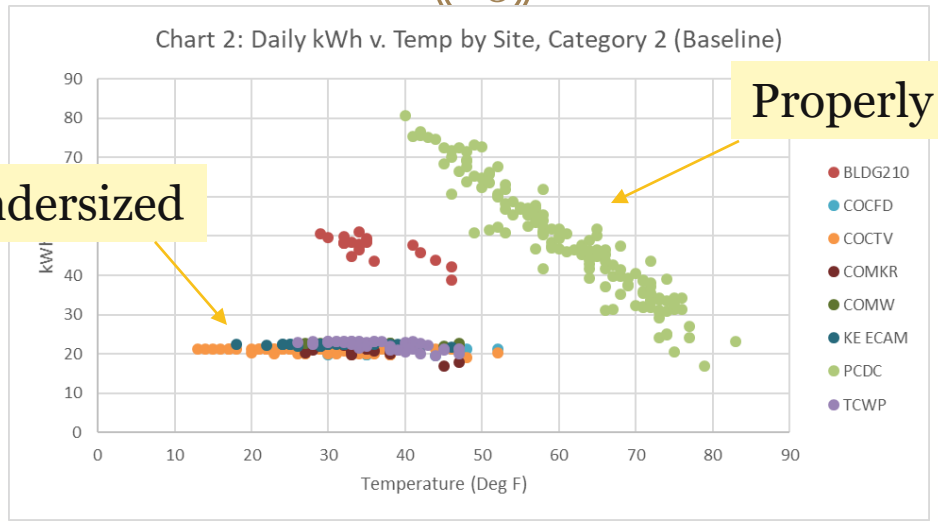
Measure Consensus - 10.10 Circulating Block Heater

- Savings



Site Size Category	Regression Coefficients	
	Intercept	Temp.
1	105.91	-1.178
2	88.92	-0.701
3	139.85	-0.932

Site Size Category	Regression Coefficients		
	Intercept	Heater Size	Heater Size * Temp.
1	3.70	13.135	-0.136
2	5.86	13.195	-0.133
3	10.26	16.688	-0.179
4	*229.52*	*0*	*-2.577*

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Measure Consensus - 10.10 Circulating Block Heater

- Savings

Savings Estimation Sample Calculation[5]:

Sample 1: Climate Zone 6, site size category 1, baseline heater size 1 kW, new heater size 1 kW, annual operation 334 days / year.

- Designation: Undersized
- Annual Average Temperature: 61.5°F
- Baseline Daily kWh: 20.2 * [Baseline Heater Size] = 20.2 kWh / day.
- Treatment Daily kWh: 3.70 + 13.135 * [New Heater Size] – 0.136 * [New Heater Size] * [61.5°F] = 8.4 kWh / day
- Annual Savings: (20.2 kWh/day – 8.4 kWh/day) * 334 days/year = **3,928 kWh/year.**

Sample 2: Climate Zone 8, site size category 3, baseline heater size 6 kW, new heater size 6 kW, annual operation 334 days / year.

- Designation: Proper-sized
- Annual Average Temperature: 63.4°F
- Baseline Daily kWh: 139.85 – 0.932 * [63.4°F] = 80.8 kWh / day.
- Treatment Daily kWh: 10.26 + 16.688 * [New Heater Size] – 0.179 * [New Heater Size] * [63.4°F] = 42.1 kWh / day
- Annual Savings: (80.8 kWh/day – 42.1 kWh/day) * 334 days/year = 12,908 kWh/year.

Input Consensus - 10.10 Circulating Block Heater

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
BldgType	Any	No Value	Any	No Value	No Value
BldgVintage	Any	No Value	Any	No Value	No Value
BldgLoc	CZ01,CZ02,CZ03,CZ04,CZ05, CZ06,CZ07,CZ08,CZ09,CZ10, CZ11,CZ12,CZ13,CZ14,CZ15, CZ16	No Value	CZ06,CZ08,CZ09,CZ10 ,CZ13,CZ14,CZ15,CZ1 6	No Value	No Value
BldgHVAC	Any	No Value	Any	No Value	No Value

	eTRM Measure Value	PG&E	SCE	SDG&E	SCG
MeasureAppType	ROBNC	No Value	RobNc	No Value	No Value
NormUnit	Each	No Value	Each	No Value	No Value
EUL ID	Motors-pump	No Value	Motors-pump	No Value	No Value
RUL ID	n/a	No Value	Motors-pump	No Value	No Value
NTGR	ET-Default	No Value	ET-Default	No Value	No Value
DeliveryType	PreRebDown	No Value	PreRebDown	No Value	No Value
GSIA	Def-GSIA	No Value	Def-GSIA	No Value	No Value

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Measure Consensus - 10.01 Industrial Blower Replacing Air Compressor

- Offering
  - SCE workpaper (SCE13PR006.3) – minimal savings in 2017
  - Existing system
    - Rotary screw compressor, 25-500 HP
  - Proposed system
    - Low pressure air application
    - Blower must be less than 50 HP
  - Electric only
  - Build Types:
    - Health/Medical – Hospital; Manufacturing - Bio/Tech; Manufacturing - Light Industrial; Retail - Single-Story Large; Office – Small (alternate for Clinic, Misc. Commercial, Transportation Communication Utilities)
- Stage 1 Issues
  - Negative incremental measure cost (IMC) – see next page.
  - Offering:
    - Should Industrial analysis also be included (not currently)?
  - Savings
    - BHP is used for normalizing savings. Assumes 100% load. Claims like per rated HP.
  - *Cost - TBD*

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Measure Consensus - 10.01 Industrial Blower Replacing Air Compressor

- Stage 1 Issues
  - Negative incremental measure cost (IMC); From Resolution E-4818:

> "An Add-on Equipment (AOE) measure installs new equipment onto an existing host improving the nominal efficiency of the host system. The existing host system must be operational without the AOE, continue to operate as the primary service equipment for the existing load, and is able to fully meet the existing load at all times without the add-on component.
>
> *The AOE must not be able to operate on its own*[12]. The actual energy reduction occurs at the host equipment, not at the add-on component, although any add-on component energy usage must be subtracted from the host savings"

Our decision not to authorize pony measures as add-on equipment leaves certain types of optimization measures without a clear alteration type classification. Currently these are treated with either normal or accelerated replacement baselines, which does not fit well since no equipment is removed or replaced at the time of installation. In the future it may be worth exploring whether a new category would serve these measure types better.

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Measure Consensus - 10.01 Industrial Blower Replacing Air Compressor

- Stage 1 Issues
  - Negative incremental measure cost (IMC); From Resolution E-4818
    - Therefore, this is not an AOE (Add-On Equipment) measure because it can operate on its own.
    - If this is an ROB / NR (Normal Replacement)
      - Base case cost: New Air Compressor
      - Measure case cost: New Blower
      - Therefore, this creates a negative IMC
    - If this is an ER / AR (Accelerated Replacement)
      - Base case cost: n/a
      - Measure case cost: New Blower
      - POE would be required – Is this an option to proceed?

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Measure Consensus - 10.01 Industrial Blower Replacing Air Compressor

- Stage 1 Issues
  - Negative incremental measure cost (IMC); From Resolution E-4818
    - If this is an ER / AR (Accelerated Replacement)
      - Base case cost: n/a
      - Measure case cost: New Blower
      - POE would be required – Is this an option to proceed?

Early Retirement Cost (ERC) is the total cost incurred to install the energy efficiency measure reduced by the net present value of the total cost that would have been incurred to install an ISP measure at the end of the remaining useful life period. This cost is considered for Early Retirement Measures only. D = Discount Rate (fixed per PA); RUL = Remaining Useful Life, in years, of Existing Equipment.

$$\mathbf{ERC = FMC - \frac{(FMC - IMC)}{(1+D)^{RUL}}}$$

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Measure Consensus - 10.01 Industrial Blower Replacing Air Compressor

- Savings Methodology

Description	Light Ind	Industrial	Source
Base Case (kW/100acfm @100 psig)	18.1	18.1	AirMaster+ default for 100HP single-stage lubricant injected rotary screw at full load
Measure Case (kW/100acfm @100 psig)	2.94 (5 psig)	5.94 (10 psig)	Manufacturer data based upon operating pressure
Operating Hours (hrs/yr)	1,534 (a)	7,752 (b)	(a) 50% of Light Industrial DEER hours; (b) 8,760 hrs/yr – 6 wks maintenance

  - Savings normalized per blower HP. Typical value taken from the most commonly used sizes 7.5-15 HP (8.3 BHP, full load)
  - Demand savings assumes operation throughout the 2-5pm period
  - Savings not weather sensitive

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Questions…

- Plans for next meeting
- Other measures
  - Industrial Steam Traps – not applicable; disposition limits these to custom and once per customer
  - Industrial Floating Head / Suction Controls

Measure Consensus -

10.12 Floating Head Pressure Control – Refrigerated Warehouse

- Offering
  - SCE workpaper (SCE17RN023.0) – no claims in 2017
  - Existing system
    - Evap-cooled condenser, fixed SCT = 85°F (air-cooled condenser not eligible)
  - Proposed system
    - DEER ID: D03-307: Evap-cooled condenser, fixed SCT = 70°F, backflood setpoint of 68°F
    - DEER ID: D03-308: Evap-cooled condenser, control SCT to wetbulb + 9°F TD, 70°F min, backflood setpoint of 68°F
    - DEER ID: D03-309: Evap-cooled condenser, control SCT to wetbulb + 9°F TD, 70°F min, backflood setpoint of 68°F, var-speed fan control
  - Build Types:
    - ECC, Eun, Gro, Hsp, Htl, MBT, MLI, Nrs, OfS, RFF, RSD, Rt3, RtL, RtS, SCn, WRf

Floating Head Pressure Controls

This measure adds controls to reset the head pressure setpoint to 70°F minimum, using either a fixed or variable-setpoint.

Methodology: The base case uses the vintage-dependent condenser and SCT control setpoint. The EEM floats the SCT setpoint to a minimum of 70°F. The backflood control setpoint is reduced accordingly (2°F below the control setpoint).

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Measure Consensus -
10.13 Floating Suction Pressure Control – Refrigerated Warehouse

- Offering
  - SCE workpaper (SCE17RN023.0) – no claims in 2017
  - Existing system
    - Fixed SST; Systems with variable speed evaporator fans not eligible
  - Proposed system
    - Reset SST based on worst-case zone demand
  - Build Types:
    - ECC, Eun, Gro, Hsp, Htl, MBT, MLI, Nrs, OfS, RFF, RSD, Rt3, RtL, RtS, SCn, WRf

Floating Suction Pressure

This measure adds controls to reset the suction pressure setpoint based on zone temperature. The compressors then operate more efficiently during periods of low load.

Methodology: The EEM consists of the addition of floating suction head controls to both the MT and LT suction groups. The minimum suction setpoint is the same as the base-case setpoint; the maximum is 5°F above the design temperature.

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Measure Consensus -
10.12 Floating Head Pressure Control – Refrigerated Warehouse

- Stage 1 Issues
  - Offering:
    - *Should these measures be included?*
    - *Is the mix of building types appropriate?*
      - *Assumed to be modelled in a refrigerated warehouse.*
    - *Where is the best application?*
  - *Cost – TBD for meeting #3*

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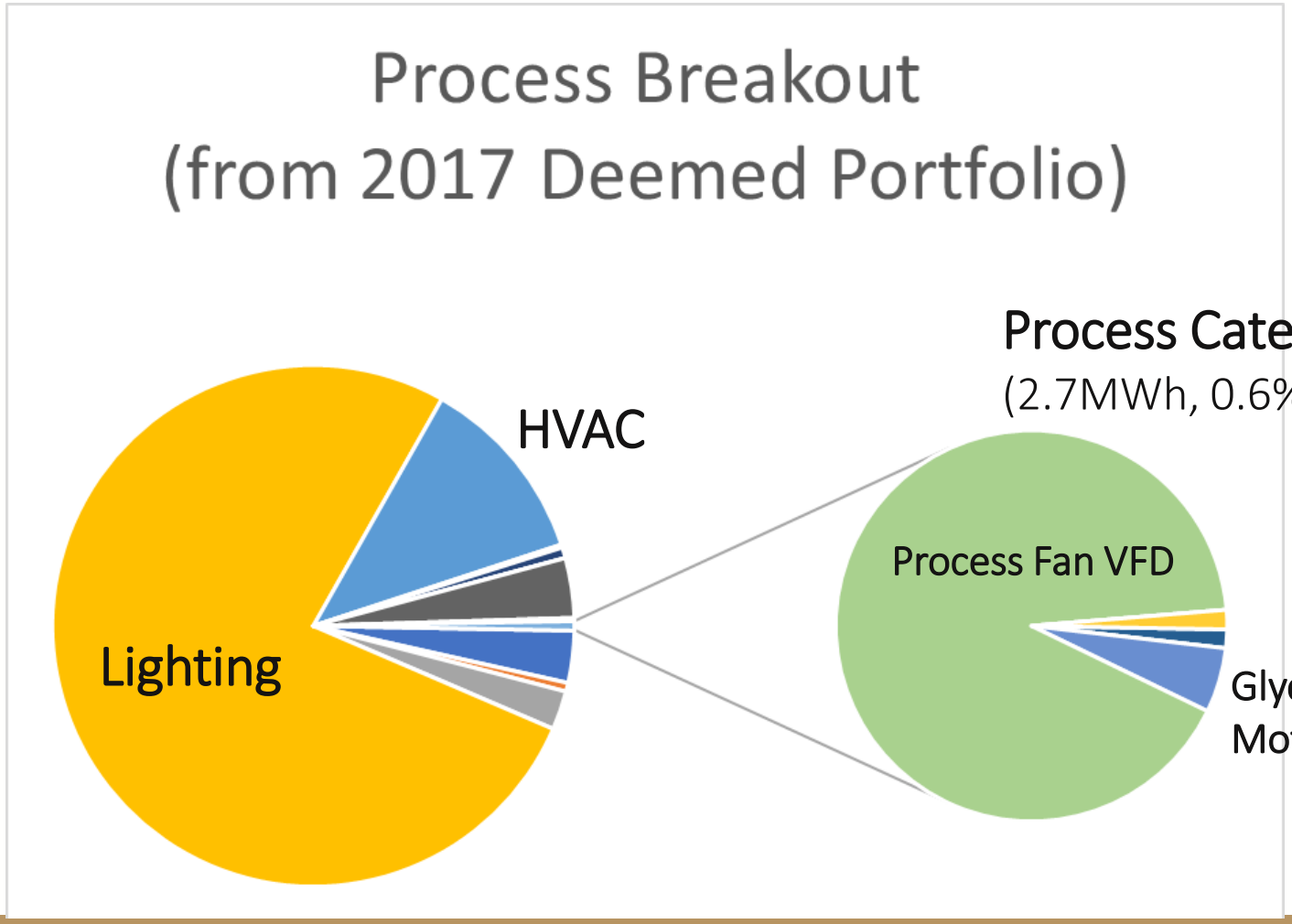
Back-up

Process Savings (Source – 2017 Q1-Q3, IOU Claims Data)



Measure Consensus - 10.06 Process Fan VFD

- Offering
  - SCE workpaper (SCE17PR008.1 – Oct 2016)
    - Short Forms (PGECOPRO110, R2 – June 2017 and WPSDGENRPR0004, Rev1 – Oct 2017)
  - Existing system
    - May be used for exhaust, ventilation, pressurization, or other process applications.
    - May not be used for air compressor systems, HVAC or refrigeration.
  - Proposed system
    - VFD controls required
    - Not applicable for back-up pumps
  - Electric only
  - Fan sizes:
    - 3 to 5HP (SCE and SDG&E)
    - >5 to 75HP Fan (all IOUs)
  - Build Types:
    - Manufacturing - Bio/Tech
    - Manufacturing - Light Industrial
- Stage 1 Issues
  - Offering:
    - Should the “3 to 5 HP” bin be offered? The text in the workpaper states that SCE and SDG&E were not offering this smaller HP bin.
  - Disposition from 3/2/17:
    - Document range of applications (including type of process, type of fan, operating hours with control type, and other parameters used in custom input tool
    - Split savings into at least two bins (to account for non-linear savings (between Rated-HP and kWh/yr)
  - *Cost - TBD*

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Measure Consensus - 10.06 Process Fan VFD

- Savings

Site Characteristics

Fan System Name	F10_70%	Location/City	Los Angeles CO (Los Angeles)
Fan System Type	Centrifugal	Exhaust Fan?	No
Number of Fans	1		

System Design Conditions @ Maximum Flow

Estimate Ambient Air Teperature?	No	Inlet Air Temperature	85.0 °F
System Design (Max) Flow	6410 CFM	Sys. Total Static Press. @ Max Flow	5.0 "Wg

Fan Operating Information

Number of Operating Modes	1	Operating Hour Input	Yearly
Annual Operating Hours	3372		

	Description	On-Peak?	Average Oper. Data	Hours/Year
1	D3	True	4487	3372

Operating Days Per Month

Operating Hours Per Day

Variable Speed Drive Installation

Full Load Efficiency	96%	Minimum Operating Speed	50%

Measure Consensus - 10.06 Process Fan VFD

- Fan Detail

Existing Equipment Specification

Fan #1 Nameplate Data

Fan ID	F3	Manufacturer	M3
Model	M3	Serial Num	S3
Fan Type	Centrifugal Airfoil DIDW	Control Type	Centrifugal On/Off
Drive Type	Std. V-Belt Drive		

Fan Performance (Design)

Fan Speed	1800 rpm	Flow	6410 cfm
Total Static Pressure	5 "Wg	Static Efficiency	64 %

Fan Drive Motor Information

Manufacturer		Model	
Size (HP)	10	Speed (RPM)	1800
Service Factor	1.15	FL Speed	1790
Enclosure	ODP	NEMA Nominal Efficiency	89.5 %

Proposed Equipment Specification

Fan #1 Nameplate Data

Fan ID	F3	Manufacturer	M3
Model	M3	Serial Num	S3
Fan Type	Centrifugal Airfoil DIDW	Control Type	Centrifugal Variable Speed Drive
Drive Type	Std. V-Belt Drive		