

# Agriculture / Pumping Subcommittee Meeting #3



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**OCTOBER 2017**

# Agenda

Measure No	Measure Name	eTRM Year	
3.01	Agricultural Pump System Overhaul for Pumps	2017	Pumping
3.05	VFD on Agricultural Well Pumps (<=300hp)	2017	
3.07	Vertical Hollow and Solid Shaft Pump Motors	2018	
3.03	Farm Sprinkler to Micro Irrigation Conversion	2017	Irrigation
3.04	Low Pressure Sprinkler Nozzles	2017	
3.02	Agricultural Ventilation Fans	2017	Dairy
3.06	Milk Cooling Scroll Compressor	2018	
3.14	Greenhouse - Heat Curtain	2018	Greenhouse
3.15	Greenhouse - Infrared Film	2018	

- Goals / Objectives
- Review Materials:
  - ❑ Ag Pumping, Sub Comm Mtg 3 – r1.ppt
  - ❑ Technology Summary - 3.0 Comm Refrig r3.1.xls
- Understand energy savings issues
  - ❑ Pump Overhaul and VFD on Well Pumps
    - ✦ Status; What is next?
  - ❑ Irrigation
    - ✦ Status on Consensus
  - ❑ Dairy Measures
    - ✦ Status on Consensus
  - ❑ Greenhouse Measures
    - ✦ Status on research; What is next?

# 3.01 Agricultural Pump System Overhaul

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- Working with SCE to understand if there dataset can:
  - Meet the Disposition request for (taken from II-B):
    - A. Pumps with both pre- and post- test data
    - B. Pumps with rated-hp that are covered by the workpaper
    - C. Exclude Base and Post OPE with >10% of total pump head
    - D. Higher post flow rates should not eliminate data
  - Be used to support pump or “pump site” EUL
- Next
  - Clarify Phase 1 / Phase 2 approach
  - PG&E / ITRC – Peak Demand study (Q4 2017)
  - PG&E / ITRC – Hours of Operation (Q1 2018) (*verify timeline*)
  - Extrapolate data statewide
    - ✦ Requested full data set from SCE to document energy savings
      - About 10 year history with customer data removed
      - We will attempt to include PG&E / SDG&E pump test results (different format)
    - ✦ Requested full data set from SCE to document “pump / pump site” EUL

# 3.01 Agricultural Pump System Overhaul

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- Phase 1 / Phase 2 Approach

- Phase 1

- ✦ Offerings consistent ( $\leq 25$  hp)
    - ✦ Data consolidated to a statewide methodology (no agreement yet)
      - **NOTE** – Savings would change because of issues with data set
    - ✦ Disposition agreement:
      - Measure application type: BRO (3 yr EUL) – Degradation is not applicable
        - Discuss how to include degradation
        - Want to get an exception
      - No demand savings

- Phase 2

- ✦ EUL update
      - Get an exception – data shows a higher values of about 4.5 yrs
      - Still be a BRO measure
    - ✦ Additional offering ( $>25$  hp and  $\leq 50$  hp)
    - ✦ Improvement on savings accuracy – other sensitive parameters
      - Include results of Hours of Operation Study
      - Using Hydrological Zones and Geological Zones
    - ✦ Include results of Demand Study
    - ✦ Pump Redesign Option – (*Suggested in Subcommittee Mtg #2*)

# 3.05 VFD on Ag Well Pumps

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Blue Text = Changes

- Phase 1 / Phase 2 Approach
  - Phase 1 – PG&E approved workpaper
    - ✦ Based upon 298 custom projects
    - ✦ Savings varies by
      - Well pumps ( $\leq 600$  hp), Booster pumps ( $\leq 150$  hp)
    - ✦ Delivery varies by
      - REA / NC;
      - PreRebDown / DI
    - ✦ Apply the measure statewide
  - Phase 2 – Improve savings accuracy
    - ✦ Document longer pump EUL
      - Currently, REA measure  $\rightarrow$  EUL = 10 yrs; RUL = 3.3 yrs
    - ✦ Consider more sensitive parameters than pump type (Well / Booster)
      - Operating hours (Muni vs Ag)
    - ✦ Opportunity to pump to open vessel (*Suggested in Subcom Mtg #2*)

## 3.07, Vertical Hollow & Solid Shaft Pump Motors

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- Final DOE rulemaking with new standards effective June 1<sup>st</sup>, 2016
  - 2014-05-29 Energy Conservation Program: Energy Conservation Standards for Commercial and Industrial Electric Motors; Final Rule
- Is there an opportunity to use existing conditions baseline (Accelerated Replacement)?
  - Can installed measure exceed code?
  - (Policy issue) Can savings be exclusively to-code?

# New Water Pump Upgrade Measure

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- PG&E Development for a deemed **replacement** pump installation.

- Alignment with DOE test procedure that will take effect in 2020.

- Timing?

- With CPUC now in review
    - Some pump manufacturers including label already
    - Launch Jan 2018
      - Labeling – Pump Energy Index (PI)
        - Equal or less than 1.0
        - Data from RTF for pump savings / with Hydraulic Institute
          - 5 pump types
          - Determined baseline
          - Currently running a pilot program (3000 permutations)
          - Hours are based upon RTF study
            - Disposition for industrial to limit hours
            - Ind – 5000
            - Ag - ~2000
            - Com - ~3000 hrs


- Program

- 3-200 hp allowable (60 permutations)
      - Constant to constant (<.96)
      - Constant to variable speed (<.49)
    - “Water Pump Upgrade”
      - Written to be adopted statewide
      - PGECOPUM106 – not approved yet
    - Hydraulic institute - Focus on pumping system together
      - Pumps.org
        - ER Portal

- Com, Ind, Ag clean water pumps

- BT – Ag irrigation; Com HVAC and DHW; Ind – process moving water



MEMBERSHIP   PUBLICATIONS   CONFERENCE	
Energy Efficiency Ecosystem > Energy Rating	
<b>Energy Rating</b>	
HI Energy Rating Program ER Portal Pump Test Lab Approval Program Application Process Style Guidelines PTLAP Approved Labs FAQs DOE Rulemaking Frequently asked questions DOE Pumps: Diagrams and Definitions Steps to Participate HI 40.5 HI 40.6	 <p>The HI Energy Rating (ER) program provides a framework for pump upgrades and changes according to HI Performance Standards.</p> <ul style="list-style-type: none"> <li>Manufacturers use the ER to...</li> <li>Public Utilities and...</li> </ul>

# Irrigation Measures

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# Irrigation Measures

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- Consensus:

- 3.04 - Low Pressure Sprinkler Measure

- ✦ Recommend: **Do not pursue**
    - ✦ Considered to be a problematic measure
      - No inherent savings involved
      - Narrow focus of brass nozzle to low pressure
      - Considered ISP now (need documentation to support this claim)

- 3.03 – Micro/Drip-Conversion Measure

- ✦ Recommend: **Phase 2** - Timing for the new measure is unclear
    - ✦ Revive this measure by redefining it
      - Address impact evaluation concerns
      - Include new requirements to make savings reliable (ie, VFD / design specs)

# iTron - Recommended Methodology

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- Must be responsive to impact evaluation issues
- Considerations when redefining measure:
  - Initial Application → Potentially Ineligible
    - ✦ Pre-project crop type, crop age and irrigation method
    - ✦ Prior year's electric billing data
    - ✦ Photographs of affected irrigation pump
  - Document pre- and post-water requirements
    - ✦ Note changing requirements
  - Document pre-pumping system
  - Document operating pumping efficiency (OPE)

# Dairy Measures

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## 3.06 Milk Cooling Scroll Compressor

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- Only one workpaper
- Low Measure usage – no claims in 2016
  - More applicable to smaller Dairies
  - Valuable measure to support that Hard-to-Reach market
- Savings based upon average values from an EM&V study (2007)
  - Normalized Unit = kWh / scroll compressor

## 3.02 Agricultural Ventilation Fans

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- Only one workpaper
- Phase 1
  - Offerings based upon fan size
    - ✦ 24-26", 36", 48", ~~50-52"~~ (remove 50-52" option)
  - Savings documented per fan (one for one replacement)
  - Fans qualify based upon a Qualified Products List (BEES lab tested)
- Phase 2 – currently custom / not deemed
  - Add a 72" option - Larger fans are more efficient
  - Include a VFD option – Control based upon temperature
  - Include new construction/added load
    - ✦ Farms that do not have cow cooling yet
  - Consider other sensitive variables (Climate Zone, Setpoint)

# Greenhouse Measures

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# Greenhouse Measures

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- CPUC decision required an updated ISP study
  - Navigant Study (2015) – saved on DropBox site
    - ✦ General Findings:
      - For both the greenhouse and irrigated agriculture market segments, the commodity drives growers' equipment installation and usage practices.
      - Growers remain very cost-constrained in their operations, and continue to rely on rebates for many of their energy-efficiency upgrades.
    - ✦ Greenhouse Findings:
      - California's greenhouse and nursery segment is increasingly facing competition from other markets, particularly in South America.
      - Energy saving opportunities exist within the greenhouse sector, particularly with respect to the building shell.
      - Although large growers tend to have more capital to invest in efficiency opportunities than small growers do, the volume of equipment that large must replace can place cost constraints on large growers' efficiency efforts, as well.
      - The use of variable frequency drives (VFDs) is becoming more common in greenhouses. However, growers interviewed typically only use VFDs on large well pumps.
      - As growers turn toward automated vent controls and other automated systems, the industry may see a corresponding increase in use of small motors.
    - ✦ Irrigated Agricultural Findings (*not included here / not related*)

# Greenhouse Measures

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- Measures still do exist in DEER
  - Blue measures correspond to SCG measures
  - (Thanks to Matthew for pulling data.)

IR Film						
Measure ID	Measure	Pre-existing	App Type	CZ 9 Savings (kWh)	CZ 9 Savings (therm)	Unit
Grnhs-Shell-LowIRRoof	Infrared film applied to roof	bare double-poly greenhouse roof	RobNC	0.024	0.15	Per Area ft2
Grnhs-Shell-LowIR-SingleLayer	Infrared film applied to single-layer wall or roof material	single-layer wall or roof material	RobNC	No Savings	No Savings	
Grnhs-Shell-LowIR_ThermCurt	Heat curtain and IR film installed	bare walls and bare double-poly roof	RobNC	0.122	0.41	Per area -ft2-BA
Grnhs-Shell-Tcurt_to_LIR_Tcurt	Infrared film applied to roof	bare double-poly roofs, heat curtain	RobNC	0.009	0.127	Per Area ft2
Heat Curtain						
Measure ID	Measure	Pre-existing	App Type	CZ 9 Savings (kWh)	CZ 9 Savings (therm)	Unit
Grnhs-Shell-LIR_to_LIR_Tcurt	Heat curtain installed	roof has with IR film and bare walls	RobNC	0.094	0.23	Per area -ft2-BA
Grnhs-Shell-ThermCurt	Heat curtain installed	bare walls and bare double-poly roof	RobNC	0.112	0.258	Per area -ft2-BA

- Pre-existing conditions (*roughly*) match Navigant findings
  - Study shows Building Shell Materials result from their 11 respondents
  - Over half of the growers stated that they did have at least one of these measures (IR Film, Heat Curtains, or Shade Cloths), and most of these respondents had a combination of these measures

# Backup

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# 3.05 VFD on Ag Well Pumps

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- Savings supported by
  - ~200 well pump PG&E custom projects
  - ~100 booster PG&E pump custom projects
  - Include SCE data, if available
  - Because of impact of this measure, VFD on Ag Pumps could be a good candidate for a deeper sensitivity analysis

Ref No	Name	Total Energy (kWh/yr)
3.01	Agricultural Pump System Overhaul for Pumps Up To 25 HP	772,578
3.02	Agricultural Ventilation Fans	523,200
3.03	Farm Sprinkler to Micro Irrigation Conversion	1,693,437
3.04	Low Pressure Sprinkler Nozzles	0
3.05	Variable Frequency Drive on Agricultural Well Pumps	32,921,200
	Variable Frequency Drive on Agricultural Well Pumps (<=300hp)	11,200,000
	Variable Frequency Drive on Agricultural Well Pumps (<=300hp)	18,100,000
	Variable Frequency Drive on Agricultural Booster Pumps (<=150hp)	1,900,000
	Variable Frequency Drive on Agricultural Booster Pumps (<=150hp)	1,000,000
	Variable Frequency Drive on Agricultural Booster Pumps (<=150hp)	800,000
3.06	Milk Cooling Scroll Compressor	0
3.07	Vertical Hollow and Solid Shaft Pump Motors	1,035,326
3.08	CHR Unit - Electric and Gas	0
3.09	Milk Vacuum Pump VSD	0
3.10	Milk Transfer Pump VSD	0
3.11	Chilled Glycol Pipe Insulation	121,713
3.12	Glycol tank Insulation	189,645
3.13	Tank Insulation	0
Grand Total		37,257,098

Type	Pump HP	Count of # of Pumps
Booster	25	1
	30	4
	40	10
	50	10
	60	14
	75	28
	100	20
	125	9
	150	3
Well	25	2
	30	8
	40	2
	50	13
	60	5
	75	20
	100	24
	125	28
	150	28
	200	27
	250	17
	300	23

# EUL of an REA Measure

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NC

REA

EUL ID	Description	Sector	UseCategory	EUL (Years)	RUL (Years)
Agr-VSDWellPmp	Well Pump Variable Speed Drive	Ag	Irrigate	10	3.3

## Effective Useful Life (EUL) adjustments:

In their comments SDG&E requests that the Commission reject the Commission staff proposed adjustments measure EUL values in their claims.<sup>72</sup> Commission staff agrees with some of the SDG&E comments but disagrees with others. In general, Commission staff disagrees with SDG&E that there is a lack of clarity in the direction or timing relative to the EUL allowed to be claimed for REA measures. The guidance document covering REA measures was developed jointly by Commission staff and the IOUs and was first distributed in draft form to all IOUs in January of 2013 with the first final “living” document published for public distribution in July of 2014.<sup>73</sup> In that document the REA section provides that “The EUL of REA measures is capped at the RUL of the equipment being retrofitted. This means that REA measures utilize the RUL of the pre-existing equipment up to and not to exceed the EUL for the REA measure.” From

# EUL of an REA Measure

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NC

REA

EUL ID	Description	Sector	UseCategory	EUL (Years)	RUL (Years)
Agr-VSDWellPmp	Well Pump Variable Speed Drive	Ag	Irrigate	10	3.3

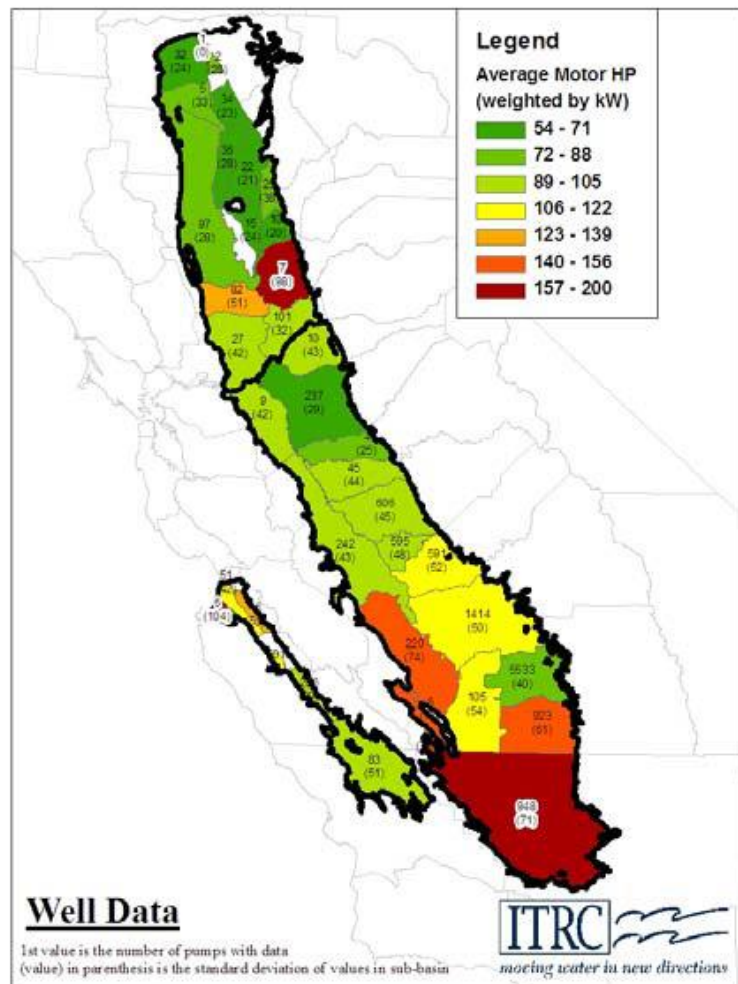
- Is this better data for pump life? (ie, by pump type from DEER)

EUL ID	Measure	EUL (Years)	RUL (Years)
PumpCentBstr	Ag Pump – Centrifugal Booster	12.7	4.33
PumpSubBstr	Ag Pump – Submersible Booster	8.3	2.77
PumpSubWell	Ag Pump – Submersible Well	6.5	2.23
PumpTurbBstr	Ag Pump – Turbine Booster	9.3	3.1
PumpTurbWell	Ag Pump – Turbine Well	6.8	2.27

- We saw that Overhauls extend life by 5 yrs, and average number of overhauls per pump in SCE database was >4.5 (from 1995-2015).

# Ex: Region Comparison by Subbasin

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## Source:

Irrigation Training and Research Center  
CEC-50002001-049, pg.124