# Agriculture / Pumping Subcommittee

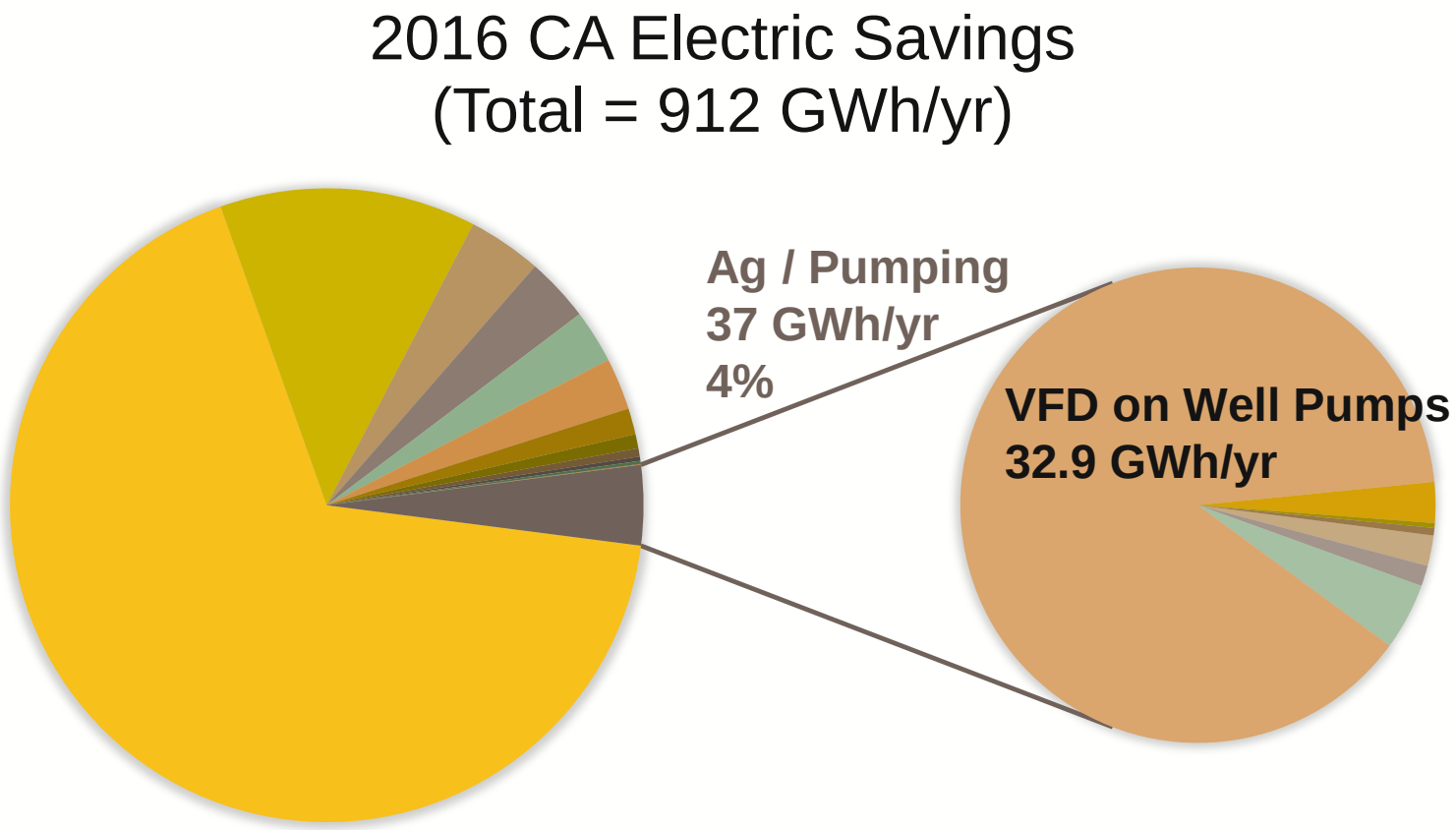

**AYAD AL-SHAIKH**

**APRIL 2017**

# Ag/Pumping Category Deemed Savings



- Savings Perspective

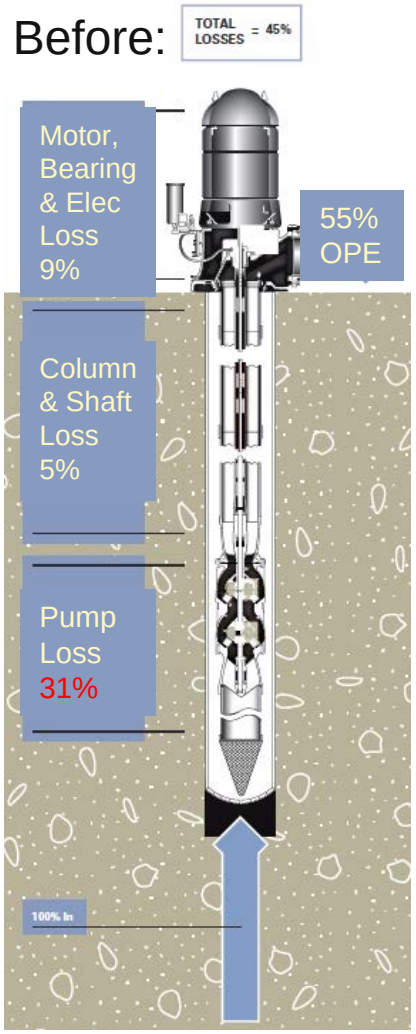


# Measure Overview



| 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 |
| | | 0 |
| Grand Total | | 37,257,098 |

Before:

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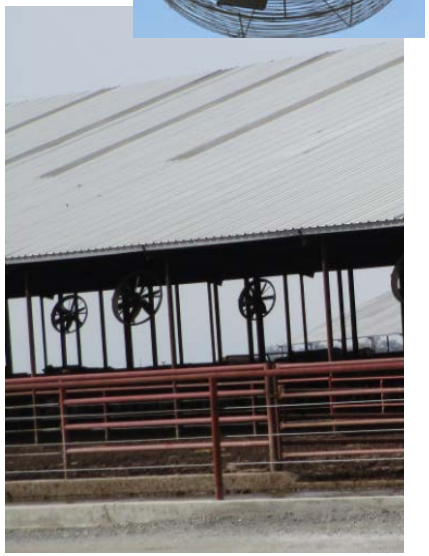

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(typical baseline compressor)

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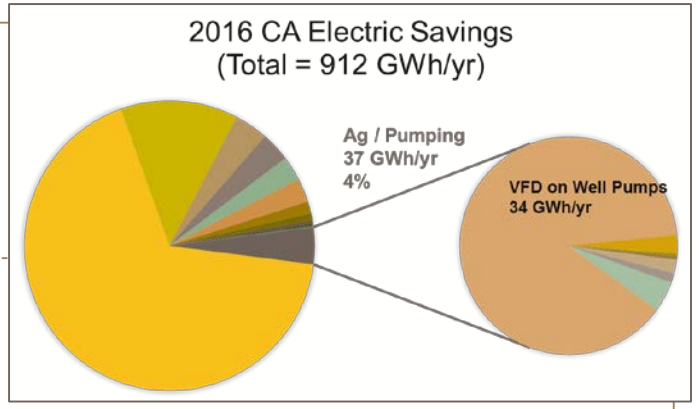


- Savings Perspective: 2016

| Ref No | Name | Units Installed PGE | Units Installed SCE | Energy (kWh/yr) PGE | Energy (kWh/yr) SCE | Demand (kW) PGE | Demand (kW) SCE | Units Installed | Total Energy (kWh/yr) | Total Demand (kW) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3.01 | Agricultural Pump System Overhaul for Pumps Up To 25 HP | 1,699 | 618 | 562,973 | 209,604 | 141 | 40 | 2,316 | 772,578 | 181 |
| 3.02 | Agricultural Ventilation Fans | 480 | | 523,200 | | 240 | | 480 | 523,200 | 240 |
| 3.03 | Farm Sprinkler to Micro Irrigation Conversion | 3,565 | | 1,693,437 | | 1344 | | 3,565 | 1,693,437 | 1,344 |
| 3.05 | Variable Frequency Drive on Agricultural Well Pumps | 130,195 | | 32,921,200 | | 15736 | | 130,195 | 32,921,200 | 15,736 |
| | Variable Frequency Drive on Agricultural Well Pumps (<=300hp) | | REA | | | | | 43,460 | 11,200,000 | 5,246 |
| | Variable Frequency Drive on Agricultural Well Pumps (<=300hp) | | NC | | | | | 70,480 | 18,100,000 | 8,507 |
| | Variable Frequency Drive on Agricultural Booster Pumps (<=150hp) | | REA | | | | | 8,320 | 1,900,000 | 1,015 |
| | Variable Frequency Drive on Agricultural Booster Pumps (<=150hp) | | NC | | | | | 4,595 | 1,000,000 | 561 |
| | Variable Frequency Drive on Agricultural Booster Pumps (<=150hp) | | ROB | | | | | 3,340 | 800,000 | 407 |
| 3.07 | Vertical Hollow and Solid Shaft Pump Motors | 29,445 | | 1,035,326 | | 428 | | 29,445 | 1,035,326 | 428 |
| 3.11 | Chilled Glycol Pipe Insulation | 6,736 | | 121,713 | | 26 | | 6,736 | 121,713 | 26 |
| 3.12 | Glycol tank Insulation | 4,577 | | 189,645 | | 50 | | 4,577 | 189,645 | 50 |
| 3.13 | Tank Insulation | 528 | | 0 | | 0 | | 528 | 0 | - |
| Grand Total | | | | | | | | 177,842 | 37,257,098 | 18,005 |

- "VFD on Well and/or Booster Pumps" contributes the majority of the savings.

# Measure Specific Issue
# Sprinkler Disposition (2015)



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- Issues related to:
  - 4 of 25 ineligible measures (added load)
  - Hours of Use lower (-25%)
  - Baseline irrigation method assumption (-33%)
  - Pumping equipment operation assumptions (-25%)
- 10% Realization Rate (Net Lifetime kWh)
- 7% Realization Rate (Net Lifetime kW)
- Recommendation:
  - Discontinuing “Low Pressure Sprinkler” and “Micro Conversion”
  - Shifting “Drip Irrigation” to custom
  - These Measures should be re-evaluated

# 3.03 – Micro Irrigation



**SDG&E**

| MeasureID | Name | Description | Abbrev | BaseDescription | Eimpact | Gimpact | Pimpact | Life | IncEquipCost | InstalledCost |
|---|---|---|---|---|---|---|---|---|---|---|
| D03-972 | Sprinkler to Micro irrigation - Field/Vegs - non well | Micro irrigation in fields without a well | Micro | Stadard 50+ PSI impact-driven sprinkler heads | 277 | 0 | 286 | 20 | $0.00 | $1,000.00 |
| D03-973 | Sprinkler to Micro irrigation - Field/Vegs - well | Micro irrigation in fields with a well | Micro | Stadard 50+ PSI impact-driven sprinkler heads | 324 | 0 | 286 | 20 | $0.00 | $1,000.00 |
| D03-974 | Sprinkler to Micro irrigation - Decid Trees - non well | Micro irrigation of deciduous trees without a well | Micro | Stadard 50+ PSI impact-driven sprinkler heads | 434 | 0 | 249 | 20 | $0.00 | $1,000.00 |
| D03-975 | Sprinkler to Micro irrigation - Decid Trees - well | Micro irrigation of deciduous trees with a well | Micro | Stadard 50+ PSI impact-driven sprinkler heads | 515 | 0 | 249 | 20 | $0.00 | $1,000.00 |
| D03-976 | Sprinkler to Micro irrigation - Citrus Trees - non well | Micro irrigation of citrus trees without a well | Micro | Stadard 50+ PSI impact-driven sprinkler heads | 456 | 0 | 136 | 20 | $0.00 | $1,000.00 |
| D03-977 | Sprinkler to Micro irrigation - Citrus Trees - well | Micro irrigation of citrus trees with a well | Micro | Stadard 50+ PSI impact-driven sprinkler heads | 541 | 0 | 136 | 20 | $0.00 | $1,000.00 |
| D03-978 | Sprinkler to Micro irrigation - grapes - non well | Micro irrigation of grapes without a well | Micro | Stadard 50+ PSI impact-driven sprinkler heads | 300 | 0 | 172 | 20 | $0.00 | $1,000.00 |

Offerings based upon crop type.

Variation cost.

EUL.

**PG&E**

| Measure Code | LIFE CYCLE (RUL if ER RET, REA) | Base Case Cost ($/unit) | MatlCost ($/unit) | LaborCost ($/unit) | Incremental/ Full Measure Cost ($/unit) | NTG | DelivType |
|---|---|---|---|---|---|---|---|
| A266 | 20 | 168 | 448 | 0.00 | 280 | 0.60 | PreRebDown |
| A266 | 20 | 0.00 | 285 | 163 | 448 | 0.60 | DirInstall |

# Measure Specific Issue

## EUL Methodology Should be Examined



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| 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 |

- DEER EUL-ID (10 yrs) references an original PG&E workpaper, but 15 yrs is more typical in TRMs.

| Measure Summary Information | |
|---|---|
| Measure description | Retrofit of a pump or fan system by installing a variable frequency drive (VFD) for variable load or fixed constant load control. |
| End use | HVAC, process |
| Project eligibility | 1. Constant-flow pump or fan serving a variable load.<br>2. Oversized constant volume pump or fan serving a constant load.<br>3. Variable flow pump or fan controlled inefficiently, such as a poorly functioning inlet guide vane or a throttling devise (discharge damper, balancing valve).<br>4. Not applicable for cooling tower fan control.<br>5. Not applicable for systems with high static head. For example:<br>a. Open-system irrigation water pumps.<br>b. Water pump lift stations.<br>c. Poorly designed VAV supply air fan systems with incorrectly positioned static pressure control sensor.<br>d. Poorly designed water or air distribution systems with undersized branches or circuits. These types of systems are often operated with a high static pressure setting to overcome design deficiencies. |
| Savings type | Semi-custom |
| Unit energy savings | Project-specific savings can be calculated using either the TRM401, TRM405, TRM406, or TRM407 energy savings calculators. |
| Measure cost | Project-specific costs are used to determine cost-effectiveness. |
| EUL | 15 years[1] |

- REA Measure will use 1/3 of EUL of pump
- SCE requesting pump life data from their 3rd party contactor

# Measure Specific Issue
## Savings Methodology



- 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 |

# Questions