



2009 Energy Efficiency Programs Industrial Projects

Pacific Gas and Electric Company

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PG & E Energy Efficiency Presentation

Metal Finishing Model Shop Program

San Jose

February 18, 2009



Today's Discussion

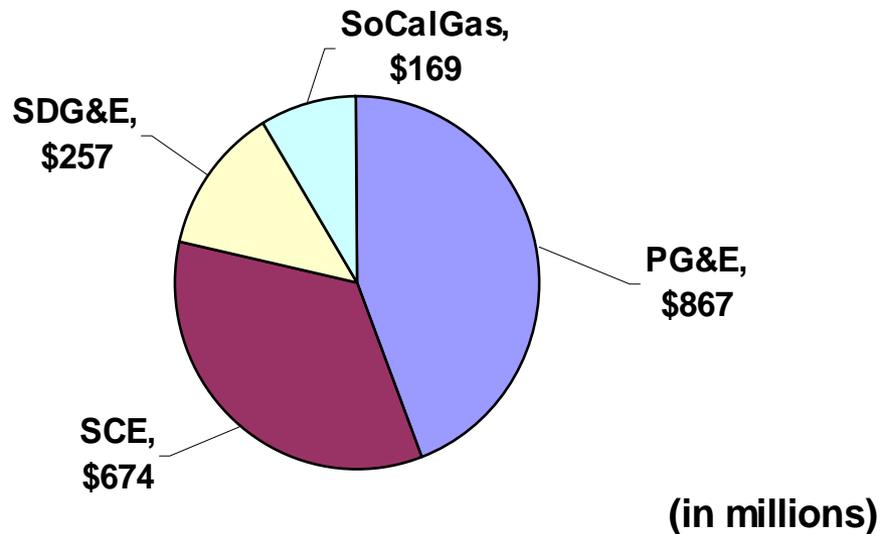
2009-2011 PG&E Energy Efficiency Programs – Industrial and Commercial Projects

- Three (3)-year approval and funding
- Program design Similar to 2006-2008
- Two (2) application approaches for PG&E 2009 Core Programs (Calculated and Deemed)
- Overview of Measures Eligible for Incentives/Rebates
- Program Specifics for Industrial Measures
- 3rd Party & Government Partnership Programs
- Demand Response (DR) & Solar Programs

Funding

3-Year 2006-2008 Utility Program Portfolio Budgets (2009-2011 Funding Similar - Not Yet Finalized)

Total \$1.9 billion



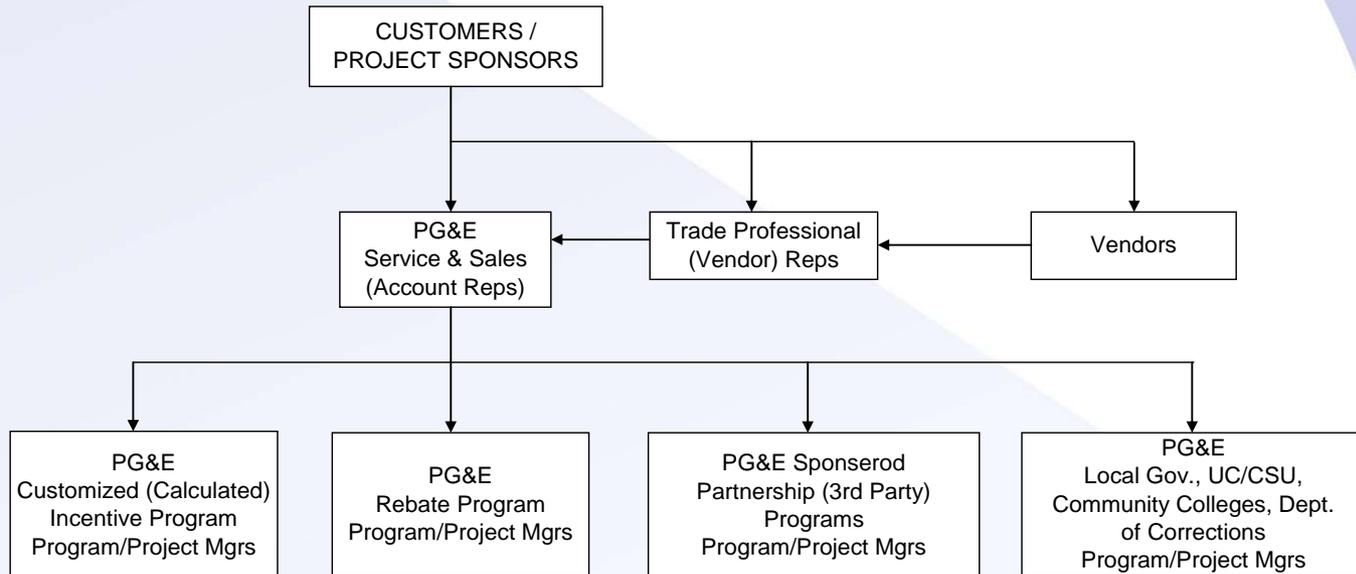


Program Design - Background

- Programs are diverse and delivered through multiple channels
 - ✓ PG&E
 - ✓ PG&E Partnership Program (3rd Party) Implementers (at least 20%)
 - ✓ Partnerships with Local Governments, UC/CSU, Community Colleges, and Department of Corrections
- Includes education & classes on Energy Efficiency – Available to All Customers
- Incentives Offered for both Retrofit & New Construction, for Industrial, Commercial, and Small Business
- Open to all PG&E Customers who pay the Public Purpose Program Surcharge on their utility bills

Project Flow Diagram

HOW TO MAKE INITIAL PG&E CONTACT for Energy Efficiency Projects



NOTE: If you don't know your Service/Sales Reps, then Contact Regional Trade Professional Reps:

-Northern Region*: Daniel Ngo, (916) 599-7986, dtn5@pge.com

-Bay Area Region*: Kristine Gallegos-Haehl, (408) 282-7114 or (408) 209-3629 (cell), ktg2@pge.com

-Southern Region: Raymond Gish, (559) 263-5560 or (559) 840-5455 (cell), regr@pge.com

*Reference: Trade Professional Representative Regional Territory Map

PG&E Customized Program Design

PG&E Customer-based market-segment approach for Retrofit (NRR) and New Construction (NRNC) Calculated Projects

Targeted Market Approach

- Food Processing / Ag.
- Fabrication / Heavy Industry / Refineries
- Water / Water Treatment
- High Tech / Bio Tech
- Medical / Hospital
- Large Commercial / Institutions
- Schools / Colleges
- Retail / Hospitality



PG&E Customized NRR-DR Program

(Non Residential Retrofit-Demand Response Program)

- **RETROFIT CALCULATED PROGRAM**
for Industrial & Commercial Customers

Uses “Targeted Market Approach” for Retrofit of Existing Equipment / Systems

- **Application** submittal (NRR-DR)
- **PG&E Project Manager Assigned** to oversee project and assist customer as required.
- **Calculation Assistance** Available (PG&E or Consulting Eng’rs)
- **Audits Available** (PG&E or Consulting Eng’rs)
- **Project Review/Incentive Approved by PG&E*** (or assigned consultant)
- **Implementation:** Customer Installation, Final Approval, Issuance of Incentive Check to Customer

NOTE: Approval Required Before Customer Starts Project

Typical Schedule: 1-2 Month to Approval

1-2 Mo. from Project Completion to Payment

(Fast Tracking Available on Case by Case Basis)



NRR Calculation Methods

- **Methods of Calculation for NRR & NRNC Industrial Programs:**
 - Hand Calculation
 - NRR (SPC) Software (PG&E Modeling Programs)
 - Other Modeling Programs Used by Industry
- **Baselines:**
 - **Individual Equipment:** Meet Government Requirements (when Applicable) or Standard Industry Practice.
 - **Systems:** Generally Standard Industry Practice; for Retrofit, Existing Equipment Operation is Often Used (Subject to PG&E Approval)

NRR Standard Software

(Also Called SPC Software)

- Selected Measures on NRR Software (CD) - Partial List

- HVAC Package Units & Chillers (Including Early Retirement)
- Variable Speed Drives (VSD's) for Chillers
- Boilers/Economizers (Natural Gas)
- Motors (Including Early Retirement)
- Lighting – Retrofit, Controls
- Compressed Air System Upgrades including VSD's
- Injection Molding Machines
- Variable Speed Drives for Pumps
- VSD's for Fan Applications (available early 2009)
- Wastewater Retro-commissioning
- Steam Trap Replacement
- CO Sensors for Parking Garages
- Thermal Oxidizer Upgrades

Note, use of software is optional, with a few exceptions



PG&E Customized NRNC Program

(Non Residential New Construction Industrial Program)

- **NEW CONSTRUCTION CALCULATED PROGRAM**
for Industrial Customers

“Uses Targeted Market Approach” for New Construction Projects

- **Contact PG&E** As Early in the Design Phase As Possible
- **Help Provided** by PG&E Targeted Market Project Manager
- **PG&E / Consultant Engineers Compile Energy Efficiency Report** w/Calculations for Individual Measures
- **Implementation: Project Review, Customer Installation, Final Approval, Issuance of Incentive Check to Customer**

Calculations / Baselines: Similar to NRR (except baselines based on current operation is not applicable)

Typical Schedule: 4-6 Month Plus Time Required for Customer to Design & Build
(Fast Tracking Available on Case by Case Basis)

Calculated Incentives

- Incentives - Calculated Approach for Industrial NRR & NRNC Programs:*

| | |
|-----------------------------|-------------------|
| Lighting | 5 ¢ /kwh |
| AC & Refrigeration | 15 ¢ /kwh ** |
| Other (motors, VFD's, etc.) | 9 ¢ /kwh |
| kW Incentive | \$100.00 /peak kW |
| Natural Gas | \$1.00 /therm |

- Incentives are based on kWh/therms saved for one (1) year
- **Incentives are Limited to 50% of the Project Cost for Retrofit and 50% of Incremental Cost for New Construction Projects.**
- * Commercial Whole Building Approach uses different rate schedule
- ** **15 ¢ paid only for measures in direct contact w/refrigerant;** all other refrigeration related measures paid at 9 ¢.

Commercial Building New Construction Program

- Overview of New Construction Commercial Building Programs:
 - Whole Building Approach:
 - Model Building- all systems (generally by PG&E)
 - Savings based on modeled efficiency compared to CA T-24 requirements
 - Incentive on sliding scale from 10% to 25% savings
 - Incentive available to customer and design team
 - Systems Approach:
 - Incentive can be paid for one system only (example - lighting)
 - PG&E performs analysis with NC Calc modeling program
 - Other systems must meet T-24 (example – HVAC & Envelope)
 - Incentive levels same as calculated programs but w/10% threshold
 - Simplified Approach:
 - For buildings less than 50,000 ft²
 - Uses SimCalc modeling program (easier than NC Calc for Systems)
 - Can use either Whole Building or Systems type analysis
 - Incentive same as above including 10% threshold

Examples of PG&E Program Energy Efficiency Measures

- Popular Measures / Typical Approximate Savings*
 - Air compressors - (10% to 40%)
 - Process and Non-process Boilers - (2 to 5%) or more for condensing
 - Motors - (2% to 10%)
 - Variable Speed Drives - (15% to 50%)
 - Refrigeration - (10%+)
 - Lighting - (15% to 35%)
 - Process Equipment - (10% or more)
 - Chillers - (10% to 30%)
 - HVAC Equipment/Energy Management Systems - (10% to 30%)
 - Waste Water Treatment Process - (10% to 30%)

***Savings Potential is Dependent on Design/Condition of Existing System and Specifications of New Systems & Equipment**

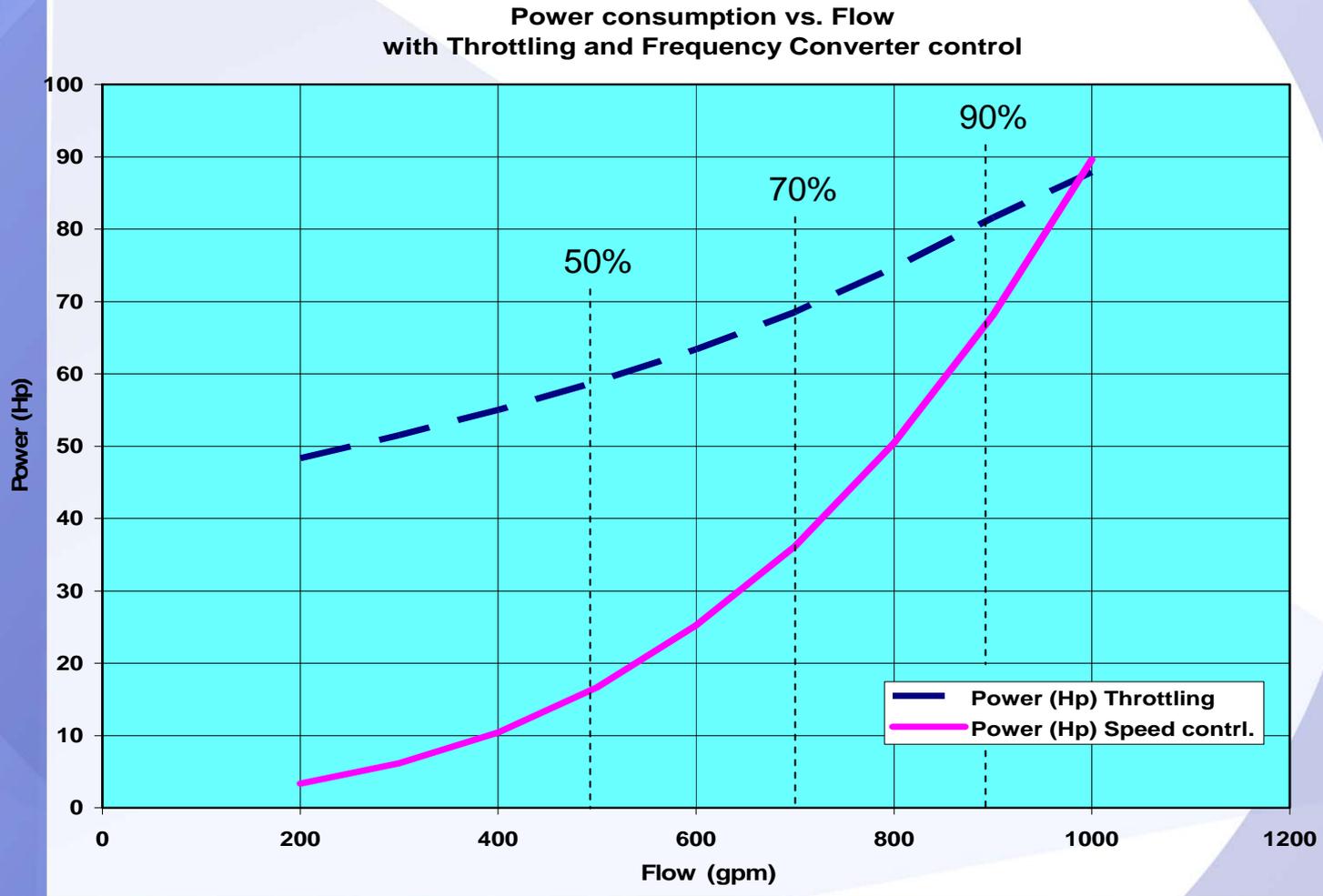
***Many Projects Have Good Simple Paybacks, Often Less Than 2 Years.**

Examples - VSD Pump – 1 of 2

Example of VSD Pump:

- Project Description: Add VSD to Existing 100 hp Pump/Throttling Valve Control
- VSD Project Cost: \$250/hp (Labor & Material) = \$25,000
- Flow Conditions: 1000 gpm
100 psig (231 feet), 90% dynamic, 10% static
- Basis of Calculation: 8000 hrs/yr
30% hrs @ 90% flow
40% hrs @ 70% flow
30% hrs @ 50% flow
- Project EE Savings: 194,000 kWh / Yr
- Calculated Incentive @ \$0.08/kWh: \$15,520
- **Incentive paid - Cap @ 50% Project Cost: \$12,500**
- Simple Payback (\$0.10 electricity): 8 Months

Example - VSD Pump – 2 of 2





Example of Motor Project

Examples of Motor Incentive Calculations:

- Calculations Provide Approximate Estimates of “Software” calculated energy savings.
- Calculations are typical for all motors covered by the programs
- Method of Estimating % Savings = $(1 - \text{Effcy}_{\text{old}} / \text{Effcy}_{\text{new}})$
- The 0.9 factor is a loading factor (% full rated hp)
- Following slide (#17) shows:
 - Efficiencies for T-20 appliance standards from 1985 to the present
 - Estimated Motor Cost (2007) for minimum standard, and added motor cost for current high efficiency standard
- Early Retirement (baseline standard = year of manufacture)
 - Motor (not rewind): 13 years of younger
 - Rewound Motor: 8 years since last rewind

Motor Efficiency and Motor Costs

5/24/2007

| BASED ON INFORMATION AVAILABLE IN EARLY 2007 | | | | | | BASED ON "MOTOR MASTER" ACTUAL MAY VARY | |
|--|--|---------------------------------|---|---|---|--|--|
| Horsepower Range | <u>% Efficiency Before 1985 "Rewound Only"</u> | <u>% Efficiency 1985 - 2000</u> | <u>Required Efficiency % 2004 Min Satandard</u> | <u>Energy Efficient NEMA Std. 12-12</u> | <u>Best Efficiency Reference Motor Master</u> | <u>New Motor Estimated Cost 2004 Min. Standard</u> | <u>Added Est. Cost High Efficiency NEMA 12-12 Standard</u> |
| 1 | 76 | 76.6 | 82.5 | 85.5 | 85.5 | \$250 | \$50 |
| 1.5 | 78 | 78.5 | 84 | 86.5 | 86.5 | \$300 | \$50 |
| 2 | 80 | 80.9 | 84 | 86.5 | 88.5 | \$300 | \$50 |
| 3 | 81 | 81.9 | 86.5 | 89.5 | 90.2 | \$350 | \$100 |
| 5 | 84 | 84.1 | 87.5 | 89.5 | 89.5 | \$400 | \$100 |
| 7.5 | 84 | 85.3 | 88.5 | 91 | 91.7 | \$600 | \$200 |
| 10 | 85 | 86.5 | 89.5 | 91.7 | 93 | \$700 | \$200 |
| 15 | 85.5 | 88 | 91 | 93 | 93 | \$900 | \$200 |
| 20 | 86 | 89 | 91 | 93 | 93.6 | \$1,200 | \$200 |
| 25 | 87 | 89.8 | 91.7 | 93.6 | 94.1 | \$1,400 | \$300 |
| 30 | 88 | 90.3 | 92.4 | 94.1 | 94.1 | \$1,500 | \$300 |
| 40 | 88 | 90.7 | 93 | 94.1 | 94.5 | \$1,800 | \$300 |
| 50 | 89 | 91.4 | 93 | 94.5 | 95 | \$2,100 | \$300 |
| 60 | 89 | 91.8 | 93.6 | 95 | 95.4 | \$2,600 | \$300 |
| 75 | 90 | 92.3 | 94.1 | 95 | 95.4 | \$2,900 | \$300 |
| 100 | 91 | 92.6 | 94.1 | 95.4 | 95.4 | \$3,900 | \$500 |
| 125 | 91 | 92.8 | 94.5 | 95.4 | 95.4 | \$4,300 | \$500 |
| 150 | 92 | 93 | 95 | 95.8 | 96.2 | \$6,300 | \$1,000 |
| 200 | 92 | 93.6 | 95 | 95.8 | 96.2 | \$7,800 | \$1,200 |
| 250 | 93 | 93.9 | 95.4 | 95.8 | 96.5 | \$10,200 | \$1,200 |
| 300 | 93 | 94.5 | 95.4 | 95.8 | 96.2 | \$13,000 | \$1,200 |
| 400 | 94 | 95 | 95.4 | 95.8 | 96.5 | \$16,000 | \$1,200 |
| 500 | 94 | 95 | 95.4 | 95.8 | 96.2 | \$23,000 | \$1,500 |

SAMPLE CALCULATION – 10 HP MOTOR

SAMPLE MOTOR CALCULATIONS - 10 hp Motor:

- Normal Incentive (retrofit or new construction): 10 hp, 90% Load Factor, 14 years or older (Current required 2004 standard to Energy Efficient NEMA Std. 12-12)

$$\begin{aligned} \text{Energy/Yr (Kwh)} &= (1-89.5 / 91.7) \times 10 \text{ hp} \times 0.9 \times 0.746 \text{ kW/hp} \times 7600 \text{ hrs} \\ &= 0.024 \times 10 \times 5,103 = &= 1,225 \text{ kWh} \end{aligned}$$

$$\text{Incentive} = 1,225 \text{ kWh} \times \$0.08/\text{kWh} = \$98$$

$$\text{Cost of New Premium Motor} = \$700 + \$200 = \$900^*$$

$$\begin{aligned} \text{Simple Payback} &= (\text{Cost} - \text{Incentive}) / \text{kWh} \times \text{Energy Cost} \\ &= (700 - 98) / 1225 \times \$0.12 = 4.1 \text{ Years}^* \end{aligned}$$

If we were to use Best Efficiency 93.0%):

$$\text{EE Savings} = 1920 \text{ kWh}, \quad \text{Incentive} = \$154, \quad \text{Payback} = 2.4 \text{ Years}^*$$

- Early Retire/Rewound (retrofit): 10 hp, 90% Load Factor, Built in 1980, Rewound 2000 to Energy Efficient NEMA Std. 12-12 (To Qualify for Early Retirement: 8 years since last rewind)

$$\text{Energy/Yr (Kwh)} = 0.073 \times 10 \times 5,103 = 3,725 \text{ kWh}$$

$$\text{Incentive} = 3,725 \text{ kWh} \times \$0.08/\text{kWh} = \$298$$

$$\text{Cost of New Premium Motor} = \$700 + \$200 = \$900^*$$

$$\text{Simple Payback} = (700 - 343) / 3,725 \times \$0.12 = 0.9 \text{ Years}^*$$

* Does not include Labor

SAMPLE CALCULATION – 25 HP MOTOR

SAMPLE MOTOR CALCULATIONS - 25 hp Motor:

- Normal Incentive (retrofit or new construction): 25 hp, 90% Load Factor, 14 years or older (Current required 2004 standard to Energy Efficient NEMA Std. 12-12)

$$\begin{aligned} \text{Energy/Yr (Kwh)} &= (1-91.7 / 93.6) \times 25 \text{ hp} \times 0.9 \times 0.746 \text{ kW/hp} \times 7600 \text{ hrs} \\ &= 0.020 \times 25 \times 5,103 = &= 2,552 \text{ kWh} \end{aligned}$$

$$\text{Incentive} = 2,552 \text{ kWh} \times \$0.08/\text{kWh} = \$204$$

$$\text{Cost of New Premium Motor} = \$1,400 + \$300 = \$1,700^*$$

$$\begin{aligned} \text{Simple Payback} &= (\text{Cost} - \text{Incentive}) / \text{kWh} \times \text{Energy Cost} \\ &= (1,700 - 204) / 2,552 \times \$0.12 = 4.9 \text{ Years}^* \end{aligned}$$

If we were to use Best Efficiency 93.0%):

$$\text{EE Savings} = 3317 \text{ kWh}, \quad \text{Incentive} = \$265, \quad \text{Payback} = 3.8 \text{ Years}^*$$

- Early Retire/Rewound (retrofit): 25 hp, 90% Load Factor, Built in 1980, Rewound 2000 to Energy Efficient NEMA Std. 12-12 (To Qualify for Early Retirement: 8 years since last rewind)

$$\text{Energy/Yr (Kwh)} = 0.071 \times 25 \times 5,103 = 9,057 \text{ kWh}$$

$$\text{Incentive} = 9,057 \text{ kWh} \times \$0.08/\text{kWh} = \$725$$

$$\text{Cost of New Premium Motor} = \$1,400 + \$300 = \$1,700^*$$

$$\text{Simple Payback} = (1700 - 725) / 9,057 \times \$0.12 = 0.9 \text{ Years}^*$$

* Does not include Labor

SAMPLE CALCULATION – 100 HP MOTOR

SAMPLE MOTOR CALCULATIONS - 100 hp Motor:

- Normal Incentive (retrofit or new construction): 100 hp, 90% Load Factor, 14 years or older (Current required 2004 standard to Energy Efficient NEMA Std. 12-12)

$$\begin{aligned} \text{Energy/Yr (Kwh)} &= (1-94.1 / 95.4) \times 100 \text{ hp} \times 0.9 \times 0.746 \text{ kW/hp} \times 7600 \text{ hrs} \\ &= 0.014 \times 100 \times 5,103 = &= & 7,144 \text{ kWh} \end{aligned}$$

$$\text{Incentive} = 7,144 \text{ kWh} \times \$0.08/\text{kWh} = \$572$$

$$\text{Cost of New Premium Motor} = \$3,900 + \$500 = \$4,400^*$$

$$\begin{aligned} \text{Simple Payback} &= (\text{Cost} - \text{Incentive}) / \text{kWh} \times \text{Energy Cost} \\ &= (4,400 - 572) / 7,144 \times \$0.12 = 4.5 \text{ Years}^* \end{aligned}$$

If we were to use Best Efficiency 95.4%):

$$\text{Efficiency is the same as NEMA Std 12-12} = \text{Same}$$

- Early Retire/Rewound (retrofit): 100 hp, 90% Load Factor, Built in 1980, Rewound 2000 to Energy Efficient NEMA Std. 12-12 (To Qualify for Early Retirement: 8 years since last rewind)

$$\text{Energy/Yr (Kwh)} = 0.046 \times 100 \times 5,103 = 23,474 \text{ kWh}$$

$$\text{Incentive} = 23,474 \text{ kWh} \times \$0.08/\text{kWh} = \$1,878$$

$$\text{Cost of New Premium Motor} = \$3,900 + \$500 = \$4,400^*$$

$$\text{Simple Payback} = (4,400 - 1,878) / 23,474 \times \$0.12 = 0.9 \text{ Years}^*$$

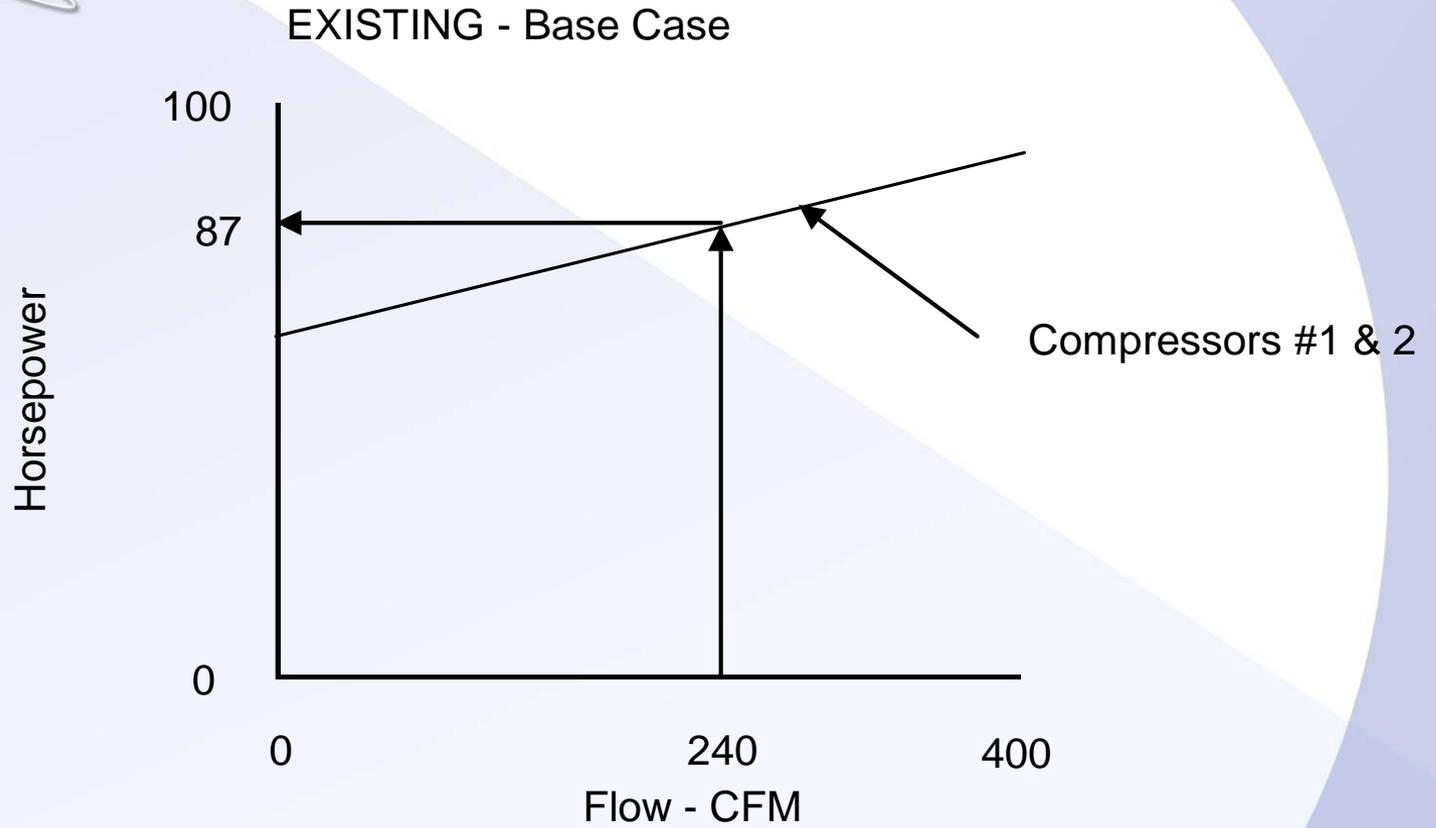
* Does not include Labor

AIR COMPRESSOR EXAMPLE – Sht 1 of 3

- Air Compressor Example

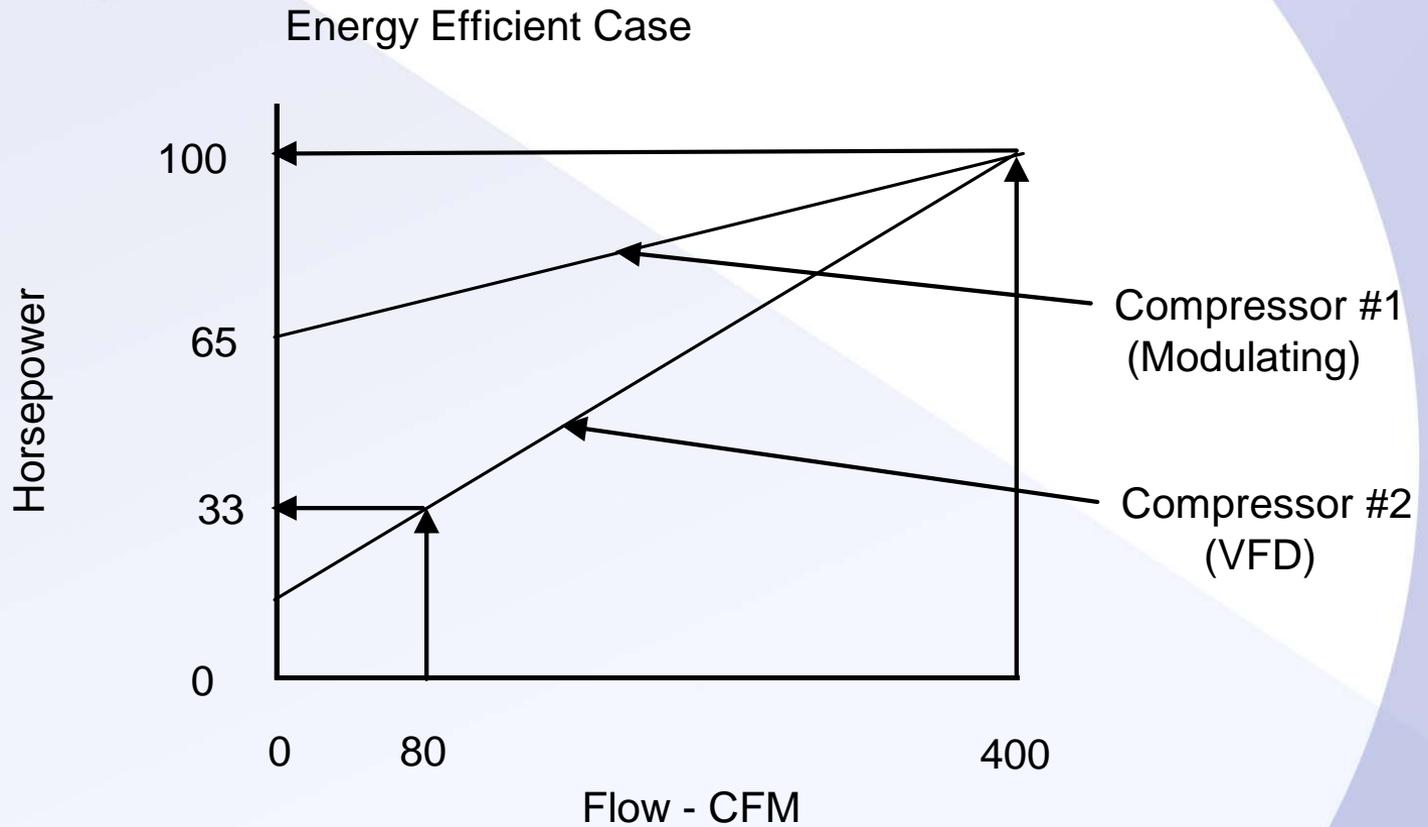
- Existing Case: Two (2) Compressors each operating at 60% capacity w/modulation controls
- Energy Efficiency Case: Same Average Load
 - Replace 1 compressor with a new Variable Frequency (Speed) Drive (VSD)
- Energy Savings Calculation:
 - Existing: $2 \times 87 \text{ hp} \times 0.746 \text{ kW/hp} \times 6,000 \text{ hrs} = 779,000 \text{ kWh}$
 - New: 1 @ 100 hp & 1 @ 33 hp
 - $133 \text{ hp} \times 0.746 \times 6,000 = \underline{595,000 \text{ kWh}}$
 - Savings = 184,000 kWh
 - Incentive = $184,000 \times \$0.09 = \$16,600$
 - Power Savings 1 year (@\$0.12) = \$22,100
 - Simple Payback (\$50,000 cost)
 - $= (50\text{K} - 16.6\text{K}) / 22.1\text{K} = 1.5 \text{ years}$

AIR COMPRESSOR EXAMPLE – Sht 2 of 3



2 Compressors Operating as Shown

AIR COMPRESSOR EXAMPLE – Sht 3 of 3



2 Compressors Operating as Shown

Boiler/Steam System Energy Efficiency Measures

| <u>Measure</u> | <u>Approx. Savings Potential</u> |
|--|----------------------------------|
| • Boiler Cleaning* - Water Side / Tube Side: | Up to 1% or More |
| • Excess Flue Gas Temperature (over 300 °F): | 1% per 40°F Reduction |
| Cause: Original Design, Scaling on Water or Tube Side | |
| • Excess Combustion Air: | 0.5% per 1% Oxygen Reduction |
| Cause: Original Design, Burner out of Adjustment, Lacks current metering controls (example: oxygen trim) | |
| • Loss of Condensate: | 0.1% per 1% Lost Condensate |
| • Loss of Steam (Leaks): | Equal to % of Steam Lost |
| • Insulation* (Missing or Inadequate): | Can be significant—see example |
| • Boiler Blowdown Losses: | 0.2% to 1.5% |
| • Gas Bypassing* (baffle or internal gas leaks) | Up to 1% or More |
| • Reduce Steam Boiler Pressure (125 to 90 psig): | 0.5% |
| • Replace Steam Boiler/System w/ Hot Water: | 3% + or – |
| • Replace Old/Leaking Industrial Steam Trap: | On average = 4 #/hr of steam/hr |

***Generally Maintenance Which Does Not Qualify for an Incentive**

PG&E Small Business Mass Market Program

- Small Business Rebate Application Process

- **Purchase and install** qualifying products shown on technology catalogues.
- **Submit application with proof of purchase** within 90 days of purchase date to qualify for a rebate.
- **Applications can be submitted electronically** using the e-Rebate Program or hard copy applications can be submitted.
- **No caps** on Project Incentives.
- **All rebates paid on a per item basis.**

Please check technology catalogs for updated listing of products qualified for rebates before purchasing and installing as they are subject to change without notice.



Examples - PG&E's Rebate Program for Small Businesses

Typical Mass Market Rebate Measures:*

EXAMPLES of REBATES:

Heating, Ventilation & Air Conditioning (HVAC) Catalogue:

- Variable Frequency Drives for HVAC Fans (under 100 hp) = \$80/hp

Lighting Catalogue (refer to catalogue for details & requirements):

- Replace T12 with T8, 4 foot lamp = \$4.50/lamp
- Replace T12 with T8, 8 foot lamp = \$7.50/lamp

Boiler Catalogue

- Large Domestic Hot Water Heater > 75,000 btu/hr, minimum thermal efficiency of 84% = \$1.50 / 1,000btu/hr

* Refer to Catalog for additional information & specific requirements.

Examples - PG&E's Rebate Program for Small Businesses - 1 of 3

Boilers and Water Heating (& related measures) Catalog:*

BOILER REPLACEMENT (Retrofit Only)

Process Boilers (Steam or Hot Water):

- Rebate Amount = \$2 per M Btu/hr
- Example: 8,000,000 btu/hr boiler

$$\text{Rebate} = 8,000 \text{ M Btu} \times \$2 \text{ per M Btu} = \$16,000$$

Space Heating Boilers (Steam or Hot Water):

- Rebate Amount = \$1 per M Btu/hr
- Example: 2,400,000 btu/hr boiler

$$\text{Rebate} = 2,400 \text{ M Btu} \times \$1 \text{ per M Btu} = \$2,400$$

Note: For Condensing Boilers, Suggest Using NRR Calculated Program

* Refer to Catalog for additional information & specific new boiler requirements.

Examples - PG&E's Rebate Program for Small Businesses - 2 of 3

Boilers and Water Heating (& related measures) Catalog:*

STEAM TRAPS FOR GAS BOILERS (Retrofit Only)

Industrial Steam Traps: for end-use customers who manufacture a saleable product. Replace existing failed (open) traps one for one.

Commercial Steam Traps are for end-use customers in commercial and institutional facilities. Replace existing failed (open) traps or old traps one for one.

Cash rebate amounts are as follows:

Product Code Rebate/Unit Measure

| | |
|---|----------------------|
| H221 Commercial Steam Traps: | \$50.00/Unit |
| H201 Industrial Low Pressure Steam Traps <15 psig: | \$100.00/Unit |
| H202 Industrial High Pressure Steam Traps > 15 psig: | \$200.00/Unit |

* Refer to Catalog for additional information and project requirements.

Examples - PG&E's Rebate Program for Small Businesses - 3 of 3

Boilers and Water Heating (& related measures) Catalog:*

PIPE INSULATION (Retrofit Only)

1" or 2" of fiberglass, foam, or calcium silicate insulation must be added to existing non-residential bare pipe systems which transfer fluid directly from gas-fired equipment.

Minimum qualifying pipe diameter is 1". Insulation thickness, liquid or steam temperature will determine the rebate amount.

Cash rebate amounts are as follows:

Product Code Rebate/Unit Measure

H106 1" Pipe Insulation; hot water @ 120 – 200 F = \$2.00 per Linear Foot

H107 2" Pipe Insulation; hot water @ 120 – 200 F = \$3.00 per Linear Foot

H108 1" Pipe Insul; low press. Steam (< 15 psig), 200 – 250 F = \$3.00 per L.F.

H109 2" Pipe Insul; low press. Steam (< 15 psig), 200 – 250 F = \$4.00 per L.F.

Note: Similar Incentives are available for tank insulation – refer to catalog

* Refer to Catalog for additional information and project requirements.



Third Party Programs

Third Party Programs

- Air Compressors (2): Air Power & Ecos/Rogers Machinery
- Boilers/Steam Plants: Enovity
- Refineries: Nexant
- Oil Fields: Global Energy Partners
- Waste Water: Quest
- Process Efficiency Improvements: CMTC
- Industrial Plants: Lockheed Martin



2009 Applications

- **Submit your Application Package for Incentive or Rebate to Your PG&E Representative or Mail to:**

PG&E Integrated Processing Center
P.O. Box 7265
San Francisco, CA 94120-7265

***Application forms and handbooks can be downloaded at
<http://www.pge.com/biz/rebates/index.html>***



Pollution Prevention & Compliance Assistance Seminar “Energy Efficient Technologies”

Pacific Gas and Electric Company

Steve Fok, P.E.

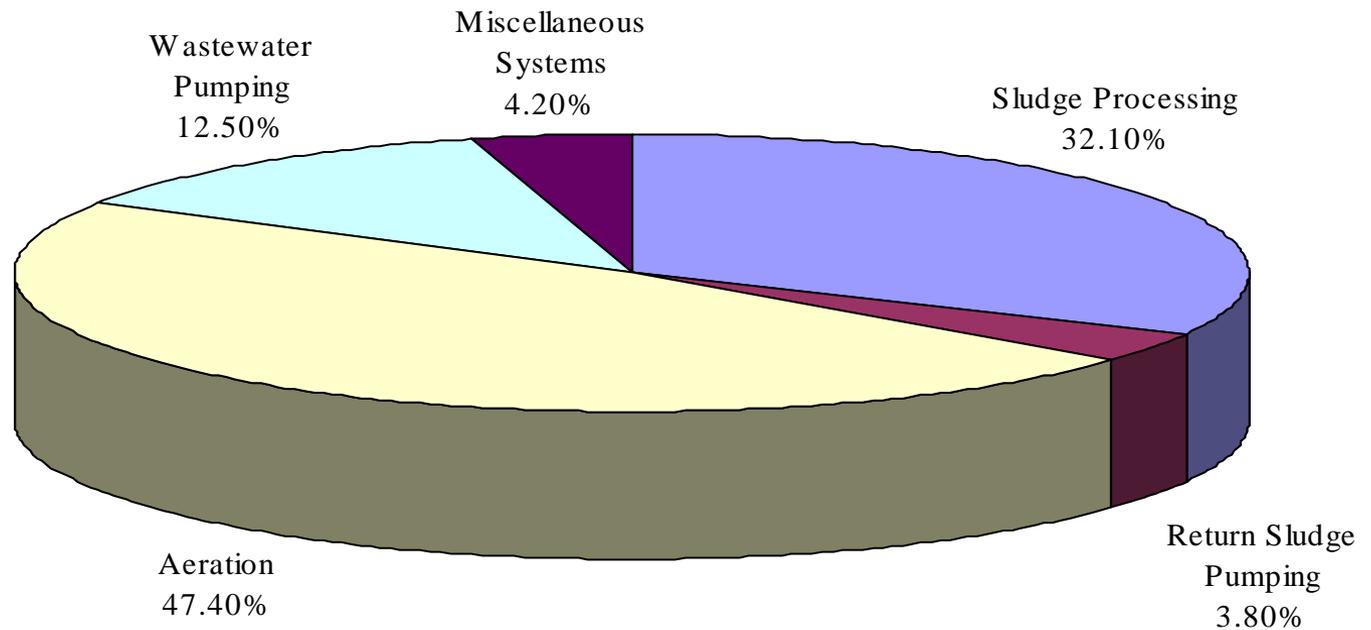
Supervising Senior Engineer

San Jose/Santa Clara Water Pollution Control Plant

San Jose

February 18, 2009

Activated Sludge Secondary Treatment – Energy Consumption



EE Incentive Measures

| Technology | Baseline | Sample Energy Efficiency Measure |
|------------------------------|---|---|
| Hydraulic-Driven Systems | Water or Hydraulic-Oil Driven System | Electrical-Driven System |
| Motors | EPAct Standard Efficiency Motors | NEMA Premium Efficiency Motors |
| Pumps | Throttle, Bypass or No Control | Variable Frequency Drive Control |
| | Hydraulic Institute (HI) Achievable Efficiency or Average Efficiency from Manufacturers' Data | High Efficiency Pump with Efficiency Better than HI Achievable Efficiency |
| | Pneumatic | Electrical-Driven |
| Sludge Dewatering | Centrifuge | Screw Press |
| Sludge Thickening | Solid-Bowl Centrifuge | Gravity Belt Thickening |
| UV Radiation Disinfection | Medium-Pressure UV System | Low-Pressure UV System |
| Wastewater Treatment Process | Aerobic Treatment System | Anaerobic Treatment System |

EE Incentive Measures

| Technology | Baseline | Sample Energy Efficiency Measure |
|-------------------------|--|--|
| Aerators (Blowers) | Coarse-Bubble Diffuser | Fine Pore Diffuser |
| | Inlet/Discharge Vane or No Control | Variable Frequency Drive (VFD) Control |
| | Multi-stage centrifugal blowers | Single-stage Centrifugal Blower with VFD Control |
| | Fan System Assessment Tool (FSAT) Achievable Efficiency or Average Efficiency from Manufacturers' Data | High Efficiency Blower with Efficiency Better than Achievable/Average Efficiency |
| Aerator (Mechanical) | Constant Speed Motor | VFD Control Based on O ₂ Content |
| Air Compressor | Rotary Screw Compressor with Load/Unload Control | Air Compressor with VFD Control |
| Dissolved Oxygen System | Continuous DO Control with Manual Control | Automatic Control of Aeration System |

2006-2007 Wastewater Incentive Projects

| Measures | Wastewater Treatment Plants (kWh) | | | |
|---------------------------------------|-----------------------------------|----------------------|--------------------|-----------|
| | Small (1-3MGD) | Medium (4-50 MGD) | Large (60+ MGD) | Total |
| Dissolved O2 Controls | 323,987 | 946,157 | 0 | 1,270,144 |
| VFD | 905,323 | 3,673,514 | 613,340 | 5,192,177 |
| Motor | 54,299 | 236,334 | 0 | 290,633 |
| Fine Bubbler Diffuser | 0 | 2,437,104 | 1,401,600 | 3,838,704 |
| Efficient Aeration Blowers | 93,000 | 0 | 0 | 93,000 |
| Efficient Effluent Pumping | 167,117 | 221,670 | 0 | 388,787 |
| UV Disinfection | 241,401 | 0 | 0 | 241,401 |
| VFD on Sludge Centrifuge | 0 | 159,323 | 0 | 159,323 |
| Screw Press | 0 | 456,980 | 0 | 456,980 |
| HVAC Controls | 0 | 215,281 | 0 | 215,281 |
| Lighting | 0 | 13,692 | 0 | 13,692 |
| Air Compressors | 0 | 297,928 | 0 | 297,928 |

Case Study: 8 MGD Water Reclamation Facility



Case Study: 8 MGD Water Reclamation Facility

| Project Description | Est. Annual Energy Savings (kW-hr) | Est. Annual Demand Savings (kW) | Est. Annual Dollar Savings (1) (\$/Yr) | Estimated Implementation Cost (\$) | Est. Incentive Amount (\$) | Simple Pay Back (Yr) |
|---|------------------------------------|---------------------------------|--|------------------------------------|----------------------------|----------------------|
| 1. New Turbo Blower | 622,428 | 71 | \$71,186 | \$450,000 | \$68,467 | 5.4 |
| 2. Replace DAFT with GBT⁽²⁾ | 228,636 | 26 | \$26,227 | NA ⁽³⁾ | \$25,149 | NA |
| 3. Replace Transformers⁽⁴⁾ | 90,083 | 10.3 | \$10,266 | \$78,787 | \$9,909 | 6.7 |
| 4. Replace Grit Pumps⁽⁵⁾ | 39,262 | 4.5 | \$4,496 | \$84,871 | \$4,318 | 17.9 |

Notes:

- 1.Costs based on PG&E E-19S Rate Schedule broken down by each rate period for an entire year.
- 2.Process Change to GBTs is under consideration for process reasons.
- 3.Final Process and project Cost for the GBT project are under development with Carollo Engineers.
- 4.Existing equipment is approximately 50 years old and is under consideration for replacement.
- 5.Existing equipment is approximately 30 years old and is under consideration for replacement.

Emerging Tech - New EE Measures

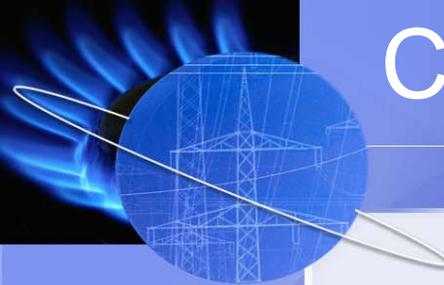
Facultative Wastewater Treatment:

- Solar-powered near-laminar radial flow circulators or mixers



Solar-driven WWT circulator

| Facility | Utility | Annual Savings (kWh) | Project Cost |
|---|----------------|-----------------------------|---------------------|
| Site 1 | PG&E | 747,228 | \$ 121,706 |
| Site 2 | PG&E | 48,478 | \$ 26,000 |
| Site 3 | PG&E | 649,116 | \$ 164,000 |
| Site 4 | PG&E | 1,647,392 | \$ 427,912 |
| Site 5 | PG&E | 795,693 | \$ 149,497 |
| Site 6 | PG&E | 959,529 | \$ 884,288 |
| Site 7 | PG&E | 855,722 | \$ 273,407 |
| Site 8 | PG&E | 472,711 | \$ 261,399 |
| Total | | 6,175,869 | 2,308,209 |
| Average Incremental Measure Cost (\$ / annual kWh) | | | \$0.374 |



Case Study: Solar-driven circulator Wastewater Treatment Plant

- ❑ **Central Valley WWT Plant – 3.5 MGD & 535 (avg) 600 (peak) BOD facultative ponds**
- ❑ **Expansion to 5 MGD and 800 (peak) BOD**
- ❑ **20 solar units instead of 6x25 hp mechanical aerators (CBOD vs BOD)**
- ❑ **Effluent BOD = 70 mg/l (avg)**
- ❑ **Annual Energy Savings 960,000 kWh**
- ❑ **Project Cost \$880,000**
- ❑ **Simple Pay Back 7 years**

Q & A

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Questions?