



# Advanced Pumping Efficiency Program

Helping California...



## Policies and Procedures Manual

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The information in this Policies and Procedures manual is current as of January 6, 2011. The Advanced Pumping Efficiency Program (APEP) may be modified or terminated at any time. Please contact the main APEP Program Office for up-to-date information, especially if you are applying for an incentive for a pump retrofit/replacement project. The APEP Program Office can be contacted by calling toll free, 1 (800) 845-6038. You may also log on to the APEP web site at [www.pumpefficiency.org](http://www.pumpefficiency.org) for more information and a knowledge-base for pumping efficiency.

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### IMPORTANT!

California consumers are not obligated to purchase any full fee service or other service not funded by this program. This program is funded by California utility ratepayers under the auspices of the California Public Utilities Commission.

Los consumidores en California no estan obligados a comprar servicios completos o adicionales que no esten cubiertos bajo este programa. Este programa esta financiado por los usuarios de servicios públicos en California bajo la jurisdiccion de la Comisión de Servicios Públicos de California.

## The Advanced Pumping Efficiency Program

### I. What is the Advanced Pumping Efficiency Program?

The Advanced Pumping Efficiency Program (APEP) is an educational and incentive program intended to improve overall water pumping efficiency and encourage energy conservation in California.

APEP is available through Pacific Gas and Electric Company's Customer Energy Efficiency offerings, funded through the Public Purpose Programs Charge under the auspices of the California Public Utilities Commission. This is a fee paid by all accounts of the major investor-owned utilities in California including PG&E, Southern California Edison Company, Southern California Gas Company, and San Diego Gas and Electric Company. The purpose of this fee is to fund activities that improve energy efficiency and promote energy conservation.

### II. How Long is APEP Active?

APEP has funding currently authorized through December 31, 2012. However, APEP may be terminated or modified without notice. This program has a limited budget. Requests for pump efficiency tests or applications for an incentive for a pump retrofit/replacement are accepted on a first-come, first-served basis until available funds are allocated or October 31, 2012, whichever comes first. Check the APEP web site at [www.pumpefficiency.org](http://www.pumpefficiency.org) or call APEP toll-free at (800) 845-6038 for up-to-date information.

### III. What Does APEP Do?

APEP has four program components:

1. Education – educational seminars concerning pumping system specification and maintenance, water management, and water measurement will be given throughout the state. The educational message has four parts:
  - o Know how to specify an efficient pumping system
  - o Know how to maintain an efficient pumping system
  - o Know how much water needs to be pumped
  - o Know how much water has been pumped
2. Technical Assistance – Program personnel are available to help in locating pump efficiency testers, completing a pump retrofit/replacement incentive application form, or answer general questions as to pumping system design and use. Note that site-specific engineering services are not available (for example, we would not be able to specify the exact pump design for a specific location.)
3. Pump Efficiency Tests – Subsidized tests are available for eligible electric or natural gas-powered water pumps that are 25 horsepower or greater, serviced by a PG&E utility account (see section IV. “Who is Eligible to Participate” for full eligibility requirements).
4. Incentives for Pump Retrofits/Replacements – incentives are available **for any size pump** to encourage individuals to retrofit/replace eligible, electric or natural gas-powered water pumps to improve overall pumping efficiency. Refer to section IV. “Who is Eligible to Participate” for full eligibility requirements.

### IV. Who is Eligible to Participate?

Eligibility extends to all owners or users of a non-residential, PG&E electric or natural gas utility account that is primarily used for pumping water for production agriculture, landscape or turf irrigation, or municipal purposes, including potable and tertiary-treated (reclaimed) water but excluding pumps used for industrial processes, raw sewage, or secondary-treated sewage, and who are paying the Public Purpose Programs Charge. Customers should call APEP first if there is a question concerning their eligibility.

**IMPORTANT!**

*Other factors may apply for individual pump retrofit projects or pump efficiency tests. Carefully read this Policies and Procedures Manual, especially sections VII. and VIII., or contact the APEP Program Office for full eligibility criteria.*

**V. How Can I Participate?**

The following summarizes how individuals can participate in the various APEP activities:

1. Educational seminars - Anyone is welcome to attend the educational seminars. Notices of upcoming seminar dates and locations will be found in agricultural trade publications, on the APEP web site ([www.pumpefficiency.org](http://www.pumpefficiency.org)), in local newspapers, and heard on radio and television.
2. Technical Assistance – Available to any eligible participant. Personnel will be available at all educational seminars, at the APEP offices (see section VI. below), and at various other times and locations.
3. Pump Tests – Subsidized pump efficiency tests are available to any eligible PG&E electric or natural gas account of 25 horsepower or more. Pump tests must be performed by one of APEP’s participating pump test companies. All you have to do is contact the participating pump test company of your choice. A list of these companies is available from the APEP Program Office, or on the APEP web site at [www.pumpefficiency.org](http://www.pumpefficiency.org).

**IMPORTANT!**

*Please note that APEP provides the subsidy directly to the pump test company, not to you. This subsidy may or may not cover the total cost of the test. You should have a clear understanding of the total cost of a pump test, and whether you will be liable for any part of that cost, before you authorize a test.*

4. Incentives for pump retrofit/replacement – Incentives are available to any eligible PG&E electric or natural gas account for retrofitting/replacing inefficient pumps. You need to fill out an application form and send it to the main APEP Program Office. The form may be obtained by contacting a regional APEP office or downloading the form from the APEP web site at [www.pumpefficiency.org](http://www.pumpefficiency.org). Refer to section VIII. “More About the Pump Retrofit/Replacement Incentive” below.

**VI. How Do I Contact APEP?**

APEP maintains regional offices in Northern California, the San Joaquin Valley, and the Central Coast. Specific questions regarding the activities of APEP can be answered by contacting one of these offices:

- Northern California – (559) 260-6148
- Main Office – Central/Southern California – (800) 845-6038
- Central Coast (San Mateo County to Ventura County) – (805) 547-1130

APEP also maintains a web site at [www.pumpefficiency.org](http://www.pumpefficiency.org). Here you will find summaries of all Program components, a calendar of upcoming events, a list of participating pump test companies, incentive application forms, phone numbers and E-mail addresses of the regional offices, and a knowledge-base to help you conserve energy and water.

**VII. More About Pump Efficiency Tests**

All you have to do is contact the participating pump test company of your choice. The results of the test are reported to APEP and PG&E. The results of the pump test will include a calculation of the kilowatt hours or therms needed to pump an acre-foot of water, the overall pumping efficiency, motor loading, power input to the pumping plant, and the estimated energy and dollar savings resulting from a pump retrofit/replacement. A sample report is seen in Figures 1a and 1b.

The knowledge-base on the APEP web site contains a full explanation of the pump test report and how to use the results. A pamphlet is also available from APEP. You can call one of the regional offices or download this pamphlet from the web site.

Test Ranch

**SUBJECT: PUMPING COST ANALYSIS**  
**HP: 100.0 Pump: S J RIVER**  
**PUMP TEST REFERENCE NUMBER: Test 1**

The following Pumping Cost Analysis is presented as an aid to your cost accounting. This analysis is an estimate prepared from data acquired from the pump test performed 12/13/2002 and information provided by you.

*Please pay careful attention to the assumptions. The estimated savings are only valid for the assumptions made and conditions measured during the pump test.*

**It is assumed that:**

1. Overall pumping efficiency is improved to: 67.0 %
2. Motor loaded at: 84.4 %
3. Flow rate will be: 1,183.2 gpm
4. Total head will be: 189.3 feet = 16 ft PWL, 75 psi Dis Pres
5. Water requirements will be: 245.1 acre-feet/year

	EXISTING EFFICIENCY	IMPROVED EFFICIENCY	ESTIMATED SAVINGS
<b>6. kWh/AF:</b>	460	289	171.4
<b>7. Estimated Total kWh:</b>	112,829	70,830	42000
<b>8. Average Cost per kWh:</b>	\$0.16		
<b>9. Average Cost per hour:</b>	\$13.46	\$10.14	\$3.32
<b>10. Average Cost Per Acre Ft.:</b>	\$74.12	\$46.53	\$27.59
<b>11. Estimated Acre Ft. Per Year :</b>	245.1	245.1	
<b>12. Overall Pumping Efficiency:</b>	42.1%	67.0	
<b>13. Estimated Total Annual Cost:</b>	<b>\$18,165.51</b>	<b>\$11,403.58</b>	<b>\$6,761.93</b>

We hope that this information is useful for you in planning your pump maintenance so you can pump more efficiently and save energy and money. Please feel free to contact the APEP Program Office if you have any questions or would like help with next steps at Toll Free, 1(800) 845-6038.

Sincerely,

Peter Canessa

**Figure 1a – Sample pumping cost analysis from a pump efficiency test report (report format may be modified at any time).**

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<b>Advanced Pumping Efficiency Program (800) 845-6038 Pump Test Report</b>			
<b>Pump/Location:</b>	Test 1 HP: 100		<b>Utility:</b> PG & E
<b>GPS Coord.:</b>	<b>Long</b>	<b>N</b>	<b>Lat</b>
<b>Motor Make:</b>	Newman		<b>W</b>
<b>Customer Addr:</b>	Test Ranch	<b>Type</b>	Turbine
			<b>Pump Make:</b> Peerless
			<b>Meter Number:</b> 99999T
			<b>Serial Number:</b>
<b>Contact:</b>	Peter Canessa		<b>Voltage:</b> 0
<b>Phone:</b> (800) 845-6038	<b>Fax:</b>		<b>Amps:</b> 0
<b>PUC</b>	<b>Acreeage:</b> 321-640		<b>State Well #:</b>
			<b>Farm Type:</b> Vineyard
<b>Test Date:</b> 12/13/2002			<b>Tester:</b> Pete Canessa
<b>Run Number:</b>		1	
1. Standing Water Level (Ft):		0	
2. Pumping Water Level (Ft):		16	
3. Draw Down (Ft):		16.0	
4. Recovered Water Level (Ft):		0	
5. Discharge Pressure at Gauge (PSI):		75	
6. Total Lift (Ft):		189.3	
7. Flow Velocity (Ft/Sec):		2.686	
8. Measured Flow Rate (GPM):		986	
9. Customer Flow Rate (GPM):		0	
			<i>If a Flow Velocity is less than 1 ft/second, the accuracy of the test is suspect.</i>
10. Well Specific Capacity (GPM/Ft draw):		61.6	
11. Acre Feet per 24 Hr:		4.4	
12. Cubic Feet per Second (CFS):		2.2	
13. Horsepower Input to		112.03	
14. Percent of Rated Motor Load		102.0	
15. Kilowatt Input to Motor		83.58	
16. Kilowatt Hours per Acre Foot:		460.4	
17. Cost to Pump an Acre Foot		\$74.12	
18. Energy Cost (\$ / Hour)		\$13.46	
19. Base Cost per KWh:		\$0.161	
20. NamePlate RPM:		0	
21. RPM at GearHead:		0	
22. Overall Pumping Efficiency (%):		42.06	
All results are based on conditions during the time of the test. If these conditions vary from the normal operation of your pump, the results shown may not describe the pump's normal performance.			

**Figure 1b – Sample results and calculations from a pump efficiency test report (report format may be modified at any time).**

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**IMPORTANT!**

Please note the following:

- *The performance and results of the pump efficiency tests are the sole responsibility of the pump test company. Any agreement for pump testing that you enter into is a business arrangement solely between the pump testing company and you. Neither PG&E, APEP, the Center for Irrigation Technology, the California State University, Fresno Foundation, the California Public Utilities Commission, nor any other party guarantees the accuracy of the pump test, nor are any of the aforementioned parties guarantors of such company.*
- *APEP provides the subsidy directly to the pump test company for eligible pump tests, not to you. Currently the subsidy is \$200/test for pumps not tested in the 47 months prior to the test date and \$100/test for pumps not tested in the 23 months prior to the test date. The subsidy is \$50/test for pumps that are in series with another pump (most commonly a booster pump being supplied by a water well). This subsidy may or may not cover the total cost of the test. You should have a clear understanding of the total cost of a pump test, and whether you will be liable for any part of that cost, before you authorize a test.*
- *Funding for pump tests is limited and is available on a first-come, first served basis. The subsidy and eligibility rules may change at any time based on budgetary constraints. Please contact the main APEP Program Office if you have questions about fund availability and eligibility.*

**Pump Test Eligibility Rules:**

- The pump test must be for the purpose of determining current overall pumping efficiency (OPE).
- Only one subsidized test is allowed per pump in a 23 month period, which may be used for documenting either pre-retrofit OPE or post-retrofit OPE in a situation involving an incentive application for a pump retrofit.
- You will have to sign an Access Agreement before the test so that the pump tester has legal access to your property. You will have to sign a Record of Test after the test so that there is proof a test was performed for you.
- Subsidized pump tests are not available for any purpose related to:
  - A real estate transaction (e.g., determine flow, pumping water level, water quality).
  - Satisfaction of a mandate of any federal, state, or local government or quasi-political agency (participants in PG&E's AG-ICE program are specifically eligible for all parts of APEP).
- Subsidized pump tests are not available for the following conditions:
  - A pump which is in the APEP database already which was previously tested at 30% OPE or less for electric pumps, 20% OPE or less for a submersible pump, and 6% OPE or less for a natural gas-powered pump, *unless that pump was retrofitted in the interim.*
  - Water wells or any other pump where the true total dynamic head cannot be determined. APEP requires that a subsidized pump test be able to calculate OPE.
  - Any pump powered by less than 25 horsepower as listed on the motor/engine nameplate.

**VIII. More About the Incentive for Pump Retrofit/Replacement**

Incentives are available only for replacement or retrofit of either or both of the pump bowl and impeller.

Efficiency improvement work can be contracted or performed wholly or partially in-house if such capability exists. For purposes of incentive calculation, in-house rates cannot exceed typical rates charged by the average of the two closest commercial pump service contractors.

**Important Pump Retrofit/Replacement Eligibility Requirements:**

- The retrofit/replacement project must have started on January 1, 2006 or afterwards.

- Only one incentive can be paid per individual pump in any one six-year period.
- A valid pump efficiency test must be performed before the retrofit project is completed and must have been done after June 1, 2002 and within five (5) years of the project start. A copy of the test results must be submitted with the application.
- A pump test must be performed after project completion and within six (6) months after the application is approved, unless there are extenuating circumstances. Regardless of the timing, no incentive will be paid until a post-project pump test is submitted.
- Only one pumping system, with one discharge point, is allowed per APEP incentive application. Note that a well, with a booster pump located at the well site and operating in series with the well, is an eligible pumping system. Projects involving multiple pumping systems are not eligible for APEP incentives. Contact APEP or PG&E to determine whether PG&E has other programs for which your project may be eligible.
- The pumping system must be operational - APEP will not provide an incentive for replacement of a broken or inoperable pumping system.
- The incentive cannot be combined with any other grant, incentive, rebate, or service offered for the project by one of the investor owned utilities or any state or local agency.
- The following are not eligible for incentives under APEP:
  - Retrofits intended to change the operating condition or use of the pumping system, e.g., changing a pump from low pressure flood irrigation to high pressure drip irrigation. (Retrofits intended to compensate for a systemic change in a water table are eligible, however.)
  - Replacements or maintenance activities for electric motors or VFDs as individual projects (however, check with your local PG&E office for other applicable PG&E energy efficiency programs).
  - Replacements or maintenance activities for an engine or gear drive.
  - Pump impeller adjustment.
  - Any actions intended to improve the efficiency of a water well (i.e. any mechanical, chemical, or biological treatment intended to improve the flow of water from the aquifer into the well).
  - Any actions intended to reduce air entrainment.
  - Actions intended to reduce total dynamic head in the system.
- The following actions are not eligible for APEP, **but** may be eligible under one of PG&E's other energy efficiency program offerings. Please contact the main APEP Program Office for more information regarding your particular project, or to locate a utility contact. Many programs require that you contact PG&E before construction or installation. Thus, it is very important to contact PG&E as soon as possible when planning the following projects to verify eligibility:
  - Premium High Efficiency Motor retrofits as stand-alone projects (Non Residential Retrofit/SPC offering)
  - Installation of a Variable Frequency Drive (VFD), or any other type of motor controller or power modulator (Non Residential Retrofit/SPC, or Savings By Design new construction offering)
  - New Premium High Efficiency Motors (Savings By Design new construction offering).
  - A new well with Premium Efficiency Motors and/or VFDs (Savings By Design offering)

***IMPORTANT!***

*Any agreement for pump retrofit/replacement service work that you enter into is a business arrangement solely between you and the pump service provider. Neither PG&E, APEP, the Center for Irrigation Technology, the California State University, Fresno Foundation, the California Public Utilities Commission, nor any other party is responsible for guaranteeing the services of such pump service provider.*

## IX. Important Time Limits on Applications Approval and Project Completion

There are some important time limitations to be aware of.

- Applicants have six (6) months from the date of application approval to complete proposed projects. If projects are not completed within this timeframe, or if the Certificate of Completion and all supporting documentation are not submitted to APEP within a) six (6) months of Application approval or b) APEP ends, or c) California Public Utility Commission funds for APEP are unavailable or otherwise inaccessible to APEP or PG&E, the application will expire and no incentives will be paid.
- Applications deemed “Incomplete” (i.e., submitted without proper documentation) by APEP will have three (3) months from the original date of application to provide necessary information required to complete the application package. If such application is not completed within that time period, or before the application cut off date, whichever date is earlier, the application shall expire and APEP shall have no incentive obligation to the Applicant.
- The current application cut off date for APEP is October 31, 2012. The cutoff date of project completions eligible for an incentive is December 31, 2012 (that is, the project must be operational by December 31, 2012). The cutoff date for a complete application package with Certificate of Completion, copies of the invoices, and the post-retrofit pump test is January 31, 2013.

## X. How Are Incentives Calculated?

### **IMPORTANT!**

*In consultation with you, APEP staff will perform all incentive calculations if so desired. APEP staff will always double-check all calculations as part of the approval process.*

Incentives are calculated based on estimated first-year project energy (kilowatt-hours or therms) and (if an electric account) kilowatt demand savings and are capped at 50% of the project implementation cost.

The energy savings component for electric accounts will be determined using an incentive rate of either \$.08/kWh saved or \$.09/kWh saved. A rate of \$.08/kWh saved will be used if the application was signed or the project physically started before January 1, 2009. A rate of \$.09/kWh saved will be used if the application was signed after December 31, 2008 and the project was physically started after December 31, 2008.

The kilowatt demand savings component will be calculated at the rate of \$100/kW. However, no demand savings will be credited for projects started or applications signed before 1/1/2011.

The energy savings component for natural gas accounts will be determined using an incentive rate of either \$.80/therm saved or \$1.00/therm saved. A rate of \$.80/therm saved will be used if the application was signed or the project physically started before January 1, 2009. A rate of \$1.00/therm saved will be used if the application was signed after December 31, 2008 and the project was physically started after December 31, 2008.

You can use either the past twelve (12) months’ energy use or the future twelve (12) months’ energy use as a basis. The choice of using the past or future 12 months’ energy use is the Applicant’s. However, this choice is permanent once the application is approved.

### **IMPORTANT!**

*There are situations where the immediate 12 months’ energy use before the physical start of the project is not representative of normal energy use. This is most common when a pump has been taken out of service for efficiency problems and there is a significant time lag between then and when the project is actually started. APEP staff will attempt at all times to establish a representative 12 months’ energy use as the basis for the*



*incentive calculation. This may entail using a different 12 month time frame than the absolute previous 12 months or may entail using a 3-5 year average of energy use depending on the circumstances. However, APEP retains full discretion in determining the 12 month basis.*

**IMPORTANT!**

*APEP reserves the right to audit the post-retrofit pump test at its discretion using an independent pump tester. APEP also reserves the right to use the kilowatt hours, or therms if a natural gas-powered pump, required to pump an acre-foot of water through the system and the normal amount of water pumped per year as the basis for the potential incentive calculation if OPE cannot be measured with a pump test.*

**Project Costs:** Project costs must be estimated, and the actual costs documented when available, with an APEP Application. Project costs can include time (diagnostics, engineering, or labor) and materials directly involved in completing the retrofit of the pump bowl and/or impeller. APEP will specifically not count the costs of a motor or engine replacement or overhaul, gear drive overhaul, motor control replacement, or installation of a variable speed drive as part of the project cost for the purposes of calculating your incentive..

**Calculations When the Last 12 Months' Energy Use is the Basis:** There are two standard methodologies used for determining the incentive for a pump retrofit/replacement based on energy savings.

**Method 1** – Method 1 should be used for electric and natural gas-powered pumps in these situations:

- It is always used for an electric-powered pump when the pre-retrofit pump efficiency test shows an overall pumping efficiency of 50% or less (40% or less if a submersible pump).
- It is always used for natural gas-powered pumps when the pre-retrofit pump efficiency test shows an overall pumping efficiency of 16% or less.

For electric-powered pumping plants the potential incentive is calculated as:

$$\text{Incentive} = (.25 \times \text{kWh}_{\text{annual}} \times \text{kWh RATE}) + (\$100/\text{kW} \times \text{kW RATE} \times \text{PUMP HP})$$

Where:

$$\text{kWh}_{\text{annual}} = 12 \text{ months of energy use}$$

kWh RATE = \$.08/kWh or \$.09/kWh depending on when the application was signed and/or the project started as explained above

kW RATE = 0.0 if the project was started or the application signed before January 1, 2011; if started and the application signed after January 1, 2011, it will be .07159 for agricultural or turf irrigation pumps and .05966 for all other pumps (Municipal, District, Agency, Water Company, etc.)

PUMP HP = the nameplate motor horsepower before the retrofit project

For natural gas-powered pumping plants the potential incentive is calculated as:

$$\text{Incentive} = \text{RATE} \times .25 \times \text{therm}_{\text{annual}}$$

Where:

$$\text{therm}_{\text{annual}} = 12 \text{ months of energy use}$$

RATE = \$.80 or \$1.00 depending on when the application was signed and/or the project started as explained above

**Method 2** – This method is used for pumps in the following situations:

- If an electric-powered pump and the pre-retrofit pump efficiency test shows an overall pumping efficiency greater than 50% (greater than 40% for submersible pumps).
- If a natural gas-powered pump and the pre-retrofit pump efficiency test shows an overall pumping efficiency greater than 16%.

As in Method 1 there are both energy savings and demand savings components of the incentive. The potential energy savings component of the incentive for an electric-powered pump is calculated as:

$$\text{Incentive} = \text{kWh RATE} \times (\text{kWh}_{\text{annual}} - (\text{kWh}_{\text{annual}} \times \text{pre-retrofit OPE} / \text{post-retrofit OPE}))$$

Where:

$$\text{KWh}_{\text{annual}} = 12 \text{ months of energy use}$$

OPE = Overall Pumping Efficiency as tested before (pre-) and after (post-) the project.

kWh RATE = \$.08 or \$.09 depending on when the application was signed and/or the project started as explained above.

The demand savings component of the incentive is calculated as:

$$\text{Incentive} = \$100/\text{kW} \times \text{kwRATE} \times \text{PUMP HP}$$

Where:

kwRATE = 0.0 if the project was started or the application signed before January 1, 2011; if started and the application signed after January 1, 2011 it will be determined as below

PUMP HP = the nameplate motor horsepower before the retrofit project

The kwRATE for agricultural and turf irrigation pumps is found by using Table 1 and the Estimated kWh Savings percentage.

$$\text{Estimated kWh Savings \%} = 100 \times (1 - (\text{Pre-Project OPE} / \text{Post-Project OPE}))$$

Table 1 – kW RATE for Agricultural and Turf Irrigation Pumps at Different kWh Savings Percentages

Estimated kWh Savings %	kW RATE
5%	.009694
10%	.02237
15%	.03729
20%	.05369
25%	.07159
30%	.08874
35%	.1044
40%	.1163
45%	.1260
50%	.1320
55%	.1357
60% and above	.184

The kW RATE for all other pumps is found by using the following equation:

$$\text{kW RATE} = .2386 \times (1 - (\text{Pre-Project OPE} / \text{Post-Project OPE}))$$

The potential incentive for a natural gas-powered pump is calculated as:

$$\text{Incentive} = \text{RATE} \times (\text{therm}_{\text{annual}} - (\text{therm}_{\text{annual}} \times \text{pre-retrofit OPE} / \text{post-retrofit OPE}))$$

Where:

Therm<sub>annual</sub> = 12 months of energy use

OPE = Overall Pumping Efficiency as tested before and after the project.

RATE = \$.80 or \$1.00 depending on when the application was signed and/or the project started as explained above

The following are requirements for post-retrofit pump efficiency tests when using Method 2. Note that APEP reserves the right to audit the post-retrofit test using an independent pump test company:

- If a water well, the pump tests must be at similar discharge pressures (+/- 5 psi of the pre-retrofit discharge pressure) and with a similar standing water level (+/- 10% of the pre-retrofit level).
- If a booster pump, either a) the same pump and impeller trim (if applicable) must be in place before and after the retrofit or b) the tests are at the same operating condition (+/- 10% of pre-retrofit flow and total dynamic head).

**Calculations When the Next 12 Months' Energy Use is the Basis:** In this situation there is always a question as to what would have been the pump operating hours absent the retrofit project. Further, APEP must be prudent in the use of the Public Goods Charge. Thus, the methodology used in this situation is different than for when the last 12 months' energy use is used as a basis.

***IMPORTANT!***

*When using the next 12 months' energy use as the basis for an incentive, we cap the calculated energy savings at 50% of the reported 12 months' energy use.*

Further requirements when using the next 12 months' energy use as a basis are:

- There must be a documentable estimate of the future energy use submitted with the application (see section XII. below for examples).
- The future energy use will have to be documented with copies of PG&E billings when available.
- The incentive will only be paid when the future energy use is documented and the incentive will be based on the actual energy use, not the estimate supplied with the Application (e.g., if the estimate in the Application was 100,000 kWh use in the next 12 months and the actual energy use was only 80,000 kWh, 80,000 kWh would be used to calculate the potential incentive).

The incentive calculations proceed as follows:

1. The Net Required Energy is calculated using the reported kWh-use and the post-project pump test OPE.

$$\text{Net Required Energy} = \text{kWh}_{\text{annual}} \times \text{OPE}_{\text{post}}$$

2. The Pre-project Gross Required Energy that theoretically would have been required is calculated using the Net Required Energy and the pre-project pump test OPE.

$$\text{Gross Required Energy}_{\text{pre}} = \text{Net Required Energy} / \text{OPE}_{\text{pre}}$$

3. The theoretical energy savings are calculated as the Pre-project Gross Required Energy minus the reported annual energy use. If this is less than one-half of the reported energy use, it is used as the Energy Savings Basis, otherwise the Energy Savings Basis is one-half of the reported energy use.

$$\text{Energy Savings Basis} = \text{Gross Required Energy}_{\text{pre}} - \text{kWh}_{\text{annual}}$$

Then:

- If the pre-project pump test OPE is 50% or less:
  - The Pre-Project Energy Use is calculated as the reported energy use plus the Energy Savings Basis
  - The energy savings component of the incentive is calculated as:

$$\text{Incentive (energy)} = \text{RATE} \times .25 \times \text{Pre-Project Energy Use}$$

Where:

$$\text{Pre-Project Energy Use} = \text{Reported annual energy use plus the Energy Savings Basis}$$

RATE = the payout rate, either \$.08/kWh or \$.09/kWh for electric-powered pumps and either \$.80/therm or 1.00/therm for natural gas-powered pumps.

- If the pre-project pump test OPE is greater than 50%:
  - The energy savings component of the incentive is calculated as:

$$\text{Incentive (energy)} = \text{RATE} \times \text{Energy Savings Basis}$$

Where:

$$\text{Energy Savings Basis} = \text{as calculated in Step 2. above}$$

RATE = the payout rate, either \$.08/kWh or \$.09/kWh for electric-powered pumps and either \$.80/therm or 1.00/therm for natural gas-powered pumps.

The demand savings component is calculated as usual.

## **XI. Examples of Pump Retrofit/Replacement Incentive Calculations**

### **Example A:**

Assume the following for an irrigation pump:

- Pre-retrofit OPE is tested at 52%.
- Post-retrofit OPE is tested at 62%.
- Billing data indicates 70,000 kilowatt hours were used in the 12 months prior to the replacement/retrofit.
- The replacement costs \$1,500 and was started 10/1/2008.
- The nameplate motor horsepower is 75 HP.

The project started before 1/1/2009, thus:

- kWh RATE = \$.08/kWh
- kW RATE = 0

The maximum Potential Incentive due to the project cost is:

$$\text{Potential Incentive (maximum)} = .5 \times \$1,500 = \$750$$

Method 2 must be used since the pre-retrofit test results show an OPE of 52%. The Potential Incentive is initially calculated as (note that there is no demand savings component):

$$\begin{aligned} \text{Incentive} &= \text{kWh RATE} \times (\text{kWh}_{\text{annual}} - (\text{kWh}_{\text{annual}} \times \text{pre-retrofit OPE} / \text{post-retrofit OPE})) \\ \text{Incentive} &= .08 \times (70,000 - (70,000 \times 52 / 62)) = \$903.23 \end{aligned}$$

However, since \$750 (50% of the project cost) is the maximum allowable payment, the Potential Incentive is \$750.

(Note that the calculations in the equation proceed as follows:

1. Divide 52 by 62;
2. Then multiply the result by 70,000
3. Then subtract the result from 70,000
4. Then multiply the result by .08

Depending on how you round the numbers during the calculations you will get an answer of more or less \$903.)

**Example B:**

Assume the following for an irrigation pump:

- Pre-retrofit pumping efficiency is tested at 52%.
- Post-retrofit pumping efficiency is tested at 62%.
- Billing data indicates 70,000 kilowatt hours were used in the 12 months prior to the retrofit/replacement.
- The replacement costs \$4,000 and the project started 1/15/2011.
- The nameplate motor horsepower is 75 HP.

The project started after 1/1/2009, thus:

- kWh RATE = \$.09/kWh
- kW RATE will depend on the kWh savings

The maximum Potential Incentive due to the project cost is:

$$\text{Potential Incentive (maximum)} = .5 \times \$4,000 = \$2,000$$

Method 2 must again be used and the energy savings component of the Potential Incentive is initially calculated as:

$$\text{Incentive (energy)} = \text{kWhRATE} \times (\text{kWh}_{\text{annual}} - (\text{kWh}_{\text{annual}} \times \text{pre-retrofit OPE} / \text{post-retrofit OPE}))$$

$$\text{Incentive (energy)} = .09 \times (70,000 - (70,000 \times 52/62)) = \$1,016.13$$

To calculate the demand savings component of the Potential Incentive, the energy savings are first calculated as:

$$\text{kWh savings} = (70,000 - (70,000 \times 52/62)) = 11,290 \text{ kWh}$$

As a percentage this is:

$$\text{kWh savings \%} = 100 * 11,290 / 70,000 = 16\%$$

Prorating between the KW RATE for 15% and 20% in Table 1 it is seen that the kW RATE is .04057. Thus, the demand savings component of the incentive is calculated as:

$$\begin{aligned} \text{Incentive (demand)} &= \$100/\text{kW} \times \text{kW RATE} \times \text{PUMP HP} \\ \text{Incentive (demand)} &= \$100 \times .04057 \times 75 = \$304.28 \end{aligned}$$

Thus, the total Potential Incentive due to energy and demand savings equals:

$$\text{Incentive (total)} = \$1,016.13 + \$304.28 = \$1,320.41$$

Since this is less than the maximum incentive permissible due to the 50% project cost cap, the Potential Incentive is \$1,320.41.

#### **Example C:**

Assume the following for a municipal pump:

- Pre-retrofit pumping efficiency is tested at 38%.
- Post-retrofit pumping efficiency is tested at 62%.
- The customer chose to use the next 12 months' energy use as the basis and billing data indicates 100,000 kilowatt hours were used in the 12 months after the retrofit/replacement.
- The replacement costs \$8,000 and was started 10/15/2009.
- The nameplate motor horsepower is 75 HP.

The maximum incentive based on project cost is:

$$\text{Potential Incentive (maximum)} = .5 \times \$8,000 = \$4,000$$

Since this was a project started after 1/1/2009:

$$\text{kWh RATE} = \$.09/\text{kWh}$$

The net required energy is the post-project OPE x the energy use:

$$\text{Net Required Energy} = .62 \times 100,000 = 62,000 \text{ kWh}$$

The Pre-project Gross Energy Use is the NRE divided by the pre-project OPE:

$$\text{Pre-project Gross Energy Use} = 62,000 / .38 = 163,158 \text{ kWh}$$

The theoretical savings are 63,158 kWh but this is more than 50% of the reported energy use of 100,000 kWh. Thus, the Energy Savings Basis is 50,000 kWh

Because the pump tested at below 50% before the project, the energy savings component of the Potential Incentive is calculated as:

$$\begin{aligned} \text{Incentive (energy)} &= \text{kWh RATE} \times .25 \times (\text{Annual Energy Use} + \text{Energy Savings Basis}) \\ \text{Incentive (energy)} &= .09 \times .25 \times (100,000 + 50,000) = \$3,375 \end{aligned}$$

There is no demand savings component associated with this project since it was started before January 1, 2011. Thus, the total Potential Incentive is \$3,375.

Since the incentive calculated from energy savings is less than the 50% cap due to project cost, the incentive to the customer is \$3,375.

**Example D:**

Assume the following:

- Pre-retrofit pumping efficiency is tested at 52%.
- Post-retrofit pumping efficiency is tested at 65%.
- The customer chose to use the next 12 months' energy use as the basis and billing data indicates 300,000 kilowatt hours were used in the 12 months after the retrofit/replacement.
- The replacement costs \$8,000.
- Although the project started 01/15/2009, the application was signed 10/15/2008.
- The nameplate motor horsepower is 150 HP

The maximum Potential Incentive due to the project cost is:

$$\text{Potential Incentive (maximum)} = .5 \times \$8,000 = \$4,000$$

The project application was signed before 1/1/2009 and thus,:

$$\text{kWh RATE} = \$.08/\text{kWh}$$

The net required energy is the post-project OPE x the energy use:

$$\text{Net Required Energy} = .65 \times 300,000 = 195,000 \text{ kWh}$$

The Pre-project Gross Energy Use is the NRE divided by the pre-project OPE:

$$\text{Pre-project Gross Energy Use} = 195,000 / .52 = 375,000 \text{ kWh}$$

The theoretical savings are 75,000 kWh (375,000 kWh theoretically would have been used and only 300,000 kWh was actually used). Since this is less than 50% of the reported energy use of 300,000 kWh the Energy Savings Basis is 75,000 kWh

The pump tested at above 50% before the project so the energy savings component of the potential incentive is based on the actual savings, just calculated as 75,000 kWh. Thus:

$$\begin{aligned} \text{Incentive (energy)} &= \text{kWh RATE} \times \text{Energy Savings} \\ \text{Incentive (energy)} &= .08 \times 75,000 = \$6,000 \end{aligned}$$

Since the application was signed before 1/1/2009 there is no demand savings component (kW RATE = 0). Thus, since the incentive calculated from energy savings is more than the 50% cap due to project cost of \$4,000, the Potential Incentive is \$4,000.

***IMPORTANT!***

*Remember, the incentive is the LOWER of either the incentive based on the past, or the actual future, 12 months' energy use, or 50% of the project cost.*

The above examples indicate that calculating a Potential Incentive can be complicated. APEP staff, in consultation with you, will perform all calculations, both to estimate your Potential Incentive before starting a retrofit project and after it is finished and the actual results are available.

**XII. Examples of Documentable Estimates of the Next 12 Months' Energy Use**

Whenever using the option of the next 12 months' energy use as the basis for an incentive, the Potential Incentive is calculated using the documentable estimate. However, the Actual Incentive will be calculated using the actual 12 months' energy use when that billing becomes available. The Actual Incentive may be less than the estimated Potential Incentive.

**Example A:**

This pump irrigates about 155 acres of mature almonds. Gross water application is about 3.2 acre-feet per acre per year. The pre-retrofit pump test indicates 200 kilowatt hours required to pump an acre foot through the system (200 kWh/AcreFoot). Thus:

$$155 \text{ acres} \times 3.2 \text{ AcreFeet/acre-year} \times 200 \text{ kWh/AcreFoot} = 99,200 \text{ kWh/year}$$

99,200 kWh would be used as the estimate of the next 12 months' energy use. Note that the customer could document the acres farmed, the crop, and the estimate of approximate gross water required to grow the crop (through written records, University of California data, or other science-based resource).

**Example B**

This well pump is the main water supply for approximately 250 acres and will operate in the range of 2,200 hours/year. The pre-retrofit pump test indicates an input kilowatt demand of 140 kW. Thus,

$$2,200 \text{ hr/year} \times 140 \text{ kW} = 308,000 \text{ kWh/year}$$

308,000 kWh would be used as the estimate of the next 12 months' energy use. Note that the customer could document the number of acres farmed (or supplied with water by this pump) and might have written records or an hour meter on the control panel to document hours of operation.

**XIII. How Do I Apply for a Pump Retrofit/Replacement Incentive?**

1. Obtain an Application form. Call your PG&E account representative, call one of APEP's offices, or log on to the APEP web site at [www.pumpefficiency.org](http://www.pumpefficiency.org). Your pump repair company or pump test company may also have applications for distribution.
2. Fill out the Agreement on Pages 1a and 1b of the Application completely. Read all statements on these pages carefully. By signing this Agreement you are certifying that these statements are true. **YOU ARE NOT COMMITTING TO COMPLETING THE PUMP RETROFIT BY SIGNING THE APPLICATION!** The application is only an agreement regarding the incentive that you might be paid to you.
3. Complete the Calculation of Potential Incentive on Page 2. If you are using the next 12 months' energy use as the basis for you incentive APEP staff will contact you regarding these calculations.



4. Fill out the Project Description as much as possible on Page 3.
5. KEEP the Certificate of Completion.
6. Make a copy of the application and supporting documentation for your records and mail or fax the following to the Advanced Pumping Efficiency Program:
  - o The original pages 1a, 1b, 2, and 3 of the Application.
  - o A documented estimate of the next 12 months' energy use (see section XII. Above for examples) as applicable.

**IMPORTANT!**

*The documentation must be copies of utility bills or a summary of energy use prepared by the utility. If you cannot find the last 12 months' bills showing kilowatt hour usage, call your local PG&E account representative, visit [www.pge.com](http://www.pge.com), call the PG&E Business Customer Service Center at 1-800-468-4743 to obtain a record, or call the APEP main office at 1-800-845-6038.*

- o Copy of a pump efficiency test performed prior to the (estimated) completion of the replacement project but after June 1, 2002. The testing company does not have to be an APEP participating pump test company but the test must be deemed accurate by APEP.
7. We will notify you of Application acceptance or the need for more information.
  8. If the Application is accepted, and when the project is complete, paid for, and the post-retrofit pump test completed, mail the following to APEP:
    - o The Certificate of Completion, including the start and finish dates of the project.
    - o Copies of invoices marked PAID by the pump service company, or copies of cancelled checks along with invoices.

**IMPORTANT!**

*The invoices must clearly state all work that was performed, including replacement of parts, labor, and diagnostics.*

- o Copy of the post-retrofit pump efficiency test performed within 6 months of the application approval date.
- o If using an estimate of the next 12 months' energy use as a basis for the calculation of the Potential Incentive you will have to supply documentation of the actual next 12 months' energy use when it becomes available. The Incentive will be recalculated based on the actual 12 months' energy use and will only be paid when this information is available.

All material should be mailed to:

Advanced Pumping Efficiency Program  
 Center for Irrigation Technology  
 6014 North Cedar  
 Fresno, CA 93710

**XIV. How Do I Register a Complaint?**

Participants in the Advanced Pumping Efficiency Program who have complaints of any form can submit these complaints in the following manner:

1. The first step is to file the complaint with the main APEP Program Office by calling toll free 1 (800) 845-6038 and notifying APEP that you would like to file a complaint. The APEP representative will document your complaint and APEP personnel will respond to the complaint in five (5) working days. There is also a feedback form on the web site at [www.pumpefficiency.org](http://www.pumpefficiency.org) where an e-mail message can be sent to APEP that is specifically marked as a complaint.
2. If you do not hear from APEP within five working days, or are not satisfied with APEP's response, you may submit your complaint to Pacific Gas and Electric Company by e-mailing your complaint to Elisa Brossard at [ejss@pge.com](mailto:ejss@pge.com) or by mailing a letter of Complaint to Elisa Brossard, Agricultural and Food Processing, Mail Code N6G, PG&E, P.O. Box 770000, San Francisco, CA 94177.
3. If you are not satisfied with the response from either or both of APEP or Pacific Gas and Electric Company you can submit your complaint directly to the Public Utilities Commission by calling 1-800-649-7570, Monday – Friday, 8:30 AM - 3:00 PM, by mailing a letter of Complaint to California Public Utilities Commission, Consumer Affairs Branch, 505 Van Ness Avenue, San Francisco, CA 94102-3298, or by filing an online complaint by going to <http://www.cpuc.ca.gov/static/forms/complaints/filecomplaint.htm>