

PGE2062 Wastewater Plant Efficiency Improvement Initiative—KEMA

2006 - 2008

1. Projected Budget*	\$2,100,000
2. Projected Net Impacts	
MWh	9,114
MW (Summer Peak)	1.040
Therms	0
3. Cost Effectiveness*	
TRC	2.13
PAC	2.58

*Does not include PG&E contract administration costs, which are estimated at 5 percent of expected contract value and included at the portfolio level.

4. Descriptors

Market Sector: Industrial
Classification: Third Party
Status: Modified

An average-size wastewater treatment plant (WWTP) is expected to consume between 6,000,000 kWh and 10,000,000 kWh annually. WWTPs are complex, highly developed networks of process vessels, pumps, piping, equipment and controls. Historically, WWTP operation has focused on meeting stringent discharge requirements with little operational focus on energy-use optimization.

The Initiative is a comprehensive approach to reducing energy use in WWTPs. The focus of the Initiative will be to optimize the use of electrical energy by providing technical support services and incentives to WWTPs that promote the installation of energy-efficient equipment and better process control. Services may include:

- Review of proposed expansion and redesign projects
- Identify potential energy saving measures
- Assistance with project design and energy savings estimation
- Support performance testing of potential process changes
- Incentives for energy efficiency improvements
- Support approval process
- Training of plant staff on new operation procedures associated with installed measures.

KEMA SERVICES will team with process design and operation experts well known and respected in the wastewater industry. The KEMA SERVICES team will market its program to the plant personnel and management most likely to influence the decision to proceed with project implementation. Key features of the Program are highlighted below:

- ***Comprehensive Approach.*** This program offers a process by which site-specific energy analysis, financial incentives, process optimization, process design, equipment procurement, and installation are all provided. Additionally, the KEMA SERVICES team will help identify integrated demand side management opportunities such as demand management, demand response, and distributive generation measures where applicable.
- ***Incentives Designed to Lower Barriers for Implementation.*** Many WWTPs have limited budgets for capital improvements. This process has been historically slow and difficult because projects for improvement in these plants can include lengthy process studies without the guarantee that the study will result in an attractive project. Projects for WWTP improvements must also compete for funds with other projects considered to be core investments for the owners. In general, wastewater plants do not contribute to profits or product quality and are built and operated solely to comply with pollution regulations. Consequently, investments in wastewater facilities are historically limited to just those needed to meet regulatory mandates.
- ***Effective, Specialized Wastewater Efficiency Services.*** KEMA SERVICES will work with incumbent plant process consultants or provide technical assistance from its team to develop cost-effective energy efficiency measures and then provide assistance in getting them implemented.

5. Statement

The WWTP market segment is characterized by a number of market barriers to the implementation of cost-effective energy-efficiency measures. These include the following:

- Stringent discharge limits mandated by State and Federal pollution control laws drive operating decisions.
- Energy consumption has generally not been a primary consideration in day-to-day operation.
- Understanding of how operating decisions affect utility bills is poor to nonexistent in many plants.
- The process for project approval is generally long and fraught with political, legal, and regulatory barriers, leading to a protracted project review and approval process.
- The plant operators often cannot make decisions to spend funds without management and regulatory approval.

- Most plants rely heavily on consulting engineers in making decisions on process and equipment upgrades and developing operating strategies to meet discharge requirements.
- WWTPs often lack the capital, expertise, and staff time necessary to assess and act on energy-efficiency opportunities comprehensively and confidently.

Together, these barriers have led to an organization focused on regulatory compliance and not on optimization of energy use. This means that most capital funds go toward process upgrades that result in better regulatory compliance and has led to a careful, slow-moving, and deliberative project review and approval process.

6. Rationale

Based on our previous experience with the Wastewater Treatment Plant Improvement Program in program years 2002 and 2003, we believe that the number one barrier to implementation in this sector that must be overcome is the protracted approval process for any project in a wastewater plant. Therefore, a cornerstone of an improved program design will be to focus on facilitating the project approval process. We will concentrate our initial efforts on establishing close relationships with key plant personnel expected to influence project approval. This investment of time and resources in the first year of the program is expected to lead to getting projects into the plant approval pipeline in the second year of the program, which can then be implemented in the third year. Because of the long lead time for studies, reviews, and approvals that are required for WWTP renovation projects, some identified projects may not gain approval until the third year of the program. These projects may or may not be completed within the 3-year program timeframe and may be candidates for future program savings.

Wastewater treatment plants often lack the capital, expertise, and staff time necessary to assess and act on energy-efficiency opportunities. The Wastewater Plant Efficiency Improvement Initiative is designed to effectively mitigate these barriers by identifying opportunities for energy efficiency improvements through process control, equipment upgrades, and incentives that lower first cost, minimize hassle and transaction costs, and reduce real and perceived risks associated with equipment performance and process reliability. This program specifically addresses the following key market barriers:

- **Lack of Access to Capital/First Cost:** WWTP operators have limited access to capital and must get projects approved through a cumbersome, often political process. The Wastewater Plant Efficiency Improvement Initiative pays an incentive to reduce the first cost of the project in order to achieve significant participation and measure penetration.
- **Hassle or Transaction Costs:** The Wastewater Plant Efficiency Improvement Initiative reduces hassle and transaction costs by offering one-stop services that include site-specific energy analysis, feasibility analysis, financial incentives, equipment procurement, and installation.
- **Information or Search Costs:** The Wastewater Plant Efficiency Improvement Initiative is specifically designed to reduce the information and search costs for

WWTP operators. Plant-wide audits, process optimization, and project design services will increase customer awareness of cost-effective energy efficiency measures and techniques to minimize energy use.

- **Performance Uncertainty and Hidden Costs:** The chief concern of WWTP operators is the effectiveness of the treatment process on the quality of the discharge water. Consequently, plant operators are often hesitant to make changes to the process or the equipment without careful study by recognized industry experts. The program will work with the incumbent process consultant at the plant on any recommendations and draw on the expertise of the KEMA SERVICES team to provide credible recommendations for efficiency improvement.

7. Outcomes

The primary outcome of this program is to encourage and assist wastewater plants with the implementation of a sufficient number of projects to result in more than 9 million kWh of net annual savings by the end of 2008. To achieve this savings goal, KEMA SERVICES anticipates that approximately 10 projects will be required, although it is likely that the majority of savings will come from 2-3 large projects. The Initiative plans to provide about 18 project proposals to the plants and work with the plant staff to obtain the required funding approvals, and expects to contact about 40 plants to inform them about the benefits of the program and assess whether they are good candidates for participation. Program metrics may include the following:

First-Year Metrics:

- Complete milestones for program development
- Initiate marketing program and contact at least 25 plants
- Visit at least eight plants and initiate proposal process
- Present at least four proposals for participation
- Get commitment for at least one project
- Provide required tracking reports for costs and savings.

Second-Year Metrics

- Market program to an additional 15 plants
- Visit at least 15 plants and initiate proposal process
- Present additional 14 proposals to plants for participation
- Obtain commitments for at least 75 percent of program savings goals.
- Achieve at least 25 percent of program savings goals
- Provide required tracking reports for costs and savings.

Third-Year Metrics

- Get final commitments for entire savings goals.
- Achieve 100 percent of program savings goals
- Conduct post-inspections of all completed projects
- Provide required tracking reports for costs and savings.

8. Program Strategy

- KEMA SERVICES will gain entry to the customer utilizing multiple channels and provide a presentation to the plant management team on the benefits of working with KEMA SERVICES to achieve energy savings.
- KEMA SERVICES will conduct one or more preliminary assessment meetings and site visits to identify an initial set of energy-saving measures currently under consideration by the plant and current plans for equipment replacement, process changes, or expansion.
- KEMA SERVICES will work with the customer to develop an initial action plan including focused energy assessments, support in securing management approval, and implementation support and commissioning. The plan will be structured in a manner consistent with the plant's budgeting and procurement process and to ensure effective use of program resources.
- KEMA SERVICES will provide services to the customer as per the action plan that result in the implementation of energy-saving measures.
- KEMA SERVICES will update the action plan via regular meetings with the customer and their engineering consultant.
- KEMA SERVICES will pay incentives to the customers once energy-saving measures are implemented and verified.

The key to success is maintaining a regular communication channel with plant management and the engineering consultants. KEMA SERVICES also plans to monitor municipal board meetings to track operational issues and potential major plant changes that can result in an energy-saving opportunity. Lost opportunities are avoided if we can establish the PG&E/KEMA SERVICES team as the plant's trusted energy advisor.

9. Objectives

The primary program objective of Wastewater Plant Efficiency Improvement Initiative will be to facilitate the implementation of cost-effective energy efficiency measures and process improvements in wastewater treatment facilities. The goals of the program are to achieve

9,114,300 annual Net kWh savings and reduce peak demand by 1,040 KW for the summer of 2008. The program TRC and PAC ratios are estimated to be 2.13 and 2.58, respectively.

Program milestones for planning, marketing and implementation are shown below. As displayed, we anticipate launching the program soon after signing a contract in late March. While there are many program activity tasks, we have only assigned milestones to the tasks that have distinct end products or quantifiable targets. Progress on program milestones will be reported in the monthly, quarterly, and final reports.

**Market Integrated Demand Side Management
Wastewater Plant Efficiency Improvement Initiative**

Program Descriptions

Projected Performance Milestones

Program Activity	Q1 2006	Q2 2006	Q3 2006	Q4 2006	Q1 2007	Q2 2007	Q3 2007	Q4 2007	Q1 2008	Q2 2008	Q3 2008	Q4 2008	Totals
Program Development													
Contract Approval		X											
Develop Implementation Plan		X											
Develop of Policies and Procedures Manual		X											
Marketing and Outreach													
Develop tracking database		X											
Develop program flyer		X											
Develop presentation materials		X											
Develop prospect list		X											
Implementation													
Program Launch			X										
Plant Recruitment Contacts			15	10	10	5							40
Proposals Presented				4	4	5	4	1					18
Proposals Accepted				1	1	1	3	2	2				10
Post installation site inspections						1	1	1	1	2	2	2	10
Net MWh savings resulting from installed measures						910	910	910	910	1824	1824	1826	9,114

10. Implementation

Program activity in 2006 will focus on plant recruitment and the development of at least four project proposals. Due to long lead times, no savings are forecasted to occur during 2006. Approximately 30 percent of the total savings for the program should be installed in 2007. These installations will likely come from plants where the program is able to influence potential projects are already under consideration. The primary focus of 2007 is to present sufficient proposals to obtain commitments for at least 80 percent of the program saving goals before the end of year. The final year of the program is where most of the savings will occur. In 2008, the program will focus primarily on providing support to the plants to ensure successful project completions and performing project saving verification visits.

The level of project commitments at the end of 2007 will be a key success indicator for the program.

Strategy and Market Actors

- KEMA SERVICES plans to team with process design and consulting engineering firms who are well known and have an established client base in the wastewater treatment industry.
- Program participants will be recruited via consulting engineers, equipment vendors, and previous program participants who have received audits in the past.
- The program will offer comprehensive services, including site-specific energy analysis, financial incentives, process optimization, process design, equipment procurement, and installation.

Activities

- Initial program launch will include developing program marketing materials.
- Initial program launch will involve the consulting engineers and vendors identifying wastewater treatment facilities with high potential for participation in the program.
- Initially, program objective will be to identify key decision makers within the wastewater treatment facilities and develop strong working relationships and partnerships with these individuals.
- Another key objective early the program will be to identify projects already being considered and facilitate added energy savings and process optimization enhancements in these projects.

- KEMA SERVICES and its implementation partners will build relationships with industry associations, trade allies, and other networking groups to promote the program.
- The program will offer a comprehensive suite of services including:
 - Review of proposed expansion and renovation projects
 - Recommendations for energy efficiency projects
 - Incentives for energy efficiency improvements
 - Plant-wide or process-specific energy audits
 - Process-specific studies and simulations to develop plant energy-use models
 - Training of operating, maintenance and engineering staff.
- Post inspection of all projects will be performed to verify installation of energy efficiency measures before incentives are paid. Documentation on the cost of the project will be required to ensure that the incentives do not exceed project costs.

11. Customer Description

The Initiative will target customers operating medium- and large-size wastewater treatment plants in the service area of Pacific Gas and Electric Company. Treatment plant operators in both the public and private sectors will be eligible for the program.

12. Customer Interface

Treatment plants will either be recruited for enrollment via existing customer relationships, telemarketing, direct mail solicitation, or through referral from a local government agency or equipment or services vendor. Customers may also be referred from other PG&E programs and/or from PG&E account managers where applicable.

The plant will be provided with information on the program and rough estimates of likely costs and benefits. If the plant expresses interest, a proposal will be presented committing the plant to investigate energy efficiency opportunities in ongoing and planned renovation and expansion projects and to explore opportunities in other areas. Following the results of the review, the plant will be apprised of the recommendations for process improvements, control optimization, and equipment upgrades. The customer will be presented with a proposal to proceed with implementation of the recommendations and to receive incentives for savings. The plant commits to being a program participant once they sign the proposal agreement. Incentives are only paid once they complete the work and the work has been inspected and found to be installed and operating as expected.

13. Energy Measures and Activities

13.1 Prescriptive measures.

Adjustable-speed drives on pumps and fans is the only prescriptive measure. There are two separate measures in the workbook depending on the size of the motor. The incentive per hp is lower for the larger motors.

13.2 kWh Level Data

The remaining measures for this program are custom in nature and primarily involve optimizing the control strategies for primary clarifier and aerator systems. The entire plant process will be reviewed for potential savings. Savings for each project will be estimated using plant-specific data and will often involve short-term monitoring.

13.3 Non-energy Activities

13.3.1 End-use Load: Wastewater Treatment Processes

13.3.2 Targeted Sector: Wastewater Plant

13.3.3 Activity Description

Implementation activities without measurable energy savings include:

- Energy efficiency studies and follow-up
- Project coordination
- Post-inspection visit
- Incentive application processing and tracking
- Project proposal development.

Energy Efficiency Studies and Follow-up. Feasibility and follow-up studies may be done at plants that the third party implementer identified to be motivated to implement identified opportunities within the program schedule. These studies will be used to determine where and how much energy is being consumed, to identify opportunities for energy efficiency improvements, and to analyze the effects of proposed changes on the ability of the plant to continue to meet its treatment requirements. The findings of these studies will be summarized in a report for the customer that includes preliminary savings and cost estimates for each measure.

Project Proposal Development. From the results of face-to-face discussions of renovation and expansion plans and any energy efficiency studies conducted, a proposal for further services may be developed. These services may include review of energy efficiency calculations, payment of incentives, design assistance to improve energy efficiency, project coordination, or start-up and commissioning assistance.

Project Coordination. Should a customer decide to proceed with implementation of a measure, a project coordination service will be offered to expedite installation to meet the program installation deadline. However, if the customer elects to use its design and installation contractor for commissioning and startup, it will be up to the customer to manage its contractors and suppliers to ensure timely completion of the facilities.

Post-Inspection Visit. Following completion of an installation, inspection for compliance with the proposal will be conducted by the program. These inspections will ensure that program funds are spent on only those facilities that are necessary for the achievement of the energy conservation measures and that the equipment is installed and operating as expected.

Incentive Application Processing and Tracking. Incentive application processing and progress tracking activities will be necessary to ensure compliance with program eligibility rules and to keep the program apprized on progress toward completion. This will provide information required for reporting of quarterly progress.

There are also four proposed marketing activities without measurable energy savings:

- Telemarket to prospects
- Face-to-face program presentations
- Project proposal presentations and follow-ups
- Direct mailing of program flyer

Telemarket to Prospects. Following the mailing of the program flyer, a telemarketing campaign will be conducted targeting respondents to the mailer and contacts known to KEMA SERVICES's subcontractors at selected facilities. The goal of this campaign will be to establish appointments for face-to-face program presentation meetings with appropriate decision makers and staff at interested facilities.

Face-to-Face Program Presentations. For those customers who show an interest in the program, follow-up phone calls will be made leading to a face-to-face meeting to formally present the program with the goal of enrolling the customer in the program with a commitment to seek out and implement cost-effective energy efficiency measures. These presentations will be directed at the plant management, engineering and operating staffs, and targeted at key decision makers in the plant management. The goal of these meetings will be to reach an agreement to review ongoing expansion and renovation plans and initiate further investigations of possible efficiency opportunities in each plant.

Project Proposal Presentations and Follow-ups. Following the review of ongoing renovation and expansion projects and completion of any energy efficiency studies, a proposal will be prepared and presented to the customer for implementation of recommended improvements. Follow-up activities including phone calls, letters, and meetings will be conducted as necessary to gain approval of the project.

Direct Mailing of Program Flyer. The program will mail a flyer that describes the program and its benefits to all of the eligible facilities identified on the prospects list.

13.3.4 Quantitative Activity Goals

Activities	Goal
Energy Efficiency Studies and Follow-up	As needed.
Project Proposal Development	12
Project Coordination	2
Post-Inspection Visit	10
Incentive Application Processing and Tracking	10
Telemarket to Prospects	50
Face-to-Face Program Presentations	12
Project Proposal Presentations and Follow-ups	10
Direct Mailing of Program Flyer	50

13.4 Subcontractor Activities

KEMA SERVICES expects to hire one or more engineering consulting companies as subcontractors for this program. KEMA SERVICES plans to work with firms that have detailed knowledge and an existing track record with the plant. In its previous wastewater project, KEMA SERVICES found that working with just a single firm was not feasible since the plants do not want to start a new relationship with another engineering company.

Two engineering firms that KEMA SERVICES has worked with in the past and expects to work with on this project are Brown and Caldwell and Carollo Engineers. Both of these firms have several established relationships with wastewater plants in the PG&E service area. The subcontractors will assist KEMA SERVICES with program marketing activities, measure assessment, design assistance, and obtaining required project approvals. They will play a key role in helping to avoid lost opportunities through their regular coordination activities with the plants.

In some instances, it is expected that a particular plant will only work with their incumbent consulting engineer(s). In these cases, KEMA SERVICES will offer

the Initiative to the plant and its consultant(s). The consultant(s) will provide design and engineering services as required and KEMA SERVICES will advise the plant and its consultant(s) on energy-efficient alternatives as well as recommend demand response and distributive generation measures.

The work performed by subcontractors may be different for each participant based on the specific configuration of each plant and the unique treatment requirements at each plant. It may become necessary to utilize an expert process consultant to conduct a process-specific study at a plant to demonstrate the feasibility of a particular measure and its effect on the ability of the plant to meet its pollution discharge requirements. When this becomes necessary, the subcontractor will be paid from the program budget for direct implementation. Since it is unknown how many customers each subcontractor will bring to the program or what services will be required for each customer, it is not possible to predict how much of the budget for these activities will be assigned to particular subcontractors.

Subcontractors are expected to refer customers to the program for participation. These customers may be public agencies or private companies. Customers with worthy energy efficiency projects that participate in the program will receive incentive payments that will decrease the customer's capital investment. By lowering the first cost of the project, it is more likely that the customer will go forward with projects, thus adding to the subcontractors' business.

Other tasks performed by the subcontractors will include consulting on feasibility studies and providing project coordination services if requested by the customer. In some cases, the subcontractor may also be the design and construction firm employed by the plant. In these cases, eligible services other than design, procurement, and installation performed by the contractor will be paid for from the program direct implementation – non-incentive activities budget. These services may include process studies for specific energy efficiency measures or project coordination activities. Any design, procurement or installation work for energy efficiency measures performed by the subcontractor will be paid from program incentive funds in accordance with the program rules.

13.5 Quality Assurance and Evaluation Activities

KEMA SERVICES will visit each site to verify proper installation and operation of each measure for which an incentive is to be paid. Inspectors will verify the quantity and size of equipment installed and note the running characteristics of the system as operated so that claimed savings can be verified.

Savings calculations done by customers and their consultants will be reviewed by KEMA SERVICES engineers for accuracy and completeness. Adjusted savings will be determined based on observations of actual operating conditions, actual equipment operating schedules, and measured power use.

Incentives will be paid based on adjusted savings calculations. Invoices for procurement and installation will be examined to determine actual measure costs. Incentive payments will be capped based on actual project costs.

13.6 Marketing Activities

A key aspect of KEMA SERVICES's marketing and outreach approach will be to leverage its subcontractors' existing customer relationships to the benefit of the program. Subcontractors are expected to refer their customers to the program for incentives for projects they are involved in. KEMA SERVICES and the subcontractor will contact the plant for a presentation of the program and its benefits and a discussion of ongoing and planned projects that may be eligible for incentives to encourage interested plants to participate in the program. A second way in which the program will leverage existing customer relationships will be to initiate customer contacts through established business relationships that the subcontractors have with WWTP operators. KEMA SERVICES's subcontractors are established consulting engineering firms with a long history of involvement of commitment and service to the wastewater industry in the PG&E service area.

The following specific activities will be conducted on behalf of the program:

Develop Program Flyer. A flyer suitable for mailing and faxing to prospects in the service area will be developed that briefly describes the attributes and benefits of the program. This mailer will be the precursor to a telemarketing campaign. It will be submitted for approval to PG&E's contract administrator before it is distributed.

Develop Presentation Materials. Presentation materials will include handouts for use in the face-to-face presentation meetings. They will include a flyer that describes information on eligibility rules, program deadlines, and other program requirements. These materials will emphasize the benefits of the program.

Establish Prospect List. KEMA SERVICES, in consultation with its subcontractors, will create a prospect list from its marketing database of wastewater plants in PG&E's service area. KEMA SERVICES will add other prospects identified by its subcontractors as operators with firm interest in improving energy efficiency. The initial list will be modified as the marketing effort unfolds. Some prospects will be dropped from the list, and others may be added. Site contacts will include plant engineers and operations managers.

Telemarket to Prospects. Following the mailing of the program flyer, a telemarketing campaign will be conducted targeting respondents to the mailer and contacts known to KEMA SERVICES and its subcontractors at selected facilities. The goal of this campaign will be to establish appointments for face-to-face program presentation meetings with appropriate decision makers and staff at interested facilities.

Face-to-Face Program Presentations. For those customers that show an interest in the program, follow-up phone calls will be made, leading to a face-to-face meeting to formally present the program with the goal of enrolling the customer in the program with a commitment to seek out and implement cost-effective energy efficiency measures. These presentations will be directed at the plant management, engineering, and operating staffs and targeted at key decision makers in the plant management. The goal of these meetings will be to reach an agreement to review ongoing expansion and renovation plans and initiate further investigations of possible efficiency opportunities in each plant.

Direct Mailing of Program Flyer. The program will mail a flyer that describes the program and its benefits to all of the eligible facilities identified on the prospects list.

Project Proposal Presentations and Follow-ups. Following the review of ongoing renovation and expansion projects and completion of any energy efficiency studies, a proposal will be prepared and presented to the customer for implementation of recommended improvements. Follow-up activities including phone calls, letters, and meetings will be conducted as necessary to gain approval of the project.

Public Outreach. KEMA SERVICES will make presentations of program benefits to industry trade groups where engineers, operators, and plant managers are present.

14. Conclusion

KEMA SERVICES will deliver to PG&E more than 9 GWH of annual net energy savings and about 1 MW of net demand reduction by working with approximately 10 WWTPs throughout the PG&E service area. The program will obtain the savings from a set of control-related measures associated with various process improvement strategies.