Equipoise Consulting, Inc.

Energy Analysis
Project Management
Training

Final Report for

Pacific Gas & Electric Company's 2000-2001 Energy Treasure Hunt and Energenius Programs Evaluation

Submitted by:

Equipoise Consulting Incorporated
in association with
Ridge & Associates
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1. EXECUTIVE SUMMARY

Pacific Gas and Electric Company's (PG&E) decision to evaluate the Energenius and Energy Treasure Hunt Programs for the 2000-2001 academic year was in compliance with Ordering Paragraph 33 issued as part of Decision (D.) 00-07-017 on July 11, 2000. This ordering Paragraph states:

> PG&E and Edison shall continue their school-based education programs for PY 2001 and SDG&E and SoCalGas shall conduct pilot tests of these school-based programs in their service territories for PY 20001. The utilities shall monitor the effectiveness of the program and changes in awareness and behaviors attributable to the program and report the results in the Quarterly Reports and in an evaluation report to be submitted to the Energy Division by December 1, 2001. The utilities shall explore the feasibility of a future statewide school-based education strategy using PG&E's and SCE's programs as models.

Motivated by this decision, PG&E implemented an evaluation of two pilot school programs – Energenius and Energy Treasure Hunt. A market characterization of the California schools market was developed first. Surveys of and in-depth interviews with various school personnel (teachers, administrators, custodians) were conducted. Results of the market characterization and data analysis are presented next.

1.1 Market Characterization

The market characterization of the schools segment was provided to PG&E as a separate report on March 20, 2001. (The full report is included in Appendix D.) We present here a high-level summary of this report in order to provide a context for this evaluation. There are a variety of conclusions that can be made regarding the California schools market segment.

- There is a drastic need for additional classrooms owing to increased enrollments and reduced class sizes. Failure to take advantage of energy efficient options when new facilities are built/added would represent a significant missed opportunity.
- Because of reduced school funding over the last 20 years, there is a drastic need for major repairs and renovation of existing buildings. This is the case despite the passage of Proposition 1A. Failure to take advantage of energy efficient options when renovations are made represents a significant missed opportunity.
- The market barriers facing schools include information-search costs, performance uncertainty, organizational practices, and high first costs. Organizational practices and high first cost may be the greatest barriers.

1.2 Energenius Program (EP)

Below are the key findings regarding the EP.

1.2.1 Participation

- From January 1 to October 31, 2001, 1,364 EP Teacher Kits were sent to 333 teachers at 325 participating schools.

- From January 1 to October 31, 2001, 22,033 EP Student Kits were sent to participating schools.

1.2.2 Impacts

- Teachers felt that the EP materials held their students' attention, were easy to incorporate into their curriculum, and that their overall quality was very good.
- Teachers felt very strongly that the EP affected their students' attitudes, knowledge, and behavior.
- In the in-depth interviews, nine of the twelve teachers indicated that their students used some of the Energenius materials at home, suggesting that the students are incorporating the lessons from school into the home.
- Overall the EP was well received. The vast majority of the teachers rated the EP as "Excellent" or "Very Good".
- Almost three-quarters of the teachers indicated they are "Very Likely" to teach another PG&E-sponsored energy efficiency program.
- Over three-quarters of the teachers indicated they are "Very Likely" to recommend the EP to other teachers.
- Across all EP components, students exposed to the EP materials experienced statistically significant increases in knowledge as measured by the pre-tests and post-tests.

1.2.3 Recommendations

- One teacher did suggest that there should be a *parent* version of the home survey, which is worth thinking about if one wants to collect the quantity and quality of information required by one of PG&E residential audits. Such an audit can provide more sophisticated information to the parents regarding how to reduce their energy use.
- Efforts should be made to link participating students to existing PG&E residential audit programs in order to provide a greater level of demand side management (DSM) services.
- Efforts should be made to measure the energy savings in the homes of the students as a result of the EP.

1.3 Energy Treasure Hunt Program (ETH)

Below are the key findings regarding the ETH.

1.3.1 Participation

- Two schools districts (a total of two high schools, one middle school, and five elementary schools) participated in the ETH in the 2000-2001 academic year.
- The ETH successfully designed and implemented three workshops that focused on financing energy efficiency projects identifying cost-effective energy conservation and energy efficiency measures and practices. Over 300 school administrators, facility managers, and custodians attended these workshops.

1.3.2 Impacts

- In general, the school administrators, facility managers, and custodians who attended the three workshops reported that the organization of the workshops was good, as was the quality of the information presented.
- Over 55 percent of the school administrators who attended the ETH-sponsored financial workshop indicated they had used the information or changed their behavior *or* planned to use the information or change their behavior within the next 12 months.
- The ETH successfully implemented three demonstration classrooms in the two school districts.
- The preliminary annual savings estimates for both districts are 956,333 kWh, 48.9 kW, and 1,980 therms. This translates into an annual total electric and gas bill reduction of $113,181 across both school districts.[1]
- ETH continues its efforts to convince participating school districts to adopt an energy conservation/efficiency curriculum.
- Participating energy partners felt that their involvement was positive. They agree that their involvement benefited the schools, provided some public-relations value to their respective organizations, and saw some opportunities for synergy between the ETH and other energy efficiency/conservation programs in California. They also plan to continue their involvement with the ETH. Finally, they are concerned that the roles of the various stakeholders were somewhat unclear.
- Participating school administrators appear to have had a very positive experience with the ETH. Some claim that they had already installed or plan to install some of the recommended measures.
- Because this is a very complex Program, involving numerous stakeholders representing large bureaucracies, there appears to be some ambiguities regarding the role and responsibilities.

1.3.3 Recommendations

- For those schools participating in the 2000-2001 school year, savings from the installation of any of the recommended measures and practices should be measured.
- Greater efforts should be made to work more closely with schools district so that an energy education curriculum can be adopted.
- Greater efforts should be made to clarify the roles of all stakeholders involved in the ETH.

[1] A technical review of these reports was beyond the scope for this evaluation. Percentages provided are taken directly from the prepared reports.

2. INTRODUCTION AND REVIEW OF ISSUES

2.1 Introduction

Pacific Gas and Electric Company's (PG&E) decision to evaluate the Energenius and Energy Treasure Hunt Programs for the 2000-2001 academic year was in compliance with Ordering Paragraph 33 issued as part of Decision (D.) 00-07-017 on July 11, 2000. This ordering Paragraph states:

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The elements of PG&E's response[2] to Ordering Paragraph 33 that form the framework for this evaluation are presented below:

> PG&E will continue to offer the school-based Program "Energenius" through PY2001. The Energenius Educational Series consists of complete curriculum programs focusing on energy-efficiency and gas and electric safety for grades 1 through 8. Each series comes with a teacher curriculum guide and activities for each student. The core of the series consists of multi-lesson classroom programs designed to engage students in active, age-appropriate learning that relate to the California curriculum standards.
>
> In addition to continuing PG&E's Energenius Program, PG&E in 2001 will pilot a new school-based program as part of the Department of Energy's (DOE) Rebuild America Program [i.e. Energy Treasure Hunt]. Included in this pilot will be a curriculum component. The pilot will utilize some of the curriculum identified by DOE in its list of the "Best Curriculum."

PG&E's response included:

> SCE and PG&E will continue to monitor and evaluate their school-based programs. The current efforts will be enhanced to monitor the effectiveness of the programs and the changes in awareness and behaviors attributable to the

[2] *Compliance filing of Pacific Gas and Electric Company (U 39 M) Southern California Edison Company (U 338 E) San Diego Gas & Electric (U 902 E) and Southern California Gas Company (U 904 G) on school-based education programs and a common definition for nonresidential retrofit and remodeling in compliance with ordering paragraphs 33 and 64 of decision 00-07-017, issued July 11, 2000*. Filed October 2, 2000.

> programs as required in Ordering Paragraph 33. SCE and PG&E's revised evaluation plan will be developed by the first quarter of 2001, and the final evaluation report will be submitted to the Energy Division by September 1, 2001. Results of the evaluation studies and monitoring will be shared with the other utilities as analyses are conducted and completed.

On August 15, 2001, PG&E filed its second 2001 Quarterly Report. PG&E indicated in the compliance section that the schools evaluation report will be submitted on December 1, 2001, as ordered by the Commission.

Finally, the issue of a statewide school-based was addressed:

> PG&E, SCE, SDG&E and SoCalGas will confer jointly to determine whether a statewide school-based program would be effective, which would be the best program model to implement, or whether to offer more than one kind of option.

Thus, the objectives of this evaluation are to:

1. monitor the effectiveness of these two programs,
2. monitor changes in awareness and behaviors attributable to these two programs,
3. develop a baseline market characterization for the schools sector, and
4. explore the possibility of a statewide schools-based program.

To accomplish these objectives, the Equipoise Consulting, Inc. and Ridge & Associates (the Evaluation Team) collected data and analyzed that data using credible estimation techniques. This report provides the results of that effort.

For each of these two programs, this plan outlines the evaluation methodology, data sources, data collection plan, sampling plan, reports and schedule. The next section describes in greater detail the Energenius Program (EP) and the Energy Treasure Hunt Program (ETH).

2.2 Study Issues

While no major study issues were identified by the Evaluation Team for the ETH, two issues were identified for the EP:

- timing,
- response rates, and
- regulatory difficulties.

Timing was an issue since EP (for 2000-2001) began in the fall of 2000. However, the evaluation effort did not begin until January 2001. This meant that certain opportunities for data collection had been missed. For example, the administration of pre-test and post-test to students could only be done for those students who were exposed to the EP curriculum in the spring of 2001.

Obtaining response rates that provided adequate data for analysis was another issue. Students were tested and teachers were surveyed to determine the effectiveness of the Program and the extent to which it changed attitudes and behavior with respect to energy efficiency. The cooperation of the teachers was central to the data collection efforts since they were asked to

administer the pre-tests and the post-tests to their students. They were also asked to complete a survey regarding their experience with the EP. A sample of these teachers was also asked to complete an in-depth interview. Teachers have very busy schedules, which meant that the data collection effort was conducted in such a manner that was not overly burdensome and thus maximized their cooperation.

Finally, PG&E's bankruptcy resulted in a serious disruption of the EP program. The key contractor refused to work on key program activities because they had not been paid and there was no apparent hope of being paid in the near future. Teachers ordered materials that were not filled until late spring, making it difficult to teach the program before the summer. The court's ruling that DSM funds were not to be considered as a part of the bankruptcy proceeding, after six weeks delay, allowed the EP to resume these activities.

3. PROGRAM DESCRIPTIONS

Program descriptions of the two programs under evaluation are presented in this section. The Energenius Program is presented first, followed by the Energy Treasure Hunt Program.

3.1 The Energenius Program

The Energenius Program (EP) provides gas and electric energy conservation and safety, water conservation to school children in grades 1 through 8. More specifically, the EP:

- provides basic education to students that help shape their energy use behavior and practices as adults in home and work environments, and
- teaches students how to conserve energy in their homes and increases their parents' awareness about energy.

There are five components to the EP with each directed to a specific topic and grade level. They are: 1) the Bill Buster Program, 2) Primary Energenius Program (Habits), 3) Intermediate Energenius Program (Measures), 4) Energenius Intermediate Safety Program, and 5) Energenius Primary Safety Program.

School districts and teachers request these materials over the Internet or by telephone. The materials include the following components and learning objectives:

- **Bill Buster Program** (grades 6-8) has the following 20 learning objectives:
  1. Students will identify the energy they use every day
  2. Students will estimate their own energy use and record this data in the Energy Survey
  3. Students will be able to describe the following energy sources: natural gas, geothermal energy, hydroelectric poser, fossil fuels, nuclear, solar, and wind.
  4. Students will be able to explain how each energy source generates the energy they use every day.
  5. Students will be able to define the terms *renewable resources* and *nonrenewable resources* and give examples of each.
  6. Students will be able to list the ways that they (and their families) can be more energy efficient.
  7. Students will be able to describe in words and/or diagram what kilowatt hours means.
  8. Students will be able to compute the amount of electricity used for various activities using the Energy Calculator.
  9. Students will be able to identify ways they can save electricity.
  10. Students will be able to describe how heat energy from natural gas is measured.
  11. Students will be able to describe in words and/or an illustration what therms means.
  12. Students will be able to compute the amount of therms needed for various activities using the Energy Calculator.
  13. Students will be able to identify ways that they can save natural gas.
  14. Students will be able to identify the relationship between their own energy use and the information on their personal energy statements.

15. Students will be able to calculate from the personal energy statement their energy use and energy savings over an extended period of time.
16. Students will be able to analyze, interpret and apply the information on their personal energy statement to various activities.
17. Students will be able to describe two additional sources of energy – recycling and efficient energy use.
18. Students will be able to identify reasons that they are sources of energy.
19. Students will be able to understand their personal energy statements and describe the changes in their energy use.
20. Students will be able to describe various ways personal energy behaviors affect the environment.

- **Primary Energenius Program - Habits** (grades 1-3) has the following 12 learning objectives:

1. Students will be able to identify two sources of energy in the home – electricity and natural gas.
2. Students will be able to give examples of energy waste.
3. Students will be able to give examples of energy-saving activities.
4. Students will be able to explain why energy should be used wisely.
5. Students will be able to retell in their own words the energy-efficient messages that are included on their calendar.
6. Students will be able to tell why these tips on saving energy are important.
7. Students will be able to tell what they can personally do to save energy in their own homes.
8. Students will be able to recite three or more safety rules found on the calendar.
9. Students will be able to identify the two most common forms of energy found in households – electricity and natural gas.
10. Students will be able to identify three or more wasteful and/or dangerous energy habits.
11. Students will be able to explain ways of conserving energy and using energy wisely.
12. Students will be able to identify wasteful energy habits described in the Energenius *Habits See and Check Activity.*

- **Intermediate Energenius Program - Measures** (grades 4-5) has the following 13 learning objectives:

1. Students will be able to identify two sources of energy in the home – electricity and natural gas.
2. Students will be able to analyze and give examples of energy waste and energy-saving measures.
3. Students will be able to give reasons and explain why energy should be used wisely.
4. Students will be able to explain why keeping energy where it is needed is one way not to waste energy.

5. Students will be able to analyze and identify five or more physical features of a home that waste energy.
6. Students will be able to describe a range of fix-its that will help to create a more energy-efficient home.
7. Students will be able to describe the two most common forms of energy found in households – electricity and natural gas.
8. Students will be able to identify five wasteful and dangerous energy habits shown in the video.
9. Students will be able to analyze how energy-saving information changed Scott's behavior.
10. Students will be able to apply what they've learned about home safety and energy conservation to their school setting.
11. Students will be able to identify wasteful energy habits in the home.
12. Students will develop their own solutions to reduce energy waste in the home.
13. Students will be able to give reasons why it is important not to waste energy (environmental and economic).

- **Energenius Intermediate Safety Program** (grades 4-5) has the following 18 learning objectives:

1. Students will, by identifying six safety rules, complete a *Scriptbook* activity.
2. Students will identify ways to prevent getting electrical shocks.
3. Students will develop a list of conductors and insulators and describe the differences between the two.
4. Students will identify and describe common household hazards that cause electric appliances to malfunction.
5. Students will explain at least two safety rules associated with the proper use of electric appliances.
6. Students will list at least three safety rules on how to keep safe around electrical utility equipment.
7. Students will define "combustion" and name three things that can cause the combustion of natural gas.
8. Students will identify the smell associated with natural gas leaks.
9. Students will describe three rules to follow if they were to detect a gas leak in their home.
10. Students will describe the three factors that are needed to ignite and sustain a fire.
11. Students will state at last three safety rules for preventing fires in the home.
12. Students will state at least three safety rules for putting out household fires.
13. Students will be able to identify various resources, including emergency telephone numbers, for dealing with home emergencies.
14. Students will state three or more safety rules for staying safe in the kitchen.

15. Students will identify potentially hazardous situations in various rooms of the household and state appropriate safety rules for avoiding these dangers.
16. Students will produce a roller movie that demonstrates how safety rules apply to real world situations.
17. Students will demonstrate and apply their knowledge of safety rules, as they participate in creating a team safety movie.
18. Students will list ten or more safety rules covered in this program.

- **Energenius Primary Safety Program** (grades 1-3) has the following 14 learning objectives:

1. Students will be able to state two or more reasons that safety rules are important.
2. Students will be able to repeat 12 safety rules in their own words.
3. Students will be able to read or "picture read" and describe the actions occurring on the 12 Home Safe Home Activity Sheets.
4. Students will be able to retell, in their own words, the safety rules that are included on the calendar.
5. Students will be able to tell why the safety rules on the calendar are important.
6. Students will be able to tell what they can safely do at home around electricity and natural gas.
7. Students will be able to tell why energy conservation tips are important.
8. Students will be able to identify the two most common forms of energy found in homes – electricity and natural gas.
9. Students will be able to explain ways of using energy safely and efficiently.
10. Students will be able to demonstrate by responses to safety questions their understanding of the safety rules.
11. Students will be able to develop their own Home Safe questions and answers based on the Energenius Safety Program.
12. Students will be able to recall and explain safety rules that they have learned in the Energenius Program.
13. Students, with their parents' or guardians' assistance, will be able to read and complete the Energenius Safety Check List.
14. Students will be able to tell in their own words what they learned by completing the Energenius Safety Check List.

3.2 The Energy Treasure Hunt Program (ETH)

The ETH provides a great opportunity to create a "new generation of energy efficient schools" given the need for major facility upgrades, rising energy costs, and the resources available at this time to help schools districts become more energy efficient. And yet, despite this immense opportunity, schools still experience barriers that can prevent them from taking advantage of the resources being made available, and realizing this timely opportunity.

Schools rarely have the in-house energy efficiency expertise, or the staff resources to evaluate the opportunities and take the necessary steps to utilize, coordinate, and manage the myriad of resources through the entire process of upgrading facilities to make them more energy efficient.

Even when a school district is fortunate enough to have a project champion, they often do not have the staff resources to manage process, because they are overwhelmed with other high priority tasks.

The ETH Program helps K-12 school districts develop and implement district-specific energy savings plans. The ETH does so by assisting districts in identifying energy-efficiency upgrade opportunities, providing access to resources to implement energy-saving projects, and educating school district personnel, students, and parents about energy-related issues. By working in partnership with organizations, such as the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® program, the U.S. Department of Energy's (DOE) Rebuild America program, the California Energy Commission's Bright Schools Program, and energy-efficient equipment manufacturers. The ETH program offers participating school districts a broad array of programs and services, including facility energy surveys, technical assistance, financing resources, educational activities, and professional training services.

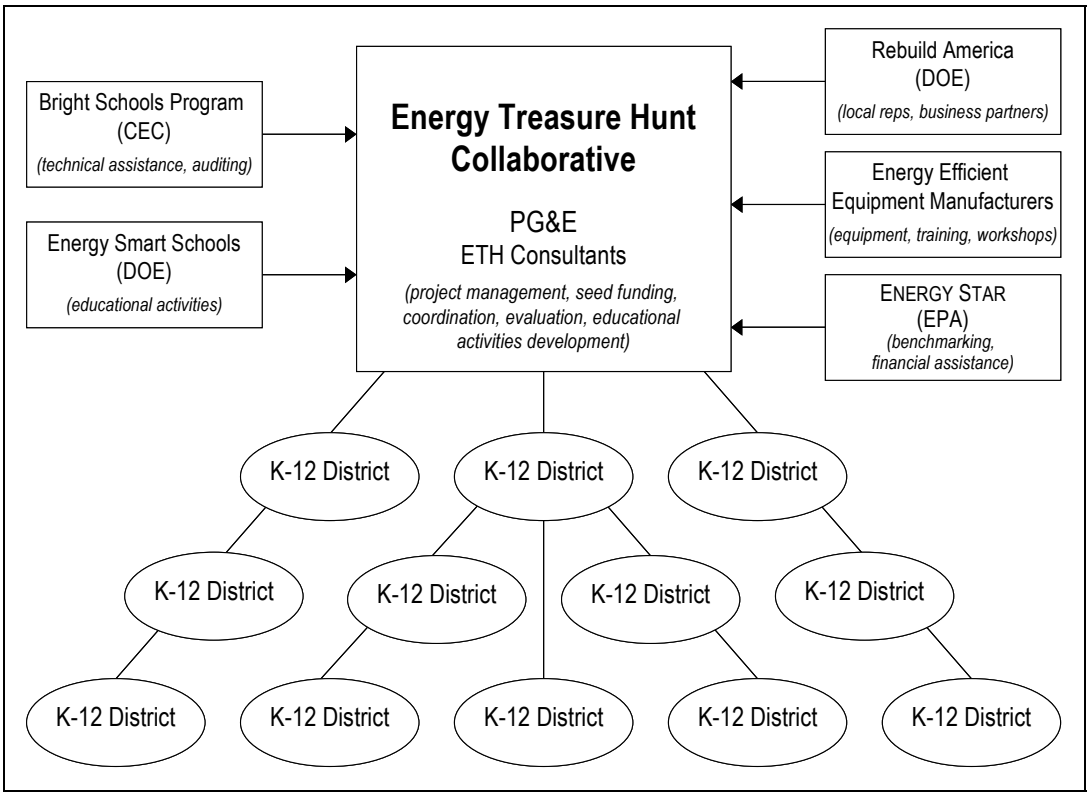
Thus, the ETH represents a collaborative partnership of federal, state, and regional organizations and industry participants that provides each participating district with local resources and support to upgrade the energy efficiency of its facilities and to educate its students, teachers, facilities staff, and decision makers about energy use, energy conservation behavior, and energy efficiency technologies and operation practices. The ETH is tailored specifically for each participating district, recognizing that each district faces different obstacles to upgrading the energy efficiency of its facilities. The level of each district's participation is based upon the district's available funding, size, commitment to range of program components, vintage of facilities, and scope and date(s) of prior energy-efficiency retrofits.

The program requires a two-way commitment of both the district and the program team, consisting of PG&E program management, field representative, and the contributing ETH business partners.

Exhibit 3.1 illustrates the organizational structure of the ETH program[3]. As shown, the ETH program uses the expertise through several types of partnering entities, including national, state, and regional energy efficiency programs, and energy efficient equipment manufacturers. PG&E serves as the foundation of the ETH program, providing project management and coordination with the assistance of consultants secured through a competitive bid process. In addition to providing program management support, various consultants to the ETH program help districts develop energy efficiency learning activities.

[3] Exhibit 3.1 and its description were provides by D&R International, which provided consulting support to the ETH staff.

Exhibit 3.1. Organizational Overview of Energy Treasure Hunt Program Collaborative



Two school districts participated in this pilot project during PY 2000-2001. The West Contra Costa School District (WCCUSD) and Ravenswood School District (RSD) in East Palo Alto were specifically targeted by the ETH staff because the two schools were already working with Rebuild America and met PG&E criteria (available school funding, hard-to-reach location, and willingness to invest staff time to attend workshops and provide necessary data for audits/benchmarking).

3.2.1 Supporting ETH Business Partners

- **DOE's Rebuild America Program.** In addition to co-funding the ETH program, DOE's Rebuild America Program provides local support to participating school districts as well as solid relationships with many equipment manufacturers.
- **EPA's ENERGY STAR® for Schools.** Examples of in-kind support provided by the ENERGY STAR® program include retrofit financing Internet presentations and workshops, training and implementation support for the ENERGY STAR® benchmarking tool, and tools for improving K-12 school indoor air quality.
- **CEC Bright Schools Program.** Resources provided by the California Energy Commission's (CEC) Bright School Program include investment-grade audits in up to four schools per district and manuals on energy efficiency retrofit financing, planning, and implementation.
- **Industry Partners.** Industry partners, primarily equipment manufacturers, provide limited co-funding, but invaluable in kind support. In particular, industry partners donate equipment for demonstration projects and participate in targeted workshops.

- **Other National, State, and Regional Partners.** ENERGY DECISIONS Magazine.

3.2.2 Program Objectives

Through a collaborative effort between PG&E, national, regional, and state government organizations, and industry business partners, the ETH helps K-12 schools save energy and money through energy efficiency retrofits and educational activities. The principal goals and objectives of the ETH Program are enumerated below:

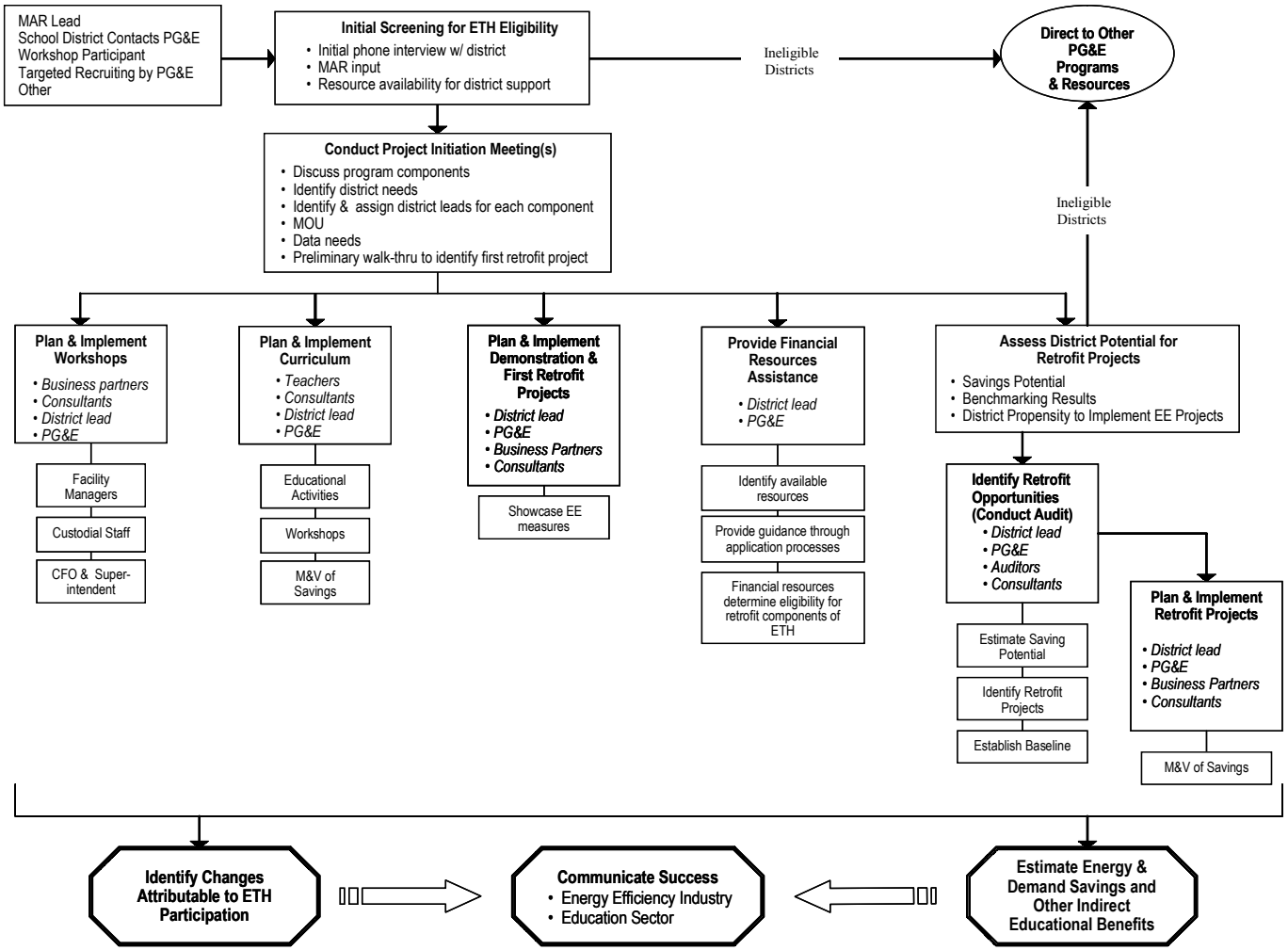
1. Educate school facility managers, superintendents, financial officers, and custodians about energy efficiency.
2. Educate primary and secondary school students about energy efficiency by linking participating schools' energy-efficiency retrofits with energy-efficiency curriculum:
    - Ensure school facilities themselves become one of the key learning tools.
    - Implement service learning and other techniques to get students and energy efficiency into the community (e.g., student energy audits of their homes, etc.)
    - Continue working with a variety of partnerships and delivery mechanisms to maintain a long-term, sustainable program.
3. Facilitate school energy retrofits by creating a network of decision makers, industry partners, implementers, and financial organizations committed to saving energy.
4. Identify cost-effective energy savings potential.
5. Realize documented, verifiable energy savings.
6. Create behavioral changes (market changes)

3.2.3 Key ETH Components

Exhibit 3.2 provides an overview of the key ETH program components designed to achieve these objectives. It also illustrates the typical participation path for each district. As shown in the upper left corner of the figure, there are several means by which districts might learn of the ETH program: 1) a PG&E major account representative (MAR) lead/referral, 2) a school district initiated contact, 3) lead resulting from a workshop or other program-related event, or 4) targeted recruiting according to specific selection criteria set by the ETH team. Once a dialogue between the district and ETH program staff commences, program staff assess the district's eligibility to participate in the ETH program. This initial screening consists of an interview with the primary district contact, input from the district's MAR, and an assessment of ETH resources and support that will be available for the district. (See Qualifying Criteria below for a brief discussion on screening metrics.)

Districts that are deemed eligible at this point begin their participation in the ETH program with a project initiation meeting with PG&E program staff. Primary objectives of this meeting are to identify district needs, discuss ETH program components, identify and assign key district personnel as the primary lead for each component, and to review (and get a signed copy) of the participant's Memorandum of Understanding (MOU). It is likely that more than one on-site meeting will be required to complete these project initiation tasks. Districts that are deemed ineligible for the ETH program are referred to other PG&E programs, such as the Express Efficiency, Savings by Design, and the Nonresidential Standard Performance Contract (SPC) programs. However, these districts are able to participate in workshops at other school districts to provide them with information on local and state resources.

Exhibit 3.2. Overview of ETH Components and Program Participation for 2000-2001[4]



[4] Exhibit 3.2 and its description were provides by D&R International, which provided consulting support to the ETH staff.

It is important to note that districts must also qualify to participate in the retrofit components of the program (objectives 4 and 5 listed above). Because of the investment required for this part of the ETH, this component of the program must be justified by the estimated savings potential resulting from the retrofits, funding availability, and other factors. Each of the remaining components is more fully described below.

3.2.3.1 Plan and Implement Workshops

The ETH Business Partners presented three workshops covering energy-saving technologies and practices, according to the needs of each school district. Workshop were targeted at the district level so personnel from many schools could attend.

Separate workshops were held for:

Facilities Personnel. The primary objective of this workshop was to educate facility managers about energy efficient technologies and behaviors.

Custodians. The primary objective of this workshop was to educate custodians about energy efficient technologies and behaviors.

School Administrators. Financing of retrofit projects is essential in making significant inroads into saving energy and money for the school districts. Although there are numerous resources available to school districts throughout the State to finance and fund retrofit projects, they are widely unknown and/or the application process can be confusing and complex. The objective of this component of the ETH is to provide participating districts with the support and guidance needed to identify the financial resources required to plan and implement retrofit projects and to provide training to district personnel in applying and securing the needed funds.

Experts in school retrofit financing from the ESCO field and Federal agencies such as the Departments of Education, DOE, the California Energy Commission, and the U.S. EPA presented seminars at the finance workshops on funding retrofit projects to Superintendents, School Boards, and other decision-makers. Financing of these projects is the linchpin in making significant inroads into saving energy and money for the school districts.

3.2.3.2 Plan and Implement Curriculum

First, we point out that, while the ETH staff made considerable efforts to implement this component of the ETH, the two districts involved were unable to agree on an energy conservation/efficiency curriculum.[5] The challenges of curriculum review and adoption are discussed more fully in the Results section of this report. Having said this, we continue the description of this Program component, which remains an important component of the ETH.

The primary objectives of the educational component of the ETH are to create and foster healthier learning environments for K-12 students and to encourage behavioral changes resulting in decreased energy use in schools. These objectives are accomplished by educating primary and secondary school students about energy efficiency and by linking participating districts' energy-

[5] It is known that Rebuild America implemented EnergySmart Schools Program in one high school in WCCUSD using a mostly volunteer staff and 38 students. However, this program was not adopted as a permanent component of the schools curriculum and was, therefore, not addressed in this evaluation.

efficiency retrofits with energy-efficiency learning activities, ensuring that school facilities, themselves, become one of the key learning tools

Educators who adopt the ETH commit to conducting learning activities that focus on saving energy and money in school buildings. Learning activities are designed to train students to identify energy conservation and efficiency opportunities at school and home. Additionally, this educational component will strive to teach various behavioral changes that will 1) help students become wiser energy consumers, 2) improve student attendance and performance in demonstration classrooms, 3) create healthier classrooms, 4) help districts save money by saving energy, and 5) provide the means by which students can apply what they learned in the classroom at home. Resources for student learning activities utilize could use materials already developed by the DOE and other organizations. Examples of learning activities that could be implemented in the curriculum component of the ETH are briefly described below.

1. In-service learning for teachers.
2. In-class learning activities and energy audits.

   Learning activities were designed to train students to identify lighting, HVAC, thermostat settings and behaviors that will help them become wiser energy consumers, improve student attendance and performance, create healthier classrooms, and save money by saving energy. Resources for all student learning activities took advantage of existing resources already such as DOE's *EnergySmart Schools,* the Alliance to Save Energy's *Green Schools,* PG&E's Energenius, and other materials that are free to schools. Materials chosen depend on the possible types of retrofits being implemented in the districts/schools and of interest to the teachers. These materials would be provided without charge and would remain with the schools at the completion of the project.
3. Take home learning activities and energy audits.
4. Web-based educational activities. A web site would allow students to participate in a virtual treasure hunt as they look for energy-saving opportunities - such as turning off unused lights, reducing plug load, and setting thermostats at reasonable levels. Students can then calculate energy savings and environmental benefits in order to qualify for the donated prizes from Philips and other Business Partners. Once they have quantifiable results, teachers will help students prepare a presentation to their School Board.
5. Outreach to the residential sector. By linking classroom activities to home activities, students put efficiency to work at home, thereby expanding the scope and impact of the ETH. The realm of possibilities includes an informational packet that trains students to become efficient energy consumers in the school and home. Students may also be given the chance to conduct audits of their schools by using a hand-held auditing tool.

Educators who adopt the ETH conducted learning activities could focus on saving energy and money in school buildings, and some could culminate in student presentations to school boards or other school decision-makers who have a say in implementing energy upgrades.

If school districts decide to adopt an energy conservation/efficiency curriculum, teacher training workshops will be offered to introduce these educational materials at the start up of the ETH. The workshops will be provided without charge.

3.2.3.3 Plan and Implement Demonstration and First Retrofit Projects

The objectives of the demonstration projects were to showcase new energy efficient technologies, thereby demonstrating their effectiveness in creating a healthy learning environment for students in addition to reducing facility energy usage. Each district participating in the ETH Program implemented a technology demonstration project in at least one room at one school facility. RSD implemented a demonstration classroom in one room while WCCUSD implemented two demonstration classrooms.

Demonstration project planning was a collaborative effort between PG&E, ETH business partners, and district personnel, with manufacturer partners donating the energy efficient equipment to be showcased.

Leveraging the impact of the demonstration projects was accomplished by:

- Developing learning activities based upon the demonstrated technologies,
- Integrating demonstration project into workshops targeting key decision makers of other participating or candidate districts,
- Press coverage, and
- Publishing an article in Energy Decisions Magazine.
- The City of Pinole offered dollar assistance for one classroom to help with labor costs.

As shown in Exhibit 3.2, key individuals involved in this program component include PG&E program staff, ETH business partners, the district lead assigned to this program component, and ETH program consultant(s).

3.2.3.4 Identification of Saving Potential

The identification and realization of saving potential at each participating school requires numerous steps involving multiple actors.

First, at WCCUSD, Energy Solutions helped prioritize facilities for audits following the completion of a CustomNet benchmarking analysis. Evaluating various auditing levels, methods and resources available, and determining how best to apply them to various facilities. At RSD, the Rebuild America representative worked directly with the school district and the CEC to determine which buildings should have a detailed audit.

Once that was completed, very detailed audits were conducted. For the WCCUSD, the audits were conducted by Digital Energy, under contract to the CEC. For the RSD, the audits were conducted by SERVIDYNE, also under contract to the CEC. These audits included the collection and analysis of data using a building energy simulation tool that identifies cost-effective savings potential. Note that this is as far in the process as the districts have gotten at this point in time. Assuming that they choose to move forward with energy saving retrofits, the following paragraph provides the process that will occur.

Although as yet implemented, once the cost-effective savings potentials are identified, the plan is to provide a broad range of support to each school, including:

1. Assisting with selecting engineering consultants with the appropriate skills including developing RFP language, identifying prospective bidders, and evaluating proposals.
2. Assisting with setting appropriate scope and budget with consultants.
3. Managing audits/survey process and reviewing results/recommendations.
4. Determining how best to bundle projects for phased implementation.
5. Evaluating the project delivery and procurement options for implementing energy efficiency projects in light of project objectives and constraints such as design-spec-bid-construct, design-build, measure specific performance specs, unit pricing, and Performance Contracting.
6. Identifying appropriate incentive programs and helping them with the applications.
7. Identifying and organizing financing, and assisting with project presentations.

Given that each customers needs are unique, depending on where they are in the process, and the in-house expertise and staff resources available, these services will be provided on a time and materials basis.

3.2.3.5 Measurement of Achieved Savings

Assuming that the WCCUSD and the RSD implement the recommended retrofits, Digital Energy and SERVIDYNE would monitor the installation of the equipment and verify that the correct equipment was installed and installed correctly. Finally, using an energy simulation model, they would estimate the kWh savings and the kW reductions resulting from the installations of energy efficient measures.

4. METHODS

This section provides an overview of the methods used in evaluating the EP and the ETH. It begins with the methods for characterizing the schools market segment, followed by separate methods sections for the EP and the ETH.

4.1 Market Characterization

Again, we note that the market characterization was submitted as a separate document on March 20, 2001. It is included in its entirety as Appendix D. The market characterization involved a review of the literature and existing data that addressed the following issues:

- Number of schools in the PG&E service territory
- Sources of school funding
- School management practices and the emergence of site-based management
- How decisions are made regarding capital investments
- Who is involved in making these decisions
- The purchasing process in schools and it varies by school
- Who has ultimate decision-making authority regarding capital investments
- The criteria for making capital investments
- The barriers to investing in energy efficient equipment
- Descriptions of the participating districts, schools and their demographic characteristics
- The existing efficiency programs for schools and in which ones they have participated

There were two existing general sources of data that were used to characterize the schools market segment:

1. data provided by the California Department of Education (CDE), and
2. literature regarding the implementation of energy efficiency programs in schools.

The goal was to provide a comprehensive and internally consistent picture of the schools market segment that could provide the context within which this evaluation will be conducted.

4.2 Methodology: The Energenius Program

This section covers, for the EP, the data collection plan, sample design, and analysis approach.

4.2.1 Data Collection

Existing data, contained in the EP Database, was used to describe patterns of participation, dates of participation, the number of participating schools within each district, the number of classes within each school, and the number of students within each class.

Additional data was collected from both students and teachers who used EP curriculum materials. Each data collection effort is described below.

4.2.1.1 Student Pre-Tests and Post-Tests

Pre-tests and post-tests were administered to students who experienced the EP curriculum in the spring and fall semesters of 2001. These pre-tests and post-tests covered the basic material linked to the learning objectives for each EP component. An adequate number of pre-test and post-tests were included in Energenius materials sent to each teacher who used the Energenius curriculum in the spring semester 2001. Instructions were included for their completion and returned to PG&E. Teachers were asked to administer the pre-test prior to teaching the EP component and administer the post-test immediately after teaching the EP component. The pre- and post tests are included in Appendix B.

However, in reviewing the program materials, it was discovered that pre-tests and post-tests were provided in the Teacher's Kits for only Primary Energenius Program (grades 1-3) and the Intermediate Energenius Program (grades 4-5). Pre-tests and post-tests did not exist for the Bill Buster (grades 6-8), the Intermediate Safety Program (grades 4-5), and the Primary Safety Program (grades 1-3). Pre-tests and post-tests were prepared by PG&E for Bill Buster and the two Safety Programs by late March 2001. Teachers requesting EP materials after this date had pre-tests and post-tests included in their EP package.

4.2.1.2 Teacher Surveys

Teachers who use the Energenius materials were also surveyed. They were asked to report the following information:

- Program elements and materials used
- Rating the Program on 1) holding students' attention, 2) ease of incorporating in curriculum, 3) helpfulness of Teacher's Kit, and 4) overall quality of Program materials
- Overall rating of the Program
- Assessment of student learning
- Number of class hours allocated to the Program
- Number of students in class
- Grades taught
- Likelihood of participating again
- Likelihood of recommending the Program to a fellow teacher

This instrument is contained in Appendix B (Energenius Educational Survey).

4.2.1.3 In-Depth Interviews with Teachers

In-depth interviews were also completed with a sample of all teachers who used the Energenius materials during the spring semester. They were asked to report the following information:

- ideas for improving the EP,
- ideas for promoting the EP, and
- any problems with the EP.

The survey used for these in-depth interviews is also included in Appendix B.

4.2.1.4 Data Collection Summary

Exhibit 4.1 presents the summary of the basic evaluation questions and the planned sources of data.

Exhibit 4.1 Evaluation Question, by Source of Data for the EP

Evaluation Question	Program Database	Lit. Review	Teacher Surveys	Students Pre-Tests and Post-Tests	In-Depth Teacher Interview
How many teachers and students is the EP reaching?	X				
Which students is the EP reaching?	X				
What other energy efficiency programs are available to California schools?		X			
How well are students performing on expected outcomes?			X	X	X
What can be done to improve the EP?		X	X		X
What are the various methods by which kWh savings are measured for school energy programs?		X			

4.2.2 Sample Design

The sample design describes the size of the sample for each data collection effort.

4.2.2.1 Student Pre-Tests and Post-Tests

We expected that the teachers requesting Program materials after December 2000, would very likely implement the Program in the spring semester of 2001 and the fall semester of 2001 and would have enough time to use the materials and administer the pre-tests and post-tests. We received test results from 713 students, only 636 of whom had both a pre-test and a matching post-test and were, therefore, used in the analysis. To have both a pre-test and a post-test was critical since a paired t test was used to determine that the mean score for a post-test was significantly different from the mean score for a pre-test. The number of students for each EP component who had both a pre-test and a post-test are presented in Exhibit 4.2.

Exhibit 4.2 Completed Pre-Tests and Post-Tests, by Program Component

Program Component	Students Using Materials	Percent
Primary Energenius Program (Habits) (grades 1-3)	131	21
Intermediate Energenius Program (Measures) (grades 4-5)	229	36
Bill Buster Program (grades 6-8)	257	40
Primary & Intermediate Safety Programs	19	3
Total	**636**	**100**

The sample size for the returned pre-tests and post-tests for the Primary and Intermediate Safety Programs were insufficient for analysis.

4.2.2.2 Teacher Surveys

All teachers who used the EP materials were surveyed. A total of 507 Energenius surveys had been sent out to teachers who used the Energenius materials during the spring and fall of 2001. A total of 106 responses were received, resulting in a response rate of 21 percent.

4.2.2.3 In-Depth Interviews with Teachers

In-depth interviews by the Evaluation Team were completed with a random sample of 11 teachers who used the EP materials during the spring 2001 semester. Of these 11 completed interviews, 7 were with primary school teachers, 2 with middle school teachers, and 2 with high school teachers.

4.2.3 Analysis Approach

The evaluation of the EP involved both a process and impact evaluation. Each is described below.

4.2.3.1 Process Evaluation

All data contained in the EP database were reviewed as well as completed surveys of in-depth interviews with teachers. This information was used to identify any program design and implementation problems. Once any problems were identified, necessary changes in the design and implementation of the EP could be made.

4.2.3.2 Impact Evaluation

The evaluation of the impact of the program on the participants was conducted through an analysis of teacher surveys, in-depth interviews with teachers, and pre- and post-tests provided by students. Analysis of completed teacher surveys revealed their perceptions of the effectiveness of the EP and whether there were any differences in teacher responses by EP component. A qualitative analysis of completed in-depth interviews with teachers was

conducted. Lastly, paired t tests were used to determine whether the student post-test means were significantly different from the pre-test means.

4.3 Methodology: Energy Treasure Hunt Program

This section covers, for the ETH, the data collection plan, sample design, and analysis approach.

4.3.1 Data Collection

Existing data, contained in the ETH Database, were used to describe patterns of participation, dates of participation, and the number of participating schools within each district.

Additional data were collected from those who attend any of the three workshops. This included data collected from a variety of school personnel such as principals, teachers, finance officers, facility managers, and custodians. In addition, results of the detailed energy audits were collected. Finally, information was collected from the PG&E Program staff, key decisionmakers at each school, and various energy partners. Each is described below.

4.3.1.1 Workshop Evaluations

Workshop participants were asked to complete an evaluation form at the end of each of the three workshops designed for teachers, facility managers, and administrators. The evaluation forms for the Financial, Facility Manager, and Custodian workshops are presented in Appendix A. These workshop evaluations focused on whether the materials were clearly presented and targeted to their needs as well as whether the length of the workshop was adequate. They were also asked for ideas about how to improve these workshops.

The instruments used to evaluate these workshops were developed by those who are responsible for designing and implementing the training workshops. The Evaluation Team reviewed these instruments and recommend modifications before they were administered. The administration and data entry for these surveys instruments were managed by PG&E.

4.3.1.2 Follow-Up Workshop Surveys

Approximately twelve weeks after the workshops, a follow-up survey was conducted with all those who attended the financial workshop. The focus of this survey was whether and how they were able to use any of the information gained through the workshop. This experience of trying to use the information should have put them in an even better position to evaluate the workshops. In the follow-up survey, they were again asked for their ideas about how to improve these workshops. The Evaluation Team prepared the follow-up survey that was sent by PG&E to the workshop participants. Data from the completed surveys were entered into Excel spreadsheets by PG&E and provided to the Evaluation Team for analysis.

4.3.1.3 Demonstration Classroom Data

Information on the design and implementation of the demonstration classrooms was obtained from PG&E and incorporated into the final report. No additional analysis of this information was done.

4.3.1.4 Identification and Realization of Savings Potential

The Evaluation Team prepared a summary of the reports, prepared by Digital Energy SERVIDYNE, that describe all the activities at each school, including the results of the initial audit and recommendations.

4.3.1.5 In-Depth Interviews with Program Staff/Key Decisionmakers

In-depth interviews were conducted by the Evaluation Team with PG&E Program staff, key decisionmakers at each school in the WCCUSD and the RSD, and various energy partners. They were asked to comment on the ETH, its successes and failures. Program staff were asked a number of questions concerning the logic or theory of the program (the various activities and outcomes and their interrelationships), the development of data collection instruments, and the collection of data. Key decisionmakers at schools and various energy partners were asked a number of questions such as whether they had implemented any of the recommended measures and, if not, whether they planned to implement any of the recommended measures in the next 12 months. Finally, they will be asked to provide any ideas on how to improve the ETH.

4.3.1.6 Student Pre- and Post-Surveys

Since no curriculum was formally adopted, no pre-test and post-test data were collected.

4.3.1.7 Data Collection Summary

Exhibit 4.3 presents the summary of the basic evaluation questions and the sources of data.

Exhibit 4.3. Evaluation Question, by Source of Data for the ETH

Evaluation Question	Literature Review	Workshop Surveys	Follow-Up Workshop Surveys	In-Depth Interviews	Energy Simulation Models
What is the program theory?				X	
What is the feasibility of collecting various data?				X	
What other energy efficiency programs are available to California schools?	X				
How are decisions in the schools segment made regarding efficient equipment?	X				
How effective are the workshops?		X	X		
What are the *expected* kWh savings and kW demand reductions at the school site resulting from the ETH?					X
How can the ETH be improved?		X	X	X	

4.3.2 Sample Design

The sample design described the size of the sample for each data collection effort.

4.3.2.1 Workshop Evaluations

All (i.e., a census) workshop participants were asked to complete an evaluation form at the completion of each of the following three workshops designed for teachers, facility managers,

custodians, and finance officers. The number of responses, by workshop, is provided in Exhibit 4.4.

Exhibit 4.4. Survey Responses, by Workshop

Workshop	Responses
Financial Workshop	18
Facility Manager Workshop	13
Custodian Workshop	55

4.3.2.2 Follow-Up Workshop Surveys

Approximately twelve weeks after the workshops, a follow-up survey was administered to all (i.e., a census) those who attended the financial workshop. Due to timing issues, no follow-up surveys were administered to those who attended the workshops conducted for facility managers and custodians. Of those who attended, 16 responded to the follow-up survey.

4.3.2.3 Demonstration Classroom Data

Information on the two demonstration classrooms implemented in the WCCUSD and the RSD was reviewed and integrated into this report.

4.3.2.4 In-Depth Interviews with Program Staff/Key Decisionmakers

Eight in-depth interviews were conducted with PG&E Program staff, key decisionmakers at each school in the WCCUSD and the RSD, and various energy partners.

4.3.3 Analysis Approach

This evaluation addressed both process and impact. The analysis approach for each is presented below.

4.3.3.1 Process Evaluation

All data contained in the ETH database were reviewed. In addition, we analyzed the completed workshop surveys and in-depth interviews with ETH staff, financial officers, facility managers, and custodians to identify any program design and implementation problems. Once any problems were identified, necessary changes in the design and implementation of the ETH could be made.

4.3.3.2 Impact Evaluation

Because the ETH is a pilot program, the evaluation of the impact of the ETH on the participants was limited to an analysis of in-depth interviews with ETH staff, financial officers, facility managers, and custodians, follow-up surveys with workshop participants, and the results of audits conducted at participating schools that provided estimates of *potential* energy savings and demand reductions.

5. RESULTS

5.1 Baseline Market Characterization for the Schools Sector

The baseline market characterization, *Final Market Characterization of the Schools Market Segment,* was reported to PG&E in March 2001 as a stand-alone document. This document is available in Appendix D. We present here a high-level summary of this report in order to provide a context for this evaluation.

There are a variety of conclusions that can be made regarding the schools market segment.

- There is a drastic need for additional classrooms owing to increased enrollments and reduced class sizes. Failure to take advantage of energy efficient options when new facilities are built/added would represent a significant missed opportunity.
- Because of reduced school funding over the last 20 years, there is a drastic need for major repairs and renovation of existing buildings. This is the case despite the passage of Proposition 1A. Failure to take advantage of energy efficient options when renovations are made represents a significant missed opportunity.
- The market barriers facing schools include information-search costs, performance uncertainty, organizational practices, and high first costs. Organizational practices and high first cost may be the greatest barriers.

5.2 Energenius Program

5.2.1 Participating Students

During the spring and fall semester in 2001, 1,364 teacher kits to 333 teachers at 325 schools and 22,088 student kits were shipped. Exhibit 5.1 and Exhibit 5.2 provide a breakdown of teacher and student kits shipped by EP component.

Exhibit 5.1. Teacher Kits Shipped, by EP Component

Teacher Kits	Number of Teacher Kits	Percent
Bill Buster Units	275	20
Primary (Habits) Units	430	32
Intermediary (Measures) Units	246	18
Primary Safety Units	262	19
Intermediate Safety Units	151	11
Total	1,364	100

Exhibit 5.2. Student Kits Shipped, by EP Component

Student Kits	Number of Student Kits	Percent
Bill Buster Units	5,063	23
Primary (Habits) Units	7,323	33
Intermediary (Measures) Units	4,359	20
Primary Safety Units	3,944	18
Intermediate Safety Units	1,400	6
Total	22,088	100

5.2.2 Pre-test and Post-test Results

Tests were returned by 713 students. Exhibit 5.3 presents the breakdown by EP component.

Exhibit 5.3. Returned Tests, by EP Component

Component	Frequency	Percent
Bill Buster	258	36
Intermediate Energenius	274	38
Primary Energenius	162	23
Safety Components	19	3
Total	**713**	**100**

However, only 613 completed both the pre-test and the post-test and were therefore useable in the analysis.

For each EP component, t tests were calculated to determine whether the mean post-test score was significantly different from the means pre-test score. Exhibit 5.4 presents the results.

Exhibit 5.4. Mean Pre-test and Post-test Scores

Component	Pre Mean Score	Post Mean Score
Bill Buster	53%	67%
Primary Energenius	79%	91%
Intermediate Energenius	42%	69%

All of the differences in the mean pre-tests and post-tests are statistically significant indicating that some learning did take place[6]. However, while the gains are statistically significant, EP staff will have to judge whether these gains are of *practical* significance, i.e., whether these gains are *educationally* significant.

Energenius In-Depths

We conducted 11 in-depth interviews with teachers, who used the Energenius materials. Some used more than one EP component while others used only one. Exhibit 5.5 presents the number of components used by these 11 teachers.

Exhibit 5.5. Energenius Components Used, by Grade Level

	Grade Levels			
Component	**1 to 3**	**4 to 5**	**6 to 8**	**Total**
Primary Energenius	7			7
Primary Safety	8			8
Intermediate Energenius		2		2
Intermediate Safety				0
Bill Buster			1	1
Total	15	2	1	18

These teachers devoted a fairly large number of classroom hours to the Energenius Program. They devoted an average of 5.4 hours for each component. This translates roughly into 5 one-hour class sessions.

A variety of indicators support the conclusion that the students responded well to the program. First, all 11 teachers said that the students responded very positively to the Program. For example, teachers said such things as my "students loved it" and that my students "really enjoyed it." Next, teachers were asked to rate the Program in terms of how effective it was in making students aware of energy saving behaviors and/or safety rules around energy. They were asked to rate the Program on a five-point scale, with a "1" meaning "Not At All Effective" and a "5" indicating "Very Effective". The teachers rated the Program very highly, with an average rating across all 11 teachers of 4.6. Finally, 9 of the teachers (82 percent) indicated that their students used some of the Energenius materials at home. This is important since it suggests that the students are incorporating into their home the lessons learned at school.

Teachers also felt that the materials were effective. When asked which materials they found most effective, stickers and the monthly calendar were mentioned most frequently. Other materials that were mentioned more than once were the materials that students could take home, the video, the poster puzzle, and the workbook. Only one teacher mentioned any

[6] Note that since there were no comparison groups, these differences should be considered *gross* impacts rather than *net* impacts.

deficiency, indicating that there should be more materials put into each packet. Of course, wanting more is itself an endorsement of the Program. We also asked teachers to rate the Program in terms of its overall effectiveness. Again, a five-point scale was used, with a "1" meaning "Not At All Effective" and a "5" meaning "Very Effective." Teachers again gave the Program a very high rating of 4.6.

Another indication of the Program's effectiveness was that 10 of the 11 teachers had no recommendations to improve the Program. One teacher did suggest that there should be a *parent* version of the home survey, which is worth thinking about if one wants to collect the quantity and quality of information required by one of PG&E residential audits. Such an audit can provide more sophisticated information to the parents regarding how to reduce their energy use.

Next, we asked teachers whether they would recommend the Program to other teachers, either within or outside of their district. All but one teacher indicated that they would recommend the Program. All but one of the teachers stated that they had *already made* such a recommendation to other teachers.

Finally, we asked the teachers for any suggestions for promoting the Energenius educational materials to more teachers in the state. Several good suggestions were made. One was to use the newsletter of the California Teachers Association as a way to publicize the Program. This newsletter is read by a very large fraction of California teachers. Another suggestion was to involve PG&E program staff at each district to "hold the teachers' hands" as they are introduced to the Program. Working more closely with districts is necessary if more districts are to successfully integrate the materials into their curriculum. This, of course, would very likely require additional funds.

5.2.3 Teacher Survey

The survey results with 106 teachers who used the EP materials during the fall and spring of 2001 are summarized below. The detailed report, *2001 Energenius Educational Survey Results through: October 31, 2001,* is provided in Appendix C.

We begin by reporting information on how respondents learned about the program, which EP classroom materials they used, and the number of classroom hours they devoted to the EP. The largest proportion (26 percent) of respondents learned about the EP through PG&E's website while another 23 percent learned about the EP through PG&E's Energenius catalog. With respect to the most frequently used classroom materials, the Video was used by 73 percent and posters by 67 percent. Finally, 35 percent of respondents assigned 8 or more classroom hours to the EP.

Teachers were also asked to rate the EP materials on a 5-point scale (5=Excellent; 4=Very Good; 3=Good; 2=Fair; 1=Poor) with respect to holding the students' attention, ease of incorporating into the curriculum, helpfulness of the teacher's kit, and overall quality of the Program materials. Exhibit 5.6 presents the mean scores for each of these four EP attributes.

Exhibit 5.6. Mean Ratings for EP Attributes

Attribute	Mean Score
Holding the Students' Attention	4.10
Ease of Incorporating into the Curriculum	4.06
Helpfulness of the Teacher's Kit	4.23
Overall Quality of the Program Materials	4.35

Teachers were also asked the extent to which they agreed or disagreed with four statement regarding students' attitudes, knowledge, and behavior with respect to energy efficiency and conservation. They were asked to use a four point scale to record their responses (1=Strongly Disagree; 2= Disagree; 3=Agree; 4=Strongly Agree). Exhibit 5.7 presents the mean ratings for each statement.

Exhibit 5.7. Mean Agreement Ratings for Statements Regarding Changes in Student Attitudes, Knowledge, and Behavior Regarding Energy Efficiency, Energy Conservation, and Safety

Statement	Mean Rating
My students exhibit more positive attitudes about saving energy.	3.41
My students know more about how to use energy more wisely.	3.56
My students can identify ways to reduce energy consumption in their homes.	3.51
My students have learned how to be safer around electricity and natural gas.	3.46

Teachers felt very strongly that the EP affected their students' attitudes, knowledge, and behavior.

Finally, we asked the teachers several questions designed to measure how they rated the EP overall. The Energenius program, with a mean score of 3.85 on a four-point scale, was well received. The vast majority (90 percent) of respondents rated the EP as "Excellent" or "Very Good". Almost three-quarters (73 percent) of respondents indicated they are "Very Likely" to teach another PG&E-sponsored energy efficiency program. Finally, over three-quarters (76 percent) of respondents indicated they are "Very Likely" to recommend the EP to other teachers.

5.3 ETH

5.3.1 Participating School Districts in ETH

In the 2000-2001 school year, two school districts participated in the ETH, the West Contra Costa Unified School District (WCCUSD) and the Ravenswood School District (RSD). The participating schools in the WCCUSD and the RSD are presented in Exhibit 5.8.

Exhibit 5.8. Schools Participating within the West Contra Costa Unified School District and the Ravenswood School District

WCCUSD	RSD
Richmond High School	Costano Elementary School
Pinole Valley High School	Menlo Oaks Middle School
Downer Elementary School	Willow Oaks Elementary School
Madera Elementary School	Flood Elementary School

5.3.2 Workshop Evaluations

In this section, we report the results of the evaluations of each of the three workshops.

5.3.2.1 Financial Workshop

At the conclusion of the financial workshop, participants were asked to complete a questionnaire (See Appendix A). In this questionnaire, they were first asked the extent to which they agreed or disagreed (1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strongly Agree) that the topics addressed at the workshop were clearly presented and informative. Exhibit 5.9 presents the mean rating for each of the topic presented.

Exhibit 5.9. Mean Agreement Score for Topics Presented

Topic	Mean Rating
ENERGY STAR® products and services	3.1
The legal basis for energy financing	3.0
Capital versus operating budget	2.9
Energy efficiency financing vehicles	2.9
Potential sources of funding	3.1
Quantifying costs of delay	3.0
Decision making and process hurdles	2.7
Developing an energy investment plan	2.7

Participants were then presented with a number of statements and asked the extent to which they agreed or disagree with each (using the same four-point scale as above). Exhibit 5.10 presents these results.

Exhibit 5.10. Mean Agreement Score for Statements Concerning the Workshop

Statements	Mean Rating
The group working sessions provided a good opportunity to learn how to apply information from the presentation to real-life situations.	2.8
The online presentation was beneficial in preparing for the workshop.	2.8
The group working session logistics (e.g., facility, registration, meals, and materials) were well arranged and organized.	3.3
Overall, the group working session was a success.	3.0

From this exhibit, one can see that the workshop participants tended to agree the workshop was well organized, focused on real-life situations, and effective.

5.3.2.2 Facility Manager Workshop

At the conclusion of the facility manager workshop participants were asked to complete a questionnaire (See Appendix A). In this questionnaire, they were first asked to rate on a four-point scale (1=Low and 4=High) the quality of the information provided on the technologies visited in the "Fieldtrip to Energy Savings." Exhibit 5.11 presents the mean rating for each of the technologies.

Exhibit 5.11. Mean Agreement Score for Technologies Visited

Topic	Mean Rating
Lighting Equipment	3.5
Lighting Control Systems	3.5
HVAC Equipment and Controls	2.8
Day-lighting	1.7
Windows	3.5
Roofs	3.3
Waterless Urinals	3.9

With the exception of day-lighting, workshop participants tended to agree or strongly that the "Fieldtrip to Energy Savings" was effective.

Participants were then presented with a number of statements and asked the extent to which they agreed or disagreed (1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strongly Agree) with each. Exhibit 5.12 presents these results.

Exhibit 5.12. Mean Agreement Score for Statements Concerning the Workshop

Statements	Mean Rating
The "Fieldtrip" provided a good opportunity to learn how to improve the energy efficiency of facilities in my school district.	3.6
I will recommend new, energy efficient design, renovation or retrofit projects to my district.	3.7
I will recommend changing maintenance materials and practices to include energy efficiency considerations.	3.8
The group working session logistics (e.g., facility, registration, meals, and materials) were well arranged and organized.	3.6
Overall, the meeting was well planned and informative.	3.8

Again, workshop participants tended to agree the workshop was well organized, focused on real-life situations, and effective.

5.3.2.3 Custodian Workshop

At the conclusion of the custodian workshop participants were asked to complete a questionnaire (See Appendix A). In this questionnaire, they were first asked to rate on a five-point scale (1=Low Quality; 3=Average Quality; 5=High Quality) the quality of the information provided for each of the topics covered in the workshop. Exhibit 5.13 presents the mean rating for each of the following topics.

Exhibit 5.13. Mean Agreement Score for Topics Covered

Topic	Mean Rating
Background information on energy use in schools	3.7
What do you think?	3.4
Systems and equipment in schools	3.2
Area-by-area search for energy use in schools	3.5
Cleaning operations	3.5
What energy misuse costs	3.9
What energy savings cam mean to you	3.9
What can you do	3.9

Workshop participants tended to strongly agree that the quality of information presented at the workshop was high quality.

Participants were then presented with a number of statements and asked the extent to which they agreed or disagreed (1=Strongly Disagree; 3=Somewhat Agree; 5=Strongly Agree) with each. Exhibit 5.14 presents these results.

Exhibit 5.14. Mean Agreement Score for Statements Concerning the Workshop

Statements	Mean Rating
The information provided during the workshop will assist me in reducing energy use in my school	3.7
The information provided gives me a better understanding of how energy can be misused in a school	4.1
As a result of this workshop, I plan to be an example to students, staff, and administration to reduce energy consumption in my school.	4.2
I recommend that other districts in the Bay Area have similar training for their custodial staff	4.1
Overall, the meeting was well planned and informative.	4.1

Workshop participants tended to agree that the information presented was useful and informative. They also tended to agree that they will model energy saving behaviors to students, staff and administration. Finally, they tended to agree that other districts in the Bay Area should have similar training for their custodial staff.

5.3.3 Follow-Up Survey of Participants in Financial Workshop

Approximately twelve weeks after the financial workshop, a follow-up survey of participants was conducted to determine which tools and information they have used or plan to use in the next 12 months. Exhibit 5.15 presents these results.

These results are quite positive. On average, over 32 percent claim to have actually used the information or engaged in certain behaviors that were presented and encouraged in the Financial Workshop. An average of 23 percent state that they plan to do so while an average of 29 percent does not plan to do anything.

Exhibit 5.15. Follow-Up Survey Results for Financial Workshop Participants

Energy Efficiency/Conservation Behavior	Percent Yes	Percent No, But Plan To In The Next 12 Months	Percent No and *Do Not* Plan To In The Next 12 Months	Percent Don't Know
Signed up for ENERGY STAR® products and services?	31	31	13	25
Sought the services offered by energy services providers (ESCOs)?	25	25	25	25
Entered into a lease/purchase agreement for energy efficient equipment?	13	31	38	18
Participated in the Standard Performance Contracting Program?	38	12	25	25
Participated in PG&E Express Efficiency Program?	25	25	25	25
Accessed the ENERGY STAR® website (www.energystar.com) to explore performance rating systems?	69	19		13
Begun an effort to institute a performance rating system that measures and rates energy consumption?	50	31	13	6
Instituted a performance rating systems that measures and rates energy consumption?	38	31	19	12
Used the Portfolio Manager (performance rating system) on the Environmental Protection Agency Website (www.epa.gov/buildings/label)?	31	38	32	0
Sought to achieve the ENERGY STAR® label for school buildings?	19	19	31	31
Used the ENERGY STAR® Institutional Purchasing Tool Kit?	6	50	31	12
Encouraged the purchase of energy efficient products?	94	0	6	0
Modified equipment specifications and purchasing guidelines to insure the purchase of energy efficient equipment?	75	12	6	6
Used the project evaluation methods (first cost, simple payback, project payback, net present value, internal rate of return, return-on-investment, lifecycle cost analysis, simple cash flow)	38	38	6	19
Financed energy efficiency project using Qualified One Academy Bonds (QABs)?	0	6	75	19
Financed energy efficiency project using Qualified Zone Academy Bonds (QZABs)?	0	6	69	25
Financed energy efficiency project using Urgent School Renovation Grants?	0	19	56	25
Financed an energy efficiency project(s) using California Energy Efficiency Financing Programs?	6	19	44	31
Accessed the product listings at the ENERGY STAR® website (www.energystar.gov)	56	25	13	6

5.3.4 Demonstration Classrooms

Three demonstration classrooms were prepared, two within the WCCUSD and one within the RSD. Below we provide the basic components of each installation. However, no additional analyses of these classrooms was done.

5.3.4.1 WCCCSD Demonstration Classroom

The following details the equipment installed at the demo classrooms in West Contra Costa County School District**.**

- Lennox Industries: Split Heating and A/C systems, economizers, registers and controls for classrooms #1, 17, and 19
- Novar Controls (a business partner with Lennox- control systems work together): External controls and rooms sensors ("smart control system") for Lennox HVAC systems.
  Dolan Lumber: R30 insulation for ceilings in classrooms #: 1, 17, and 19
- Cutler Hammer: To donate Smart Breakers (& Smart Break Panel) for rooms 1, 17 and 19
- Traco Windows: installed double pane windows with internal blinds in room #1
  The Watt Stopper: To donate occupancy sensors room #1
- Novitas to donate occupancy sensors for rooms #17, and 19
- Wellmade Lighting Industries: donated lighting fixtures in rooms#1
  Metal Optics donated lighting fixtures in rooms 17 & 19
- Advanced Transformer (owned by Philips): donated ballasts to Wellmade Industries and Metal Optics for fixture installation - Philips sent info on their T-8 lamps to Wellmade and Metal Optics

5.3.4.2 RSD Demonstration Classroom

In the demonstration classroom at RSD, the following technologies were installed:

- Controls
- Fixtures
- Lamps/ballasts
- Windows
- Daylighting

5.3.5 ETH In-Depths

Seven in-depth interviews were conducted with program staff and those who provided them with consulting assistance, energy partners, and school personnel. The respondents were fairly experienced with the ETH, with the average length of involvement being slightly more than one year. The results will be grouped by these three categories of stakeholders.

5.3.5.1 School Personnel

School personnel interviewed have been involved in a number of activities that included reviewing the program to determine the interest of their school district, benchmarking, identifying saving potential, determining the best place in which to place the demonstration

classrooms, training facilities managers and custodians, performing energy audits, and facilitating meetings.

We asked them whether their school(s) had implemented any of the recommended energy conservation behaviors or energy efficiency measures as a result of participating in the ETH. Two of the three respondents said that they had, but were not specific about the measures. They were also asked whether their school(s) planned to implement, within the next 12 months, any energy conservation or energy efficiency measures as a result of participating in the ETH. All three indicated that they were. One indicated that they planned in install HVAC and lighting controls as well as daylighting, and windows. He pointed out that the district has just passed a 1.5 million dollar bond, some of which he expected to use for some of the recommended retrofits. He indicated that the design phase should start in two months with construction to begin later this year. The third indicated that he didn't know at this time, but stated that his district was definitely going to implement some measures.

We also asked whether their school district benefited in any other ways. One said that it made them aware that there are things that they could do to conserve energy. Another responded that their participation gave their school the ability to do peer reviews and become part of a large body of knowledge. It also exposed them to other organization such as DOE programs, EPA, CEC, and utility programs. In short, it has expanded the universe of people to talk to and validate what they were doing.

On a scale of 1 to 10, with a "1" meaning "Very Dissatisfied" and a "10" meaning "Very Satisfied", we asked them how satisfied overall they were with the ETH Program. All three indicated that they were very satisfied, with the average being 9.2. All three indicated that they would recommend the ETH to administrators in other school districts.

Finally, we asked them what they liked the most about their participation in the ETH and what they liked the least. As positive features, two of the three mentioned the hard work, dedication, and professionalism of the people involved in the ETH. Another mentioned the demonstration classrooms, and how exciting it was to see them go into place. Another mentioned that the ETH brings energy and environmental issues down to the students who need to take it home and bring it into their communities. He went on to point out that if the students can integrate that body of energy conservation for the 13 years they are in school (user side, supply side, environmental side), they have the chance to create a more responsible adult.

In terms of what they liked least, two respondents mentioned that it took a lot of time to make things happen and they were frustrated that they couldn't do more. However, they added that this should not be interpreted as a negative comment, since they understood that to educate schools and change their behavior involves a very long and complex process with a limited budget.

In terms of what should be done to improve the ETH, one felt that communications could be improved. With so many stakeholders, coordination becomes difficult and important information did not always reach its intended audiences. They felt that it would help to have a single person who could serve as the source of all program information. Another mentioned that the agenda was not always clear. This again could be due to the fact that this was the first year of a very complex pilot program that changed frequently in response to identified

barriers and the needs of participants. Another felt that PG&E should focus on schools that are ready to take on the shared responsibility and are prepared to quickly implement the Program.

In summary, school personnel appear to have had a very positive experience with the ETH. Some claim that they had already installed or plan to install some of the recommended measures. This suggests that it may be worthwhile to conduct a verification audit of each site during the spring 2002 to measure any savings. Lastly, because this is a very complex Program, involving numerous stakeholders representing large bureaucracies, there appears to be some ambiguities regarding the role and responsibilities. This should be addressed in the next program cycle.

5.3.5.2 Energy Partners/Implementers

Recall that two of the three of the respondents were an integral part of the program, one was actively involved in assisting with the planning and implementation of the ETH and one was an energy partner representing a national lighting corporation. Their answers to the questions should be viewed in light of their roles in the program.

Some of the energy partners provided direct support to the PG&E staff by helping with the program design and implementation. This included serving served as a key point of contact with the school districts, helping make contacts for benchmarking, setting up meetings for initial audits. That is, they served as a funnel that takes available energy education resources and makes sure that the information reaches the school districts. One of the respondents co-developed the ETH.

We asked them whether they had assisted schools in implementing any energy conservation or energy efficiency measures as a result of participating in the ETH. They pointed out that their corporate interest is the same as PG&E's – to bring together various resources to help schools. One served as a key coordinator for the demonstration classrooms. One worked on the workshops and helped to identify potential upgrades.

They were also asked whether they planned, within the next 12 months, to assist schools in implementing any energy conservation or energy efficiency measures. Three of the respondents indicated that they plan to continue to be involved with the ETH and, as a result, will provide assistance to schools. One indicated that they will continue to be involved in the program and play a supporting role.

We also asked whether their company had benefited in any way by participating in the ETH. One indicated that they had no direct benefits but the public-relations value. Helping to resolve the capacity problems in California is good for now. Two also indicated that every time a community succeeds they succeed. They consider ETH to be a huge success and one will feature it in an article coming out in their next newsletter. The ETH has effectively involved their organization resulting in greater sales of their product and increased profits.

On a scale of 1 to 10, with a "1" meaning "Very Dissatisfied" and a "10" meaning "Very Satisfied", we asked them how satisfied overall they were with the ETH Program. All three indicated that they were very satisfied, with the average being 8.5. All indicated that they would recommend the ETH to other organizations similar to theirs.

Finally, we asked them what they liked the most about their participation in the ETH and what they liked the least. One person indicated that they liked the number of resources that they were able to bring to the school district. Another mentioned that they found a strong partnership that was a good broad partnership with a strong local leadership and representative in PG&E.

In terms of what did not work, two mentioned the problem of not having more clearly defined roles for all stakeholders involved in the design and implementation of the ETH. Better communication and coordination would have helped. However, they realize that this is what a pilot is for. They think ETH is a great approach in that it tries to approach energy efficiency from two different angles – retrofit and education. However, the education is not working out as intended.

The one energy partner who co-developed the ETH concept enjoyed seeing his ideas come to fruition and hopes it works. He also considers the energy partners to be good corporate citizens and hopes that they get some public-relations value for their involvement. While he found that the bureaucracy was an obstacle to getting things done, he recognized that this is similar to any business dealings.

They also need to work on role clarification. Early on, each person needs to be very clear on what everyone wants out of the program. Given that, as far as he knows, this is the first time that PG&E has partnered with DOE, it is critical to clearly define roles. Finally, one respondent indicated that they hoped the program would be adopted by the CEC or the governor's office. Another suggested that it could possibly be incorporated into the California High Performance School Program (CHPS[7]). What is need is a combination of government and industry to provide good work for the community schools. They need to look at teaching schools now about energy use so they have good habits as adults.

Finally, referring to the difficulty experienced by ETH staff in getting the districts to adopt an energy education curriculum, one suggested that ETH staff re-examine how learning activities are provided to the school districts. They suggested that Green Schools[8] could serve as a model for part of it.

In summary, energy partners also felt that their involvement was positive. They agree that their involvement benefited the schools, provided some public-relations value to their respective organizations, and saw some opportunities for synergy between the ETH and other energy efficiency/conservation programs in California. At least one felt that their involvement had generated greater sales of their product. They also plan to continue to be

[7] See page 4-5 of the *Final Market Characterization of the Schools Market Segment* for a description of the CHPS.

[8] Green Schools, very similar to the ETH, is a comprehensive and long-term approach to school efficiency, bringing together the facilities, instructional and administrative staff in a cooperative effort to improve education, using energy as a tool. Energy savings are achieved from behavior and operations as well as encouraging retrofits. Students are integrally involved in the efficiency activities, from energy patrols to in-depth school audits. Classroom activities include instruction, energy saving activities, and involvement of others from the school and broader community. The GSP instructional materials are correlated to the California Department of Education standards, making them easier for teachers to use to strengthen student academic learning. Students learn about ways they can help the environment, a compelling issue for many young people, and will involve their families in their energy lessons.

involved with the ETH. Another suggested that the Green Schools Program could serve as a model for how to get an energy education curriculum into classrooms. Finally, there was some concern the roles of the various stakeholders were somewhat unclear.

5.3.5.3 Program Staff

Interviews with ETH staff were on-going and covered a number of topics mostly revolving around the logic or theory of the program (the various activities, their outcomes and their interrelationships), the development of data collection instruments, and the collection of data. The results of these conversations resulted in the construction of various data collection instruments and strategies and the theory of how the ETH is organized and the activities are designed to achieve its objectives (see Exhibit 3.1 and Exhibit 3.2).

5.3.6 Savings Potential

In this section, we present the preliminary estimates of savings potential for the WCCUSD and the RSD. These descriptions are taken directly from the reports prepared for PG&E by Digital Energy and SERVIDYNE.

5.3.6.1 West Contra Costa Unified School District

This section of the report summarizes the study, *Energy Efficiency Study for West Contra Costa Unified School District*, which estimate the preliminary energy and demand reduction for four schools. The full text of this study is available upon request. This study was conducted under the California Energy Commission's Bright Schools Partnership Energy Assistance Program. This program provides technical assistance through energy audits, analyses, and low interest loans to California public school districts in order to identify, install, and finance energy efficiency projects. The goal of this CEC Program is to reduce energy costs through the implementation of energy reduction measures in existing systems.

The following summary highlights potential energy efficiency measures (EEMs) at four of the schools in the West Contra Costa Unified School District. The specific schools included in this study are:

- Richmond High School
- Pinole Valley High School
- Downer Elementary School
- Madera Elementary School

The study required a review of the school's major energy using systems. This included site surveys and discussions with school personnel. After review of the historical energy use, EEMs were determined and analyzed based on cost effectiveness. The site survey, analyses, and report preparation were performed by Digital Energy.

The study recognizes that the school has two primary objectives:

1. Implement cost effective energy efficiency measures.
2. Integrate the energy efficiency measures with the District's school modernization program

Efforts focused primarily on the first issue, although some basic recommendations and concepts were addressed pertaining to the latter objective. Modernization of the schools will require several other concurrent efforts including but not limited to asbestos abatement and disposal and seismic retrofits. The study recommended integrating energy efficiency measures recommended herein into the District's modernization program to implement the best possible long-term solution for the District.

The current energy crisis in California, including the most recent developments such as PG&E's bankruptcy declaration and the State Public Utilities Commission's approval of an unprecedented rate increase of up to 40% or higher has significantly raised the visibility of energy conservation in all sectors of the industry. There is currently considerable uncertainty on exactly what the cost impact will be for any large entity, including the District. The analysis provided in this study was still based on the last year's energy rate, which is approximately $0.11/kWh for electricity. It is to be noted that at the higher electricity rates which appear imminent at this time, the projects recommended will become even more cost effective.

The four schools included in the audit currently spend $347,831 for 3.23 million kWh of electricity and $74,282 for 121,449 Therms of natural gas annually. Electricity and gas are purchased from Pacific Gas and Electric. The total energy budget of $422,113 could potentially be reduced by 22%, if the recommended energy efficiency measures are implemented. These projects will cost approximately $1,028,945 and save $93,067 annually. This would result in a simple payback of 11 years under last year's electricity rate, and 7.8 years if the electricity rate increases by 40%, as recently approved in concept by the State Public Utilities Commission.[9] Exhibit 5.16 summarizes the project economics by EEM.

[9] PG&E staff point out that these paybacks do not include PG&E rebates which would shorten the payback.

Exhibit 5.16. Project Economics for West Contra Costa Unified School District

#	EEM	Electricity Savings	Gas Savings (Therms)	Cost Savings ($)	Project Cost ($)	Simple Payback (Years)
L1	Install T8 lamps and electronic ballasts in approximately 4,936 fixtures	377,012	0	$41,471	$365,038	8.8
L2	Replace incandescent fixtures with fluorescent fixtures with new suspended ceilings in classrooms of Downer elementary school	372,748	0	$41,002	$371,405	9.1
L3	Replace multi-vapor or mercury vapor fixtures with metal halide or HPS fixtures	30,415	0	$3,346	$20,887	6.2
L4	Hallway light level switching for Richmond High School	6,239	0	$686	$4,600	6.7
L5	Install 265 occupancy sensors in classrooms and conference rooms	59,651	0	$6,562	$74,611	11.3
Total Construction		846,065	0	$93,067	$836,541	8.9
Total Project[1]		846,065[2]	0	$93,067	$1,028,945	11

[1]Costs include 10% A&E, 8% construction management, and 5% contingency. If the electricity rate jumps up by 40%, this payback reduces to 7.8 years.

[2]Represents a reduction of 25% in existing electricity use.

Normally energy efficient measures (EEMs) that are recommended for development have a 7-year simple payback period or less. Incorporation of new suspended ceiling systems in Downer Elementary School classrooms as well as the old and deteriorating luminous ceiling systems in the Richmond High School makes it difficult to achieve a 7-year payback. However, since the school is looking for a sound long term solution, use of new ceiling systems in such locations is indeed justified from a practical standpoint.

Not included in the above project costs are other modernization related cost items such as asbestos abatement and seismic retrofits to existing lighting fixtures that will remain in place. These measures are essential to ensure overall integrity of the lighting and ceiling systems. The District is recommended to include such measures as an integral part of the building renovation and modernization projects.

5.3.6.2 Ravenswood City School District

This section of the report summarizes the study, *Energy Efficiency Study for Ravenswood City School District*, which estimate the preliminary energy and demand reduction for four schools. The full text of this study is available upon request.

The Ravenswood City School District spent just under $122,000 in the past year for electricity and natural gas use at the four schools that were selected for this study:

- Costano Elementary School,
- James Flood Elementary,
- Menlo Oaks Middle School, and
- Willow Oaks School Elementary School.

Annual energy expenditures can be reduced by approximately $20,000 or 17% of utility bills if all energy projects recommended in this report are implemented. The cost to implement all of these measures is approximately $54,000, resulting in an average payback of 2.7 years. Exhibit 5.17 on the following page summarizes the recommended measures, their annual energy savings, installation costs and simple payback periods.

Modernization work over the past several years at Costano, Menlo Oaks and Willow Oaks included new efficient T -8 fluorescent lighting. However, there is still a significant savings opportunity for lighting retrofit work at these schools as well as at Flood, where all the lighting fixtures utilize older T-12 technology. Seven lighting projects were recommended in this report. The largest project was a lighting retrofit that involves replacing all remaining T -12 fluorescent lamps and magnetic ballasts with T -8 lamps and electronic ballasts in existing light fixtures at all sites. This project also calls for delamping of selected fixtures in overlit areas.

Exhibit 5.17. Project Economics for Ravenswood City School District

Project Descriptions	Peak Demand Savings (kW)	Annual Energy Savings (kWh)	Annual Natural Gas Savings (Therms)	Annual Cost Savings	Project Cost Estimate	Simple Payback (Years)
Lighting Projects						
Corridor lighting Photocell Control – Willow Oaks	1.6	2,529	0	422	909	2.2
Eave lighting Timeclock/photocell control – Menlo Oaks	0.3	1,183	0	174	425	2.4
LED exit signs – Costano, Willow Oaks	0.3	2,961	0	419	1,338	3.2
T-8 lamps/electronic ballasts – all schools	45.2	72,350	0	12,075	41,567	3.4
Interior incandescent fixture replacement – Willow Oaks	1.1	1,830	0	305	1,324	4.3
Metal halide lamp replacement – Willow Oaks	0.4	640	0	107	530	5.0
Exterior lighting retrofit – Menlo Oaks, Willow Oaks	0.0	1,940	0	263	1,619	6.2
HAVC Projects						
Scheduling controls for room furnaces – all schools	0.0	15,207	1,980	3,772	4,072	1.1
Scheduling controls for heat pumps – all schools	0.0	11,628	0	1,577	2,144	1.4
Misc. Projects						
Change electric rate schedule	---	---	---	1,000	---	Immediate
Total	48.9	110,268	1,980	$20,114	$53,928	2.7

Utility incentives may be available from PG&E for assistance in funding several of the recommended projects. The utility company representative should be contacted prior to project implementation to determine funding eligibility. The project economics presented in the report did not include any potential utility incentives.

The California Energy Commission has a Low Interest (3%) Finance Program for which the school may qualify for financing the -recommended energy projects. If the District is contemplating replacing a roof in the near term, it may make sense to consider participating in the California Energy Commission's Cool Savings Program, where rebates are available to offset the incremental cost of the improved roofing material. See www.consumerenergycenter.org/coolroof for program details and an Application.

5.3.6.3 Combined Impacts for Impacts for WCCUSD and RSD

While neither school district has yet implemented the recommendations presented in the previous two sections, Exhibit 5.18 points out the magnitude of potential savings.

Exhibit 5.18 Potential Energy Impacts across Both School Districts

School District	Potential kW Savings	Potential kWh Savings	Potential Therm Savings	Cost of EEM's	Simple Payback
WCCUSD	Not provided	846,065	0	$1,028,945	7.8 - 11
RSD	48.9	110,268	1,980	$53,928	2.7
Total	48.9	956,333	1,980	$1,082,873	-

Based upon the information reported by Digital Energy and SERVIDYNE, the potential kWh savings varies from 17% to 25% of the total kWh annual bill when compared with previous years.[10]

5.4 Overall Conclusions

Both the EP and ETH programs have been actively involved in implementing their respective programs and will continue to do so through 2001. Both have evolved considerably over the last 12 to 18 months in response to changing district and student needs and have been well received by students, teachers, and administrators. While ETH has been more successful than the EP in measuring potential energy impacts, the EP is exploring other ways to measure energy and demand impacts. Both programs have also occasionally incorporated (or are considering incorporating) certain features from other programs that complement their programs. This kind of cross-fertilization is a key to their continuing improvement and demonstrates flexibility on the part of the program designers and openness to new ideas.

Because both of these programs are pilot programs, there is a greater emphasis on process evaluation with the main objective of improving the programs and the methods for estimating impacts than on impact evaluation itself. Once the programs are further developed and program designs stabilize, greater emphasis will be placed on impact evaluation. Thus, it is premature to judge how effective the programs are in achieving their educational and energy saving objectives.

This completes the evaluation of the PG&E PY2001 Energenius and Energy Treasure Hunt Programs. Appendices follow of relevant materials.

[10] A technical review of these reports was beyond the scope for this evaluation. Percentages provided are taken directly from the prepared reports.

Appendix A. ETH Questionnaires

This appendix has multiple surveys used within the ETH Program. In the order provided they are:

In-depth Interview Guide for the School Personnel

In-depth Interview Guide for the ETH in general

- Evaluation form for the Financial Workshop
- Evaluation form for the Facility Manager Workshop
- Evaluation form for the Custodian Workshop
- Follow-up Survey for the Financial Workshop participants

In-Depth Interview Guide:

Energy Treasure Hunt:
School Personnel

ID: _____

Date: _____

Name: _____

Title: _____

School: _____

Address: _____

Introduction: Hello. I'm Mary Sutter with Equipoise Consulting and I've been hired by the Pacific Gas & Electric Company to evaluate the Energy Treasure Hunt Program. The California Public Utilities Commission has required that PG&E evaluate this program. Our records indicate that you've been involved with this Program and I'd like to talk with you a few minutes about your participation. I want to emphasize that all of your answers will be kept strictly confidential. [IF THE RESPONDENT WISHES TO CONTACT A PG&E REPRESENTATIVE TO VERIFY THE LEGITIMACY OF THIS EVALUATION, PROVIDE THE NAME OF PAM MURRAY AT (415) 972-5333.]

IF RESPONDENT REFUSES, GO TO NEXT SAMPLE POINT.

IF RESPONDENT CANNOT BE INTERVIEWED AT THIS TIME SCHEDULE A CALLBACK FOR: Date/Time: _____

---

1. When was your school district first contacted about the Energy Treasure Hunt Program?

2. Please briefly describe your own personal involvement with the Energy Treasure Hunt Program.

3. What components of Energy Treasure Hunt has your school district participated in?

Possible answers may include:

- Benchmarking
- Audits
- Demonstration classroom(s)
- Workshops
  - Financing Workshop (February 2001)
  - Facility Managers Workshop (May 2001)
- Learning activities for teachers
- Access to other resources, such as:
  - California Conservation Corps
  - California Energy Commission's audits or financing
  - Energy Star's benchmarking tool (Portfolio Manager) or other products
  - PG&E's programs and rebates

4. Has your school implemented any of the recommended energy conservation or energy efficiency measures as a result of participation in the ETH Program?

___ Yes [CONTINUE]
___ No [GO TO Q. 6]
___ Don't know [GO TO Q. 6]

5. Please describe.

Possible answers may include:

- Financing energy efficiency projects,
- Changes in maintenance or operations practices,
- Changes to designs or plans for retrofit or new construction projects (including schools Master Plan),
- Changes in criteria used to select architects and/or engineers,
- Changes in equipment/materials procurement criteria or specifications
- Education with teachers

6. Does your school plan to implement, within the next 12 months, any of the recommended energy conservation or energy efficiency measures as a result of participation in the ETH Program?

___ Yes [CONTINUE]
___ No [GO TO Q. 8]
___ Don't Know [GO TO Q. 8]

7. Please describe.

8. Did your school district benefit in any other ways from participating in the ETH Program?

___ Yes [CONTINUE]
___ No [GO TO Q. 10]
___ Don't Know [GO TO Q. 10]

9. Please briefly describe these other benefits.

10. On a scale of 1 to 10, with a "1" meaning "Very Dissatisfied" and a "10" meaning "Very Satisfied", how satisfied are you *overall* with the ETH Program?

11. What did you like most about the ETH Program?

12. What did you like least about the ETH Program?

13. Would you recommend the ETH Program to administrators and teachers in other school districts?

___ Yes
___ No [IF NO, ASK] 13a. Why not? _____
___ Don't know

14. What, if anything, would you recommend to improve the ETH Program?

In-Depth Interview Guide:
Energy Treasure Hunt

ID: _____

Date: _____

Name: _____

Title: _____

School: _____

Address: _____

Introduction: Hello. I'm Mary Sutter with Equipoise Consulting and I've been hired by the Pacific Gas & Electric Company to evaluate the Energy Treasure Hunt Program. The California Public Utilities Commission has required that PG&E evaluate this program. Our records indicate that you've been involved with this Program and I'd like to talk with you a few minutes about your participation. I want to emphasize that all of your answers will be kept strictly confidential. [IF THE RESPONDENT WISHES TO CONTACT A PG&E REPRESENTATIVE TO VERIFY THE LEGITIMACY OF THIS EVALUATION, PROVIDE THE NAME OF PAM MURRAY AT (415) 972-5333.]

IF RESPONDENT REFUSES, GO TO NEXT SAMPLE POINT.

IF RESPONDENT CANNOT BE INTERVIEWED AT THIS TIME SCHEDULE A CALLBACK FOR: Date/Time: _____

---

1. When was your company first contacted about the Energy Treasure Hunt Program?

2. Please briefly describe your own personal involvement with the Energy Treasure Hunt Program.

3. What components of Energy Treasure Hunt has your company participated in?

Possible answers may include:

- Benchmarking
- Audits
- Demonstration classroom(s)
- Workshops
  - Financing Workshop (February 2001)
  - Facility Managers Workshop (May 2001)
- Learning activities for teachers
- Access to other resources, such as:
  - California Conservation Corps
  - California Energy Commission's audits or financing
  - Energy Star's benchmarking tool (Portfolio Manager) or other products
  - PG&E's programs and rebates

4. Has your company assisted schools in implementing any energy conservation or energy efficiency measures as a result of participation in the ETH Program?

___ Yes [CONTINUE]
___ No [GO TO Q. 6]
___ Don't know [GO TO Q. 6]

5. Please describe.

Possible answers may include:

- Financing energy efficiency projects,
- Changes in maintenance or operations practices,
- Changes to designs/plans for retrofit or new construction projects (including schools Master Plan),
- Changes in criteria used to select architects and/or engineers,
- Changes in equipment/materials procurement criteria or specifications
- Education with teachers

6. Does your company plan to assist any schools in implementing, within the next 12 months, any energy conservation or energy efficiency measures as a result of participation in the ETH Program?

___ Yes [CONTINUE]
___ No [GO TO Q. 8]

___ Don't Know [GO TO Q. 8]

7. Please describe.

8. Did your company benefit in any way from participating in the ETH Program?

___ Yes [CONTINUE]
___ No [GO TO Q. 10]
___ Don't Know [GO TO Q. 10]

9. Please briefly describe these other benefits.

10. On a scale of 1 to 10, with a "1" meaning "Very Dissatisfied" and a "10" meaning "Very Satisfied", how satisfied are you *overall* with the ETH Program?

11. What did you like most about your participation in the ETH Program?

12. What did you like least about your participation in the ETH Program?

13. Would you recommend the ETH Program to other companies similar to yours?

___ Yes
___ No [IF NO, ASK] 13a. Why not? _____
___ Don't know

14. What, if anything, would you recommend to improve the ETH Program?

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Evaluation Form for Financial Workshop

	Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**
Please indicate the extent to which you agree or disagree that the presentations of the following workshop topics were *clear and informative*:				
ENERGY STAR® products and services				
The legal basis for energy financing				
Capital versus operating budget				
Energy efficiency financing vehicles				
Potential sources of funding				
Quantifying costs of delay				
Decision making and process hurdles				
Developing an energy investment plan				
Please indicate the extent to which you agree or disagree with the following statements:				
The group working sessions provided a good opportunity to learn how to apply information from the presentation to real-life situations.				
The online presentation was beneficial in preparing for the workshop.				
The group working session logistics (e.g., facility, registration, meals, and materials) were well arranged and organized.				
Overall, the group working session was a success.				

Please provide any suggestions for future topics/sessions:
Please provide any suggestions to improve future group working sessions:

Evaluation Form for Facility Manager Workshop

On the four-point scale of "Low" to "High", please rate the quality of the information provided on the technologies visited during "The Field Trip to Energy Savings"	**Low 1**	**2**	**3**	**High 4**
Lighting Equipment, Lamps and Ballasts				
Lighting Control Systems				
HVAC Equipment and Controls				
Day-lighting				
Windows				
Roofs				
Waterless Urinals				
Please indicate the extent to which you agree or disagree with the following statements:	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
The "Field Trip" provided a good opportunity to learn how to improve the energy efficiency of facilities in my school district.				
I will recommend new, energy efficient design, renovation or retrofit projects to my district.				
I will recommend changing maintenance materials and practices to include energy efficiency considerations.				
The group working session logistics (e.g., facility, registration, meals, and materials) were well arranged and organized.				
Overall, the meeting was well planned and informative.				

Which aspects of the workshop were the most beneficial to you?
Which aspects of the workshops could be improved?

What suggestions do you have for future meetings/workshops?

Evaluation Form for Custodian Workshop

On the five-point scale of "Low" to "High", please rate the quality of the information provided on the following topics covered during the workshop:	**Low 1**	**2**	**3**	**4**	**High 5**
Background information on energy use in schools					
What do you think?					
Systems and equipment in schools					
Area-by-area search for energy use in schools					
Cleaning operations					
What energy misuse costs					
What energy savings can mean to you					
What can you do?					
Please indicate the extent to which you agree or disagree with the following statements:	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
The information provided during the workshop will assist me in reducing energy use in my school.					
The information provided gives me a better understanding of how energy can be misused in a school.					
As a result of this workshop, I plan to be an example to the students, staff and administration to reduce energy consumption in my school.					
I recommend that other districts in the Bay area have similar training for their custodial staff.					
Overall, the workshop was well planned and informative.					

What were the best parts of the workshop?
What areas (if any) need to be improved?
Is there anything else you would have liked this workshop to include?

Follow-Up Survey for Financial Workshop

Below, please indicate which of the following resources or tools your school or school district have used or plan to use within the next 12 months.

Since attending the PG&E-sponsored financing workshop on February 20, 2001, has your school or school district,	**Yes**	**No, But Plan To In The Next 12 Months**	**No and *Do Not* Plan To In The Next 12 Months**	**Don't Know**
Signed up for ENERGY STAR® products and services?				
Sought the services offered by energy services providers (ESCOs)?				
Entered into a lease/purchase agreement for energy efficient equipment?				
Participated in the Standard Performance Contracting Program?				
Accessed the ENERGY STAR® website (www.energystar.com) to explore performance rating systems?				
Begun an effort to institute a performance rating system that measures and rates energy consumption?				
Instituted a performance rating systems that measures and rates energy consumption?				
Used the Portfolio Manager (performance rating system) on the Environmental Protection Agency Website (www.epa.gov/buildings/label)?				
Sought to achieve the ENERGY STAR® label for school buildings?				
Used the ENERGY STAR® Institutional Purchasing Tool Kit?				
Encouraged the purchase of energy efficient products?				
Modified equipment specifications and purchasing guidelines to insure the purchase of energy efficient equipment?				
Used the project evaluation methods (first cost, simple payback, project payback, net present value, internal rate of return, return-on-investment, lifecycle cost analysis, simple cash flow)				
Financed energy efficiency project using Qualified One Academy Bonds (QABs)?				
Financed energy efficiency project using Qualified Zone Academy Bonds (QZABs)?				
Financed energy efficiency project using Urgent School Renovation Grants?				
Financed an energy efficiency project(s) using California Energy Efficiency Financing Programs?				
Accessed the product listings at the ENERGY STAR® website (www.energystar.gov)				

Thank you for your cooperation.

Appendix B. Energenius Questionnaires

This appendix has multiple surveys used within the Energenius Program. In the order provided they are:

Teacher survey provided with the Energenius packet. This survey has been analyzed by PG&E with the results provided in Appendix C.

- In-depth teacher survey form used for data collection for this evaluation.
- Student pre- and post-test survey provided with the Energenius packet. The first set is for the Habits components (Grades 1-3), the second set is for Measures (Grades 4-5), and the third set is for Bill Buster (Grades 6-8).

ENERGENIUS EDUCATIONAL SURVEY

1. Which Energenius Program did you teach?
(*If you used more than one Energenius Program, use the second enclosed Energenius Educational Survey form)*

[5]☐ Habits (Primary)
[4]☐ Measures (Intermediate)
[3]☐ Primary Safety
[2]☐ Intermediate Safety
[1]☐ Bill Buster

2. Please rate the Energenius Program on:

	Excellent	Very Good	Good	Fair	Poor
a. Holding students' attention	[5]☐	[4]☐	[3]☐	[2]☐	[1]☐
b. Ease of incorporating into curriculum	[5]☐	[4]☐	[3]☐	[2]☐	[1]☐
c. Helpfulness of Teacher's Kit	[5]☐	[4]☐	[3]☐	[2]☐	[1]☐
d. Overall quality of the Program materials	[5]☐	[4]☐	[3]☐	[2]☐	[1]☐

3. As a result of the Energenius Program:

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. My students exhibit more positive attitudes about saving energy	[4]☐	[3]☐	[2]☐	[1]☐
b. My students know more about how to use energy more wisely.	[4]☐	[3]☐	[2]☐	[1]☐
c. My students can identify ways to reduce energy consumption in their homes.	[4]☐	[3]☐	[2]☐	[1]☐
d. My students have learned how to be safer around electricity and natural gas.	[4]☐	[3]☐	[2]☐	[1]☐

4. Which materials did you use from the Energenius Program? *Check all that apply*

[12]☐ Posters
[11]☐ Stickers
[10]☐ Calendar
[9]☐ Puzzle
[8]☐ Video
[7]☐ Check List
[6]☐ Script Books
[5]☐ Star Times
[4]☐ Software
[3]☐ See & Check Survey
[2]☐ Energy Survey
[1]☐ Other

_____
_____

5. Overall, how would you rate this Program?

Excellent	Very Good	Good	Fair	Poor
[5]☐	[4]☐	[3]☐	[2]☐	[1]☐

6. How many class hours did you allocate to this Program?

[4]☐ 1 to 3 [3]☐ 4 to 7 [2]☐ 8 to 12 [1]☐ Over 12

7. How likely are you to teach in another PG&E-sponsored energy efficiency educational program?

[5]☐ Very likely
[4]☐ Somewhat likely
[3]☐ Not sure
[2]☐ Somewhat unlikely
[1]☐ Very unlikely

8. How likely are you to recommend this Program to another teacher?

[5]☐ Very likely
[4]☐ Somewhat likely
[3]☐ Not sure
[2]☐ Somewhat unlikely
[1]☐ Very unlikely

9. What grade(s) do you teach?
(*Check all that apply)*

[8]☐ 8th grade [6]☐ 6th grade [4]☐ 4th grade [2]☐ 2nd grade
[7]☐ 7th grade [5]☐ 5th grade [3]☐ 3rd grade [1]☐ 1st grade

10. How many students are there in your class(es)?___

11. How did you learn about the Energenius Program? *Check all that apply*

[6]☐ Parents
[5]☐ Educational colleagues
[4]☐ PG&E's Energenius Catalog
[3]☐ Internet
[2]☐ Professional meetings
[1]☐ Other

12. Please provide the following information so that PG&E can keep you informed regarding future energy efficiency programs.

Name:_____
School: _____
School Phone: _____
E-Mail Address:_____

Thank you again for participating in our Energenius Education Program and for completing this survey.
If you would like additional information on energy efficiency, visit www.pge.com or call PG&E's Smarter Energy Line at 1*800-933-9555

Pacific Gas and Electric Company
WE DELIVER ENERGY.

In-Depth Interview Guide:

Energenius

ID: _____

Date: _____

Name: _____

Title: _____

School: _____

Address: _____

Introduction: Hello. I'm Mary Sutter with Equipoise Consulting and I've been hired by the Pacific Gas & Electric Company to evaluate the Energenius Program. The California Public Utilities Commission has required that PG&E evaluate this program. Our records indicate that you've been involved with this Program and I'd like to talk with you a few minutes about your participation. I want to emphasize that all of your answers will be kept strictly confidential. [IF THE RESPONDENT WISHES TO CONTACT A PG&E REPRESENTATIVE TO VERIFY THE LEGITIMACY OF THIS EVALUATION, PROVIDE THE NAME OF PAM MURRAY AT (415) 972-5333.]

IF RESPONDENT REFUSES, GO TO NEXT SAMPLE POINT.

IF RESPONDENT CANNOT BE INTERVIEWED AT THIS TIME SCHEDULE A CALLBACK FOR: Date/Time: _____

How did you first find out about the Energenius Program?

What curriculum components of Energenius Program did you use in your classroom?

___ Energenius Primary Program (Grades 1-3)
___ Energenius Primary Safety Program (grades 1-3)
___ Energenius Intermediate Program (Grades 4-5)
___ Energenius Intermediate Safety Program (Grades 4-5)
___ Bill Buster (Grades 6-8)

3. Approximately how many classroom hours (or periods) did you spend teaching the (Name of Energenius Program) materials?

4. Did you administer the pre and post tests? If not, why? If yes, do have any comments on the tests or returning them, etc?

5. Did your students do any of the take-home Energenius activities? And were parents (or other adults in the homes) involved in any of the Energenius learning activities?

6. Overall, how did your students respond to the lessons and student activities in the (Name of Energenius Program)?

7. On a scale of one to five, with a one indicating "not at all effective" and a five indicating "very effective," how effective do you think the (Name of Energenius Program) was in making students aware of energy saving behaviors and/or safety rules around energy?

Note: Perhaps elicit comments on what teachers have observed in the classroom or in school since the Energenius lessons were taught (turning off all lights, equipment when not in use, practicing safety around electric cords, etc.).

8. What components of the (Name of Energenius Program) did you find to be most effective? The least effective?

9. On a scale of one to five, with a one indicating "not at all effective" and a five indicating "very effective," how would you rate, *as a teacher*, the overall educational effectiveness of (Name of Energenius Program) for your grade level?

10. Do you have any specific recommendations to enhance the (Name of Energenius Program) that you taught?

11. Would you recommend the Energenius Educational Program materials to other teachers in your own school or district or to teachers in other school districts?

    If no why not?

    If yes, a follow up could relate to recommending the Energenius programs to administrators, curriculum coordinators and other staff.

12. Do you have any suggestions for promoting the Energenius educational materials to more teachers in the state?

ENERGENIUS HABITS PROGRAM

PRE-TEST

DIRECTIONS: Read each item below and circle the correct answer.

1. On cold days, how can you help save energy in your home?

a) Turn up the heater a lot.

b) Put on a warm sweater and close the windows.

c) Sit close to the window.

2. Which one of these is an appliance?

a) Bicycle

b) Clothes line

c) Television

3. How do you think adults can save energy when they do the laundry?

a) By washing only a few clothes at a time.

b) By washing only full loads.

c) By washing clothes every day.

4. What should you do every time you leave a room to save energy?

a) Leave the door open.

b) Turn on the lights.

c) Turn off all the lights.

5. What is one important way you can use less electricity in your home?

a) Open the windows.

b) Help with the dishes.

c) Always turn off the television when no one is watching it.

6. What do you think an Energenius is?

a) Someone who uses energy wisely.

b) Someone who wastes energy.

c) Someone who uses lots of energy.

7. What is wasted when hot water is left running in a sink?

a) Just water is wasted.

b) Water and the energy to heat the water are both wasted.

c) Just energy is wasted

8. When should you open the refrigerator door?

a) Whenever I want to have a look.

b) Whenever I want to feel the cold.

c) Whenever I know what to take out.

9. What is the best energy-saving way to keep yourself clean?

a) Take a bath in a full tub.

b) Take a short five-minute shower.

c) Take a long, hot shower.

10. When adults cook, why do you think they should cover pots and pans with lids?

a) The food cooks faster and energy is saved.

b) The smell of the food stays in the kitchen.

c) The food tastes better.

Energenius Habits Program

Post-test

DIRECTIONS: Read each item below and circle the correct answer.

1. When adults cook, why do you think they should cover pots and pans with lids?

a) The food cooks faster and energy is saved.

b) The smell of the food stays in the kitchen.

c) The food tastes better.

2. What is the best energy-saving way to keep yourself clean?

a) Take a bath in a full tub.

b) b) Take a short five-minute shower.

c) c) Take a long, hot shower.

3. When should you open the refrigerator door?

a) Whenever I want to have a look.

b) b) Whenever I want to feel the cold.

c) c) Whenever I know what to take out.

4. What is wasted when hot water is left running in a sink?

a) Just water is wasted.

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5. What do you think an Energenius is?

a) Someone who uses energy wisely.

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6. What is one important way you can use less electricity in your home?

a) Open the windows.

b) Help with the dishes.

c) Always turn off the television when no one is watching it.

7. What should you do to save energy every time you leave a room?

a) Leave the door open.

b) Turn on the lights.

b) Turn off all the lights.

8. How do you think adults can save energy when they do the laundry?

a) By washing only a few clothes at a time.

b) By washing only full loads.

c) By washing clothes every day.

9. Which one of these is an appliance?

a) Bicycle

c) Clothes line

c) Television

10. On cold days, how can you help save energy in your home?

a) Turn up the heater a lot.

b) Put on a warm sweater and close the windows.

c) Sit close to the window.

ENERGENIUS PRIMARY SAFETY PROGRAM

PRE TEST

Energenius wants to know:

What do you already know about safety around electricity and natural gas?

Instructions: Circle the letter next to the correct answer.

1. What is the very first thing to do if you are home alone and smell natural gas?
a) Turn off the television and all lights.
b) Go outside quickly and tell an adult you know.
c) Check the stove to see if burners are turned off.

2. When is it safe to reach over the burners on a stove?
a) After all the cooking is finished.
b) If a pot holder is used.
c) It is never safe.

3. When can a metallic balloon be very dangerous?
a) When it catches on a power line.
b) When it gets caught in the bushes.
c) When it loses its air very quickly.

4. Which one is the right safety rule about electric substations?
a) Never go near an electric substation without a friend.
b) Keep out! Never go near or in an electric substation.
c) Danger ahead! You must be 18 to enter an electric substation.

5. Why is it important to keep appliances away from water?
a) Most appliances cannot float.
b) Appliances in water will rust.
c) People can be hurt badly if water carries electricity to their bodies.

6. How can you stay safe around a furnace or heater?
a) Keep yourself and all toys far away from the furnace.
b) Sit close enough to only warm your hands and feet.
c) Only put your metal toys close to the furnace.

7. What objects can be safely put into a toaster?
a) Small forks.
b) Flat plastic knives.
c) Only food items like bread.

8. When are electric power lines dangerous to touch?
a) Only when they are up on the poles.
b) When they are up on the poles or on the ground.
c) Only when they have fallen to the ground

9. When is it safe to play in or with appliances?
a) When they are no longer being used.
b) When an older friend is with you.
c) Never.

10. What objects can be safely put into electric outlets?
a) Metal tools.
b) Electric plugs and plug guards.
c) Plastic objects.

Key: 1 b, 2 c, 3 a, 4 b, 5 c, 6 a, 7 c, 8 b, 9 c, 10 b

ENERGENIUS PRIMARY SAFETY PROGRAM

POST TEST

Energenius wants to know:

What have you learned about safety around electricity and natural gas?

Instructions: Circle the letter next to the correct answer.

1. What should you do when your family is cooking with an electric barbecue or on the top of the stove top?
   a. Touch it to make sure its hot.
   b. Never get too close or reach over the top.
   c. Play immediately next to electric barbecue or stove.

   (correlates to pre-test question #2)

2. What should you do If you find toys or other things too close to a heater or furnace?
   a. Move them far away.
   b. Leave them where they are.
   c. Watch them closely.

   (correlates to pre-test question # 6)

3. What should you do if you see your brother, sister, or a friend trying to stick a small toy into an electric outlet?
   a. Help them.
   b. Stop them immediately and explain that it is unsafe.
   c. Tell an adult after dinner.

   (correlates to pre-test question #10)

4. What should you do if you smell natural gas and your are home alone?
   a. Call a repairperson.
   b. Wait for your family to come home.
   c. Leave your home immediately and find an adult you know to tell.

(correlates to pre-test question #1)

5. What should you do if you get a metallic balloon for your birthday?

   a. Keep it away from power lines.
   b. Always hold on to it very tightly.
   c. Both of the above.

   (correlates with pre-test question #3)

6. What should you do if you see an electric power line down after a storm?
   a. Move it out of the way.
   b. Don't touch it and keep away.
   c. Cover it with leaves.

   (correlates with pre-test question #8)

7. Where is it safe to hide if you are playing hide and seek at home?
   a. In unused appliances.
   b. Behind the washer or dryer.
   c. Behind the sofa.

   (correlates with pre-test question #9)

8. What should you do if a friend asks you to go with him or her to an electric substation?
   a. Keep out! Never go near or in an electric substation.
   b. Stay close together.
   c. Get someone older to go with you.

   (correlates with pre-test question #4)

9. What should you do it a piece of bread gets stuck in a toaster?
   a. Dig it out with a metal fork.
   b. Use a plastic knife to dig it out.
   c. Get an adult to help you.

   (correlates with pre-test question #7)

10. Why should electric appliances be kept away from the sink or bathtub?

    a. They might get scratched.
    b. People can be hurt badly when water carries electricity to their bodies.
    c. They will not work.

    (correlates with pre-test question # 5)

KEY: 1 b, 2 a, 3 b, 4 c, 5 b, 6 b, 7 c, 8 a, 9 c, 10 b

Energenius Measures

Pre-test

DIRECTIONS: Read each item below and circle the correct answer.

1. What are the two most common forms of energy used in the home?

a) Televisions and VCRs

b) Stoves and refrigerators

c) Natural gas and electricity

d) Clothes washing machines and dryers

2. Which one of the following household appliances is sometimes run by natural gas and sometimes by electricity?

a) Study lamp

b) Toaster

c) Television

d) Stove

3. What is the most energy-efficient way to keep yourself clean?

a) Take a long, hot shower.

b) Take a hot bath in a full tub of water.

c) Take a short hot shower of less than five minutes.

d) Take a hot shower of 10 minutes.

4. How do you think an energy-saver showerhead can save energy?

a) By making shower time shorter.

b) By keeping the water from getting too hot.

c) By reducing the amount of water used and the energy needed to heat the water.

d) None of the above.

5. On cold days, what is the recommended energy -efficient temperature?

a) 75°F

b) 85°F

c) 68°F

d) Any temperature under 78°F

6. How can planting shade trees outside home windows save heating energy?

a) By shading the house all the year.

b) By letting sun in during the hot months.

c) By keeping sun out during hot months.

d) None of the above.

7. Which one of the following habits can reduce the use of energy?

a) Putting on a sweater instead of turning the heat on or up.

b) Deciding what you want from the refrigerator before opening the door.

c) Opening the curtains on a sunny winter day.

e) All of the above.

8. What is the most energy-efficient way to dry clothes on sunny days?

a) Dry only the few clothes you might need for the next day.

b) Dry clothes outside on a clothesline.

c) Dry only small-size loads.

d) None of the above.

9. Which one of the following is an energy-saving device that won't allow heat to transfer?

a) Water heater blanket

b) Attic insulation

c) Duct insulation

d) All of the above

10. How can an energy-efficient person be described?

a) Someone who doesn't waste energy.

b) Someone who knows that energy is a limited resource.

c) Someone who recycles.

d) All of the above.

Energenius Measures

Post-test

DIRECTIONS: Read each item below and circle the correct answer.

1. On cold days, what is the recommended energy-efficient temperature?

a) 68°F

b) 85°F

c) 75°F

d) Any temperature under 78°F

2. How do you think an energy-saver showerhead can save energy?

a) It reduces the amount of water used and the energy needed to heat the water.

b) It keeps the water from getting too hot.

c) It decreases shower time.

d) None of the above.

3. What is the most energy-efficient way to keep yourself clean?

a) Take a short hot shower of less than five minutes.

b) Take a hot bath in a full tub of water.

c) Take a long hot shower.

d) Take a hot shower 10 minutes long.

4. Which one of the following household appliances is sometimes run by natural gas and sometimes by electricity?

a) Television

b) Toaster

c) Study lamp

d) Stove

5. What are the two most common forms of energy used in the home?

a) Natural gas and electricity

b) Stoves and refrigerators

c) Televisions and VCRs

d) Clothes washing machines and dryers

6. How can an energy-efficient person be described?

a) Someone who recycles.

b) Someone who knows that energy is a limited resource.

c) Someone who doesn't waste energy.

d) All of the above.

7. Which one of the following is an energy-saving device that won't allow heat to transfer?

a) Duct insulation

b) Attic insulation

c) Water heater blanket

d) All of the above

8. What is the most energy-efficient way to dry clothes on sunny days?

a) Dry only small-size loads.

b) Dry clothes outside on a clothesline.

c) Dry only the few clothes you might need for the next day.

d) None of the above.

9. Which one of the following habits can reduce the use of energy?

a) Opening the curtains on a sunny winter day.

b) Deciding what is wanted from a refrigerator before opening the door.

c) Putting on a sweater instead of turning the heat on or up.

d) All of the above.

10. How can planting shade trees outside home windows save heating energy?

a) By keeping sun out during hot months.

b) By letting sun in during hot months.

c) By shading the house all the year.

d) None of the above.

ENERGENIUS INTERMEDIATE SAFETY® PROGRAM PRE-TEST

Instructions: For each question, there is only one correct answer.
Circle the letter next to the correct answer for each question.

1. Which statement about electricity is true?
   a. People should never touch electricity nor let electricity touch them.
   b. It is safe to play in or on electric appliances when they are not in use.
   c. Water does not conduct electricity.
   d. It is always safe to plug as many appliances as possible into an electric outlet.

2. Which of the following rules about electric substations is correct?
   a. Never go near an electric substation without a friend.
   b. Always keep away! Never go near or in an electric substation.
   c. Enter an electric substation only if you are over 18 or with an adult.
   d. Always tell an adult before you plan to enter an electric substation.

3. Which of the following is NOT involved in getting power to your home?
   a. Power plants.
   b. Transmission towers, powerlines, and electric substations.
   c. Electrical appliances in the kitchen.
   d. Utility poles in the neighborhood.

4. What should children do if an appliance sputters, flashes, or makes a spark?
   a. Tug on the cord to make sure the plug is in correctly.
   b. Check the fuse box to make sure everything is working.
   c. Turn on at least five appliances to see if they still work.
   d. Tell an adult immediately and let him or her take care of the problem.

5. When are electric powerlines dangerous to touch?
   a. Only when they are up on the poles.
   b. Only when they fall to the ground.
   c. When a person is wearing anything with metal.
   d. When they are up on the poles or on the ground.

6. What should children do when they are home alone and smell natural gas?
   a. Go outside right away and ask an adult they know for help.
   b. Wait inside until an adult arrives and tell him or her.
   c. Light matches or a candle to see if the gas leak can be found.
   d. Turn off appliances and electric switches to see if the smell disappears.

7. Which of the following is NOT involved in getting natural gas from underground sources to homes?
   a. Gas wells.
   b. Compressor stations.
   c. Gas stoves and water heaters.
   d. Gas meters and regulators.

8. Which of the following statements is true?
   a. People should never reach over the burners on a stove, whether the burners are hot or not.
   b. Pot and pan handles should always hang over the side of the stove.
   c. Food can be warmed in the microwave when it is wrapped in metal or foil.
   d. A metal fork is the correct way to get stuck bread out of a toaster.

9. Which of the following statements about fire safety is true?
   a. The best way to put out a grease fire is with water.
   b. Every family should have its own emergency plan in the event of a fire or other disasters such as earthquakes.
   c. The correct way to put out an electrical fire is with water.
   d. None of the above.

10. What is needed to create a fire?
   a. Fuel — something that will burn.
   b. Oxygen — a gas always in the air we breathe.
   c. Heat — energy that raises the temperature of fuel high enough to burn.
   d. All of the above.

ENERGENIUS INTERMEDIATE SAFETY® PROGRAM POST-TEST

Instructions: For each question, there is only one correct answer.
Circle the letter next to the correct answer for each question.

1. Which is the correct definition of a conductor of electricity?
   a. A material that permits the easy flow of electricity.
   b. A worker in a power plant.
   c. A material that does not allow electricity to flow through it easily.
   d. None of the above.

2. Which of the following statements about appliances is true?
   a. Always keep electrical appliances away from water.
   b. Handle electrical appliances with wet hands only if you are extra careful.
   c. There is no danger reaching across the stove top if burners look like they are turned off.
   d. Use only a metal knife or fork to remove bread stuck in the toaster.

3. Which is the correct definition of an insulator of electricity?
   a. A material that permits the easy flow of electricity.
   b. A person who installs window insulators.
   c. A material that does not allow electricity to flow through it easily.
   d. A wool material wrapped around hot water heaters.

4. Which one of the following statements is true?
   a. Flying balloons and kites near powerlines is safe during daylight hours.
   b. Powerlines are always dangerous to touch.
   c. It is safe to climb trees that have powerlines running through them.
   d. People should not enter electrical substations unless they are over 18.

5. Which rule can help keep people safe around electricity?
   a. Never use an electric mixer close to the kitchen sink.
   b. Never mix water and electricity! This can cause electric shocks.
   c. Never stand close to electric heaters or any furnace.
   d. All of the above.

6. Which of the following statements about appliances is true?

a. When an appliance cord is frayed or damaged, the cord should be grabbed and the plug pulled from the outlet.

b. Plug as many appliances as possible into each outlet.

c. If an appliance or cord sputters or sparks, an adult should take care of the problem.

d. Children should check the fuse box when an appliance stops working.

7. What is the best way for an adult to put out a grease fire if it starts in a pan in the kitchen?

a. Spray it with water.

b. Cover the pan completely with the pan top or spray it with a fire extinguisher rated ABC-Handy.

c. Cover the pan with a wet dish towel.

d. Fan the fire rapidly.

8. Which is the correct safety rule for children to follow?

a. Never light a natural gas pilot light that goes out. This is a job for an adult.

b. Never turn electric switches on or off when you smell natural gas.

c. When you smell smoke or see a fire start, get away and call for help.

d. All of the above.

9. What is involved in getting natural gas from underground sources to homes?

a. Gas wells.

b. Compressor stations.

c. Gas meters and regulators.

d. All of the above.

10. What should children do if they smell smoke or see a fire starting at home?

a. Try to put the fire out.

b. Open windows wide so the fire will blow out.

c. Get away from the fire or smoke and tell an adult to call for help.

d. Smother the flames with a blanket or towel.

Pre-Test Answer Key:

1 a, 2b, 3 c, 4 d, 5 d, 6 a, 7 c, 8 a, 9 b, 10 d

Post-Test Answer Key:

1 a, 2 a, 3 c, 4 b, 5 d, 6 c, 7 b, 8 d, 9 d, 10 c

Correlation between Pre-Test and Post-Test:

PRE-TEST	POST-TEST
1	5
2	3
3	1
4	6
5	4
6	8
7	9
8	2
9	7
10	10

BILL BUSTER -- ENERGENIUS

PRE TEST

INSTURCTIONS: PLACE AN X BEFORE THE CORRECT ANSWER.

1. Energy efficiency is NOT affected by:
   - ____ a. personal habits
   - ____ b. recycling
   - ____ c. how energy is measured
   - ____ d. how energy is used

2. Which of the following is an example of recycling?
   - ____ a. re-using grocery bags
   - ____ b. buying a used CD
   - ____ c. turning newspapers into drawing paper
   - ____ d. all of the above

3. Which of the following is NOT a source of energy?
   - ____ a. solar power
   - ____ b. an air conditioner
   - ____ c. every individual
   - ____ d. natural gas

4. Renewable energy is energy that:
   - ____ a. is easily restored or made again by nature
   - ____ b. is gained through conservation
   - ____ c. is made by individuals
   - ____ d. is efficiently used energy

5. Alternative energy is energy that:
   - ____ a. alternates yearly
   - ____ b. comes from sources other than fossil fuels such as wind
   - ____ c. is made from petroleum

____ d. is made from natural gas

6. What is geothermal power?
   - ____ a. energy produced by water power
   - ____ b. energy from the sun
   - ____ c. energy from heat inside the earth
   - ____ d. energy from the wind

7. A definition of kwh is:
   - ____ a. a measure of electric power used over time
   - ____ b. the physical movement of machines
   - ____ c. a form of energy
   - ____ d. all of the above

8. Which of the following will reduce energy use when washing clothes?
   - ____ a. sorting the clothes by light and dark colors
   - ____ b. adjusting the water level to match the size of the load
   - ____ c. using more detergent
   - ____ d. washing twice a day

9. People can reduce the amount of energy used when cooking on the stove by:
   - ____ a. always covering the pot
   - ____ b. increasing the level of the heat
   - ____ c. using aluminum pots
   - ____ d. all of the above

10. A definition of a therm is:
    - ____ a. the temperature
    - ____ b. a proposal
    - ____ c. unit of measurement for natural gas
    - ____ d. car gas

11. Which of the following is NOT an energy-saving measure?
    ____ a. installing storm windows
    ____ b. rinsing dishes in hot water before putting in dish washer
    ____ c. weather-stripping doors and windows
    ____ d. using fluorescent bulbs

12. Which of the following is true? Saving energy . . .
    ____ a. means more energy for future use
    ____ b. will mean less air pollution
    ____ c. will result in conservation of the world's limited resources
    ____ d. all of the above

13. Which of the following uses the most energy in the average home?
    ____ a. refrigerator
    ____ b. television
    ____ c. stove
    ____ d. computer

14. What is the most energy efficient way to keep warm on a cold day?
    ____ a. turn up the heat
    ____ b. put on a sweater or other additional clothing
    ____ c. buy additional heaters
    ____ d. use the oven to provide additional heat

15. What is the most energy efficient way to keep your home cooler on hot days?
    ____ a. turn on a fan
    ____ b. turn on an air conditioner
    ____ c. open doors and windows
    ____ d. close windows, doors, shades, and curtains

16. Which one of the following statements is true?
    ____ a. people are sources of energy
    ____ b. using energy wisely, leaves more for the future
    ____ c. using less energy reduces pollution
    ____ d. all of the above

17. Which one of the following statements is true?

____ a. recycling saves energy
____ b. reusing things doesn't help the environment
____ c. collecting trash isn't a problem
____ d. energy isn't used to keep the environment clean

18. What temperature is recommended for a house on cold days?

____ a. 65 degrees
____ b. 85 degrees
____ c. 72 degrees
____ d. any temperature under 80 degrees

19. Which one of the following statements describe an energy-efficient person?

____ a. someone who recycles
____ b. someone who turns off appliances when not in use
____ c. someone who takes public transit and not the family car
____ d. all of the above

20. Which of the following is NOT true?

____ a. energy is limited
____ b. every individual is a source of energy
____ c. energy use does not affect natural resources
____ d. energy use affects the environment

Answer Key: 1 c, 2 d, 3 b, 4 a, 5 b, 6 c, 7 a, 8 b, 9 a, 10 c
11 b, 12 d, 13 a, 14 b, 15 d, 16 d, 17 a, 18 c, 19 d, 20 c

BILL BUSTER -- ENERGENIUS
POST TEST

INSTRUCTIONS: PLACE AN X BEFORE THE CORRECT ANSWER

1. Which of the following is a non-renewable source of energy?

____ a. fossil fuels

____ b. wood

____ c. solar power

____ d. wind power

(correlates with pre-test question 4)

2. An energy-efficient person can be described as?

____ a. someone who doesn't waste energy

____ b. someone who knows that energy is a limited resource

____ c. someone who recycles

____ d. all of the above

(correlates with pre-question 19)

3.. Which of the following is NOT an example of being energy efficient?

____ a. turning the computer off when its not in use

____ b. taking a short shower instead of a bath in a full tub

____ c. using the car to go to the corner store instead of walking

____ d. wearing a sweater instead of turning up the heat

(correlates with pre-test question 1)

4. Which of the following is NOT an alternative source of energy?

____ a. solar energy

____ b. wind power

____ c. gasoline

____ d. hydroelectric power

(correlates with pre-test question 5)

5. Which one of the following statements is true?
   - ____ a. people are sources of energy
   - ____ b. using energy wisely, leaves more for the future
   - ____ c. using less energy reduces pollution
   - ____ d. all of the above.

   (correlates with pre-test question 16)

6. Recycling is:
   - ____ a. reusing materials from trash
   - ____ b. energy that can be made again
   - ____ c. not a means of energy efficiency
   - ____ d. caused by nuclear fission

   (correlates with pre-test question 2)

7. Energy can be defined as:
   - ____ a. the amount of soap it takes to operate a washing machine
   - ____ b. the capacity for work or action
   - ____ c. a part of nature that is useful for people
   - ____ d. a measure of power

   (correlates with pre-test question 3)

8. The energy that comes from heat inside the earth is:
   - ____ a. solar power
   - ____ b. hydroelectric power
   - ____ c. geothermal power
   - ____ d. electricity

   (correlates with pre-question 6)

9. Which one of the following statements is true?
   - ____ a. energy is limited
   - ____ b. every individual is a source of energy
   - ____ c. energy use affects the environment
   - ____ d. all of the above

   (correlates with pre-test question 20)

10. A definition for kwh is:

____ a. the amount of kilowatt hours of electricity used over one hour

____ b. a measure of natural gas usage

____ c. a measure of speed

____ d. a measure of temperature

(correlates with pre-question 7)

11. What is the most energy-efficient way to keep clean?

____ a. taking a long hot shower

____ b. taking a hot bath in a full tub of water

____ c. taking a short hot shower of less than five minutes

____ d. taking a hot shower of ten minutes

(correlates with pre-question 11)

12. What is the most energy-efficient way to wash clothes?

____ a. using a hot water wash and cold water rinse

____ b. using a cold water wash and cold water rinse

____ c. using a hot water wash and hot water rinse

____ d. using a cold water wash and hot water rinse

(correlates with pre-question 8)

13. When cooking food on top of the stove, energy is saved when:

____ a. cooking slowly

____ b. covering the pot

____ c. using aluminum pots

____ d. all of the above

(correlates with pre-question 9)

14. If it is a hot day at home, what should people do first to keep cool?

____ a. turn on the air conditioner

____ b. turn on a fan

____ c. close windows, doors, shades, and curtains

____ d. open doors and windows

(correlates with pre-question 15)

15. Being energy-efficient means:

____ a. not wasting energy
____ b. recycling glass, paper, and metals
____ c. reusing own bags when shopping
____ d. all of the above

(correlates with pre-question 12)

16. The following appliance uses the most energy in the average home.

____ a. television
____ b. refrigerator
____ c. dish washer
____ d. video games

(correlates with pre-question 13)

17. What should people do at home first to keep warm if it is a cold day?

____ a. put on a sweater or additional clothing
____ b. turn on a portable heater
____ c. turn on the house's main heater
____ d. open windows and doors

(correlates with pre-question 14)

18. Which one of the following statements is true?

____ a. recycling saves energy
____ b. reusing things helps the environment
____ c. collecting and disposing of trash uses energy
____ d. all of the above

(correlates with pre-question 17)

19. On cold days, what is the recommended energy-efficient temperature?

____ a. 72 degrees
____ b. 85 degrees
____ c. 65 degrees
____ d. any temperature under 78 degrees

(correlates with pre-question 18)

20. Which of the following statements is true?

____ a. therms measure the quantity of natural gas used

____ b. one therm equals 100,000 Btu

____ c. natural gas is found in the earth

____ d. all of the above

(correlates with pre-question 10)

Answer Key: 1 a, 2 d, 3 c, 4 c, 5 d, 6 a, 7 b, 8 c, 9 d, 10 a,
11 c, 12 b, 13 b, 14 c, 15 d, 16 b, 17 a, 18 d, 19 a, 20 d

Appendix C. PG&E Report of Energenius Teacher Survey Results

2001 Energenius Educational Survey

Results through: October 31, 2001

prepared for:

Pam Murray

Customer Energy Management

prepared by:

Jennifer Murray

Customer Research & Measurement

October 2001

2001 Results: Energenius Educational Survey

(Year-to-date through October 31, 2001)

Total Responses *(Jan. - June)*	62
Total Responses *(July - August)*	44
Total Responses (YTD)	**106**

YTD Summary

- To date, a total of 106 Energenius responses have been reviewed and databased. A total of 507 Energenius surveys have been sent-out in 2001; response rate of 21%.

- The mean score ratings are on a 5-point scale of 5=Excellent; 4=Very Good; 3=Good; 2=Fair; 1=Poor

- The Energenius program, with a mean score of 3.85, is shown to be well received. The vast majority (90%) of respondents rate this program as "Excellent" or "Very Good".

- Respondents indicated that the Energenius program has been successful in providing (in order of satisfaction by mean score): quality Program materials (4.35), a helpful teacher's guide (4.23), holding students' attention (4.10) and easy implementation into curriculum (4.06).

- Respondents indicated that as a result of Energenius (in order of agreement): students know more about how to use energy wisely (100% agree), students exhibit more positive attitudes abut saving energy (99% agree), students can identify ways to reduce energy consumption in their homes (98% agree) and students have learned how to be safer around electricity and natural gas (96% agree).

- The largest proportion (26%) of respondents learned about the Energenius Program through PG&E's website. Another 23% learned about the Energenius Program through PG&E's Energenius catalog.

- More than one-third (35%) of respondents assigned 8 or more classroom hours to the program.

- The Habits (52%) and the Primary Safety (23%) Energenius programs were the most widely selected programs. The Intermediate Safety program was only selected by 2% of the respondents.

- The Video (73%) and the Posters (67%) are the most often used materials from the Energenius Program. "Star Times" was used by only 6% of respondents.

- Almost three-quarters (73%) of respondents indicated they are "Very Likely" to teach another PG&E-sponsored energy efficiency program.

- Over three-quarters (76%) of respondents indicated they are "Very Likely" to recommend the Energenius Program to other teachers.

2001 Results: Energenius Educational Survey

(Year-to-date through October 31, 2001)

1. Which Energenius Program did you teach?

	# of Responses	% of Responses
Habits (Primary)	54	51.9%
Measures (Intermediate)	10	9.6%
Primary Safety	24	23.1%
Intermediate Safety	2	1.9%
Bill Buster	14	13.5%
Total Responses	**104**	
No Answer	2	

Mean Score	**3.85**

2. Please rate the Energenius Program on:

(a) Holding Students' Attention

	# of Responses	% of Responses
Excellent *(5)*	39	37.1%
Very Good *(4)*	39	37.1%
Good *(3)*	26	24.8%
Fair *(2)*	0	0.0%
Poor *(1)*	1	1.0%
Total Responses	**105**	
No Answer	1	

Mean Score	**4.10**

(b) Ease of Incorporating into Curriculum:

	# of Responses	% of Responses
Excellent *(5)*	39	37.5%
Very Good *(4)*	37	35.6%
Good *(3)*	24	23.1%
Fair *(2)*	3	2.9%
Poor *(1)*	1	1.0%
Total Responses	**104**	
No Answer	2	

Mean Score	**4.06**

2001 Results: Energenius Educational Survey

(Year-to-date through October 31, 2001)

(b) Helpfulness of Teacher's Kit:

	# of Responses	% of Responses
Excellent *(5)*	44	42.3%
Very Good *(4)*	42	40.4%
Good *(3)*	17	16.3%
Fair *(2)*	0	0.0%
Poor *(1)*	1	1.0%
Total Responses	**104**	
No Answer	2	

Mean Score	**4.23**

(d) Overall quality of the Program materials:

	# of Responses	% of Responses
Excellent *(5)*	53	51.0%
Very Good *(4)*	36	34.6%
Good *(3)*	14	13.5%
Fair *(2)*	0	0.0%
Poor *(1)*	1	1.0%
Total Responses	**104**	
No Answer	2	

Mean Score	**4.35**

2. As a result of the Energenius Program :

(a) My students exhibit more positive attitudes about saving energy:

	# of Responses	**% of Responses**
Strongly Agree *(4)*	44	41.9%
Agree *(3)*	60	57.1%
Disagree *(2)*	1	1.0%
Strongly Disagree *(1)*	0	0.0%
Total Responses	**105**	
No Answer	1	

2001 Results: Energenius Educational Survey

(Year-to-date through October 31, 2001)

(b) My students know more about how to use energy more wisely:

	# of Responses	% of Responses
Strongly Agree *(4)*	59	56.2%
Agree *(3)*	46	43.8%
Disagree *(2)*	0	0.0%
Strongly Disagree *(1)*	0	0.0%
Total Responses	**105**	
No Answer	1	

(c) My students can identify ways to reduce energy consumption in their homes:

	# of Responses	% of Responses
Strongly Agree *(4)*	56	53.3%
Agree *(3)*	47	44.8%
Disagree *(2)*	2	1.9%
Strongly Disagree *(1)*	0	0.0%
Total Responses	**105**	
No Answer	1	

(c) My students have learned how to be safer around electricity and natural gas:

	# of	% of

	Responses	**Responses**
Strongly Agree *(4)*	51	50.0%
Agree *(3)*	47	46.1%
Disagree *(2)*	4	3.9%
Strongly Disagree *(1)*	0	0.0%
Total Responses	**102**	
No Answer	4	

2001 Results: Energenius Educational Survey

(Year-to-date through October 31, 2001)

4. Which materials did you use from the Energenius Program?

	# of Responses	% of Responses
Video	77	72.6%
Posters	71	67.0%
Stickers	68	64.2%
Calendar	61	57.5%
Energy Survey	38	35.8%
See & Check Survey	32	30.2%
Check List	30	28.3%
Puzzle	29	27.4%
Script Books	21	19.8%
Software	9	8.5%
Star Times	6	5.7%
Other	6	5.7%

5. Overall, how would you rate this Program?

	# of Responses	% of Responses
Excellent *(5)*	50	47.6%
Very Good *(4)*	44	41.9%
Good *(3)*	10	9.4%
Fair *(2)*	0	0.0%
Poor *(1)*	1	1.0%
Total Responses	**105**	
No Answer	1	

Mean Score	**4.35**

6. How many class hours were assigned to this Program?

	# of Responses	% of Responses
1 to 3	34	32.4%
4 to 7	34	32.4%
8 to 12	26	24.8%
Over 12	11	10.5%

Total Responses	**105**	
No Answer	1	

2001 Results: Energenius Educational Survey

(Year-to-date through October 31, 2001)

7. How likely are you teach another PG&E sponsored energy efficiency program?

	# of Responses	% of Responses
Very Likely *(5)*	77	73.3%
Somewhat Likely *(4)*	16	15.2%
Not Sure *(3)*	8	7.6%
Somewhat Unlikely *(2)*	2	1.9%
Very Unlikely *(1)*	2	1.9%
Total Responses	**105**	
No Answer	1	

8. How likely are you to recommend this Program to another teacher?

	# of Responses	% of Responses
Very Likely *(5)*	80	76.2%
Somewhat Likely *(4)*	14	13.3%
Not Sure *(3)*	5	4.8%
Somewhat Unlikely *(2)*	3	2.9%
Very Unlikely *(1)*	3	2.9%
Total Responses	**105**	
No Answer	1	

9. What grade(s) do you teach?

	# of Responses	% of Responses
1st Grade	29	27.4%
2nd Grade	34	32.1%
3rd Grade	25	23.6%
4th Grade	13	12.3%
5th Grade	18	17.0%
6th Grade	11	10.4%
7th Grade	12	11.3%
8th Grade	10	9.4%

2001 Results: Energenius Educational Survey

(Year-to-date through October 31, 2001)

10. Total number of students in your classes?

	# of Responses	% of Responses
Less than 20	25	23.6%
20 - 30	63	52.8%
31 – 50	4	3.7%
Over 50	14	13.2%

Total Responses	**106**	
No Answer	0	

Mean Score	**30.25 students**

11. How did you learn about the Energenius Program?

	# of Responses	% of Responses
Parents	3	2.8%
Educational Colleagues	18	17.0%
PG&E's Energenius Catalog	24	22.6%
PG&E's Website	27	25.5%
Professional Meetings	1	0.9%
Other	26	24.5%

2001 Results: Energenius Educational Survey

(Year-to-date through October 31, 2001)

12. What recommendations do you have to make the Energenius Program a more educational program?

A WIDER VARIETY OF ACTIVITIES WOULD BE HELPFUL
ADVERTISE MORE IN SCHOOLS, OFFER INCENTIVES TO CHILDREN WHO DOCUMENT ENERGY SAVINGS.
COULD YOU PLEASE ADD ADDITIONAL POSTERS? EXCELLENT PROGRAM
HANDS ON EXPERIMENTS WITH ELECTRICITY, MOTORS AND CAPACITORS.
I BELIEVE THERE WAS AN ERROR. I DID NOT RECEIVE THIS PROGRAM. I HAVE HAD STUDENTS VIEW AND EXPLORE THE WEB SITE, HOWEVER. GOOD INFO!!
I DID NOT RECEIVE ALL MATERIALS THAT I ORDERED, 1 BOX DID NOT ARRIVE.
I LOVE USING IT JUST AS IS, EASILY INTEGRATED INTO OUR CURR. I ORDER MAT FOR 4 TEACHER THESE MAT HAVE BECOME REG PART OF OUR PROG
I PASSED THE EXTRA MATERIALS ON TO A PRIMARY GRADE TEACHER. SHE LOVE THEM ALSO :)
I THINK IT IS VERY EFFECTIVE AS IT IS.
I THOUGHT IT WAS VERY WELL DONE!
IMPROVED VIDEO IT'S A LITTLE CORNY BUT THATS OK
INCLUDE COMPUTER GRAPHICS TO ALL STUDENTS TO CREATE POWER PT PRESENTATIONS. SAMPLE SPREADSHTS FOR STUDENTS TO MAINTAIN THEIR OWN DATA
IT MUST FIT STATE STANDARDS (I.E.) MATH, SCIENCE & LANG ARTS
IT WOULD BE GOOD IF A REPRESENTATIVE FROM PG&E COULD COME OUT TO SCHOOLS FOR LIVE PRESENTATIONS. GREAT PROGRAM!
I'VE USED THIS PROGRAM FOR 7+ YRS. I'M VERY PLEASED WITH IT SINCE CHILDREN ENJOY MUSIC & SONG PERHAPS ADDING A CD WITH RELATED SONGS.
JUST WANT TO SAY HOW HELPFULL EVERYONE AT PG&E WAS
KEEP OFFERING THE PROGRAMS
KEEP UP THE GOOD WORK
MORE INTERACTIVE ACTIVITIES THEY LOVE THE STICKERS!
NICE PROGRAM THE WAY IT IS STRUCTURED NOW
NONE ITS VERY WELL PUT TOGETHER!
PUPPET, KINSHTHETIC, HANDS ON MATERIAL
REVISE VIDEO STUDENTS FIND IT A LITTLE CHEESY
SINCE I TEACH YOUNG CHILDREN MORE PROJECTS & KINESTETIC ACTIVITIES
THE MATERIALS WERE OVERWHELMING & BULKY. I RECOMMEND YOU STREALINE YOUR MATERIALS. THEY IN THEMSELVES SEEMED WASTEFUL

THE SCRIPT PROGRAM DOESNT CREATE MUCH INTEREST TOO CONFUSING FOR INTERMIDIATE, I WOULD TRY A NEW METHOD

Appendix D. Schools Market Characterization

This appendix presents the full report that had been separately provided for PG&E in March, 2001.

Equipoise Consulting, Inc.

Energy Analysis

Project Management

Training

Final Market Characterization of the Schools Market Segment

Submitted by:

Equipoise Consulting Incorporated

in association with

Ridge & Associates

March 20, 2001

Equipoise Consulting Incorporated is committed to environmentally friendly practices in the workplace. We use recycled paper in all our proposals and reports. We print double sided and use electronic faxes when possible to decrease paper use. All our office paper is recycled. Our distributed office arrangement means that work between colleagues is performed by telecommuting, thereby minimizing environmental transportation impacts.

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1. INTRODUCTION

Pacific Gas and Electric Company (PG&E) is evaluating the 2000-2001 Energy Treasure Hunt Program (ETHP) and the Energenius Program (EP). -One component of this evaluation is a baseline market characterization of the schools market segment. This market characterization will involve a review of the literature and existing data and will address the following topics:

- Descriptive statistics the elementary and secondary schools in the PG&E service territory
    - Number of elementary and secondary schools
    - Number of students
    - Ethnicity of students
- Funding
    - Sources of school funding elementary and secondary schools
    - The existing efficiency programs for schools and in which schools in PG&E service territory have participated
- School management/decision making
    - How decisions are made regarding capital investments
    - Who is involved in making these decisions
    - The purchasing process in schools and how it varies by school
    - Who has ultimate decision-making authority regarding capital investments
    - The criteria for making capital investments
- The barriers to investing in energy efficient equipment

There are two existing general sources of data that were used to characterize the schools market segment:

3. data provided by the California Department of Education (CDE), and
4. literature regarding the implementation of energy efficiency programs in schools.

The existing literature was reviewed and integrated with the results of data from the California State Department of Education. The goal was to provide a comprehensive and internally consistent picture of the schools market segment that provides the context within which this evaluation will be conducted.

Each is briefly described below.

1.1.1 California Department of Education

The CDE contains information that will be used to describe the context within which the EP and the ETH are implemented. The CDE maintains demographic and financial information on each school district. This information will be used to determine whether the programs are reaching a representative sample of all schools.

1.1.2 Literature

Various sources of literature will be explored including the University of California on-line library, the California High Performance Schools Program, the Rand Corporation library, conference proceedings such as those published by the American Council for an Energy Efficient Economy (ACEEE) and International Energy Program Evaluation Conference, and the Internet.

2. DESCRIPTIVE STATISTICS

2.1 Enrollment in California Public and Private Schools

In 1999-2000, there were 1,054 public school districts in California with 5,951,612 students enrolled. Exhibit 2.1 presents the breakdown of the number of districts and enrollments by type of district.

Exhibit 2.1. California Public School Districts by Type, 1999-2000

Type	Number	Enrollment
Elementary	571	1,209,110
High School	93	547,952
Unified	323	4,123,509
Sub-Total	***987***	***5,880,571***
County Office	58	65,850
California Youth Authority	9	5,191
Total	**1,054**	**5,951,612**

In the period 1999-2000, there were 8,563 elementary and secondary public schools in California. Exhibit 2.2 presents the breakdown of the types of schools and their associated enrollments.

Exhibit 2.2. Types of Schools and Enrollment

Grade Level	Number	Enrollment
Elementary	5,311	3,128,262
Middle	1,134	1,040,827
Junior High	20	1 7,726
High School	908	1,538,497
Continuation	523	68,598
Alternative	227	61,221
Special Education	121	29,964
K-12	27	19,849
Community Day	199	7,069
Opportunity	12	1,262
Juvenile Court	56	30,366
County Community	11	2,780
California Youth Authority	14	5,191
Total	**8,563**	**5,951,612**

Although not the focus of this market characterization, some mention must be made of the private school sector.

Exhibit 2.3. California Private Schools and Enrollment

Type	Number	Enrollment
Church-Affiliated	2,045	441,847
Religious	676	68,127
Other	1,545	130,828
Total	**4,266**	**640,802**

Exhibit 2.4. California Private School Enrollment by Grade Level

Grade Level	**Enrollment**
Kindergarten	71,058
Elementary (1st through 8th)	428,314
High School (9th through 12th)	141,430
Total	**640,802**

Thus, in California, there are 12,829 elementary and secondary public and private schools with a total enrollment of 6,592,414.

2.2 Ethnic Background

The ethnic background of students enrolled in California public elementary and secondary schools is presented in Table 3.

Exhibit 2.5. Ethnic Background of California Elementary and Secondary School Students

Ethnicity	Number	Percent
American Indian	50,750	0.9%
Asian	479,073	8.0%
Pacific Islander	37,995	0.6%
Filipino	141,045	2.4%
Hispanic	2,513,453	42.2%
African American	509,637	8.6%
White	2,195,706	36.9%
Multiple/No Response	23,953	0.4%
Total	**5,951,612**	**100.0%**

2.3 Enrollment in Elementary and Secondary Schools in PG&E Service Territory

Based on a recent extract from PG&E's Customer Information System (CIS), there are an estimated 5,994 elementary and secondary (public and private) schools in PG&E's service territory. This represents 46.7 percent of the 12,829 schools in all of California. Assuming that the number of students in PG&E's service territory is proportional to the number of schools in PG&E's service territory, we estimate that there are 3,080,125 (46.7 % X 6,592,414) students in both public and private elementary and secondary school in the PG&E service territory.

2.4 Forecasted Enrollment in California Elementary and Secondary Schools

The California Department of Finance (CDF) estimates that the state will add over 300,000 new students in the five years from 1997-98 to 2001-02, bringing the total number of public K-12 students to nearly six million. Assuming a similar percent increase in private schools, would add an additional 32,300 private school students. Again assuming that the growth rate in PG&E's service territory will be in proportion to the number of students in its service territory, we expect an increase in public school enrollment of 140,100 (46.7% X 300,000) and an increase in private school enrollment of 15,084 (46.7% X 32,300).

2.5 School Personnel

To attempt to keep up with the demands of increased enrollments and reduced class sizes, the number of certified teachers has grown three percent from 1998-1999 school year to the 1999-2000 school year. Exhibit 2.6 presents the number of administrators, certified teachers and others in these two school years.

Exhibit 2.6. California Full-Time-Equivalent Public School Personnel

	1999-2000		1998-1999	
Full Time Staff	**FTE**	**Pupils Per FTE**	**FTE**	**Pupils Per FTE**
Administrators	21,653	275	20,618	284
Pupil Services[1]	19,887	299	17,357	337
Certified Teachers	284,628	21	276,313	21
Classified[2]	271,721	22	258,688	23

[1] Counselors, librarians etc.

[2] Instructional aides, bus drivers, custodians, secretaries.

The salaries and benefits of these FTEs typically are 80-85 percent of a district's expenditures.

2.6 The Facilities Overload

Californians spent over $20 billion on school facilities from 1986 to 1996. But as large as that investment might sound, it has been inadequate to meet a tremendous statewide need. The need arises from three sources. One is the growth in California's student population, described above. Many California School districts are struggling to catch up with the housing needs caused by this enrollment growth. Most recently, high schools have felt increasing pressure as the students who flooded elementary schools in the late 1980s enter the secondary systems. The two other reasons are the effect of reduced class sizes and the number of school buildings in need of repair, renovation, and modernization.

2.6.1 Class Size Reduction

California's class size reduction program (CSR) has also had a profound effect on school facilities. In the first years of CSR implementation - 1996-97 and 1997-98 – California's elementary schools added about 28,000 new K-3 classroom spaces through a variety of strategies, including a heavy reliance on portable classrooms. They reduced class sizes to not more than 20 students for an estimated 85 percent of the state's kindergarten through third grade students. If schools throughout the state had reached full implementation in 1997-98, it could have required from 2,000 to 4,000 more classroom spaces.

2.6.2 School Maintenance and Modernization

The California Department of Education (CDE) reports that 55 percent of California's public school buildings are over 30 years old. Due simply to their age, many schools are in need of basic repairs and routine maintenance.

In a national survey completed in 1995 by the U.S. General Accounting Office, California ranked among the worst states in most of the building features below. Seven out of 10 school districts reported at least one inadequate building feature and four out of ten reported at least one inadequate building. The state's schools ranked a little better on some environmental factors, most notably ventilation, indoor air quality, and air conditioning.

Exhibit 2.7. Percent of California Schools Reporting "Inadequate" Building Features in 1994-95

Building Features	California Respondents	National Survey
Roofs	0.41	0.27
Framing, floors, foundations	0.28	0.18
Exterior walls, finishes, windows, doors	0.42	0.27
Interior finishes	0.47	0.24
Plumping	0.41	0.3
Heating, ventilation, air conditioning	0.41	0.36
Electrical power	0.32	0.26
Electrical lighting	0.43	0.25
Lifesafety codes (such as fire and earthquake)	0.21	0.19

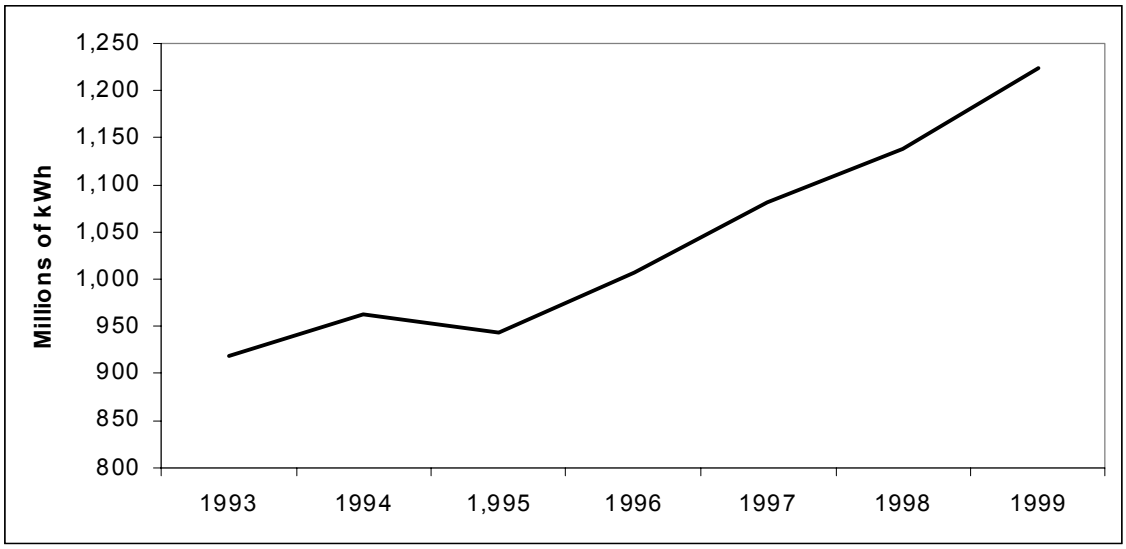
Exhibit 2.8. Percent of California Schools Reporting "Unsatisfactory" Environmental Factors in 1994-95

Environmental Factors	California Respondents	National Survey
Lighting	0.31	0.16
Heating	0.25	0.19
Ventilation	0.29	0.27
Indoor Air Quality	0.22	0.19
Acoustics	0.34	0.28
Space Flexibility	0.70	0.54
Energy Efficiency	0.60	0.41
Physical Security	0.41	0.24
Schools With Air Conditioned Classrooms	0.67	0.51

2.7 Energy Consumption

Of the total state budget for California elementary and secondary schools, approximately 2 to 3 percent is spent on energy (Rand, 1996). From 1993 through 1999, consumption in elementary and secondary schools in PG&E's service territory has grown from 1.9 percent to 2.3 percent of total nonresidential energy consumption. The compound annual growth rate (CAGR) for schools is nearly five percent, nearly five times the CAGR of the entire nonresidential sector. Exhibit 2.9 presents the kWh consumption for elementary and secondary schools in PG&E's service territory from 1993 through 1999. There are currently increasing kWh prices in San Diego Gas & Electric service territory. The other investor owned utilities are expected to face increased electricity prices in the near future. Natural gas prices are also rising throughout the state.

Exhibit 2.9. Energy Consumption by Public and Private Elementary and Secondary Schools in the PG&E Service Territory



3. FUNDING

The revenue for California schools is constrained because of the voter-approved initiative, Proposition 13, that limited the collection of property taxes and because of a 20-year-old law that specifies how much money each district may receive for general purposes (its revenue limit). Almost all of school districts' income is controlled by the Governor and Legislature. Another voter-approved initiative, Proposition 98, somewhat offsets these limits by guaranteeing a minimum amount of revenue for K-12 education. However, in November 1998, voters approved Proposition 1A, which authorizes $9.2 billion in bonds, with $6.7 billion earmarked for K-12 schools and the remainder for higher education. The money will be used for new construction ($2.9 billion), class size reduction ($0.7 billion), and other needs ($1 billion) over the next four years. However, the CDE has estimated that approximately $20 billion is needed between 1997 and 2002 to address the facilities crisis in California. Of this $20 billion, approximately$15 billion is needed for facility improvements with the remainder going to new construction.

In 2000-2001, the total projected revenue for schools in California is $49.2 billion. This reflects a one-year increase in state funding of $4.5 billion that will become part of the base revenues in future years. About 84 percent of the total – or about $41.3 billion including state funds and local property taxes – is controlled by the State's governor and Legislature

The breakdown of revenues for public school districts is provided in Exhibit 3.1.

Exhibit 3.1. Breakdown of Revenue Sources for Public Schools

Source	Percent
State Aid	38.9%
Local Property Taxes and Fees	27.5%
Federal Revenue	5.4%
Other State Revenue	21.3%
Lottery	2.2%
Other Local Revenues	4.7%
	100.0%

In addition to these sources of funds, there is a wide variety of federal, state, and utility sponsored energy conservation programs can also make a significant contribution in the construction and renovation of schools. These programs are discussed in the following section.

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4. CURRENT ENERGY EFFICIENCY PROGRAMS AND RESOURCES

In the PG&E service territory there are a number of resources and programs that are available to schools. Each is briefly described below.

4.1 Bright Schools Program

This California Energy Commission Program offers specific services to help schools become more energy wise, such as identifying cost-effective energy-efficient systems to meet their needs and providing design and implementation assistance – at little or no cost to them. This Program has two components: 1) new schools construction, and 2) school modernization, deferred maintenance and energy audits.

4.1.1 New School Construction

Schools built with energy-efficient designs will cost less to operate, offering continuous savings and leaving more money for education. Many new schools incorporate equipment and building measures that barely meet recommended energy-efficiency standards. However, many of these designs could be improved with little or no additional expense. Bright Schools provides technical assistance early in the design phase, before the plans are solidified. The savings accumulate from the first day of operation. For new school construction, Bright Schools can:

1. provide design consultation,
2. identify cost-effective energy-saving measures,
3. compare different technologies,
4. develop specifications for energy-efficient equipment,
5. help select architects and other design professionals with school construction and energy-efficiency expertise,
6. review construction plans, and
7. complete value engineering of specific energy-efficiency measures.

4.1.2 School Modernization, Deferred Maintenance and Energy Audits

Bright Schools can help you get the most from your modernization and maintenance investments. With an evaluation of your five-year deferred maintenance plans or an energy audit of you facilities, you could identify energy-related projects that should be implemented immediately as part of a comprehensive Bright Schools energy package. Schools planning major renovations can benefit from our technical assistance. The program can also help you get loans to obtain the matching funds required by some State programs. For school modernization and deferred maintenance efforts, Bright Schools can:

1. conduct energy audits and feasibility studies,
2. review existing proposals and designs,

3. provide equipment bid specifications,
4. assist with contractor selection, and
5. assist with installations.

4.2 Energy Quest

This is the California Energy Commission's web site for kids. This website includes art contests, science projects, literature, puzzles, history, and game shows with a focus on energy, all presented at several levels of difficulty. For example, users can click on Poor Richard's "Energy" Almanac and learn about Benjamin Franklin's experiments with electricity, how energy was used in 1740 and how energy use evolved to the present day, and some of Ben Franklin's energy saving devices.

4.3 PG&E's Energenius Program

The Energenius Program provides gas and electric energy conservation and safety, water conservation, and recycling education to school children in grades 1 through 8. More specifically, the EP:

- provides basic education to students that help shape their energy use behavior and practices as adults in home and work environments, and
- teaches students how to conserve energy in their homes and increases their parents' awareness about energy.

Participation over the years has continued to increase. Since 1991, PG&E has been providing these free energy efficiency and safety materials to all schools within their service territory. In 2000, PG&E provided education materials to over 27,000 students. School districts and teachers request these materials over the Internet or by telephone. Of all the DSM programs, the Energenius Program reaches the greatest number of schools.

The materials consist of five basic lessons:

1. Bill Buster Program (grades 6-8)
2. Primary Energenius Program (grades 1-3)
3. Energenius Primary Safety Program (grades 1-3)
4. Intermediate Energenius Program (grades 4-5)
5. Energenius Intermediate Safety Program (grades 4-5)

4.4 PG&E's Energy Treasure Hunt Program

PG&E is facilitating the implementation of DOE's Rebuild America through a Program that PG&E has named the Energy Treasure Hunt Program. The ETHP provides a great opportunity to create a "new generation of energy efficient schools" given the need for major facility upgrades, rising energy costs, and the resources available at this time to help schools districts become more energy efficient. Despite this immense opportunity, schools still experience barriers that can prevent them from taking advantage of the resources being made available, and realizing this timely opportunity.

Schools rarely have the in-house energy efficiency expertise, or the staff resources to evaluate the opportunities and take the necessary steps to utilize, coordinate and manage the myriad of resources through the entire process of upgrading facilities to make them more energy efficient. Even when a school district is fortunate enough to have a project champion, they often do not have the staff resources to manage process, because they are overwhelmed with other high priority tasks.

Rebuild America is a DOE program focused on energy efficiency upgrades in commercial buildings. Rebuild America's EnergySmart Schools campaign has three more specific objectives:

1. to raise awareness about energy in K-12 schools,
2. to help schools address their facility needs, and
3. to facilitate student energy education.

A resource that Rebuild America brings to the ETHP is that of private industry - its "Business Partners." Philips Lighting Company is a Rebuild America Business Partner that is providing seed monies, web site design, prizes, and actual materials to the initiative. PG&E, another business partner, will sponsor, promote, coordinate, and tailor most of the activities of the ETHP in its service territory. Other ETHP Business Partners include Trane, Sarnafil Reflective Roofing, My-Lite Daylighting, and Sempra Energy Services.

Currently, there are two school districts participating in the pilot ETHP. Within each district, four schools are participating.

4.5 PG&E's Nonresidential Standard Performance Contracting (NSPC) and Large Nonresidential Standard Performance Contracting (LNSPC) Programs

Under the 1998 NSPC[11] Program and the 1999 LNSPC Program, the program administrators offered fixed price incentives to Energy Efficiency Service Providers (EESPs)[12] for measured kWh energy savings achieved by the installation of energy efficiency measures. The fixed price per kWh, performance measurement protocols, payment terms, and all other operating rules of the programs were specified in a standard contract. The role of the program administrator was to manage the programs in a fair and nondiscriminatory manner, promote

[11] In 1998, the Program's first year, it was called the "Nonresidential Standard Performance Contract Program." In 1999, the Program was separated into two separate programs based on customer size. The 1999 LNSPC was designed to serve end users with peak demand of 500 kW or more, while the 1999 Small Business SPC Program was designed to serve customers of less than 500 kW peak demand. In this report, we focus on the 1999 LNSPC and its predecessor the 1998 NSPC. For an evaluation of the Small Business SPC Program refer to XENERGY, Inc., *1999 State-Level Small/Medium Nonresidential MA&E Study, Final* Report, December 2000.

[12] In the context of the program, an EESP can be any company, organization or individual that contracts with the administrator to receive payment for measured energy savings resulting from an energy efficiency project. In the 1998 NSPC Program, a customer could act as an EESP by contracting directly with their utility and installing and measuring savings from an energy efficiency project at their own facility. Within the context of this paper, however, we refer separately to self-sponsoring customers and EESPs. Our references to EESPs in the remainder of this report refer to third-party firms, not customers.

the programs, educate customers and EESPs on the programs, and enter into contracts with applicants to pay for measured energy savings.

The programs were both "pay-for-performance" programs. With traditional utility rebate programs, the utility pays an incentive directly to its customer based on an estimate of annual savings from a project. However, under these pay-for-performance SPC programs, the utility program administrator pays a variable incentive amount to a third-party EESP, or to a customer acting without a third-party EESP, based on measured energy savings.

It is important to note that a review of the 1998 and 1998 NSPC and LNSPC Program databases revealed that of the 82 PG&E customers *only three* (3.7 percent) were elementary or secondary schools.

4.6 PG&E's Small Standard Performance Contracting Program (SBSPC)

The SBSPC is also a statewide program. Under the 1999 Program, third-party project sponsors (including contractors) were paid for measured, verified savings, based on a fixed schedule for verified savings amounts. End users could not self-sponsor projects. A standard contract between the program administrator (utilities) and third-party sponsors specified incentives, performance measurement and verification (M&V) options and protocols, payment terms, and other operating rules. Measures had to have a useful life of at least 3 years, and save 20,000 to 200,000 kWh/year (or 2,000-20,000 therms/year). Third-party participants submitted applications that might or might not be accepted, depending on adherence to program requirements, including detailed justification for expected savings.

A review of the 1999 SBSPC Program revealed that participation by elementary and secondary schools was very low (one participating school), despite an application process that was far simpler.

4.7 PG&E's Express Efficiency Program

The 1999 Express Efficiency Program was a statewide rebate program targeted to adoption of high-efficiency measures by businesses with electricity demands <500 kW. The Program has been available to PG&E's nonresidential customers in one form or another for almost 10 years (although prior to 1998, there was no customer size requirement). Each of the other utilities has had nonresidential rebate programs in some form or another for most of the past 10 years as well. Annual rebate expenditures peaked in the mid-1990s and are currently dramatically lower than what they were during this peak period.

The statewide 1999 Express Efficiency Program was similar to PG&E's former Retrofit Express Program except that it was designed to encourage market transformation and includes two upstream components (HVAC and motors). Under the 1999 Express Efficiency Program small/medium businesses could receive rebates for a number of high-efficiency HVAC, lighting, refrigeration, and other measures. Rebates were paid to customers generally within one month of completed installation paperwork. Payment was subject to utility verification of appropriate installation, at the utility's discretion.

A review of the 1999 Express Efficiency Program revealed that participation was much higher than in the NSPC, LNSPC, and the SBSPC Programs. This was primarily due to the fact that participation involves the least amount of hassle. While the participation rate was

higher, the absolute number of participants was only 89, which is 1.5 percent of PG&E's 5,994 elementary and secondary schools (both public and private).

4.8 Savings By Design

Savings by Design is a program to encourage high performance non-residential building design and construction. Sponsored by four of California's largest utilities under the auspices of the Public Utilities Commission, Savings By Design offers building owners and their design teams a wide range of services such as:

- Design Assistance provides information and analysis tailored to the needs of their project to help design more efficient buildings.
- Owner Incentives help offset the costs of energy efficient buildings.
- Design Team Incentives to reward designers who meet ambitious energy efficiency targets

Savings By Design seeks to improve the comfort, efficiency, and performance of buildings by creating a team approach to design. Between the owner, design team, and utility representatives, every member of the team has a role to play, and the program offers benefits for each.

4.9 The California High Performance Schools Program (CHPS)

The CHPS seeks to create a new and improved generation of energy-efficient, high performance educational environments. It plans to achieve this goal through the development and promotion of tools, processes and interventions to deliver sustainable energy efficiency in California K-12 schools. More specifically, CHPS will accomplish this objective by:

1. communicating the value of high performance schools through public and professional outreach and educational efforts, and linking that value proposition with specific solutions and resources available through the stakeholders,
2. providing technical assistance, tools, and training to influence the design, specification, construction and operation of energy efficient schools,
3. coordinating the availability of various financial option for design teams and schools,
4. demonstrating the performance benefits of high performance schools through pilot new construction and modernization projects, and
5. collaborating with school facilities planning and approval agencies to institutionalize high performance design methods.

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5. SCHOOL MANAGEMENT/DECISION MAKING

Restrictions present in California Education Code, categorical aid funding restrictions, and previous empirical work, suggest that districts will allocate similar shares of their dollars on particular spending categories. The education code, categorical aid programs, and collective bargaining agreements all lead to high minimum expenditures on classroom personnel and materials. The share of dollars devoted to expenditures on classroom personnel and materials is likely to be similar across districts even though the per pupil spending may vary due to discretionary resources. On other categories of expenditure, which have a smaller base minimum level of expenditures required or where there are less restrictions governing the spending, districts may show greater flexibility in their design decisions. For example, districts are likely to show more variation in the share and level of total expenditures they devote to maintaining school facilities, which have lower minimum spending restrictions and are more discretionary in nature.

This greater discretion with respect to facility-related expenditures suggests that it is possible to get schools to at least consider adopting energy efficient equipment and building designs. That is, they do have some discretion to assume the higher first costs, if the payback is reasonably short.

5.1 Decision-Making in the Schools Market

The focus in this section is on decision making in schools in general and decision making regarding capital expenditures in particular. While the local government's role in controlling education funding decisions has diminished, it is still at the local level that the allocation of resources for education ultimately takes place. The local school district remains the basic administrative unit of schooling. And, despite increased federal and state regulations that have developed throughout the years, practical realities of daily government and the belief in local control of education have kept education a fundamentally local enterprise. Placing restrictions on use is always a matter of degree, and what really matters is how the restrictions affect behavior at the local level.

At the local level, who are the key decision-makers typically involved in planning educational facilities? Castaldi (1994) mentions five key stakeholders:

1. the *school board* holds the ultimate decision making power for all school sites in a district,
2. the *chief administrator at the school* (the principal) has ultimate decision-making power at a specific school,
3. the *facility planner/operations manager* at the school typically oversee the entire planning and design process and act as liaisons to the school board and superintendents,
4. the *educational consultant* is responsible for assisting the architect in converting educational concepts into school facilities, and
5. the *architect/engineer* has the primary responsibility for translating educational concepts and functions into educational facilities that are conducive to learning.

The extent to which these stakeholders can overcome the market barriers they face will determine whether opportunities to invest in energy efficiency will be taken. The most significant market barriers facing these stakeholders are discussed in the next section.

6. BARRIERS TO INVESTING IN ENERGY EFFICIENT EQUIPMENT

One key element in any market characterization is the identification of probable market barriers that might impede the adoption of the efficiency products. For reference purposes, the generic barriers defined in the *Scoping Study*[13] are described in Exhibit 6.1. Then the conclusions of the CHPS Advisory Committee regarding the most significant market barriers facing the schools sector are presented. These market barriers are couched in terms of those defined in Exhibit 6.1.

Exhibit 6.1. Market Barrier Descriptions

Barrier	Description
Information or Search Costs	The costs of identifying energy-efficient products or services or of learning about energy-efficient practices, including the value of time spent finding out about or locating a product or service or hiring someone else to do so.
Performance Uncertainties	The difficulties consumers face in evaluating claims about future benefits. Closely related to high search costs, in that acquiring the information needed to evaluate claims regarding future performance is rarely costless.
Asymmetric Information and Opportunism	The tendency of sellers of energy-efficient products or services to have more or better information about their offerings than do consumers, which, combined with potential incentives to mislead, can lead to sub-optimal purchasing behavior.
Hassle or Transaction Costs	The indirect costs of acquiring energy efficiency, including the time, materials and labor involved in obtaining or contracting for an energy-efficient product or service. (Distinct from search costs in that it refers to what happens once a product has been located.)
Hidden Costs	Unexpected costs associated with reliance on or operation of energy-efficient products or services - for example, extra operating and maintenance costs.
Access to Financing	The difficulties associated with the lending industry's historic inability to account for the unique features of loans for energy savings products (i.e., that future reductions in utility bills increase the borrower's ability to repay a loan) in underwriting procedures.
Bounded Rationality	The behavior of an individual during the decision-making process that either seems to be or actually is inconsistent with the individual's goals.
Organization Practices or Customs	Organizational behavior or systems of practice that discourage or inhibit cost-effective energy-efficiency decisions - for example, procurement rules that make it difficult to act on energy-efficiency decisions based on economic merit.
Misplaced or Split Incentives	Cases in which the incentives of an agent charged with purchasing energy efficiency are not aligned with those of the persons who would benefit from the purchase.

[13] Eto, Joseph, Ralph Prahl, and Jeff Schlegel. 1996. *A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs*, Earnest Orlando Lawrence Berkeley National Laboratory, LBNL-39058 UC-1322, prepared for The California Demand-Side Measurement Advisory Committee, Berkeley, CA.

Table 6-1 (continued)
Market Barrier Descriptions

Barrier	Description
Product or Service Unavailability	The failure of manufacturers, distributors or vendors to make a product or service available in a given area or market. May result from collusion, bounded rationality, or supply constraints.
Externalities	Costs that are associated with transactions, but which are not reflected in the price paid in the transaction.
Non-Externality Pricing	Factors other than externalities that move prices away from marginal cost. An example arises when utility commodity prices are set using ratemaking practices based on average costs (rather than marginal).
Inseparability of Product Features	The difficulties consumers sometimes face in acquiring desirable energy-efficiency features in products without also acquiring (and paying for) additional undesired features that increase the total cost of the product beyond what the consumer is willing to pay.
Irreversibility	The difficulty of reversing a purchase decision in light of new information that may become available, which may deter the initial purchase - for example, if energy prices decline, one cannot resell insulation that has been blown into a wall.

Source: Eto, et al., 1996.

6.1 Information and Search Costs

The information and search cost market barrier is primarily due to a lack of awareness of the value of energy efficiency. This lack of awareness is tied to the low interest in energy efficiency in this sector arising from the fact that energy costs in a given school are such a low percentage (2 percent) of overall operating costs.

In the schools market, schools often do not have the technical expertise to conduct energy audits or conduct the engineering modeling needed to estimate savings. They also do not have information about high performance schools benefits, cost effectiveness, and process information. As a result, districts do not know what to ask for when shopping for new equipment or architectural designs.

In addition, those who design schools (architects and engineers) often lack the information and training to design high performance schools.

6.2 Performance Uncertainty

In the schools, there is little enthusiasm for adopting the more efficient technologies, since they are uncertain about their performance. Put another way, there is a fear of being first to market.

6.3 Organizational Practices

In the schools market, they have little practice in incorporating efficient technologies in educational or building specifications, since they have traditionally opted only for standard equipment and designs. Decision-makers have usually focused on the first costs rather than consider the stream of future benefits in the form of reduced energy bills. In addition, the current budgetary process does not allow sufficient time to examine all the energy efficient

equipment and design options, making the use of standard equipment and building designs, and convenient rules-of-thumb the norm.

6.4 High First Costs

While not technically a market barrier, declines in school funding over the last 20 years have left little or no room in school budgets for incorporating high performance measures. While the effects of Proposition 1A may help, much more money is needed before schools will seriously consider the more energy efficient options.

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7. CONCLUSIONS

There are a variety of conclusions that can be made regarding the schools market segment.

- There is a drastic need for additional classroom owing to increased enrollments and reduced class sizes. Failure to take advantage of energy efficient options represents a significant missed opportunity.
- Because of reduced school funding over the last 20 years, there is a drastic need for major repairs and renovation of existing buildings. This is the case despite the passage of Proposition 1A. Failure to take advantage of energy efficient options represents a significant missed opportunity.
- Energy consumption in PG&E's schools market is increasing much faster than the nonresidential population in general.
- A wide variety of energy conservation programs can have a significant financial impact on school facilities. However, the number of elementary and secondary schools participating in many of PG&E-sponsored energy conservation programs has been limited. It may be that the complexity of school funding and a decision-making process that involves numerous stakeholders operating in a politically-charged environment is simply too labor-intensive to gain the attention of energy efficiency service providers.
- The market barriers facing schools include information-search costs, performance uncertainty, organizational practices, and high first costs. Organizational practices and high first cost may be the greatest barriers.

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8. REFERENCES

Castaldi, Basil. Educational Facilities: Planning, Modernization, and Management. Boston, MA: Allyn and Bacon, 1994.

Eley Associates. Collaborative for High Performance Schools (CHPS) Comprehensive Plan. Prepared for the CHPS Advisory Committee, 2001.

Eto, Joe, Ralph Prahl, and Jeff Schlegel. "A Scoping Study on Energy efficient Market Transformation by California Utility DSM Programs." July 1996.

Hanson, E. Mark. Educational Administration and Organizational Behavior. Needham Heights, MA: Allyn and Bacon, 1996.

Krop, Cathy S. The Finances of Education Governance Reforms in California. The RAND Graduate School, 1996.

Krop, Cathy S., Stephen J. Carroll, and Randy Ross. Tracking K-12 Education Spending in California. The RAND Institute on Education and Training, 1995.

The California Energy Commission. The California Energy Plan: Critical Changes: California's Energy Future. Sacramento, CA, 1997.