

# Reaching Future Customers through K-12 Energy Education and Outreach Programs

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## ABSTRACT

School outreach programs are a conduit for connecting with students, their families, and the community, delivering practical information and engaging experiences that can have a positive impact on customer relations well into the future. Educational programs in schools can also help open the way for school district participation in energy efficiency retrofit programs.

This paper explores a variety of outreach initiatives that utilities and state energy programs are using to build relations with schools and support energy education, while at the same time raising awareness of energy efficiency. Several types of initiatives are reviewed, including curriculum, assemblies, contests, fundraisers, solar demonstrations, and school audits by students. Based on interviews with program implementers and teachers, recommendations for school outreach implementation include aligning curriculum with academic standards, provide complete lesson plans for easy implementation in the classroom, and recruit student, teacher, and administrative leaders at schools to champion your efforts.

## Introduction

Students in classrooms today will be making decisions about their energy consumption in the future, and energy education now can lead them to adopt energy-conscious lifestyles as adults. Many energy utilities and energy efficiency organizations operate outreach programs targeting kindergarten through 12th grade (K-12) students. E Source, a membership-based retail energy research firm, is frequently asked to provide examples of K-12 outreach programs and recommendations for implementation. To address these questions, E Source contacted several organizations operating such programs to collect information on their goals, implementation approaches, and metrics for measuring success. Through hours of interviews and examination of program materials, we explored many examples of school outreach programs and obstacles encountered in implementation, and compiled recommendations for others considering such initiatives (Farnsworth 2007).

This paper highlights a sampling of options for K-12 energy education outreach programs. The program types covered in this paper and the organizations we contacted include:<sup>1</sup>

- Curriculum (Pacific Gas & Electric, We Energies, Energy Outreach Colorado, Alliance to Save Energy)
- Assemblies (Florida Power & Light, New Jersey Natural Gas, We Energies)
- Contests (Roseville Electric, FirstEnergy, Xcel Energy, Snohomish County PUD)
- Compact fluorescent lamp (CFL) and LED fundraisers (Midwest Energy Efficiency Alliance, Pacific Gas & Electric)
- Solar energy technology demonstrations (Roseville Electric, Pacific Gas & Electric, TXU Energy)

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<sup>1</sup> The organizations cited may operate additional energy education outreach initiatives than those described in this paper.

- Lending props (We Energies, Snohomish County PUD, City of Palo Alto Utilities)
- Grant Awards (Sacramento Municipal Utilities District, FirstEnergy)
- School audits by students (British Columbia Hydro & Power Authority, Alliance to Save Energy)
- Home audits by students (Energy Outreach Colorado)

The goals of these initiatives are almost as varied as the forms that they can take. Typically, the objective is to simply spread awareness of energy efficiency and improve energy literacy among students. Another goal we encountered is to build stronger relations with schools to boost participation in energy efficiency retrofit or new construction programs. Sometimes educational and relationship-strengthening goals are backed up with an interest in generating community-wide goodwill and brand recognition for the implementing organization. And finally, the intent of a handful of school programs is to extract energy savings through behavior changes in the classroom or student's homes.

## **Defining Success**

School outreach initiatives promoting energy literacy and energy efficiency typically do not track results beyond the number of participating schools or students. This is primarily due to the fact that regulatory agencies normally do not require additional tracking or evaluation for educational programs. Some programs measure the cost-per-student reached through the initiative.

The next level of assessment beyond a tally of participants is to conduct a survey of teachers, students, and even parents to request feedback or measure satisfaction with the program. Student surveys can include content questions to measure retention of information presented in the program. Ethnographic research can help to further clarify student, teacher, or parent impressions of the program and whether they have acted on the material presented.

Although the underlying intent may be to encourage energy conserving behaviors, there are many uncertainties and measurement challenges along the chain of events beginning with a student's exposure to a conservation message and ending with the desired change in behavior and reduction in energy consumption. Programs featuring an energy audit component or that involve distribution of energy saving equipment may provide an opportunity to estimate energy savings. However, even audit-based initiatives that produce specific energy-saving recommendations face challenges in tracking not only avoided energy consumption but also whether measures are implemented. It is possible to simply record the number of audits completed, but even that is not directly associated with a specific level of energy savings.

Due to the variety of success metrics, goals, and program features, we did not attempt to compare effectiveness of one type of school outreach program against another.

## **Achieving Program Goals**

Through interviews with program managers at energy utilities, energy efficiency organizations, teachers, and vendors of educational outreach materials, equipment, and programs, we compiled many recommendations and best practices for implementing various K-12 initiatives. The following recommendations are relevant to the outreach programs described below.

## **Align Curriculum with Academic and Testing Standards**

Several program implementers reported that it is challenging to get the attention of teachers when they propose to introduce new material on energy conservation into classroom instruction. According to interviewees, teachers face many competing demands and do not have time to add topics or material to their lesson plans, especially if the material does not support academic requirements or standardized tests. Because teacher performance assessment in many locations depends heavily on student standardized test scores, test-related curriculum requirements tend to dominate classroom time.<sup>2</sup> Therefore, it is important to design classroom materials that match up with national or state academic standards—otherwise many teachers simply will not use the lessons in their classrooms.

## **Simplify Lesson Planning and Delivery**

When providing curriculum to schools on energy efficiency and conservation topics, the materials should be designed for easy implementation. If the teacher must develop supporting materials or create a lesson plan in order to introduce the curriculum in the classroom, it is less likely to be utilized. One teacher interviewed for this research commented on a home energy audit curriculum that lacked sufficient tools to follow through with the lesson plans and investigative projects. Providing a CD-ROM with spreadsheets and clearly segmenting the work into shorter, discrete lesson plans would have enabled her to introduce the material to 130 students in her regular science classes instead of 6 students in an after-school club.

## **Find a Champion**

One element of program design that is useful across a spectrum of school outreach initiatives is to identify motivated individuals within the target group who are strongly interested in energy. For example, BC Hydro Youth Program Director Mary Ferguson says the utility has learned to start by forming a group of core students to lead energy efficiency campaigns and audit efforts at each school. The Smart Energy Living Alliance (SELA), a non-profit organization in Colorado, uses this approach in their Home Energy Investigation Contest curriculum, which requires one teacher to act as the primary point of contact in a school or district. Teachers that participate in TXU Energy's Solar Academy teacher training workshops are asked to share what they learn with other educators in their school district.

## **Use Online Tools**

Whether it is to reserve a time for an on-site presentation or to order classroom materials, online tools can enable a small program staff to coordinate outreach with dozens of schools and hundreds teachers. We Energies created an online portal for teachers to request classroom materials and schedule presentations. With this online resource, the utility has been able to maintain and even grow its Education Outreach Program with just one full-time employee (Connally 2006). Florida Power & Light created Internet microsites for their popular school assembly programs, [Captain Conservation](#) and [Professor Why's Powerful Adventure](#). School administrators or teachers can refer to those Web sites for logistical details or to schedule a performance. Interactive instructional tools can be delivered online. For example, many utilities sponsor

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<sup>2</sup> This theory has not necessarily been proven quantitatively, but it is frequently cited anecdotally. Some studies have attempted to determine changes in the allocation of classroom lesson time toward specific topics and in response to standards or testing requirements, although the issue has not been decisively resolved (Mitchell 2006).

subscriptions to online photovoltaic (PV) system performance monitoring software for schools that participate in their PV demonstration programs.

### **Take Your Message Beyond the Classroom**

Developing community awareness and participation in a school outreach initiative can foster opportunities to leverage support for maintaining, growing, and deepening the effort. Contests, grants, solar technology demonstrations, and audit training programs can all benefit by extending the effort beyond the school and into the broader community.

### **Well-Timed and Personalized Communications Support Program Diffusion**

Unfortunately, it is not simply a matter of “if you build it, they will come.” It is important to understand a school district’s curriculum planning, budget, and academic cycles to determine the best time to propose a new initiative. Utilities can effectively utilize the connections and relationships they already have with school district staff to build program support.

### **Examples of K-12 Programs**

A number of local and national nonprofits, as well as commercial vendors, develop turnkey K-12 outreach and educational programs. When utilities and efficiency organizations sponsor these programs, they bring valuable funding and distribution channels, and they inspire confidence as energy experts. Yet even when a utility adopts a prepared program or curriculum, implementation involves recruiting, training, dissemination of materials, and other administrative and management tasks. The program managers that we interviewed offered many recommendations for simplifying the process, increasing program uptake, and overcoming or avoiding obstacles to implementation.

### **Curriculum**

Many states collaborate with the [National Energy Education Development Project \(NEED\)](#), which develops educational materials and teacher training programs on energy topics. NEED’s materials are designed to correspond to state curriculum requirements and standardized tests. Commercial publishers also produce energy education materials. Unfortunately, schools often can’t afford to buy the materials directly, or they may not prioritize those purchases in their budgets. Energy providers and efficiency organizations can step in to fill this gap by providing the funds to acquire teacher guides, lesson plans, quizzes, instructional booklets, and videos.

Much of the educational materials that We Energies, a midwestern U.S. investor-owned utility, offers to teachers are purchased through private curriculum publishers. Prepared curriculum, however, may not align well with the goals or topics of a particular school outreach program. We Energies also develops unique materials on topics not covered in published materials. By producing its own educational materials, the utility is able to keep students informed of energy-related topics relevant to the state of Wisconsin. For example, beginning in 2005, We Energies partnered with the *Milwaukee Journal Sentinel* to annually publish a multipage educational insert called “Energy in Our World Today.” We Energies is the only sponsor of the supplement. An education specialist on staff creates the content with assistance from the Wisconsin Department of Public Instruction, which advises on alignment with state educational standards. The supplement is delivered to 50,000 high school students and to newspaper subscribers by early May to mark National Safety Month. Topics range from energy efficiency to renewable resources and safety. By

producing a newspaper supplement, We Energies is able to provide information specific to its customers' needs and interests, reaching students and the community through a credible source.

Producing original curriculum materials can be cost effective for utilities and efficiency organizations. Rather than rely entirely on catalog materials from publishers, Pacific Gas and Electric Co. (PG&E), a major electric and natural gas provider in California, publishes its own [Energenius](#)® curriculum. Some of the classroom materials correspond to other PG&E programs, such as a CFL school fundraiser. Energenius materials are segmented by grade level and cover energy fundamentals, safety, and efficiency. The utility is also developing instructional resources on broad environmental topics like climate change, reforestation, and water. PG&E sends the materials free of charge to any schools in its service area that request them. The utility's education program manager reports that this approach is cost effective because they have control over printing, content, and design.

Just sending out booklets and lesson plans without additional support or training, however, may have a weak impact. Energy education involves abstract concepts and fundamental science, so enabling teachers to provide quality instruction on energy topics often requires some specialized teacher training. Teachers are not necessarily well versed in topics such as energy science, the connection between energy conservation and global warming, or how time-of-use affects system reliability. Energy efficiency organizations and energy providers can help by offering seminars and funding scholarships to workshops, particularly those that provide graduate-level credits. For example, Sacramento Municipal Utility District (SMUD) in Sacramento, California began offering seminars through the Lawrence Hall of Science, which provides teacher training workshops through its Great Explorations in Math and Science (GEMS®) program. The energy education coordinator at SMUD recommends that teacher training workshops be scheduled on weekends to avoid interfering with regular class time. Alternatively, TXU Energy reimburses school districts for teachers that participate in its [Solar Academy](#) teacher training workshops.

Any initiative that involves students could benefit from curriculum materials that explain and support the goal of the effort. For example, many contests—such as essay or art competitions with an energy theme—are launched with no supporting curriculum. This essentially assumes that teachers will pick up the slack by creating a lesson plan on their own to properly introduce the subject of the contest to their students.

Recommendations from program managers for successful deployment of energy efficiency curriculum include:

- Match each lesson plan with a curriculum requirement or academic standard.
- Design interactive, inquiry- or project-based lesson plans.
- Provide materials in discrete segments for individual lessons, activities, and assignments.
- Include a detailed teachers' guide for each lesson or activity.
- Provide supplementary tools, such as pre-formatted spreadsheet templates.

## **Assemblies**

In-person programs targeting elementary school students have evolved over the years, from classroom presentations that reach 20-30 students to more cost-effective approaches that maximize student contacts. Assemblies can reach many more students in an hour than is possible with smaller classroom sessions.

School assemblies can be a highly cost-effective mechanism to introduce students to energy topics. Non-profit organizations that produce school assembly programs report costs of \$3 to \$10 per student. Actual costs are determined by the mechanisms used to recruit and schedule participating schools, presenter fees, and costs for travel and/or delivery of costumes and props. Relying on volunteers or teachers to present assembly programs can reduce costs. However, hired and trained performers will ensure consistent delivery

of the material. Additionally, teachers will be more inclined to schedule an assembly if it does not place a burden on them.

A few energy utilities have successfully designed and deployed their own assemblies. Electric utility Florida Power & Light (FPL) launched its “Captain Conservation Saves the Day” assembly program in January 2006. This show was created to introduce FPL’s youngest customers to energy efficiency and to the steps they can take to conserve. Boosted by the popularity of FPL’s other traveling educational shows and previous educational outreach efforts, FPL key account managers found it relatively easy to inspire school representatives to book the presentation. In a single semester the program provided entertainment and instruction to 5,045 students. It consistently and rapidly booked at the program’s capacity of 19 presentations per semester.

For-profit and non-profit organizations also produce assemblies on energy efficiency that are available for sponsorship. The Alliance to Save Energy (ASE) offers one version of the “Energy Hog Traveling Road Show.” Energy Outreach Colorado (EOC), a Colorado nonprofit organization, designed the Energy Hog show based on surveys of children ages 8 to 13. ASE, the Ad Council, and EOC launched the show as a national public awareness campaign in 2004.

Sponsoring organizations can work through EOC in Colorado or ASE nationally to deliver the Energy Hog show to schools in their area. EOC, in partnership with SELA, hires and trains contractors to perform the skit (Packer 2008). ASE usually mails the costume and materials to a sponsored school and provides training so that teachers can perform the skit. However, in 2009, ASE will begin implementing a different approach. New Jersey Natural Gas (NJNG) has licensed the Energy Hog program from ASE, along with custom branded educational materials. The utility will market the program, schedule performances, and hire performers to present the skit at schools (Ellingson 2008).

Assemblies may be one example of an outreach program that can stand on its own without supporting curriculum. An evaluation that OEC commissioned to measure the effectiveness of the Energy Hog show revealed that, over the period from 2003 through 2007, fewer teachers were doing the classroom exercises which accompany the assembly presentation. However, student retention of the material, as measured by a student questionnaire administered in the classroom 2 to 3 weeks after the assembly, was not significantly different whether the classroom activity was completed or not. This result may be closely tied to the quality of the performance.

Recommendations from program managers for successful deployment of assemblies include:

- Know the audience—design an entertaining program to connect with students in the targeted age groups.
- Get the audience involved with the action, with sing-alongs, clapping, audience volunteers, or question-and-response.
- Utilities can leverage their relationships with school districts to promote assembly programs.
- Enable easy booking with online forms or a phone hotline.
- Use trained performers for consistent delivery.

## **Contests**

Participating in a contest can be a rewarding and inspiring way for kids to learn about energy, with relatively low investment by the sponsor. But contests may have a limited impact in terms of educating students unless they are supported by curriculum. Because of this limitation, they may be more appropriate as community and media relations tools to build awareness of a conservation message, or as a promotional mechanism supporting a larger effort. Some contest options are art for posters or calendars, science exhibits, and essays.

Frequently contest themes are broadly defined—good reason to provide supporting educational materials. The theme for the submissions to Roseville Electric’s student art contest in 2007 was “Shaping Our Environment,” covering water and energy conservation, recycling, and protection of local waterways. Snohomish PUD’s photography contest in 2008 challenged kids to represent “energy” in their images. One electric utility contacted for this research lamented that they received many unusable submissions for an art contest with an energy safety theme. It appeared that students did not grasp the intended topic.

In Roseville, California, the simple idea of a utility-sponsored calendar contest has matured over the years into a community event. Each year some 14,000 calendars are distributed free of charge at selected public counters such as utility offices, libraries, and recreation centers. Roseville Electric and Roseville Environmental Utilities, which jointly operate the contest, received nearly 400 submissions of artwork from students eager to have their drawing featured in the 2007 calendar. Thirteen winning submissions were awarded \$100 each.

FirstEnergy Corp., a diversified energy company headquartered in Ohio, had a bit of unexpected success with its “Electric Safety—It’s Watt You Know” multimedia competition, which encouraged students to devise creative ways to promote electricity safety awareness. Students submitted videos and PowerPoint presentations for the utility’s 2003 contest. One team created a board game to introduce kids and adults to electrical safety concepts. FirstEnergy liked that idea so much it not only awarded the team the Ohio grand prize but also published an enhanced version of the game to share with all educators in its territory.

Contests can also be designed as project-based, investigative learning activities. For several years, energy providers in Colorado have sponsored a Home Energy Investigation Contest. In this science fair, teams of students compete for cash prizes by creating presentations and posters documenting home energy use. Teams of middle and high school students analyze energy usage of several homes and conduct homeowner interviews. Winners receive cash prizes and a visit to the Denver Museum of Nature and Science (Doe 2008). SELA implements the program, which EOC designed to correlate to Colorado Model Content Standards for math, science, reading, and social studies.

Recommendations from program managers for launching a successful contest include:

- Back up a project contest with related teacher instruction or classroom materials to ensure the intended message is being communicated accurately.
- Select a theme that fits the contest format.
- Consider contest projects that go beyond the typical art and essay approach.

## **CFL and LED Lighting Fundraisers**

Schools regularly deploy students to raise funds by selling cookies, candy bars, and magazines to neighbors, relatives, and family friends. Recently, some schools have switched to a CFL or LED holiday lighting fundraiser initiative.

One such fundraiser program is the Lights for Learning™ campaign administered by the Midwest Energy Efficiency Alliance (MEEA), a collaborative advocacy network. Working with Energy Federation Inc., a nonprofit distributor of residential energy-efficiency products, the program provides students with a variety of CFLs from multiple manufacturers at subsidized prices. Students sell the bulbs and schools keep 50 percent of the funds raised, plus bonus payments for exemplary sales performance. In 2006, the program added LED (light-emitting diode) holiday lights to the product catalog, which appears to have increased participation.

Recruiting schools to energy efficient lighting fundraisers can be challenging. Many schools rely on the same fundraising programs for years and are not actively seeking alternatives. When it first launched its

CFL fundraiser, MEEA contacted 800 organizations through mailings and follow-up calls in 2005. Of those contacted, 15 schools and youth groups signed up. In subsequent years, interest grew through word-of-mouth in the education community.

PG&E designed its own CFL fundraiser to target hard-to-reach communities. The “Light It Right” fundraiser targets schools in areas where few retailers participate in the utility’s CFL programs. In the 2006 pilot phase, students at 12 schools sold nearly 6,000 CFLs. On average, each school sold 375 bulbs and raised \$1,500 to \$1,800. PG&E provides the bulbs at no charge so participants can keep 100 percent of the funds raised—a strong incentive for schools. Once a school decides to participate, interested teachers are invited to attend an after-school workshop where they are provided with background materials to instruct students on energy efficiency and how CFLs play a role in conservation. An added benefit is that program participants can collect CFL distribution data at the customer level to estimate energy savings.

Recommendations from program managers for designing and implementing an energy efficient lighting fundraiser include:

- Ensure that schools can earn a sufficient profit margin to build interest and participation.
- Schedule program recruiting to coincide with the planning cycle for school fundraising.
- When competing with long-standing, popular school fundraising mechanisms, targeted, in-person marketing may be more effective than direct mail.
- Provide easy-to-use mechanisms for schools to track purchases and deliveries.
- Provide supporting curriculum materials to educate teachers, administrators, parent-teacher organization members, and students on energy efficient lighting.
- Offer the option to sell CFLs by catalog with mail delivery, as some schools are concerned about children carrying bulbs.

## **Solar Demonstrations**

Installing PV systems on school rooftops can be an exciting educational tool as well as a prominent symbol of an energy provider or efficiency organization’s community involvement. Solar panels at one school can be an educational spark for an entire district, and across grade levels. A PV installation can also capture students’ imagination and pique their interest in other clean energy sources and energy efficiency. But making it happen is not a simple task.

Host-roof PV projects can experience delays due to a multilayered and extensive review and approvals process in school districts. Safety is a key issue, including structural concerns, student protection from electrical equipment, and the integrity of the PV panels in case of wayward baseballs. For older buildings, it can be difficult to locate as-built drawings. However, once a precedent-setting installation is complete at one school, future solar systems at other schools in the district should be easier and faster to implement.

Roseville Electric embarked on a host-roof solar project with Silverado Middle School in 2002, and the 12.24-kilowatt (kW) system came on-line four years later. The utility financed Silverado’s PV system with funds from its green energy program and keeps the renewable energy credits (RECs). This approach provides a notable volume of renewable power relative to the school’s total electricity consumption.

If the goal is to reach as many schools as possible with a solar demonstration project, a uniform and small-scale system design may be appropriate. For example, PG&E donates small, pole-mounted units using shareholder funds. From 2004 to 2006, PG&E donated 60 1.3-kW PV systems to selected schools in its territory at an average cost of \$20,000 each. The utility does not keep the associated RECs.

PG&E also offers teacher training workshops. By the end of 2006, more than 1,000 teachers participated in PG&E’s curriculum training and received classroom materials relating to PV systems. The

utility works with external nonprofit partners: NEED administers the school applications and teacher training, and the Foundation for Environmental Education (FEE) manages the installation contractors.

TXU Energy began installing PV systems at schools in Texas in 2008, following a model similar to PG&E's. However, instead of targeting individual schools, TXU is reaching out to school districts. The district selects which school receives the PV installation. All schools in that district can then participate in the curriculum and each district can send 40 teachers to the training workshop (Chen 2008).

Each of these utilities sponsor subscriptions to Web-based energy monitoring software created by Fat Spaniel Technologies to provide classroom access to performance data for their school's PV systems. Classroom exercises using PV monitoring data could overlap nicely with curriculum standards for math and science. There are numerous sources of curriculum and lesson plan ideas to teach kids about solar energy, as NEED outlines in its free guide, "Schools Going Solar Activities." But most currently available lesson plans on solar energy are geared around handheld PV devices (rather than building-scale systems), so teachers are left to craft their own classroom activities. This presents an opportunity for PV sponsors to customize curriculum for their installations.

Some recommendations for PV demonstration programs are:

- Determine at the outset whether the goal is to produce renewable power and RECs to offset grid power for a few schools, or to rapidly reach many schools.
- Rooftop systems are safely out of reach but entail structural considerations. Ground- or pole-mounted systems are more visible.
- Simplify implementation by creating a one-size-fits-all equipment package rather than customizing installations for each site.
- Online monitoring of PV system performance can be a useful instructional tool and is accessible to the community.
- Determine ongoing responsibilities for PV system maintenance and performance monitoring software.

## **Lending Props**

Lending out classroom props can make energy education tangible and fun for kids. This is a way that energy providers can fill an important need for schools that do not own equipment to use in instructional or exploratory lessons about energy. We Energies, Madison Gas & Electric (MGE), and City of Palo Alto Utilities (CPAU) are three utilities that lend props for energy education to schools in their territory.

Wisconsin K-12 Energy Education Program (KEEP) created Energy Education Trunks for teachers to borrow for three weeks for their classes in grades 5-7. The trunks are packed with tools and materials for experiments and other classroom activities, including videos, a "Watts Up?" meter, a photocell kit, and packets of different types of coal. We Energies and MGE purchase the trunks and then ship them out by request to teachers in their territory. The trunks are expensive to mail, so We Energies is working with KEEP to develop smaller trunks that are easier to transport.

A popular prop is a stationary bicycle that children pedal to power electrical devices such as light bulbs, radios, and fans. These can be lent out with an informational display and lesson plans. KEEP has 4 "Pedal Power" bikes to lend out, 3 of which are kept at host facilities in counties dispersed across Wisconsin. CPAU assembled an "Energy Bike" that it lends to schools in the Palo Alto Unified School District. Students operate the bike to power different types of light bulbs to compare their energy use.

A simple prop for a lending program is a portable meter. Some models include software to record and export data; some just display real-time data. Meter vendors may offer lesson plans for schools. Consider allowing students to bring watt meters home.

Program managers have encountered challenges in marketing props to teachers, delivering the props, and providing effective, related curricula. Some props are pricey. KEEP's Energy Education Trunks are worth \$500 each. Some recommendations for prop-lending programs are:

- Props should be easy to deliver. For larger items, delivery can be costly, and pick-up or drop-off arrangements may be complicated.
- Lesson plans should clearly define how to use the props in classroom instruction or lab sessions, including instructions to ensure that props are operated correctly and safely.

## **Grant Programs**

By operating an educational grant program, utilities can inspire teachers to create new curricula or activities. FirstEnergy has found that educators can become rather creative when they're offered \$500 for thinking of new ways to introduce energy topics to students. The utility awards mini-grants of up to \$500 each based on a juried review of applications. Educational Advisory Councils comprised of teachers and school administrators in each state of FirstEnergy's territory rate the applications.

There are logistics and overhead costs involved in administering grant programs. PG&E hires NEED to operate the application process for its "Bright Ideas" program, which funds the purchase of classroom materials or innovative instructional and extracurricular programs for students. Winning applicants also receive an assortment of NEED curricula and science experiment kits, plus a teacher scholarship to attend a workshop. Although many utility grant programs outsource administration of the application and selection process, SMUD launched its "Energize Minds Solar Grant Program" program in 2006 on a very short timeline, relying on internal staff to review other utilities' grant programs, draft the Request for Proposal (RFP), and judge responses.

Grant programs lend themselves well to media exposure and often have a community element to them, extending the outreach effect beyond the schoolyard. SMUD evaluated applications for its grant program in part based on "community benefit and outreach" aspects, such as how the proposed project would engage or benefit the larger community including parents, businesses, and the media.

Grant programs can help to fill in gaps in a utility's repertoire of educational activities. For example, SMUD's education programs mainly target grades K-8, so the utility's grant program targeted middle school, high school, and community college applicants.

Some recommendations from program managers of grant programs are:

- Schedule the RFP or application process to occur when school is in session and teachers have time to focus on them.
- When planning ahead for a new grant program, consider outsourcing the program design, application, and selection process.
- Balance the application and selection criteria with the amount of funding offered. Teachers or school district administrators are more willing to embark on a time-consuming application process when substantial funds are at stake.

## **School Audits by Students**

The hands-on experience and real-world application of an energy audit enables students to take home lessons about energy resources and apply them in their own lives now and in the future. Recognizing this, British Columbia Hydro and Power Authority (BC Hydro), an electric utility in Canada, developed "Power Smart Students," a comprehensive program that teaches students how to evaluate energy use within their own schools and then challenges them to identify ways to make their school more efficient. The behavioral

changes as well as retrofit projects that this program inspired saved school districts across the province an estimated \$2 million in four years. Since its launch in 2002, the program has reached all 52 school districts in the province, with 900 schools participating. However, such results are not easily achieved; this is a complex program to develop and administer.

One element of Power Smart Students is “School Campaigns,” in which students and teachers in grades 3 to 8 attend an all-day workshop where BC Hydro representatives introduce them to the basics of energy efficiency and the students brainstorm on how their school could use less energy. A core group of students from each school then creates a behavior-change campaign. Older students participate in the “Energy Reviews” work experience program, in which they learn how to conduct technical energy audits of the school. Students then present their energy-saving recommendations to the school board. The curriculum meets scholastic standards and the “Energy Reviews” program enables students to earn work-study hours and graduation credits.

The Alliance to Save Energy (ASE) developed a similarly multi-faceted and audit-focused curriculum for schools called “Green Schools” (Khawaja 2006). Utilities and efficiency organizations can sponsor implementation of this program for local school districts. For 5 to 15 participating schools in each district, a team of teachers, custodial staff, and administrators from each school customizes the program and attends a 12-hour training over two days. A facilitator representing the program sponsor visits the school monthly. The student curriculum includes “School Energy Audit Training,” and also “Small Business Audits,” “Home Energy Audits,” and “School Energy Patrols.”

Some recommendations for school audit programs include:

- Beginning with long-term perspective on program implementation, offer graduated curriculum, to develop student understanding from one grade to the next.
- Instructing students on how to conduct energy efficiency audits requires teacher training.
- Secure approvals from school and district officials to ensure sufficient class time is devoted to the program and to receive access to school energy data. Their buy-in is also necessary for implementation of audit recommendations.

## **Home Audits by Students**

Kids that learn about energy conservation in an engaging way in school are often eager to take that information home and share it with their parents. Seeking a way to transmit an energy conservation message to parents via their children is one reason utilities embark on school outreach programs.

The Home Energy Investigation Contest, described above, is one example of a home audit program implemented by students. Alternatively, complete in-home audit kits can be purchased, including teacher lesson plans and instruction guides, homework assignments, reporting checklists, and energy efficient equipment such as CFLs and low-flow showerheads. With direct installation of energy saving devices, these educational programs produce measurable energy savings. Resource Action Programs, a non-profit provider of home audit kits for students, estimates an average of 338 kWh of electricity first-year savings per kit, at a cost of approximately \$20 - \$40 per kit. Each kit also saves an average of 44 therms of natural gas and 9,308 gallons of water.

Because an in-home audit usually occurs without the teacher’s oversight, it is important to make the educational materials easy to use and with a child’s level of understanding in mind. Additional recommendations for student home energy audit initiatives include:

- Write the lesson plan for an adult audience (the teacher), the homework assignment for students, and instructional materials for parents to engage them in the activity.

- Provide a telephone hotline or Web site for teachers or students to turn to if they have questions.
- A home audit does not need to be conducted all at once and can be split into discrete lesson plans and homework exercises.
- Include simple tracking forms, checklists, and formatted spreadsheets with formulas.

## Multiple Stakeholders, Multiple Goals

School outreach programs are a mechanism for utilities and energy efficiency organizations to meet the goals of growing energy literacy, encouraging energy-saving behavior, boosting the sponsoring organization's image in the community, and even increasing participation in technical energy efficiency programs. A 2005 survey of district superintendents, curriculum specialists, facility managers, and business office personnel at California schools revealed they desire an educational component to utility-sponsored facility improvement programs. District staff that had not participated in a utility retrofit or new construction program indicated they would consider future participation if the program included "high educational value" (Khawaja 2006, 13). Educational outreach initiatives and facility improvement incentive programs can support and complement each other, satisfying multiple goals for the multiple stakeholders involved.

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