Energy Research and Development Division
FINAL PROJECT REPORT

TECHNICAL BRIEFS AND OUTREACH EFFORTS TO SPEED MARKET ADOPTION OF PIER RESEARCH

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PREFACE

The California Energy Commission Energy Research and Development Division supports public interest energy research and development that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

The Energy Research and Development Division conducts public interest research, development, and demonstration (RD&D) projects to benefit California.

The Energy Research and Development Division strives to conduct the most promising public interest energy research by partnering with RD&D entities, including individuals, businesses, utilities, and public or private research institutions.

Energy Research and Development Division funding efforts are focused on the following RD&D program areas:

- Buildings End-Use Energy Efficiency
- Energy Innovations Small Grants
- Energy-Related Environmental Research
- Energy Systems Integration
- Environmentally Preferred Advanced Generation
- Industrial/Agricultural/Water End-Use Energy Efficiency
- Renewable Energy Technologies
- Transportation

Technical Briefs and Outreach Efforts to Speed Market Adoption of PIER Research is the final report of the Conduct Market Connection Efforts That Will Speed Market Adoption of PIER Research project (contract number 500-03-005) conducted by E SOURCE. The information from this project contributes to Energy Research and Development Division's Buildings End-Use Energy Efficiency Program.

For more information about the Energy Research and Development Division, please visit the Energy Commission's website at www.energy.ca.gov/research/ or contact the Energy Commission at 916-327-1551.

ABSTRACT

In the Buildings End-Use Energy Efficiency area, the California Energy Commission's Public Interest Energy Research Program sponsors research that will reduce building energy use by developing or improving energy efficient technologies, strategies, tools, and building performance evaluation methods. A goal for all PIER-sponsored research is to maintain a strong market connection by identifying research that is responsive to market needs, including market partners on research teams, and identifying or developing links to the building community, manufacturers, utilities, codes and standards groups, and other implementers of building efficiency market actions. This project developed a set of procedures for presenting information about PIER projects in an easy-to-understand format, and then put that information into the hands of professionals to use. This project produced 53 two-page technical briefs and updates describing a range of PIER Buildings projects. The information was disseminated to thousands of energy and building industry professionals through e-mail announcements, articles in trade publications, and networking at trade shows and conferences.

Keywords: Buildings, lighting, HVAC, envelope, architects, engineers, building managers, building owners, design guide, residential, commercial, commissioning, benchmarking, utilities, and electronics.

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EXECUTIVE SUMMARY

Introduction

The Public Interest Energy Research (PIER) Program has funded a number of excellent research projects that have the potential to substantially improve building energy efficiency. These technologies and practices must be widely adopted in the marketplace for the PIER Program to achieve its goal of reducing building energy use.

Project Purpose

The initial objective of this project was to produce and distribute 25 or more two-page technical briefs in PDF format and to disseminate the content of the briefs to publications and other media editors. Additional objectives included:

- Produce and distribute a minimum of 25 additional technical briefs.
- Determine methods to improve the Web search engine presence of PIER technical briefs.
- Find additional construction trade and association journals in which technical brief content could be published.
- Increase and maintain direct communication with industry and education professionals who could use the technical brief information regularly.

Project Results

Researchers identified projects that were ready to be promoted and produced a series of technical briefs, each focused on a single project or aspect of a project. The briefs were circulated to energy industry professionals and editors of trade publications targeted at professionals who could make use of this research. Outreach was expanded to additional channels to maximize the exposure of the technical briefs to the mainstream architectural, engineering, and construction community. The target audience extended beyond California because the technologies discussed in the technical briefs had a global reach. It was necessary to reach out to a broader market including a national audience to get traction with partners and end users. For example, manufacturing partners would also require a national audience if the products that the PIER program helped to develop were to be successful.

This project produced 53 technical briefs on 45 projects. The number of briefs was greater than the number of topics because updated versions were produced for several of the briefs during the contract. These briefs were provided to targeted professionals through list serves, publications, website listings, classes, and trade shows, as shown in Table 1.

Table 1: Marketing results for technical briefs

PIER technical briefs viewed or downloaded from E SOURCE	22,100
PIER technical briefs and brochures distributed at conferences and other events	1,350
Articles published in industry publications about PIER technical briefs	94
External websites that link to PIER technical briefs	8
Association of Energy Services Professionals (AESP) Industry Information	
American Institute of Architects (AIA) Soloso website	
McGraw-Hill GreenSource	
Pacific Energy Center (PEC) Energy Resource Center	
Architecture Week Download Center	
Building Operator Certification (BOC) website (links to featured tech briefs rotate every month under News & Trends on home page)	
University of Calgary Libraries and Cultural Resources International web resources	
International Facility Management Association (IFMA) GreenZone	
Energy professionals on PIER technical brief e-mail distribution list	2,309

Source: Provided by E source

The technical briefs served as crucial links in the technology transfer chain that flows from research through development and on to adoption in the commercial marketplace. The products and strategies developed through the PIER Program cannot become mainstream if the architectural/engineering firms, tradespeople, and building owners don't know about them.

The technology briefs have helped build the PIER brand, which has become a respected name in energy efficiency. That reputation has become even more significant as the nation shifts toward science and technology-driven solutions to today's energy efficiency challenges. The briefs have led more practitioners to adopt PIER technologies and more utilities to pilot the technologies in their emerging technologies programs, and have also led to overall energy savings and reductions in greenhouse gas emissions.

Thousands of engineers, architects, contractors, and other building professionals have become aware of the results of PIER Buildings research as a result of this project. Creating technical briefs that documented the results of PIER-funded research in a clear useable format and getting those briefs into the hands of professionals who can put the results to good use proved to be an effective means of technology transfer.

The authors recommended that the technical briefs program be expanded to cover more topics, use a wider range of marketing tools, and reach out to utility and government professionals who can provide incentives for adopting PIER-funded technologies. Possible additional means of disseminating information about PIER research include Web conference presentations and online streaming media presentations.

Project Benefits

Disseminating the technical briefs directly and indirectly benefits California ratepayers. Businesses that learn about and install new technologies to increase energy efficiency directly improve their bottom line. Indirectly, implementing the PIER technologies and strategies for energy efficiency described in these briefs will reduce energy usage in California, deferring the need for additional generation, transmission and distribution. This benefits all Californians by making energy more affordable and improving the environment by reducing harmful emissions and pollution caused by electricity generation from fossil fuels that contribute to global climate change.

For many years California's utilities have been educating their customers about and advocating for energy efficiency and utilities continue to have aggressive energy savings goals. Meeting these goals and claiming energy savings will require utilities to be informed about next generation technologies. Utilities can speed public adoption of these technologies by providing incentives and marketing their energy- and monetary-saving potential using information contained in the technical briefs developed during this project.

CHAPTER 1: Introduction

In the Buildings End-Use Energy Efficiency area, the California Energy Commission's Public Interest Energy Research (PIER) Program sponsors research that will decrease building energy use by developing or improving energy-efficient technologies, strategies, tools, and building performance evaluation methods. A goal for all PIER-sponsored research is to maintain a strong market connection by identifying research that is responsive to known market needs, including market partners on research teams, and identifying or developing links to the building community, manufacturers, utilities, codes and standards groups, and others implementing building efficiency market actions.

Despite this market orientation, PIER Program management has determined that additional effort is necessary to ensure that the findings of PIER-funded research projects are adequately disseminated to the key market players who are in the position to put these results to work. The PIER Program has funded a number of excellent research projects that have the potential to substantially improve building energy efficiency; however these technologies and practices must be widely adopted in the marketplace for the PIER Program to achieve its goal of reducing building energy use.

This project helped disseminate the findings of PIER-funded research projects to the key market players who are in the position to put these results to work. This contract included determining the best methods to produce and distribute a series of briefs summarizing PIER Program research in the Buildings End-Use Energy Efficiency area. These briefs were sent to editors of energy, architecture, engineering, building, and contractor trade publications as well as to colleges and industry trade associations to increase awareness of new technologies that improve building energy efficiency.

Additional goals included increased journal article placement and outreach activities to trade associations and education professionals.

1.1 Goals

This project produced a series of technology briefs covering the California Energy Commission PIER Program research in the Buildings End-Use Energy Efficiency area, distributed these technology briefs to interested parties, and contacted editors of publications for professionals who could benefit from this research and further dissemination of these materials.

This project also determined additional distribution channels for the already developed and future technology briefs material to maximize their exposure to the mainstream architecture, engineering, and construction community.

1.2 Objectives

The initial objective of the project was to produce and distribute 25 or more two-page technical briefs (in PDF format), and disseminate the content of the technology briefs to publications and other media editors.

Additional objectives included:

- Produce and distribute an additional 25 or more technical briefs.
- Determine methods to improve the Web search engine presence of PIER technology briefs.
- Find additional construction trade and association journals in which technology brief materials can be published.
- Increase and maintain direct communication with industry and education professionals that can regularly use technology brief content.

1.3 Report Organization

This report summarizes the efforts that went into designing, producing, and marketing the technical briefs and presents the results of those efforts. Additional details are presented in a series of Appendices: A: represents modifications to the initial marketing plan made in late 2007; B: presents all the briefs and their appearances in the media; C: presents marketing materials (brochure, poster, and sign-up sheet) used to promote briefs at trade shows and conferences; D: presents Web analytics reports on how often the briefs were viewed on the E SOURCE website; E: presents an analysis of the heat pump water project and why the technology did not succeed in the marketplace; and F: presents a list and descriptions of educational programs that were contacted as possible users of the briefs.

CHAPTER 2:
Project Approach

The approach to disseminating the results from PIER research efforts in the Buildings End-Use Energy Efficiency area called for the identification of projects ready to be promoted; the production of a series of technology briefs that each focused on a single project or aspect of a project; and the dissemination of the briefs to appropriate audiences. After production, the briefs were distributed to interested parties and sent to editors of publications likely read by people who could benefit from this research. Amendment 1 to the contract expanded the outreach to additional outreach channels to maximize their exposure to the mainstream architecture, engineering, and construction community. The target audience extends beyond California because the technologies being developed have a global reach and it was found that in order get traction with partners and end users, it was necessary to reach out to a broader market. For example, specifiers in the Midwest, may be working on buildings in California, and it is desirable that they know about the PIER technologies. Manufacturing partners will also need a national audience if the products that the PIER program helped to develop are to be successful.

2.1 Identifying Topics

The PIER program manager supplied E SOURCE with an initial spreadsheet identifying potential projects, a website where each project's final report could be found, contact information for the PIER project manager, and some descriptive notes. E SOURCE also added several suggested topics. Over time more projects were added as more PIER research was completed. Initially, topics were only selected for the briefs if a final report was available. Later the requirement became whether or not significant milestones had been reached. In addition, over the course of the contract sufficient additional research had been completed on some of the topics necessitating updates to some existing briefs. The complete list of briefs is presented in Table 2.

Table 2: List of briefs

Brief #	Brief Title	Pub number
TB-1	Integrated Classroom Lighting System: Light's Great, Less Billing	CEC-500-2005-047FS
	Classroom lighting update - May 2008	CEC-500-2008-033FS
TB-2	Design Guide: Big Savings on Small HVAC Systems	CEC-500-2005-046FS
TB-3	Guide Illuminates Modular Skylight Well Design	CEC-500-

Brief #	Brief Title	Pub number
		2005-045FS
TB-4	Nightbreeze Cuts Peak Demand, Keeps Residents Cool	CEC-500-2005-098FS
	Nightbreeze update	CEC-500-2005-098FS
TB-5	Up with CFL Downlights	CEC-500-2005-057FS
TB-6	Residential Commissioning Guide Brings Home Comfort and Savings	CEC-500-2005-058FS
TB-7	HPWHs: Efficient, Reliable Alternatives to Electric Water Heaters	CEC-500-2005-100FS
TB-8	Guide Aids Commissioning of Air Handling Systems	CEC-500-2005-099FS
TB-9	Hybrid Fixture Lights Up the Night	CEC-500-2005-059FS
TB-10	Automatic Diagnosis for Ailing Rooftop Air Conditioners	CEC-500-2005-127FS
TB-11	Commercial Buildings Breathe Right with Demand-Controlled Ventilation	CEC-500-2005-126FS
TB-12	The Next Stage in Evaporative Cooling (OASys)	CEC-500-2005-131FS
	OASys update	CEC-500-2007-106FS
TB-13	Estimating Energy Use Early and Often (Green Building Studio)	CEC-500-2005-140FS
	GBS update	CEC-500-2005-140FS
TB-14	Guide to Optimizing Commercial Kitchen Ventilation	CEC-500-2005-138FS

Brief #	Brief Title	Pub number
TB-15	Residential Roofs: Cool Colors, Cool Gaps	CEC-500-2005-164FS
	Cool roofs update	CEC-500-2005-164FS
TB-16	Radiant Heating and Cooling Made Easy and Inexpensive	CEC-500-2005-139FS
TB-17	Duct Leakage: If You Can Measure It, You Can Cut It	CEC-500-2005-163FS
TB-18	Sweet SPOT™ for Daylighting	CEC-500-2005-178FS
	SPOT update	CEC-500-2005-178FS
	SPOT update 2	CEC-500-2008-052FS
TB-19	Large VAVs, Low Loads, and High Performance	CEC-500-2005-179FS
TB-20	Energy Benchmarking: Does Your School Get a Passing Grade?	CEC-500-2006-011FS
TB-21	SpeciFlow™: A Fresh Approach to Measuring Outdoor Airflow	CEC-500-2006-011FS
TB-22	Design Guide: How to Make Homes Cool and Efficient	CEC-500-2006-015FS
TB-23	Electronic Products: Making Power Supplies More Efficient	CEC-500-2006-012FS
	Power Supplies update	CEC-500-2006-012FS
TB-24	Bathroom Lights Save Energy and Boost Safety	CEC-500-2006-013FS
TB-25	High Hopes for Low-Glare Outdoor Luminaire	CEC-500-2006-014FS

Brief #	Brief Title	Pub number
TB-26	Collaborating on Commissioning	CEC-500-2006-061FS
TB-27	Underfloor Air: Better Models, Better Performance	CEC-500-2008-032FS
TB-28	Thermally Driven Heat Pump Runs Hot and Cold for Food and Beverage Industries (Thermosorber)	CEC-500-2007-109FS
TB-29	TDV Improves Efficiency and Classroom Environment	CEC-500-2008-040FS
TB-30	Relocatable Classrooms: Less Energy, Better Air	CEC-500-2007-107FS
TB-31	Automated Demand Response Cuts Commercial Building Energy Use and Peak Demand	CEC-500-2008-086FS
TB-32	Energy Use of Household Electronics: Taming the Wild Growth	CEC-500-2008-064FS
TB-33	Integrated Office Lighting Systems: Making It Personal	CEC-500-2007-108FS
TB-34	Static Pressure Reset Strategy Boosts VAV System Efficiency	CEC-500-2008-046FS
TB-35	Builder's Guide: Reducing Mold Risk	CEC-500-2008-034FS
TB-36	Daylight Harvesting Made Simple	CEC-500-2008-067FS
TB-37	LED Hybrid Porch Light Cuts Energy, Maintenance Costs	CEC-500-2008-045FS
TB-38	Wireless Lighting Controls Make Retrofits Practical	CEC-500-2008-062FS
TB-39	Savings Persist with Monitoring-Based Commissioning	CEC-500-2008-053FS
TB-40	DC Power Distribution Cuts Data Center Energy Use	CEC-500-

Brief #	Brief Title	Pub number
		2008-042FS
TB-41	What Lies Within: Improving the Efficiency of Internal Power Supplies	CEC-500-2008-063FS
TB-42	Variable Speed Comes to the (Kitchen) 'Hood	CEC-500-2008-068FS
TB-43	Task/Ambient Lighting: Efficient, Stylish, and Portable	CEC-500-2008-051FS
TB-44	Electronic Products: Making Battery Chargers More Efficient	CEC-500-2008-066FS
TB-45	Uninterruptible Power Supplies: A Data Center Efficiency Opportunity	CEC-500-2008-065FS

Source: Provided by the author

2.2 Design of the Briefs

The design of the technical briefs required the development of templates for both content and appearance.

2.2.1 Content Template

An iterative process with the Commission program manager resulted in the decision to produce two-page documents for each technical brief with the content outline below:

Title

The Problem: Define the problems that the technology helps to solve.

The Solution: Brief description of the technology/solution and current status.

Features/benefits: The benefits and limitations of the technology; include performance and cost data, and user perspectives when available.

Applications: For what types of applications can the product be used; may be defined by various parameters, e.g. types of facilities, types of climates etc.; for national audience, not just California.

California Codes/Standards Connections: Describe how the technology fits into current codes and/or how Title 24 (or Title 20, as appropriate) code development staff will consider the project results for future code revisions.

What's Next: Ongoing research, field trials, product enhancements or other planned activities

Collaborators: brief listing of organizations involved in developing or using the project results (e.g., CHPS, California Commissioning Council, Cool Roof Rating Council, California Office of State Architect).

For more information: Website, e-mail for more information and available reports about the project.

Contacts: California Energy Commission: PIER website; PIER project manager, e-mail address.

Manufacturers: (website; contact name, e-mail, phone number)

Researchers: (contact name and e-mail address w/project website if applicable)

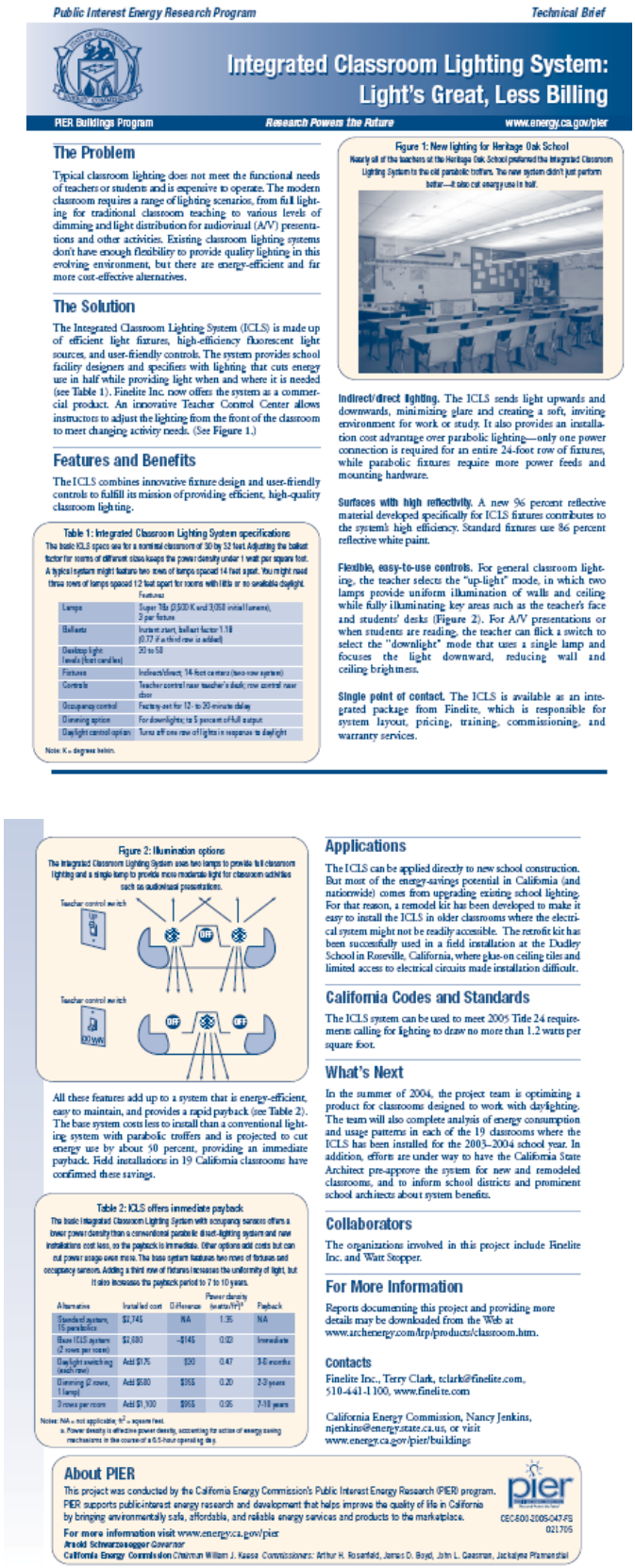
2.2.2 Design Template

The graphic design of the brief template was also an iterative process, with the following general criteria decided on:

- Put the PIER logo on the top of the front page.
- Use a two-column format
- Put an "about PIER" at the bottom of the last page with the following text:

  This project was conducted by the California Energy Commission's Public Interest Energy Research Program (PIER). PIER supports public interest energy research and development that helps improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.
- Briefs will be two pages long, two-color.

The design as implemented in the first brief is shown Figure 1.



Public Interest Energy Research Program — *Technical Brief*

Integrated Classroom Lighting System: Light's Great, Less Billing

PIER Buildings Program — *Research Powers the Future* — www.energy.ca.gov/pier

The Problem

Typical classroom lighting does not meet the functional needs of teachers or students and is expensive to operate. The modern classroom requires a range of lighting scenarios, from full lighting for traditional classroom teaching to various levels of dimming and light distribution for audiovisual (A/V) presentations and other activities. Existing classroom lighting systems don't have enough flexibility to provide quality lighting in this evolving environment, but there are energy-efficient and far more cost-effective alternatives.

The Solution

The Integrated Classroom Lighting System (ICLS) is made up of efficient light fixtures, high-efficiency fluorescent light sources, and user-friendly controls. The system provides school facility designers and specifiers with lighting that cuts energy use in half while providing light when and where it is needed (see Table 1). Finelite Inc. now offers the system as a commercial product. An innovative Teacher Control Center allows instructors to adjust the lighting from the front of the classroom to meet changing activity needs. (See Figure 1.)

Features and Benefits

The ICLS combines innovative fixture design and user-friendly controls to fulfill its mission of providing efficient, high-quality classroom lighting.

Table 1: Integrated Classroom Lighting System specifications

The basic ICLS specs are for a nominal classroom of 30 by 32 feet. Adjusting the ballast factor for rooms of different sizes keeps the power density under 1 watt per square foot. A typical system might feature two rows of lamps spaced 14 feet apart. You might need three rows of lamps spaced 12 feet apart for rooms with little or no available daylight.

	Features
Lamps	Super 70s (3,500 K and 3,050 initial lumens), 2 per fixture
Ballasts	Instant start, ballast factor 1.18 (0.77 if a third row is added)
Desktop light levels (foot candles)	20 to 50
Fixtures	Indirect/direct; 14-foot centers (two-row system)
Controls	Teacher control near teacher's desk; row control near door
Occupancy control	Factory-set for 12- to 20-minute delay
Dimming option	For downlights; to 5 percent of full output
Daylight control option	Turns off one row of lights in response to daylight

Note: K = degrees kelvin.

Figure 1: New lighting for Heritage Oak School

Nearly all of the teachers at the Heritage Oak School preferred the Integrated Classroom Lighting System to the old parabolic troffers. The new system didn't just perform better—it also cut energy use in half.

Indirect/direct lighting. The ICLS sends light upwards and downwards, minimizing glare and creating a soft, inviting environment for work or study. It also provides an installation cost advantage over parabolic lighting—only one power connection is required for an entire 24-foot row of fixtures, while parabolic fixtures require more power feeds and mounting hardware.

Surfaces with high reflectivity. A new 96 percent reflective material developed specifically for ICLS fixtures contributes to the system's high efficiency. Standard fixtures use 86 percent reflective white paint.

Flexible, easy-to-use controls. For general classroom lighting, the teacher selects the "up-light" mode, in which two lamps provide uniform illumination of walls and ceiling while fully illuminating key areas such as the teacher's face and students' desks (Figure 2). For A/V presentations or when students are reading, the teacher can flick a switch to select the "downlight" mode that uses a single lamp and focuses the light downward, reducing wall and ceiling brightness.

Single point of contact. The ICLS is available as an integrated package from Finelite, which is responsible for system layout, pricing, training, commissioning, and warranty services.

Figure 2: Illumination options

The Integrated Classroom Lighting System uses two lamps to provide full classroom lighting and a single lamp to provide more moderate light for classroom activities such as audiovisual presentations.

All these features add up to a system that is energy-efficient, easy to maintain, and provides a rapid payback (see Table 2). The base system costs less to install than a conventional lighting system with parabolic troffers and is projected to cut energy use by about 50 percent, providing an immediate payback. Field installations in 19 California classrooms have confirmed these savings.

Table 2: ICLS offers immediate payback

The basic Integrated Classroom Lighting System with occupancy sensors offers a lower power density than a conventional parabolic direct-lighting system and new installations cost less, so the payback is immediate. Other options add costs but can cut power usage even more. The base system features two rows of fixtures and occupancy sensors. Adding a third row of fixtures increases the uniformity of light, but it also increases the payback period to 7 to 10 years.

Alternative	Installed cost	Difference	Power density (watts/ft²)[a]	Payback
Standard system, 16 parabolics	$2,745	NA	1.35	NA
Base ICLS system (2 rows per room)	$2,600	–$145	0.93	Immediate
Daylight switching (each row)	Add $175	$30	0.47	3-6 months
Dimming (2 rows, 1 lamp)	Add $500	$355	0.20	2-3 years
3 rows per room	Add $1,100	$955	0.95	7-10 years

Notes: NA = not applicable; ft² = square feet.
a. Power density is effective power density, accounting for action of energy saving mechanisms in the course of a 6.5-hour operating day.

Applications

The ICLS can be applied directly to new school construction. But most of the energy-savings potential in California (and nationwide) comes from upgrading existing school lighting. For that reason, a remodel kit has been developed to make it easy to install the ICLS in older classrooms where the electrical system might not be readily accessible. The retrofit kit has been successfully used in a field installation at the Dudley School in Roseville, California, where glue-on ceiling tiles and limited access to electrical circuits made installation difficult.

California Codes and Standards

The ICLS system can be used to meet 2005 Title 24 requirements calling for lighting to draw no more than 1.2 watts per square foot.

What's Next

In the summer of 2004, the project team is optimizing a product for classrooms designed to work with daylighting. The team will also complete analysis of energy consumption and usage patterns in each of the 19 classrooms where the ICLS has been installed for the 2003–2004 school year. In addition, efforts are under way to have the California State Architect pre-approve the system for new and remodeled classrooms, and to inform school districts and prominent school architects about system benefits.

Collaborators

The organizations involved in this project include Finelite Inc. and Watt Stopper.

For More Information

Reports documenting this project and providing more details may be downloaded from the Web at www.archenergy.com/lrp/products/classroom.htm.

Contacts

Finelite Inc., Terry Clark, tclark@finelite.com, 510-441-1100, www.finelite.com

California Energy Commission, Nancy Jenkins, njenkins@energy.state.ca.us, or visit www.energy.ca.gov/pier/buildings

About PIER

This project was conducted by the California Energy Commission's Public Interest Energy Research (PIER) program. PIER supports public-interest energy research and development that helps improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

For more information visit www.energy.ca.gov/pier

Arnold Schwarzenegger Governor

California Energy Commission Chairman William J. Keese Commissioners: Arthur H. Rosenfeld, James D. Boyd, John L. Geesman, Jackalyne Pfannenstiel

CEC-500-2005-047-FS
021705

Figure 1: First technical brief

Source: Provided by the author

2.3 Production of the Briefs

For each topic selected, the following process was carried out to produce a technical brief:

- Interview the principal investigator for each project and other parties involved in or familiar with the research project.
- Review reports prepared by major parties involved in projects to be reported on.
- Prepare the first draft of text for the technology brief and submit to Commission for review.
- Revise text and produce and submit the draft technology brief(s) in layout form to the Commission contract manager for comment.
- Revise the draft technology brief(s) as necessary and submit final PDF file to the Commission contract manager
- After receiving approval from the Commission contract manager, post the brief on the Web, and distribute via e-mail, as described in Section 2.4.

For posting on the Web, each brief was placed into one or more of the following categories:

- Appliances and office equipment
- Benchmarking
- Building envelope
- Building simulation
- Commissioning
- Controls
- Design
- Drivepower
- HVAC and refrigeration
- Industry and agriculture
- Lighting
- Load management
- Operations and maintenance
- Power quality and reliability
- Technology standards and labeling
- Water heating

Copies of all the completed briefs are included in Appendix B.

2.4 Dissemination

Upon final approval from the Commission Media Office, the briefs were posted to the Web. E SOURCE created a website to host the briefs and track downloads (Figure 2). Later, a PIER website was also added to host the briefs (Figure 3). In addition, each brief was sent out in an e-mail announcement to selected professionals and to a list of publications relevant to the particular project being covered. Additional marketing efforts were conducted for the briefs as described below.

Figure 2: E SOURCE web page hosting the briefs

Source: Provided by the author

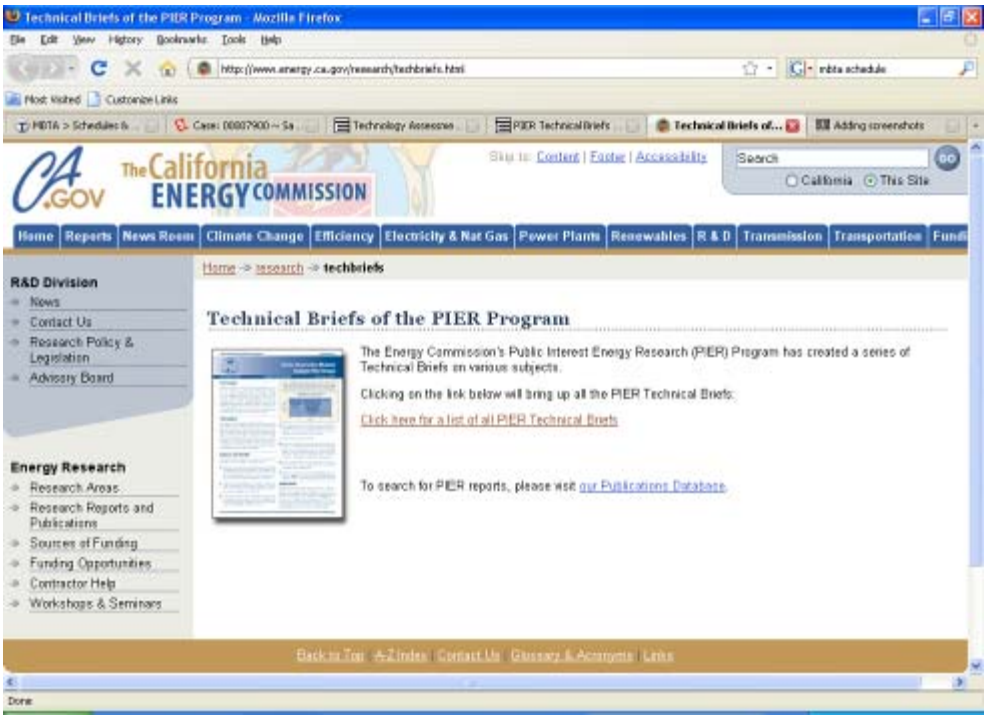


Figure 3: PIER website hosting the briefs

Source: Provided by the author

2.4.1 E-mail announcements

After approval and posting to the E SOURCE website, the briefs were sent via e-mail announcement to thousands of professionals. The lists came from three sources:

E SOURCE. From the E SOURCE database, the authors pulled people with interests in the following areas: lighting, HVAC, building envelope, building systems, appliances, water heating, refrigeration and commercial or residential buildings.

Conferences. E SOURCE created a sign-up sheet for industry professionals who wanted to be added to the PIER tech brief e-mail announcement distribution list. E SOURCE collected names at two events in September 2008, the AESP Technology Symposium and the E SOURCE Annual Forum.

E SOURCE website. E SOURCE collected names, affiliations, and e-mail addresses from each visitor to the E SOURCE website who requested access to the tech briefs. Visitors had the option to be added to an e-mail announcement distribution list.

The Commission. The PIER program manager pulled a list for the e-mail announcements with the following instruction: "Could you please sort our T&C listing using these criteria:

- yes for outreach
- yes for any and/or all technologies
- no for "no e-mail"
- no for "no outreach"
- no for newspapers or TV

For these sorted items please include in the extract:

- full name
- position or title
- street address w/city and state
- company name
- phone
- e-mail address
- categories

McGraw-Hill Construction. Through April 2006, E SOURCE was a part of the McGraw-Hill Companies (MGH) and had access to MGH Construction list. E SOURCE sent e-mails announcing three briefs at a time to 10,000 professionals on the MGH Construction list. McGraw-Hill Construction is a leading supplier of information to the design and construction industry.

E-mail announcements included a PDF copy or Web link to the brief, a content summary of the brief, contact information, and opt-out options from the e-mail announcements. Here is a sample:

Dear Energy Professional:

Skylights equipped with photosensors and lighting controls can cut energy use by significant amounts in commercial buildings, yet they are seldom installed because designers and architects lack the information they need to do it right. If you're interested in cutting energy use while improving the indoor environment, you'll want to check out "Design Guidelines for Skylights with Suspended Ceilings." Highlights from this guide are included in the latest of our ongoing series of Technical Briefs, which you can access below:

Click here to download "Guide Illuminates Modular Skylight Well Design"

Note:

If you provide your contact information when you click on the link above, and your computer accepts cookies, you won't have to provide this information again in the future.

This brief and others that will follow in coming months are being produced by the California Energy Commission's Public Interest Energy Research (PIER) Program. The program is aimed at decreasing building energy use through research that develops or improves energy-efficient technologies, strategies, tools, and building performance evaluation methods. Presenting information in the areas of lighting, HVAC, building envelope, and controls, each brief will distill volumes of research results into a two-page summary of the problem addressed, the solution, and the benefits of implementing that solution. The briefs will also tell you where to get more information as you consider applying these technologies and practices.

Feedback requested: If you can spare us a few more moments of your time, we invite you to participate in a brief survey. Just hit reply and tell us:

1. Was the attached Technical Brief useful to you?

2. If so, how do you plan to use the information it presented?

3. How could we make these briefs more useful to you?

Thanks for letting us share the fruits of our research with you. We sincerely value any constructive feedback from you that could help us make our information more useful.

UNSUBSCRIBE INSTRUCTIONS:

If you would like to stop receiving Technical Briefs from the California Energy Commission's Public Interest Energy Research Program, or if this e-mail has been sent to you in error, please reply to this message. Type "REMOVE -- CEC" in the subject line. We will remove you from our list.

If you have any QUESTIONS regarding the Tech Briefs or the content of this message, please contact Eric Stubee at estubee@energy.state.ca.us.

2.4.2 Contacting Publications

As part of the effort to get articles about the PIER research projects published, an extensive spreadsheet of publications was developed for the various topical areas covered by the briefs and was added to over time as more topics were covered or more publications were identified. The final list is included in Table 3.

Table 3: List of publications by topic

Buildings - Residential & Commercial
Appliance Design Magazine
50+ Housing
American School & University Magazine
Architect Magazine
Architectural Record
Architecture Week
AutomatedBuildings.com
Better Homes & Gardens
Big Builder Magazine
Boulder Green Building Journal
Builder Magazine
Building Design & Construction
Building Design & Construction
Building Operating Management
Building Women Magazine
Buildings Magazine
California Builder
California Builder and Engineer
California Construction

Chief Engineer Magazine
College Planning and Management
Colorado Construction
Colorado Green Business
Commercial Builder Magazine
Construction Bulletin
Construction Digest
Construction Distribution
Contracting Business Magazine
Contractor Magazine
Cool Metal Roofing
Cool Roofs Rating Council
Council of Educational Facilities Planners International
Custom Builder
Custom Home
Design Cost Data
Dixie Contractor
Education Insider
Electrical Line Magazine
Engineering News-Record
ENR
Environmental Building News
Environmental Design + Construction
Facility Care

Facility Service Decisions
GreenSource
Healthcare Building Ideas
Home Power
Hospitality Construction
Insulation Outlook
Land Development Magazine
Maintenance Solutions
Medical Construction & Design
Michigan Contractor and Builder
Mid-Atlantic Construction
Midwest Construction
Midwest Contractor
National Clearinghouse for Educational Facilities
National School Plant Management Association
NBN Online
NCHI - The Preferred Supplier Resource
New England Construction
New York Construction
Pacific Builder and Engineer
PE: The Magazine for Professional Engineers
Professional Builder
Professional Remodeler
Professional Roofing

Residential Architect
Retail Construction Magazine
Roofing Contractor Magazine
RSI Magazine
School Construction News.com
School Planning and Management
SchoolFacilities.com
Sunset Magazine
Sustainable Facility
Today's Facility Manager
Washington Hotline and Multifamily Outlook
Western Builder
Western Roofing Magazine
General Energy
Consulting-Specifying Engineer
Energy & Power Management
Energy Design Update
Energybiz
EnergyPulse
Engineered Systems
Environmental News Network
Green @ Work Magazine
Green Building News
Home Energy Magazine

Mechanical Engineering
NAHB Research Center
On Earth Magazine
Western Area Power Administration Energy Services Bulletin
Lighting
Architectural Lighting
Contract Lighting
Design News
EC&M
Electrical Contractor
LD+A Magazine
Light Now
Lighting Controls Association
Lighting News Wire
Lighting.com
Professional Lighting Design Magazine
Residential Lighting Design Magazine
TED Magazine
Plumbing, Heating & A/C
ASHRAE Insights
ASHRAE Journal
HPAC Engineering Magazine
HVAC Insider
HVACR Business

Indoor Comfort News
PHC News
Plant Engineering Magazine
Plumbing & Mechanical Magazine
Plumbing Engineer
Reeves Journal
Society Connections
The Air Conditioning, Heating & Refrigeration News
The HVAC&R Industry
The Wholesaler
Foodservice & hospitality
Chain Leader
Cheers
Cornell Hotel and Restaurant Administration Quarterly
Food and Drink Magazine
Food Management
Food Service & Hospitality
Foodservice Director
Foodservice Equipment & Supplies
Foodservice Equipment Reports
Global Foodservice
Hospitality Design
Hospitality Technology
Hotel & Motel Management

Hotel Motel Engineering Association
Hotels
National Restaurant Association SmartBrief
Nation's Restaurant News
QSR Magazine
Restaurant Business
Restaurant Hospitality
Restaurant Report
Restaurants & Institutions
SLAMMED Magazine
Southeast Food Service News
Southwest Food Service News
Total Foodservice
Power Sources
American National Standards Institute
IEC e-Tech (Int'l Electrotechnical Commission)
ISO Focus (Int'l Organization for Standardization)
ISO Management Systems
Power Sources Manufacturers Assocation newsletter

Source: Provided by the author

The authors sent each publication an e-mail that included a copy of the brief (PDF file), summarized the content of the brief, and described the PIER Program. Here is a sample:

Subject line: Residential Commissioning Guide

I am writing to inform you about a residential commissioning guide that I think your readers would be interested in. Houses are complex systems of interacting components that don't always perform properly. A major reason for poor performance is the lack of consistent procedures to ensure that a home is built and operated in the way it was intended. "Guidelines for Residential Commissioning," developed through the California Energy Commission's Public Interest Energy Research (PIER) Program, addresses this issue by integrating many available procedures into a comprehensive process that considers the house as a whole system. The attached pdf is a technical brief, "Residential Commissioning Brings Home Comfort and Savings," that describes the new guide. If you agree that this information is of interest to your readers, feel free to publish in any format you deem appropriate—i.e. use as is; summarize further; or add more information. If you have any questions, please call or e-mail.

This brief and others that will follow in coming months are being produced by the California Energy Commission's PIER Program. The program is aimed at decreasing building energy use through research that develops or improves energy-efficient technologies, strategies, tools, and building performance evaluation methods. Presenting information in the areas of lighting, HVAC, building envelope, and controls, each brief will distill volumes of research results into a two-page summary of the problem addressed, the solution, and the benefits of implementing that solution. The briefs will also tell you where to get more information as you consider applying these technologies and practices. The brief can be accessed from the web at http://esource.com/public/products/cec_form.asp.

2.4.3 Extended Marketing Plan

In early 2007 the authors developed a formal marketing plan as part of a contract extension to expand outreach for the technical briefs. The plan follows below. The authors developed a modified plan in late 2007, based on a request from the Commission contract manager to focus outreach efforts in terms of audience rather than in terms of channel (website, publications, etc.). The revised plan appears as Appendix A.

Target Audience

The primary audience for technical briefs is those that can make use of the technologies and strategies that the briefs describe. This includes architects, engineers, designers, contractors, building developers and owners, and building operators and managers for industrial, commercial, and residential facilities.

The secondary audience includes market partners on research teams, building product manufacturers, utilities, codes and standards groups, government and non-governmental organizations focused on energy and environmental issues, and other implementers of building efficiency.

Targets within the State of California were the primary focus, but distribution beyond California was welcome and encouraged.

Goals

The overall goal of this plan is to drive adoption of energy-efficient technologies and strategies developed through the PIER Buildings Program by distributing and otherwise making available PIER technology briefs to interested parties, particularly those in a position to put these findings into practice. Market adoption of these technologies depends on awareness of their availability and efficacy.

Metrics

Metrics to measure overall success are not stated in the Commission/E SOURCE contract in terms of a specific number of technology briefs to be distributed or a certain number of people, organizations, or publications to be contacted. The idea is to achieve widespread promotion about the availability and cost-effectiveness of energy-efficient building materials, technologies, and design to as many potentially interested and relevant audiences as possible. To this end, E SOURCE has proposed specific metrics for the strategies and tactics included in this plan to track progress and results, enabling ongoing assessment and making possible midcourse corrections to improve results. Deliverables related to these metrics are noted at the end of each strategy section and then compiled again at the end for easy reference.

Budget and Strategy

As of March 1, 2007, the remaining marketing budget for this project was $77,935. Due to these financial limitations and the practical considerations of the Commission, the marketing plan focused on low-cost and no-cost promotion strategies to achieve its goals. The authors focused on five areas:

- Websites
- E-mail
- Media placements
- Trade Shows
- Educational and Industry Outreach

Each strategy and its attendant tactics and metrics are outlined in the Execution section below. The majority of the expenses incurred in the execution of this plan will be labor costs, rather than large expenditures for advertising and other mass market promotions.

Execution

I. Website

The objective for the website strategy is to increase the number of technical briefs downloaded by our target audiences.

The strategy is threefold: 1) improve the E SOURCE website to make it more effective for marketing purposes and easier to use for site visitors; 2) drive traffic to the PIER technical brief section of the E SOURCE website; 3) add technical briefs to other websites.

Strategy 1 – Improve E SOURCE website to make it more effective for marketing purposes and easier to use for site visitors.

Tactics

- Change wording on login page of the website so that more people click through the page by explaining what the briefs are and how to use them. The goal was also to encourage people to sign up to be notified when new briefs are posted, and require all future site users to either accept or decline to subscribe to future notifications for new briefs.
- Fix the technical glitch that prevents the website from accepting cookies so that people only need to sign up and log in the first time.
- Apply taxonomy to the growing number of briefs to make them easier to find. Categorize them by technology type, such as lighting, heating, etc**.**
- Create a one to two sentence description of each brief to better describe it and encourage more downloads. Consider changing file/link names for the same reason.
- Ensure that Google Analytics is properly tracking page hits, downloads, referring pages, and other statistics for reporting to the Commission.

Metrics

1) List of tasks accomplished in month.
2) Google Analytics tracking to include number of monthly web page visits to the PIER side of the E SOURCE website and the number of downloads for each brief.

Strategy 2 – Drive traffic to the PIER technical brief section of the E SOURCE website by increasing the number of websites with embedded links.

Tactics

- Drive traffic to the PIER technical brief section of the E SOURCE website per efforts under e-mail and media placement.
- Identify organizations that may embed a link to the PIER technical brief section of the E SOURCE website on their websites, such as the Emerging Technologies Coordinating Council (ETCC), ASHRAE, the AIA, and the Lawrence Berkeley National Laboratory. Although scope is not limited to California, special attention should be given to organizations within California.

- Target E SOURCE members to see if links can be placed on their websites: Send e-mail to all service subscribers, explaining availability of briefs, how their organizations might use them and how to access them or contact the authors.
- Identify organizations that already host copies of briefs on their websites and contact them about placing new briefs.

Metrics

1) Names and number of external organizations contacted and links placed.
2) Google Analytics tracking to include number of monthly Web page visits to the PIER side of the E SOURCE website and the number of downloads for each brief.
3) List of tasks accomplished in month.

Deliverables

1) **Description of Technology Brief Integration.** A written description of where the technology briefs have been integrated within the E SOURCE website and the California Energy Commission website. Also include a written description of outside organizations that have integrated briefs into websites.
2) **Final Benchmarking Report.** Use Google Analytics to track and compare downloads of briefs from the E SOURCE website.

II. E-mail

The objective is to build awareness of technical briefs and stimulate interest in their use among architects, engineers, contractors, building developers, owners, operators and managers, materials manufacturers, utilities, state and local governments, codes and standards groups, and other implementers of building efficiency.

Strategy 1 – Send out e-mail messages to energy professionals that will drive traffic to the E SOURCE website so that people can download the briefs.

Tactics

- Build e-mail list membership by reviewing Salesforce and Lyris lists and previous mailing results so researchers can target people and companies with similar profiles. Commission to send names as appropriate.
- Rectify issue with existing names not currently in mailing list due to fact the authors didn't ask them if they wanted to subscribe. Craft and send a one-step opt-in e-mail message to names on list to see if they'd like to subscribe. (Per website objective: Change wording on website so all future e-mail addresses captured have either accepted or declined to subscribe to future notifications for new brief.)
- Add new names to e-mail list each month by requesting opt-in contact info from people who wish to download briefs from the E SOURCE website.

- Promote technical briefs to utility audience through existing monthly e-mail announcements such as Tech News and other TAS newsletters.
- Build e-mail list through sign ups via website links, media placements, trade shows, and educational outreach efforts. See those strategies for details.
- Rework the copy used to announce new briefs in order to make it more compelling.

Metrics

1) Number of e-mails sent each month, recipients, opens, links followed (statistics available from 4/1/07 forward).
2) List of tasks accomplished in month.

Deliverables

1) **E-mail List.** Provide the Commission with the information of those who have subscribed to received ongoing tech brief updates. Also provide data on additional tech brief e-mails sent (for example, announcements sent to E SOURCE members through existing e-mailings).
2) **Draft of E-mail Summary Report.** Document the total number of e-mails sent regarding each brief. List organizations targeted and job categories of recipients if known. If statistics are available, note the number of recipients, number of opens, links followed. Submit draft for review to the Commission contract manager (CCM).
3) **Final Publication Summary Report.** Integrate feedback from the CCM to finalize the Publication Summary Report.

III. Media Placement

The objective for media placement is to increase public awareness of technical briefs through their publication in appropriate newspapers, magazines, and journals. Secondarily, it is to drive traffic to the E SOURCE website so that people can download PDFs of the briefs.

Strategy – contact by phone and/or e-mail editors of publications likely to be read by people who could benefit from this research in order to solicit media placement; rewrite tech briefs as necessary to accommodate editors' requests.

Tactics

- For each new brief send out e-mails to relevant audience announcing brief and soliciting publication. Track responses per metrics below.
- Build larger circulation list by reviewing existing publications on the author's list and the results the authors have achieved to date so we can target editors and publications with similar profiles.
- Develop a list of print and online publications that cover energy, building, engineering, architecture, HVAC, lighting, or related topics.

- Identify relevant previously issued briefs and promote them as appropriate to new organizations that are identified.
- Create copy unique to each tech brief announcement to make it more compelling to the specific publication type and audience it is addressed to.
- Contact utility companies to see about media placement in customer newsletters, internal company publications, etc. Use Salesforce to develop a contact list.

Metrics

1) Number of publications contacted each month by phone or e-mail. Statistics on articles placed, date of placement, date of publication, example of article, approximate circulation size of audience reached, if known.
2) Names and number of new publications added to the list each month.

Deliverables

1) **List of Relevant Publications.** Compile a list of the relevant publications and publishers to be contacted for possible brief media placement.
2) **Draft of Publication Summary Report.** Document the quantity of each brief that was distributed, as well as the number and type (architect, designer, utility, manufacturer, etc.) of people that likely received each of those materials. For each technology brief, document the name of each publication that used that brief. To the extent possible, file electronic and paper copies of media containing content from technology briefs. Provide PDF files and hard copies of all placed briefs via a scrapbook. Submit draft for review to the Commission contract manager (CCM)**.**
3) **Final Publication Summary Report.** Integrate feedback from the CCM to finalize the publication summary report.

IV. Trade Shows and Conferences

The objective is to increase awareness of PIER technical briefs at trade shows and conferences that E SOURCE plans to attend. While the authors are focusing on a cost-sharing arrangement to keep Commission expenses low, there is a limited budget available for them to attend conferences on behalf of the Commission.

Strategy – Bring brochures, printed technical briefs, and e-mail list signup sheets to trade shows and conferences at which E SOURCE plans to attend and, on a less frequent basis, attend conferences on behalf of the Commission. Devote table space and conversation time to promoting the tech briefs.

Tactics

- Build on the existing list of upcoming tradeshows.
- Coordinate speaking engagements with E SOURCE staff speakers.

- Develop and print brochure (and downloadable PDF version) describing PIER Program, tech briefs, and E SOURCE efforts.
- Print copies of technical briefs for distribution.
- Create a sign-up sheet so people can subscribe to e-mail list to be notified when new briefs are available.
- Arrange with E SOURCE researchers, member services, and salespeople to encourage distribution of Commission materials at relevant conferences and trade shows.
- If possible, obtain attendee lists from trade shows and conferences and add names and contacts to prospect list for e-mail notifications, potential publications, for media placement, educational outreach opportunities, etc.
- Send an all E SOURCE e-mail notifying colleagues of researchers' intentions and requesting support.
- Identify trade shows and conferences that are appropriate for distributing briefs and E SOURCE is not planning to attend. Commission approves and decides attendance.

Metrics

1) Number of trade shows and conferences attended each month, subject and date of event, who was the audience, how were briefs distributed, number of attendees in aggregate if known, and the results of outreach effort (how many briefs distributed, how many e-mail sign-ups, etc.). Also track associated expenses to be allocated to the Commission, number of briefs and brochures distributed.
2) List of tasks accomplished in month.

Deliverables

1) **Post-Conference Reports**. Provide post-conference reports on all conferences and tradeshows attended. Include subject and date of event, who was the audience, how were briefs distributed, and the results of outreach effort (how many briefs distributed, how many e-mail sign-ups, etc.).

V. Educational and Industry Outreach

The objective is to increase awareness of PIER technical briefs and maintain communications with trade associations, trade training schools, and colleges and universities.

Strategy – Increase awareness of PIER technical briefs among educators and future end users.

Tactics

- Consult with Paul Komor, Ph.D., lecturer at the University of Colorado School of Engineering and E SOURCE senior advisor, on most appropriate tactics for this objective.

- Create a list of colleges, universities, and technical schools that offer energy related courses.
- Use the E SOURCE DSMdat database to create a list of utilities and industry groups that provide energy efficiency training courses for their customers. Identify key administrators in these organizations**.**
- Phone, mail, or e-mail relevant organization administrators, department heads, and faculty to arrange to send them brochures and sample tech briefs. Inquire if they are interested in sharing these materials with their audience on a one-time or regular basis. Determine if they are willing to place a link on their Websites to the E SOURCE tech briefs web page. See if they are interested in signing up for e-mail notifications of future briefs.
- Develop and print brochure on PIER Buildings program, technical briefs, and E SOURCE efforts.
- Print copies of technical briefs for distribution.

Metrics

2) Track the number of utilities, industry organizations, training programs, colleges, and universities contacted each month, and which distributed briefs.
3) List of other tasks accomplished in month.

Deliverables

1) **Provide a List of College/Universities.** Document the colleges and universities who researchers intend to contact and the results of their efforts.
2) **Provide a List of Utilities and Training Programs.** Document the utilities and training programs whom the authors intend to contact and the results of their efforts.
3) **Provide Documentation of Outreach Materials.** Provide copies of materials gathered through planned and completed contacts with education professionals and utilities. These materials may be in electronic or hard copy.

Deliverables

I. Website

Description of Technology Brief Integration. A written description of where the technology briefs have been integrated within the E SOURCE website and the California Energy Commission website. Also include a written description of outside organizations that have integrated briefs into websites.

Final Benchmarking Report. Use Google Analytics to track downloads of briefs from the E SOURCE website.

II. E-mail

E-mail List. Provide the Commission with the information of those who have subscribed to received ongoing tech brief updates. Also provide data on additional technical brief e-mails sent (for example, announcements sent to E SOURCE members through existing e-mail announcements).

Draft of E-mail Summary Report. Document the total number of e-mails sent regarding each brief. List organizations targeted and job categories of recipients if known. If statistics are available, note the number of recipients, number of opens, links followed. Submit draft for review to the Commission contract manager (CCM).

Final Publication Summary Report. Integrate feedback from the CCM to finalize the publication summary report.

III. Media Placement

List of Relevant Publications. Compile a list of the relevant publications and publishers to be contacted for possible brief media placement.

Draft of Publication Summary Report. Document the quantity of each brief that was distributed, as well as the number and type (architect, designer, utility, manufacturer, etc.) of people that likely received each of those materials. For each technology brief, document the name of each publication that used that brief. To the extent possible, file electronic and paper copies of media containing content from technology briefs. Provide PDF files and hard copies of all placed briefs via a scrapbook. Submit draft for review to the Commission contract manager (CCM).

Final Publication Summary Report. Integrate feedback from the CCM to finalize the publication summary report.

IV. Trade Shows and Conferences

Post-Conference Reports. Provide post-conference reports on all conferences and trade shows attended. Include subject and date of event, who was the audience, how were briefs distributed, and the results of outreach effort (how many briefs distributed, how many e-mail sign-ups, etc.).

V. Educational and Industry Outreach

Provide a List of College/Universities. Document the colleges and universities who we intend to contact and the results of our efforts.

Provide a List of Utilities and Training Programs. Document the utilities and training programs whom the authors intend to contact and the results of their efforts.

Provide Documentation of Outreach Materials. Provide copies of materials gathered through planned and completed contacts with education professionals and utilities. These materials may be in electronic or hard copy.

CHAPTER 3:
Project Outcomes

In the course of this contract, a total of 53 technical briefs on 45 projects were produced. (The number of briefs is greater than the number of topics because updated versions were produced for several of the briefs in the course of the contract.) These briefs received exposure to targeted professionals through list serves, publications, and trade shows (Table 4).

Table 4: Marketing results for technical briefs

PIER tech briefs viewed or downloaded from E SOURCE	22,100
PIER tech briefs and brochures distributed at conferences and other events	1,350
Articles published in industry publications about PIER tech briefs	94
External websites that link to PIER tech briefs	8
Association of Energy Services Professionals (AESP) Industry Information	
American Institute of Architects (AIA) Soloso website	
McGraw-Hill GreenSource	
Pacific Energy Center (PEC) Energy Resource Center	
Architecture Week Download Center	
Building Operator Certification (BOC) website (links to featured tech briefs rotate every month under News & Trends on home page)	
University of Calgary Libraries and Cultural Resources International web resources	
International Facility Management Association (IFMA) GreenZone	
Energy professionals on PIER technical brief e-mail distribution list	2,309

Source: Provided by the author

3.1 Publications and Listserves

3.1.1 Publications

Each brief was sent to approximately 100 online and print publications. Ultimately, 94 articles about PIER technical briefs were published. The articles ranged from short notices or news items about the technology to full-length feature articles that expanded on the information in the brief. (See Figure 4 for an example; and Appendix B for a web link to articles covering briefs.)

Indoor Comfort News (ICN) regularly reformatted the HVAC related briefs and published them. ICN is the West's leading monthly newsmagazine for the air conditioning, heating, refrigeration, sheet metal, and ventilating industries. Circulation is about 25,000 copies in the western United States, and 74.3 percent of the magazine circulation is contractor-based. In addition, ICN is widely distributed to major HVAC manufacturers, distributors, and wholesalers, as well as many specifying and mechanical engineers, utility companies, and governmental agencies.

CEC PIER Buildings Program

Design Guide: Big Savings on Small HVAC Systems

Editor's note: reprinted with permission from the California Energy Commission's website at www.energy.ca.gov

The Problem

Small packaged heating, ventilation, and air-conditioning (HVAC) systems are among the most common HVAC systems for small commercial buildings. These systems, however, are notorious for a host of problems requiring 25 to 35 percent more energy than is necessary to heat, cool, and ventilate California buildings (see Figure 1). This poor performance results from inadequate design and installation as well as from poor maintenance and operating practices.

The Solution

The "Small HVAC System Design Guide," available from the California Energy Commission, discusses solutions to common problems in the design, operation, and maintenance of small rooftop HVAC systems. It begins by emphasizing the importance of an integrated design approach; offers information on overall building design practices used to minimize HVAC loads; discusses the importance of selecting the proper unit size and how to design effective distribution and control systems; and concludes with discussions of commissioning, operation, and maintenance.

Features and Benefits

The guide outlines approaches to improving HVAC systems and overall building performance. The main recommendations are:

- Reduce load by using such strategies as reducing lighting power, using high-performance glass and skylights, adopting cool roofs, and increasing roof insulation (see Figure 2 on page 28).
- Specify reliable, factory-installed and -tested economizers with direct-drive actuators and low-leakage dampers.
- Specify commercial grade two-stage cooling thermostats with the ability to schedule fan operation and heating and cooling setpoints independently, ensuring continuous ventilation as required by code.

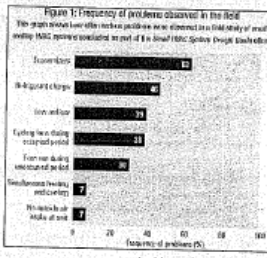


Figure 1: Frequency of problems observed in the field

- Size HVAC units using ASHRAE-approved methods that account for the reduced loads achieved in the design phase, and make reasonable assumptions for plug load power and ventilation air quantities when sizing equipment.
- Specify right-sized high-efficiency units that meet Tier 2 efficiency standards established by the Consortium for Energy Efficiency (www.cee1forum.org).
- Design distribution systems with lower air velocities to reduce pressure-drop and noise. Seal and insulate duct systems located outside the building's thermal envelope.
- Incorporate demand-controlled ventilation to reduce heating and cooling loads.
- Commission HVAC systems prior to occupancy. In particular, check the functioning of economizers, fans, and controls.
- Clearly define the services to be provided by HVAC maintenance personnel.

By applying the integrated design principles outlined in the guide, the energy consumption of buildings with small HVAC systems can be reduced by 25 to 35 percent without incurring significant increases in capital costs. These load-reduction strategies result in smaller and therefore less costly HVAC systems that have simple payback periods of 0.2 to 2.4 years. For example, following the recommended procedures for a typical building in Sacramento could cut the required cooling capacity by more than 40 percent, saving enough in HVAC

Continued on Page 28

The Dynamic Duo!

No matter the size of the AC&R system, here are two leak detection kits that are perfect for all your inspection needs.

OPK-50EZ/E
For Small to Medium AC&R Systems.
Features the award-winning, super-compact OPTIMAX Jr™ cordless leak detection flashlight.
Power comparable to 75W lamps!
Treats up to 50 lbs. of refrigerant,
4 gallons of lubricant or 24 tons of cooling.

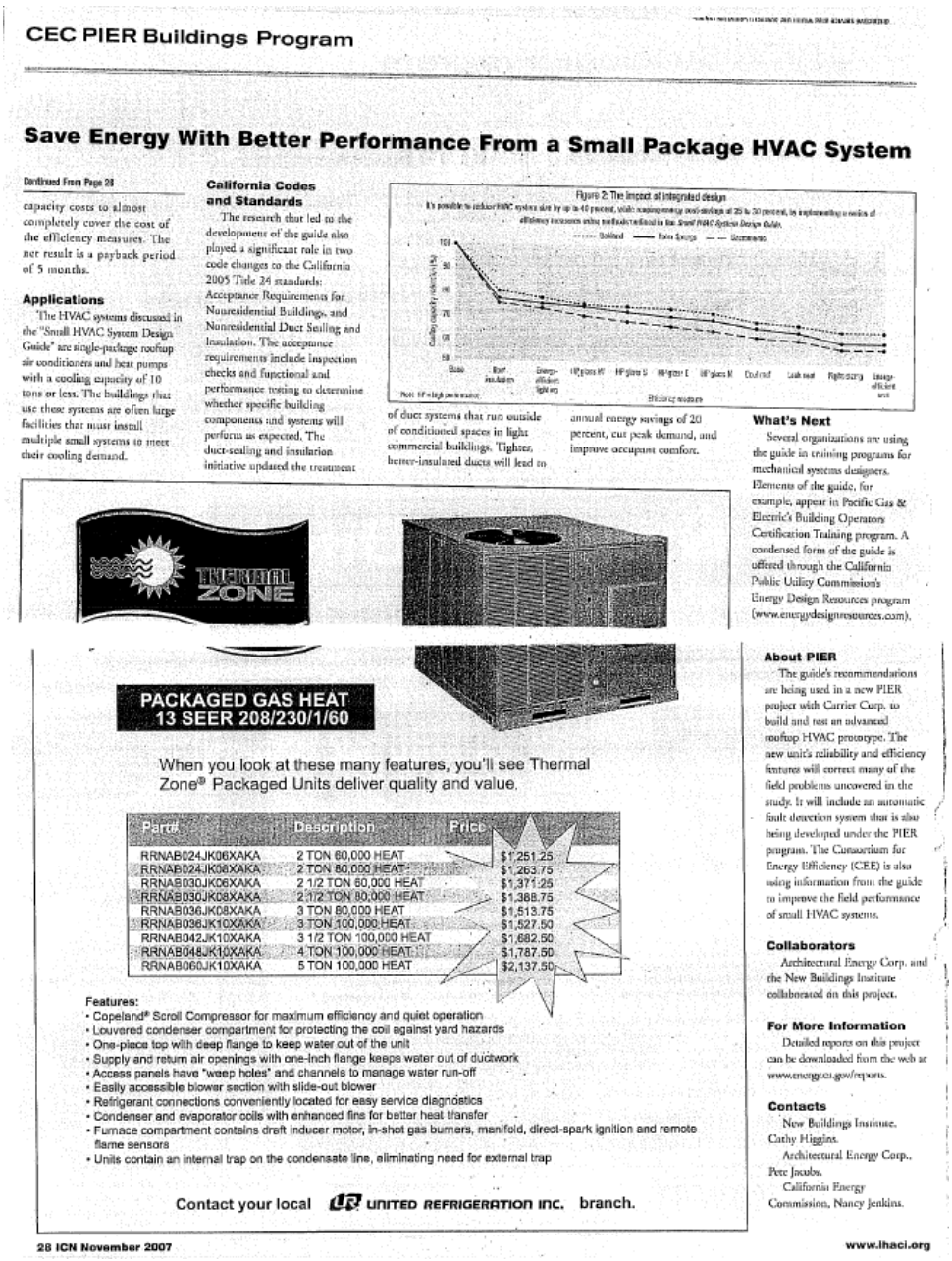
OPK-300BEZ/E
For Medium to Large AC&R Systems.
Features the super-powerful OPTIMAX™ 3000 cordless, rechargeable leak detection flashlight.
Power comparable to 150W lamps!
Treats up to 400 lbs. of refrigerant,
16 gallons of lubricant or 150 tons of cooling.

Each kit features a powerful LED flashlight, universal fluorescent dye cartridges that are OEM-approved and co-solvent free, and patented dye injectors for precision dosing. In addition, both kits come complete with GLO-AWAY™ dye cleaner, fluorescence-enhancing glasses and a rugged carrying case. With these fully loaded kits, finding all refrigerant leaks in any size AC&R system is a snap! Best of all, you can inspect the entire system *without* shutting it down! Spectroline® OPK-50EZ/E and OPK-300BEZ/E kits – *the dynamic duo of leak detection!*

For more information, call 1-800-274-8888 or visit www.spectroline.com

SPECTRONICS CORPORATION

ISO 9001:2000 CERTIFIED COMPANY



CEC PIER Buildings Program

Save Energy With Better Performance From a Small Package HVAC System

Continued From Page 28

capacity costs to almost completely cover the cost of the efficiency measures. The net result is a payback period of 5 months.

Applications

The HVAC systems discussed in the "Small HVAC System Design Guide" are single-package rooftop air conditioners and heat pumps with a cooling capacity of 10 tons or less. The buildings that use these systems are often large facilities that must install multiple small systems to meet their cooling demand.

California Codes and Standards

The research that led to the development of the guide also played a significant role in two code changes to the California 2005 Title 24 standards: Acceptance Requirements for Nonresidential Buildings, and Nonresidential Duct Sealing and Insulation. The acceptance requirements include inspection checks and functional and performance testing to determine whether specific building components and systems will perform as expected. The duct-sealing and insulation initiative updated the treatment of duct systems that run outside of conditioned spaces in light commercial buildings. Tighter, better-insulated ducts will lead to annual energy savings of 20 percent, cut peak demand, and improve occupant comfort.

Figure 2: The impact of integrated design

What's Next

Several organizations are using the guide in training programs for mechanical systems designers. Elements of the guide, for example, appear in Pacific Gas & Electric's Building Operators Certification Training program. A condensed form of the guide is offered through the California Public Utility Commission's Energy Design Resources program (www.energydesignresources.com).

THERMAL ZONE

PACKAGED GAS HEAT
13 SEER 208/230/1/60

When you look at these many features, you'll see Thermal Zone® Packaged Units deliver quality and value.

Part#	Description	Price
RRNAB024JK06XAKA	2 TON 60,000 HEAT	$1,251.25
RRNAB024JK08XAKA	2 TON 80,000 HEAT	$1,263.75
RRNAB030JK06XAKA	2 1/2 TON 60,000 HEAT	$1,371.25
RRNAB030JK08XAKA	2 1/2 TON 80,000 HEAT	$1,388.75
RRNAB036JK08XAKA	3 TON 80,000 HEAT	$1,513.75
RRNAB036JK10XAKA	3 TON 100,000 HEAT	$1,527.50
RRNAB042JK10XAKA	3 1/2 TON 100,000 HEAT	$1,682.50
RRNAB048JK10XAKA	4 TON 100,000 HEAT	$1,787.50
RRNAB060JK10XAKA	5 TON 100,000 HEAT	$2,137.50

Features:
- Copeland® Scroll Compressor for maximum efficiency and quiet operation
- Louvered condenser compartment for protecting the coil against yard hazards
- One-piece top with deep flange to keep water out of the unit
- Supply and return air openings with one-inch flange keeps water out of ductwork
- Access panels have "weep holes" and channels to manage water run-off
- Easily accessible blower section with slide-out blower
- Refrigerant connections conveniently located for easy service diagnostics
- Condenser and evaporator coils with enhanced fins for better heat transfer
- Furnace compartment contains draft inducer motor, in-shot gas burners, manifold, direct-spark ignition and remote flame sensors
- Units contain an internal trap on the condensate line, eliminating need for external trap

Contact your local UNITED REFRIGERATION INC. branch.

About PIER

The guide's recommendations are being used in a new PIER project with Carrier Corp. to build and test an advanced rooftop HVAC prototype. The new unit's reliability and efficiency features will correct many of the field problems uncovered in the study. It will include an automatic fault detection system that is also being developed under the PIER program. The Consortium for Energy Efficiency (CEE) is also using information from the guide to improve the field performance of small HVAC systems.

Collaborators

Architectural Energy Corp. and the New Buildings Institute collaborated on this project.

For More Information

Detailed reports on this project can be downloaded from the web at www.energy.ca.gov/reports.

Contacts

New Buildings Institute, Cathy Higgins.
Architectural Energy Corp., Pete Jacobs.
California Energy Commission, Nancy Jenkins.

28 ICN November 2007 www.ihaci.org

Figure 4: Brief appearance in *Indoor Comfort News*

In addition, a number of organizations and industry online communities embedded links to briefs. Highlights include:

- ***Indoor Comfort News***. Circulated monthly, this West Coast-based news magazine for the air conditioning, heating, refrigeration, sheet metal, and ventilating industries regularly featured full copes of the HVAC-related briefs. While the briefs were reformatted to fit the publication's style, they still contained all the same information including links to the PIER website. Coverage was listed on the front page under the heading "CEC PIER Program."

- **The Association of Energy Service Professionals (AESP).** The AESP, "a member-based association dedicated to improving the delivery and implementation of energy efficiency, energy management and distributed renewable resources" lists all the PIER tech briefs on the Industry Information section of its website. The page lists each brief title, a short description, and a link to download the PDF of the brief. AESP staff members have been very responsive and willing to make updates to the website to add newly posted briefs. AESP twice highlighted new briefs in its e-newsletter, which is sent to all AESP members.
- **The American Institute of Architects (AIA).** The AIA has posted 26 PIER tech briefs on its Soloso website. Soloso provides the architectural community information such as research and resources, and "fosters and facilitates the sharing of knowledge, exchange of ideas, and collaboration among architects." AIA posts each technical brief with a description of the problem the brief addresses and offers visitors a link to the full PDF copy of the brief.
- **The Internet Scout Project** focuses on research and development projects that provide better tools and services for finding, filtering and delivering online information and metadata, provided a link to the briefs: http://scout.wisc.edu/Reports/NSDL/MET/2005/met-050617-research.php
- **Architecture Week** included a link to briefs in its Green Buildings Directory.
- **The Whole Building Design Guide**, an online resource for high-performance building design, references the lighting-related briefs http://www.wbdg.org/resources/efficientlighting.php and http://www.wbdg.org/resources/electriclighting.php.
- **The Schatz Energy Research Center**, at Humboldt, Arcata, California, listed the briefs as a resource in a class on "Greening Our Campus."
- A blog from a librarian at **Case Western Reserve University** pointed to the briefs as a good source of technical information http://blog.case.edu/bcg8/2005/06/22/esource_pier_technical_briefs.

For these organizations, the briefs have become a part of the PIER brand. Continuing to provide briefs for these websites will enhance the PIER reputation.

In addition, the briefs also play an integral role in supporting other PIER programs and research:

- For any demonstration site for which a brief is available, the demonstration website posts the brief as an information resource (Figure 5). Links on the site take users to case study data (including payback curves that are of interest to designers and project engineers), product specifications in a format (CSI MasterSpec) that is useable by specification writers and procurement officials; LEED details, and the briefs. The briefs serve as Cliff Notes-type quick summaries for executives and decision-makers in the

approval chain. The briefs are also being used as marketing tools to recruit partners, such as the city of Cambridge, Massachusetts, into the program.

- Briefs on lighting topics can be accessed from the PIER project "Lighting California's Future."

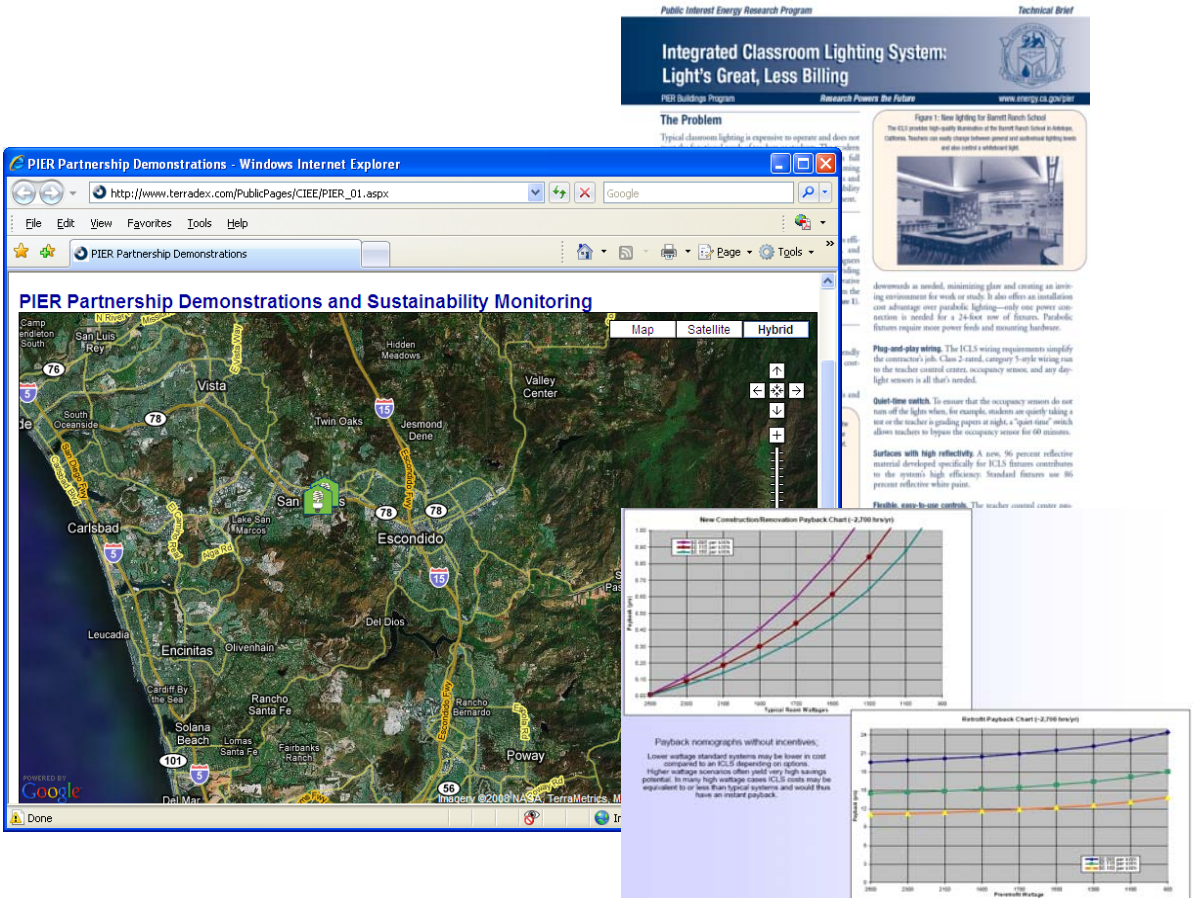


Figure 5: Briefs provide vital information for demonstrations program

3.1.2 Listservs

The authors were able to build a listserv of 2,309 professionals who received regular PIER announcements and tech brief updates. Using Google Analytics, the authors were able to track the number of PIER brief downloads from the E SOURCE site – there were more than 22,000 downloads January 1, 2007, (when the authors started tracking) through December 1, 2008. In addition, we received much positive feedback from those receiving ongoing updates. Specific comments can be found in Section 3.3.

3.2 Trade Shows and Conferences

As part of the extended marketing plan, the authors attended a number of trade shows and conferences (Table 5) and distributed briefs and/or gave presentations describing PIER projects related to the audience.

Table 5: Trade shows and conferences

AESP Technology Symposium: What's New in Demand Response and Energy Efficiency	Irwindale, CA	October 12–13, 2006
AESP National Conference	Las Vegas, NV	January 29–February 1, 2007
AESP Technology Symposium: Energy Efficiency and Demand Response	Long Island, NY	September 17–19, 2007
20th Annual E SOURCE Forum	Boulder, CO	September 25–28, 2007
EEI Fall National Accounts Workshop	Indianapolis, IN	September 30–October 3, 2007
Alliance to Save Energy Energy Efficiency Global Forum & Exposition	Washington, DC	November 11–14, 2007
Advanced Facilities Management & Engineering Conference 2008	Denver, CO	November 12–13, 2007
AESP National Conference	Clearwater, FL	January 28–31, 2008
ASHRAE Boston chapter event	Boston, CO	April 15, 2008
E SOURCE MAS and CEMC Summits	Seattle, WA	May 7–9, 2008
Ecobuild America and AEC Science and Technology 2008	Anaheim, CA	May 19–22, 2008
LightFair International 2008	Las Vegas, NV	May 26–30, 2008

UC/CSU/CCC Sustainability Conference 2008	San Luis Obispo, CA	July 31–August 3, 2008
ACEEE Summer Study on Energy Efficiency in Buildings 2008	Pacific Grove, CA	August 17–22, 2008
AESP Technology Symposium	Long Beach, CA	September 17–19, 2008
E SOURCE Annual Forum	Denver, CO	September 21–25, 2008

Source: Provided by the author

In total, approximately 1,350 PIER technology briefs were distributed at the conferences listed above. Highlights include:

- PIER Buildings sponsored an exhibit table at the E SOURCE Annual Forum in September 2008. The Forum attracts more than 300 industry professionals comprised of utility executives from utilities across the United States and Canada (with a good representation from California utilities) as well as consultants and technology vendors. Forum attendees who visited the PIER booth could sign up to be added to the tech brief e-mail announcement distribution list. In addition, Chris Calwell of Ecos Consulting spoke on a panel session at the forum about his research for PIER related to plug load metering of household electronics.
- E SOURCE and PIER also sponsored an exhibit table at the AESP Technology Symposium in September 2008. The Technology Symposium brought together approximately 150 people from the energy industry including utility representatives, technology vendors, and consultants. The tech briefs were well received, and again, about 20 attendees signed up to be added to the tech brief e-mail announcement distribution list.
- E SOURCE staff organized two meetings on August 21, 2008, during the American Council for an Energy-Efficiency Economy (ACEEE) Summer Study conference. The purpose was to bring together PIER staff, utilities, and contractors to network with each other and discover avenues of collaboration. The meetings also introduced other utilities that were unfamiliar with PIER to the work that the organization does. A total of 14 contractors or consultants and more than 25 utility representatives attended the networking sessions.
- In August 2008 E SOURCE staff met with Irene Stillings, executive director, and Ashley Watkins, program manager of the California Center for Sustainable Energy (CCSE). The CCSE contains displays of lighting, motors, etc., and walls lined with brochures and other information. E SOURCE staff showed them the PIER tech briefs, which they

weren't familiar with. They were very impressed and excited about the free resource and practically ran out of the meeting to start printing them out. Visitors to the CCSE range from utility people, to builders, architects, and even school groups. CCSE also has quite a large meeting facility that is accessed through the display area, which increases traffic. The center also runs some high visibility community sustainability events.

- In May 2008, E SOURCE staff attended EcoBuild America in Anaheim, California. EcoBuild attendees consisted of designers, architects, engineers, facilities managers, and building owners. Thirty four attendees signed up to receive ongoing brief updates, 18 made specific requests for briefs to pass on to their customers (4 were professors of sustainability related courses), and 3 wanted to embed links (DOE was one). The authors also spoke with representatives from Roseville Electric, Anaheim Public Utilities, LADWP, SCE, and the California Center for Sustainable Energy about embedding links/providing briefs in customer newsletters.

3.3 Direct Feedback

Testimonials that the authors received from editors and those who downloaded briefs from the E SOURCE site are proof that briefs are an important, valuable, and appreciated resource. In terms of future considerations, the fact that so many responded positively to the resource indicates that future investment to create and disseminate briefs should continue to be made.

A few of the testimonials the authors received include:

- **Program manager, Pacific Gas and Electric**: "The tech briefs are extremely useful in my work as Program Manager for the PG&E School Resource Program. I use the briefs as leave-behind materials when consulting with public school districts on energy efficient design and retrofit concepts. I appreciate that the briefs are limited to two pages. This improves the probability that they will be used as a design reference because the technology descriptions are succinct."

- **Editor, *Chief Engineer* magazine**: "I think the briefs are very beneficial to our readers. Although published for California, the information is something that can be applied to our readers as well. Please keep us on your mailing list."

- **Northwest Energy Efficiency Council**: "They are fantastic technical briefs! Thanks for publishing!"

- **Program Manager, E-Ster (Belgium)** regarding TB-28, "Thermally Driven Heat Pump Runs Hot and Cold for Food and Beverage Industries": "The technical briefs are very useful. I already sent the information to a client which is one of the largest meat processing factories in Belgium. We also hope to use it for a forthcoming energy audit of a brewery, provided that this technology becomes commercially available in Belgium/Europe. Please keep up the good work!"

- **Edward H. Cook & Associates, P.A.**: "They are excellent!! Thanks for the fine work."

- **Davis Energy Group**: "I appreciate receiving the technical briefs. We will be using the information for our work under the Building America program and other projects."
- **Process Applications Engineer, Energy Systems Group, Georgia Power Company**: "I find your briefs useful in keeping me up to speed on the latest energy efficiency tips. They help me help my customers in turn. Your efforts are appreciated. Thank you."
- **Coordinator, DSM Portfolio, Union Gas Ltd.:** "The concept of the technical e-mail briefs is good. So is the conciseness. They're great! So much better than the spam I get all of the time from ASHRAE and AESP."
- **President, Kreider & Associates:** "The tech briefs are a novel idea with promise. I plan to use the briefs in university graduate courses in energy efficiency."

CHAPTER 4:
Conclusions and Recommendations

4.1 Conclusions

The technical briefs serve as crucial links in the technology transfer chain that runs from research through development and on to adoption in the commercial marketplace. If the architectural/engineering firms, tradespeople, and building owners don't know about products and strategies developed through the PIER Program, the products won't get traction. The technical briefs are written and disseminated to those essential audiences.

The technology briefs have helped build the PIER brand, which has become a respected name in energy efficiency. That reputation has become all the more significant as the nation shifts towards science and technology-driven solutions to today's energy efficiency challenges. The briefs have led more practitioners to adopt PIER technologies, more utilities to pilot the technologies in their emerging technologies programs, and therefore led to overall energy savings and reductions in greenhouse gas emissions.

As a result of this project, thousands of engineers, architects, contractors, and other building professionals have become aware of the results of PIER Buildings research efforts. Creating technical briefs that document the results of PIER funded research in a clear useable format and getting those briefs into the hands of professionals who can put the results to good use proved to be an effective means of technology transfer.

4.2 Recommendations

The authors recommend that the technical briefs program be expanded to cover more PIER projects as they reach significant milestones or are completed, and to use a wider range of marketing tools, and provide outreach to utility and government professionals who have the power to incentivize adoption of PIER funded technologies. Possible additional means of disseminating information about PIER research include Web conference presentations and online streaming media presentations.

4.3 Benefits to California

The dissemination of the technical briefs directly and indirectly benefits California ratepayers. Businesses that learn about and install new technologies to increase energy efficiency can directly improve their bottom line. Indirectly, the more PIER technologies and strategies for energy efficiency described in these briefs are implemented, the more energy they will save Californians, thus deferring the need for additional generation, transmission and distribution. This benefits all of California by saving money (making energy more affordable) as well as improving the environment by reducing harmful emissions and pollution caused by electricity generation from fossil fuels that contribute to global climate change. Increasing awareness of

PIER research will drive greater implementation of these advanced, energy-efficient technologies and will keep energy rates as low as possible.

Utilities in California have been educating their customers about and advocating for energy efficiency for a long time, yet they still have aggressive energy savings goals to meet. Meeting these goals and claiming energy savings will require utilities to be informed about next generation technologies. Utilities can speed the implementation of these technologies by providing incentives and marketing their energy and money saving potential. Utility energy efficiency programs benefit California ratepayers by deferring the need for additional generation and expanded transmission and distribution systems and keeping energy costs low. technical briefs produced for this project were disseminated to thousands of readers, putting information into the hands of professionals to use in their projects and pursuits. The authors recommend that this activity be continued as new PIER projects are completed or achieve meaningful milestones.

Appendix A:
Revised Marketing Plan

The agreed-upon strategies within the "Tech Brief Marketing Plan" had primarily focused on targeting large organizations with frequent influential access to their constituent audiences. The approach more recently suggested by Commission Contract Manager Michael Seaman is akin to the agreed upon strategy within the marketing plan for contacting target audiences directly (e.g. via trade shows). In discussions with Norm Bourassa (the previous Commission contract manager), this direct contact method was determined to be less efficient and cost-effective due to staff time considerations and printing costs. However, this document "To Reach <Target Audience>" gives a draft example of how each target audience can be contacted via six different approaches, where level one represents the most direct contact with the target audience and level six represents the least direct contact. (Target audience is reached via a third party.)

Level One: Via Direct Personal Contact

- Identify the trade shows and external events that <Target Audience> attend.
- Once identified, rent a space at the event.
- Pick out those briefs that will be appropriate for <Target Audience>.
- Print the identified briefs in appropriate format as well as other materials – PIER Program brochure, contact information cards, sign-up sheet for the e-mail announcements.
- Send a staff member to the tradeshow to distribute the briefs directly to attendees.

Results Tracking:

- To the extent possible, record the contact information (name, title, e-mail) of all who take briefs.
- Have a sign-up sheet for those who would like to receive ongoing e-mail updates regarding new briefs.
- Record the title and number of each brief taken to an event, and compare against how many were taken. (For example, 50 Sweet SPOT for Daylighting briefs were brought to the event, and 30 were taken.)
- As people are moving towards less printing and, therefore, less distribution of hard-copy briefs, it will be most important to track how many brochures were handed out and to track a potential increase in website hits as a result.

Level Two: Via Managers

- Identify who <Target Audience> reports to.
- Once identified, craft a pitch letter to this managerial audience that addresses the specific needs of their staff. This step includes identifying those briefs that are the most appropriate for <Target Audience>.
- Send the pitch letter to those who manage <Target Audience>; follow-up with a phone call to those who are interested; send appropriate materials to those who request additional information; follow-up with a phone call to those who do not respond.

Results Tracking:

- Record the number of managers who decide to use briefs.
- Record how those managers used the briefs.
- If used for distribution to employees, ask for an estimate of how many employees the briefs were given to.

Level Three: Via Training Courses

- Identify the training courses available to <Target Audience>.
- Once the appropriate training programs are identified, contacts need to be determined.
- Once an appropriate contact is found, craft a pitch letter appropriate for the audience. In this case, we may supply hard copies of briefs to be used as a handout in classroom settings (or sent via e-mail in PDF format), or we may supply a Web link so that participants may download the briefs at will (this would allow for better tracking).
- Send the pitch letter; follow-up with a phone call to those who are interested; send appropriate materials to those who request additional information; follow-up with a phone call to those who do not respond.

Results Tracking:

- Determine how training courses are distributing briefs to students.
- Determine number of students the briefs reach by how many students are enrolled in the course.
- For those courses that embed a link to briefs on a website, record the number.
- For those who use the technical brief resource in a different capacity (newsletter, personal e-mail, handout, etc.) we will have to work to determine which briefs are being distributed, and how many briefs are being passed on.

- We should ask all training course organizers to send us feedback and if they plan to continue using briefs for future courses

Level Four: Via Local and National Organizations

- Part I: Identify the local organizations that <Target Audience> belong to.
- Part II: Identify the national organizations that <Target Audience> belong to.
- Once the local or national organization is identified, an appropriate contact at each organization can be determined.
- Once the appropriate contact is determined, craft a pitch letter to this audience that addresses their specific needs. Send the pitch letter; follow-up with a phone call to those who are interested; send appropriate materials to those who request additional information; follow-up with a phone call to those who do not respond.

Results Tracking:

- Determine how organizations are distributing briefs.
- Determine number of briefs being distributed.
- For those organizations that embed a link to briefs on a website, record the number.
- For those who use the technical brief resource in a different capacity (newsletter, personal e-mail, handout, etc.), we will have to work to determine which briefs are being distributed, and how many briefs are being passed on.

Level Five: Via Publications

- Identify the publications that <Target Audience> read.
- Once the appropriate publications are identified, craft a pitch letter that appeals to the needs of a given publication's readers.
- In this case, a publication's editor is generally the most appropriate contact. Identify and send the pitch letter to editors; follow-up with a phone call to those who are interested; send appropriate materials to those who request additional information; follow-up with a phone call to those who do not respond.
- In this case, materials that are most often requested are the author (from E SOURCE), the author's bio to include with the published brief, and the brief in Word document form along with high resolution images.

Results Tracking:

- To date we track results based on a publication's first, and then second response. The first response being in regards to the initial pitch letter, and the second response being in

regards to the follow-up phone call or request for additional information. We then request that the publications that use briefs send us a hard copy of the publication or, in the case of online publications, links to the brief. For those publications that fulfill these requests, we make a hard copy of the published article and also create an electronic copy in PDF format. For those that do not, we actively search for the appearance of briefs in those publications we have sent them to.

Level Six: Via Utility Programs

- Identify the utility programs available for <Target Audience>.
- This is the easiest level for us as we can already readily identify most utility programs available to <Target Audience>. We are also in the position to easily find contact information for managers of these programs.
- Craft a pitch letter appropriate for this audience; send the pitch letter; follow-up with a phone call to those who are interested; send appropriate materials to those who request additional information; follow-up with a phone call to those who do not respond.

Results Tracking:

- Results are currently tracked based on the utility program manager's first, and then second response. The first response being in regards to the initial pitch letter, and the second response being in regards to the follow-up phone call or request for additional information. If the briefs are being presented as a web link housed on the utility website, track results by the number of embedded links, and the companies who have embed them. If the briefs are being used in a customer newsletter, we ask that we receive information on the number of newsletters sent.

*** NOTE:** For different audiences and levels there may be overlap. For example, the trade show may be an audience entirely composed of one target audience (for example, building operators), or it can be a mix of several target audiences (for example, building operators, engineers, and architects). In all levels, we need to keep this in mind when crafting pitch letters, identifying appropriate briefs, and when bringing materials to trade shows.

Appendix B:
Technical Briefs and Media Appearances

The web link to technical briefs published by the PIER program:

http://www.energy.ca.gov/publications/pierSearchReports.php?title=technical percent20brief

Appendix C:
Trade Show and Conference Marketing Materials

These are images of the poster, tech brief e-mail distribution list sign-up sheet, and the postcard. E SOURCE also created a binder for display at conferences that included a hard copy of each tech brief organized by topic that conference attendees could peruse.

SIGN UP TO RECEIVE CALIFORNIA ENERGY COMMISSION

PIER TECH BRIEF E-MAIL UPDATES

Name	***Title***	***Organization***	***E-mail address***	***Areas of interest***

PIER Buildings Program

Save Energy, Money, and Time with Free Technical Briefs

Research Powers the Future

Learn more about the latest technologies and trends in energy-efficient design with Technical Briefs from the California Energy Commission.

Topics include:

- Lighting fixtures and design
- Energy benchmarking
- Design guides
- HVAC
- Green building

To download briefs, visit the "Free Resources" page at **www.esource.com**.

For more information on the PIER Buildings Program visit: **www.energy.ca.gov/research**.

Appendix D:
Heat Pump Water Heater Analysis

One of the early technical briefs described a heat pump water heater project (Heat Pump Water Hearters: Reliable, Efficient, CEC-500-2005-100-FS, 052505). The product that was developed failed to make it in the marketplace, and the authors were asked to do a brief write-up discussing the reasons for the failure.

Heat Pump Water Heaters: What Went Wrong in the Marketplace

The Public Interest Energy Research Buildings Program of the California Energy Commission funded the development of a heat pump water heater. Although the unit was a technological success and became a commercial product, it failed in the marketplace and its production has been discontinued. This memo discusses the reasons for the lack of commercial success.

Interview with Karl Mayer, OEM Sales Manager, ECR International, Inc.

February 23, 2007

The Watter$aver heat-pump water heater (HPWH) has been discontinued due to poor sales. The 50-gallon residential-size product was developed by TIAX LLC in conjunction with manufacturer EnviroMaster International (EMI). The unit was available as a commercial product from EMI, a subsidiary of ECR International, from 2002 to 2006.

The reasons for the WatterSaver's lack of commercial success are:

High cost. Consumers could purchase the Watter$aver for $1,500 to $1,800 installed, or contractors could purchase it for $1,000 to $1,200 from distributors. The Watter$aver was never produced in mass quantities necessary to reduce the cost of production. EMI was only producing about 10 per day and buying the tank from another water heater manufacturer. Still, the energy savings often yielded a payback period of 3 to 5 years, depending on the cost of electricity and the amount of hot water consumption. However, it was difficult to sell when compared to a $200 electric water heater.

Difficulty accessing marketing channels. It proved difficult for EMI to persuade distributors to stock the product unless dealers were already asking for it. Distributors don't want to take on a new, unknown product and then try to persuade dealers to buy it. Plumbers and dealers are notoriously conservative and don't like to install products that they are unfamiliar with.

The equipment didn't require any special training to install. EMI offered training, but anyone who could install an electric water heater could install the HPWH because it had exactly the same connections. The heat pump part was entirely self-contained and charged and ready to go. Sizing was straightforward because there was only the 50-gal unit that could replace a 30, 40, or 50 gal unit.

However, the HPWH did require an HVAC technician for servicing, not a plumber because plumbers cannot troubleshoot compressors and refrigeration systems. Therefore, the best channel for sales and installation and service was HVAC dealers who also work with water heaters and boilers.

About 4 million electric water heaters are sold every year and about half of those are sold straight to do-it-yourselfers from the hardware store and not through plumbers. Therefore, few dealers make a living selling electric water heaters. Many just do it part of the time so they are reluctant to learn a new technology.

Also, rural locations tend to have a lot of electric water heaters because they often don't have access to gas. Gas water heaters are usually as cheap to operate as a heat pump and at a lower capital cost. However, the rural market is spread out and therefore more expensive to serve, making it less attractive for dealers.

Other than through utility programs, EMI Watter$aver sales originated from savvy customers who heard about the technology and looked up the product on the website. When they called, EMI representatives would tell them that they could sell them a product if they find get a plumber to agree to install it. If the customer could find a plumber to agree to do it – no simple task in many cases - EMI would sell them a unit through a local distributor.

Poor reputation of heat pump technology. HPWHs were first sold commercially in the late 1970s or early 1980s, some were stand-alone units or else incorporated into the heating system. But they were very expensive, complex, and didn't work very well. In fact, many utility people didn't even want to hear a sales pitch for HPWHs because of the technology's reputation.

In the residential market, programs sponsored by electric utilities have accounted for about 90 percent of HPWH sales in the past decade. These programs have had limited success, however. For example, a large program sponsored by Connecticut Light & Power involved the installation of 3000-4000 units at a very reduced cost. This program lasted through most of the 1990's until about 2001. By now, the utility or dealers have probably replaced or fixed every one of them. The units, which were not made by EMI, had problems with controls and reliability. The utility worked with the manufacturer and tried to get improvements made, but the manufacturer eventually lost interest in the product. A second manufacturer came along and many of the same problems came up. EMI did some field testing with the utility, but they never sold through the program because the program ended.

The Watter$aver product provided good performance and reliability when it was in commercial production. In the prototype stage, through field tests with Oak Ridge National Lab and Connecticut Light & Power and others, EMI was able to work out the kinks with controls and electromagnetic interference and sensors that were unreliable so that the actual production unit worked well.

The future of HPWH technology. Mayer told us there are enough water heating alternatives out there with combined heat and power and solar thermal systems that there may not be a future for HPWHs. Unless a utility wants to run a program that is big enough to get a manufacturer interested in producing a HPWH, manufacturers will probably not get involved in this market. Mayer said that it would take a large manufacturer to successfully market an integrated residential HPWH at a low cost. The best candidate would be a company that already makes HVAC units and water heaters. But none of them are interested in making a HPWH, except Rheem/Ruud who is making a HPWH for the Australian market because of the government incentives available there.

Although no integrated HPWHs remain on the market, several manufacturers do make add-on HPWHs for commercial and residential applications. In an add-on system, the heat pump apparatus stands alone. Heat is transferred from the heat pump condenser to the water tank via a heat exchanger and a small pump, using the tank's water as a heat exchange medium. This system makes use of the existing electric resistance water heater, which can be convenient. It is a little more complicated to install than an integrated unit like the Watter$aver because you have to run a pump to make it work and run the control wiring. The hardware and directions come with it so a regular plumber could do the install. In the case of an add-on HPWH, any company that can make an air conditioner or a refrigerator can make one.