NATIONAL ENERGY EFFICIENCY BEST PRACTICES STUDY

VOLUME O2 – NONRESIDENTIAL EDUCATION AND TRAINING BEST PRACTICES REPORT

Submitted to

California Best Practices Project Advisory Committee
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TABLE OF CONTENTS

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ES. EXECUTIVE SUMMARY FOR NONRESIDENTIAL TRAINING AND EDUCATION PROGRAMS

The Best Practices Study team ("Best Practices Team") reviewed six programs that provide information on energy efficiency primarily through training and education for a variety of market actors in the nonresidential customer sector. The programs are listed in Exhibit ES-1 below and presented in the body of this report.

Exhibit ES-1
Programs Reviewed

Program Name	Implementer
Building Operator Certification	Northwest Energy Efficiency Council
California Statewide Education & Training	California Investor-Owned Utilities
Compressed Air Challenge	U.S. Department of Energy
Energy Design Resources	Southern California Edison
Industrial Efficiency Alliance	Northwest Energy Efficiency Alliance
Daylighting Collaborative	Energy Center of Wisconsin

These training and education (T&E) programs have several objectives. Some are designed to increase the capability of market actors to deliver energy efficiency services to end-users, others provide a clearinghouse for specific technical information and tools, and still others teach end-users how to operate and maintain their buildings more energy efficiently. Often these T&E programs support market transformation efforts by educating market actors on energy efficiency practices and technologies in an effort to develop market capabilities to provide energy efficiency services that are sustainable over the long-run.

ES.1 KEY CATEGORY THEMES

The review identified the following crosscutting issues for this program area.

The most successful programs intentionally incorporate best practices from adult learning theory into T&E activities so they are relevant and accessible to the adults that attend them. Best practices in adult learning include: offering information and experiences that show how to solve real problems that occur in daily work life; providing opportunities during the training for attendees to practice new skills and receive feedback; including small group activities and concrete experiences rather than relying solely on expert lecture; and providing limited or focused content that does not overwhelm attendees. These practices increase the likelihood that T&E will result in behavior change.

Market transformation is a frequent driver for nonresidential T&E programs. These programs are often key components of a market transformation strategy. They may take several forms. For example, some have a broad focus, seeking to inform key energy efficiency constituencies (for example contractors, engineers, and design professionals); others are more narrowly defined as a component of a larger program. Most T&E programs seek to overcome market barriers related to lack of information, asymmetric information, and performance uncertainty. In addition to educating key market actors on desired energy efficiency practices, they serve as a vehicle for disseminating program information to the market and making market actors aware of program opportunities.

Training and education further the overall goal of achieving energy savings. Many of these programs also support resource acquisition efforts by enhancing the skills, knowledge, capabilities and understanding of market actors so that they can more effectively develop energy savings projects with end users.

Effective T&E programs provide value to the target market specifically, not just the utility. Training approaches and content can be enhanced by market research, baseline studies, partnerships with professional organizations, and early evaluation efforts to create training programs that provide significant value to market actors. Coordination with professional organizations can qualify T&E courses for continuing education (CEU) credits, increasing the appeal and value of the program.

Successful T&E programs require a long-term commitment from implementing organizations. The programs reviewed here all represent multi-year commitments to training for a sector, a group of market actors or to a certification effort. The multi-year commitment is important in building expertise among trainers, refining curriculum and leveraging word-of-mouth communication. It can take years to build the program, the organizational capacity and the program reputation to the point where the training effort is poised to influence a discernable portion of the targeted market.

Best Practices by Component

Exhibit ES-2 summarizes the best practices identified in the program area for each program component and the associated rationales.

Exhibit ES-2
Best Practices by Component

Best Practice	Rationale
Program Theory and Design	
Develop a program plan with a program theory that describes the learning objectives and expected outcomes	This is particularly important for T&E programs that expect indirect or long-term market effects.
Understand the specific requirements of the targeted market	This helps define a T&E program that is most relevant and attractive to the market. Valuable input can be obtained from n advisory group, market intelligence about specific concerns of the targeted market actors, or market/baseline studies. Research or input that reveals the primary concerns among the targeted market regarding competition, sales, and skill deficiencies is most valuable for scoping and framing the training opportunity to maximize participation.
Determine the levels of training needed in the marketplace and provide training that fills the gaps	Training targeted to different skill levels allows attendees to get value from training experiences regardless of their skill level. Implementers may be able to determine this from market intelligence or other research available prior to launch, or it may emerge organically after experience with delivery or from participant feedback.
Project Management	
Build a management or advisory board that includes members of the targeted industry and other stakeholders, then work to build consensus throughout the team.	A stakeholder team can provide guidance on the goals, needs, and approach important to success. Involvement of stakeholders is the best strategy for receiving feedback about training program relevance and leveraging existing industry communication networks.
Use a cooperative approach with trade organizations, utilities, or other partner organizations	This will increase the commitment of these organizations to support the training and increases the likelihood that the training program will receive valuable feedback about potential improvements.
Develop local capacity to implement programs; do not rely solely on outside experts.	Developing local capacity can help overcome time limitations on the part of experts, and supports market transformation goals by developing a network of skilled efficiency expertise. Local trainers may benefit from increased trust of attendees because of their knowledge of local building codes, climate issues, and political considerations.
Reporting and Tracking	
Identify the key data required to track and accurately report program activities and success indicators early in the program process if possible; be prepared to adjust databases as refinements become clear.	It may not be possible to identify all the key data requirements at the beginning of a program; however efforts should be made to identify and track those data fields that are obvious. The tracking system should ideally be sufficiently flexible and streamlined to allow program staff to easily access program information and to add new tracking data fields as needed.
Carefully document the tracking system.	Careful documentation, including T&E database structure, data field definitions and screening criteria, and data entry and analysis procedures will help mitigate problems stemming from staff turn-

	over, especially given that tracked T&E data fields may be different from those for other program categories.
Create systems for electronic upload of data.	A system that allows trainers and program staff to remotely upload information into the tracking system facilitates ease of its use and increases the likelihood that all data will be captured and entered.
Communicate to sponsors or training hosts the importance of accurately recording attendee information and providing it to the organization in a timely manner.	When T&E programs are implemented in multiple service territories or are coordinated by multiple organizations, the administrative organization relies upon the records of others to determine the reach of the program. Unless the importance of the data is communicated clearly, the sponsor or training host may fail to track and report attendee numbers and contact information accurately, undermining reporting and evaluation efforts.
Curriculum Development and Content Delivery	
Defining and targeting desired behavioral outcomes results in more powerful program effects	Training efforts involving work-related scenarios and hands-on learning are more likely to create change among adult learners. Defining the desired behavioral and learning objectives during the curriculum development process helps focus training content on the most important topics.
Provide relevant, credible information to attendees.	Providing information that is current, from a credible source, and that demonstrates tangible benefits to the attendee and/or their company increases the likelihood that attendees will transfer the new information to the work environment through real behavioral change.
When possible, link training content to required professional continuing education (CEU) credits	This will provide value to participants by aligning the training with professional growth opportunities and professional obligations. Working with professional associations to certify that trainings meet their content requirements also provides opportunities for relationship development, communication, and market feedback.
Employ technical experts for development of technical training content.	The use of recognized experts to develop the technical content will help to assure the information is accurate, current, and practical. Experts may be in-house staff, advisory boards, or outside consultants
Use adult learning theory to guide the training approach and content	Touching base with adult learning theory as training courses are developed and delivered will help to ensure that the content is being presented in the most effective way to reach the desired audience.
Employ curriculum experts to work with content experts to assure that the information is presented in an effective format for learning.	Sound pedagogical practices must be built-in to training material to ensure that lessons and information are meaningful and communicated effectively.

Train the trainers to improve the quality and consistency of trainings.	By improving the skills of trainers and clarifying the expectations of the sponsoring organization, trainers will more effectively and consistently deliver the training content. Regular communication opportunities also offers opportunities for continuous improvement and feedback as trainers compare experiences and discuss successful or unsuccessful practices. Curriculum experts and others with knowledge of adult learning should be involved in training

	new trainers.
Marketing & Outreach	
Market the program to the specific profession targeted.	Effective program marketing has a clearly defined target market and develops messages that address specific on-the-job concerns associated with that profession.
Emphasize the value of the training to the target audience. If possible, personalize the marketing message.	All marketing messages should stress the benefits of the training in tangible terms that are valued by the prospective trainee. These benefits may include: increased knowledge of energy savings strategies, increased business development opportunities, or continuing education credits.
Partner with local community, government, and trade organizations associated with the target market to increase program awareness and participation.	Successful programs use local, regional, or national trade associations to reach the targeted market. True collaboration and communication with these groups validates the training activity and increases the likelihood a training effort will tie into real business concerns for a given profession.
Utilities can integrate training needs into account management plans; enrolling managed accounts into training courses as appropriate	Proactive identification of training needs as part of account management plans will help to ensure that training related needs are met.
Integrate marketing and tracking activities to identify future attendees.	Gathering names and conducting targeted recruitment helps T&E programs identify potential attendees. This allows program sponsors to hold off scheduling training events until they are likely to be well-attended.
Participation Process	
Keep participation simple.	A streamlined, accessible registration process makes it more likely that prospects will enroll in the training opportunity. For programs that rely heavily on website information dissemination, this means providing an intuitive, interactive website that allows visitors to quickly find the information they seek.
Match location and scheduling to the work schedule of the target audience.	Provide training locations that are within a reasonable driving distance. Schedule training to accommodate the needs of the target audience to maximize attendance. Convenience can also be enhanced through web-based training and information dissemination, on-site demonstrations, and on-the-spot technical support.

Augment recruiting with trade allies.	Encourage key market actors - trade allies, trade associations, and/or local utility contacts - to recruit others and disseminate information about the training opportunity. This facilitates word of mouth recruitment and adds credibility to the training as colleagues discuss the training with each other.
Maintain accurate contact lists.	Track down new contact information and replace bad email addresses whenever possible. Update the system when addresses and phone numbers change.

Consider charging for courses	When participants are required to pay for training (even a modest fee) it increases their commitment to attending and reinforces the value of the course.
Program Evaluation	
Invest in quality, independent evaluation early in the life of a T&E program.	First year evaluations are important for identifying the strengths and weaknesses of new programs and can provide invaluable feedback from participants after they have returned to their jobs with the new information.
An evaluability assessment may help assess readiness for evaluation among programs that have never been evaluated.	An evaluability assessment helps to assure that evaluation results are reliable and that resources are well spent. It assesses whether a program's target behaviors and target market are defined sufficiently to permit measurement, whether sufficient time has passed for training to influence behavior, and whether the program's influence of its target market is likely large enough to justify the cost of a comprehensive evaluation.
Implement evaluation activities that follow the logic of learning.	Efforts to get immediate impressions regarding satisfaction with training content or relevance of the material should be done at the time of training, when the information is still fresh.
Specificity is important in measuring behavior change.	Whether conducting a baseline study, a follow-up study by survey, or on-site observation or plan review, the specific behaviors targeted by the program need to be defined and questions developed that address the behavior as precisely as possible. Lack of precision will generally lead to overestimates of behavior presence.
Map and leverage the word-of-mouth communication within trade allies to determine the influence of the program and whether the information provided is valued	Interpersonal communication among peers is a powerful force for change; programs that are well-respected and well-known are more likely to have tapped into these networks. Evaluations can trace the effect of word-of-mouth communication to assess the reach of the program.

1. OVERVIEW OF REVIEWED PROGRAMS

1.1 BACKGROUND

Preliminary research on four of the six selected programs was completed in 2004 as part of the Phases I/II Best Practices study; however the full report was not completed. Since many of the findings from this earlier effort were still likely to be relevant, we reviewed the previous research and determined that four of the programs continued to be good candidates for inclusion in this study phase. Information collected previously from these four programs, was reviewed with program managers and findings were updated as necessary. These four programs were: the Building Operator Certification Program operated by the Northwest Energy Efficiency Council; the California Statewide Education and Training Program; the Daylighting Collaborative operated by the Energy Center of Wisconsin; and Energy Design Resources (EDR) developed by Southern California Edison.

To complete our sample, three additional programs were then selected via a three step process. First, programs were identified and nominated from a combination of sources: a review of recent best-practices studies, team-member recommendations, and Internet research. Next, brief interviews were conducted with nominated programs to determine if sufficient information was available to conduct the research required. Finally, in-depth interviews were conducted for those programs that had sufficient information. Two of the three new programs had sufficient information to meet the needs of the study and were included in our sample frame. These two new programs are the Compressed Air Challenge, a program implemented independently through a voluntary collaboration of stakeholders and implemented nationwide by a nonprofit board, and the training component of the Industrial Efficiency Alliance—an industrial sector program offered by the Northwest Energy Efficiency Alliance.

1.2 OVERVIEW OF PROGRAMS

The role of T&E programs in addressing information-related barriers and advancing resource acquisition and market transformation goals has long been recognized. T&E programs have been popular for many years and have a well established place in demand side management (DSM) program portfolios. Of the six programs reviewed in this study, five[1]are mature, having been offered for nine years or longer. Only the Northwest Energy Efficiency Alliance (NEEA)'s Industrial Efficiency Alliance (IEA) program is newer. Approved by the NEEA board in 2004, IEA is about 18 months into a multi-year, comprehensive effort to target specific industrial sectors in the Northwest.

The six programs reviewed offer a variety of training and education services that generally seek to increase nonresidential market actors' knowledge and understanding of energy efficient products, practices, and design. The broad goals of these programs are to increase the quality

[1] Building Operator Certification, the Compressed Air Challenge, the Pacific Energy Center component of the California Statewide Program, the Daylighting Collaborative, and Energy Design Resources

and quantity of installed and implemented energy efficient products and services, increase participation in other DSM programs, and ultimately save energy through changes in market practices or behavior. The targeted market actors vary according to the programs' stated purposes but include architects, engineers and other design professionals, building owners, HVAC and lighting contractors, equipment vendors, production floor operators and facility operations and maintenance staff.

Building Operator Certification Program (BOC). The BOC training program targets facility operations and maintenance staff with two levels of building operator training focused on improving job skills and developing more comfortable, energy efficient facilities. The program concept and curriculum emerged from a 1996 proposal by the NEEC to NEEA to develop a series of courses on building operations that would offer professional certification. The first Level I BOC course series was offered in 1997. Now, a decade later, there are 2,200 certified operators on the West Coast (California, Oregon, and Washington) and the training and certification opportunity is offered in 20 states through a variety of implementing organizations (regional efficiency nonprofits and utilities) via licensing agreements with NEEC.

California Statewide Education and Training Program. Energy efficiency T&E efforts have existed in California for many years. The Pacific Energy Center, one of three utility-sponsored regional Energy Centers, began in the early 1990s, offering a set of core seminars and workshops to educate a variety of market actors including contractors, designers, building inspectors, manufacturing and industrial customers, facility managers, and the general public. (Of the three California investor-owned utilities, only San Diego Gas and Electric does not operate a central training location; instead the utility offers energy efficiency classes to its customers at a variety of utility and non-utility sites.) The Statewide program, operating primarily through the energy centers, is designed to collect, transfer, research, evaluate, demonstrate, and showcase energy-efficiency concepts, technologies, and products. The 2002 Statewide program conducted 444 seminars with more than 7,000 nonresidential market actors attending. The Pacific Energy Center training has been operated as a local program since 2002. In PY 2006-08 all of the Energy Centers are being operated as local programs because the statewide program model had been abandoned.

Compressed Air Challenge (CAC). The CAC is run by an independent, product neutral board of directors representing a voluntary collaboration of industrial users, manufacturers, distributors and their associations, consultants, state research and development agencies, energy efficiency organizations, and utilities. The CAC was initiated by Lawrence Berkeley Laboratory on behalf of the United States Department of Energy (USDOE), the Energy Center of Wisconsin, and the American Council for an Energy Efficient Economy (ACEEE) in 1997. Originally envisioned as a way to develop and provide resources to educate industry on the opportunities to increase net profits through compressed air system optimization, the program has grown into a nonprofit organization that relies on sponsorship and participation by many partners and stakeholders. The CAC training program is one part of a comprehensive approach offering a wide range of tools and information to facilitate the development of compressed air energy efficiency projects. As of May 1, 2003, 4,203 individuals at 1,891 locations had been trained by the CAC.

Energy Design Resources (EDR). Southern California Edison began EDR in 1998 as a stand alone market transformation program to provide information and tools to encourage energy efficiency design in non-residential new construction projects. It evolved to support the Savings

by Design commercial new construction program by providing education about approaches to participants and potential participants in the statewide program. EDR is an integrated package of design tools and information resources, including publications, software tools, and training offered statewide by 2000. In 2002, EDR was fully incorporated into the Savings by Design program. Over the years, the budget for EDR has decreased and the focus of the program has been redefined. The current focus of the program is to encourage increased use of the existing web-based tools and enhancement of those tools to meet the needs of the new construction market. In 2002, EDR reached over 2,300 market actors in the new construction market through publications, trainings and on-line design resources (including software tools and modeling), EDR's website averaged approximately 3,500 visits per month (a total of 41,498), and 34 trainees completed EDR through on-line training courses. In 2005, average monthly website visits were approximately 17,800.

Northwest Energy Efficiency Alliance; Industrial Efficiency Alliance (IEA). The IEA is a broad based industrial focused initiative launched by NEEA in 2005. The IEA concept emerged after extensive market research and review of previous program efforts. The initiative is designed to develop and implement a systematic plan to reach the entire Pacific Northwest industrial sector with a clear and consistent message on energy efficiency, beginning with two focus markets: pulp and paper and food processing. Training is one of several major components of the program and is particularly important in the early stages of the initiative's ten-year planning and implementation horizon. Between April 2005 and June 2006, the IEA had provided more than 48 trainings reaching approximately 1,500 people.

Daylighting Collaborative was initiated in 1999 at the direction of the Wisconsin Public Service Commission and is operated by the Energy Center of Wisconsin (ECW). ECW offers a variety of training programs that address various aspects of energy efficiency. The Daylighting Collaborative seeks to promote the use of daylighting and cooling load avoidance as part of an integrated design of building envelopes, electric lighting, and HVAC systems of commercial and institutional buildings without increasing first costs. The Daylighting Collaborative brings together a variety of organizations and professionals interested in promoting the benefits of daylighting. The program focuses on training to achieve an incremental approach to change: identifying ordinary—not extraordinary—measures. The Daylighting Collaborative also prioritizes using local experts, and leveraging non-energy benefits. By December 2000, the Daylighting Collaborative had reached 584 people through 15 technical workshops. Funding for the Daylighting Collaborative shrank considerably in the early 2000's—by 2006 it was funded primarily through in-house support at ECW. According to contacts at ECW, decision-makers in Wisconsin would not continue funding after the monies were pulled from the utilities in Wisconsin because the State did not want another brand competing with the state-sponsored programs. In 2006 Daylighting Collaborative staff sought a stable funding stream by promoting the Collaborative as a clearinghouse of information and training opportunities related to daylighting. Over the course of the program, the Collaborative has reached over 2,000 designers nationally through technical education programs with minimal funding.

Specific program characteristics are noted in the following table:

Exhibit 1-1
Summary of Training and Education Program Characteristics

ITEM	BUILDING OPERATOR CERTIFICATION (BOC)	CA STATEWIDE	COMPRESSED AIR CHALLENGE (CAC)	ENERGY DESIGN RESOURCES [CA]	NEEA INDUSTRIAL EFFICIENCY ALLIANCE	DAY-LIGHTING [WI]
Period Reviewed	Since inception in 1997	2002	May 1, 2001- May 1, 2003	Mid 2002-Mid 2003	April 2005-June 2006	1999-2000
Program Budget	$1.7 M (first five years)	$6.9 M	$170,000 annual	NA[2]	$663,000[7]	$250,000[6]
Individual Participants	~2,640 (West Coast)	7,000	2,184[8]	2,300[3]	~1,500	584[5]
Number of Training Sessions	244	503 seminars or events[1]	108[9]	On-going web-based information	>48	15[5] Events

1. Number includes 444 seminars plus 59 HTR events.

2. Energy Design Resources is an integrated component of the larger, statewide Savings by Design Program that offers incentives and design assistance to nonresidential new construction projects in California. The Savings by Design program budget for PY 2002 was $930,839 (SCG), $7,173,364 (SCE), and $2,968,096 (SDG&E).

3. Individual market actors listed in EDR databases – includes training attendees, people who downloaded software, lists of website members and newsletter recipients. Undeliverable email addresses and utility affiliated names were removed from an original list of 3,172 names. [2003 EDR Evaluation.]

4. Sessions include outreach sessions, ally distributor training sessions and contractor training sessions. Training sessions are held to increase participants' skills in designing and promoting lighting solutions using new technologies that result in better lit spaces and decreased energy use.

5. The numbers of events and attendees covers the period ending mid-December 2000. As of April, 2007 the Collaborative has reached over 2,000 designers.

6. Budget information is for PY 2002. With specific program funding eliminated due to the formation of a public benefits program, technical trainings were continued with funding under general non-residential training budgets, but still under the Collaborative name.

7. IEA operates with a multi-year budget that includes more than training. This represents total 2005 expenses associated with all IEA activities in both targeted sectors.

8. More than 5,000 individuals have been trained by the CAC since inception.

9. Includes attendees to both Fundamentals and Advanced courses.

2. CONTEXT

2.1 POLICY ENVIRONMENT

Information, education and training programs were among the first energy efficiency programs offered by utilities and other organizations advocating efficiency in the 1970s and 1980s and they remain common today. Early efforts frequently focused on training residential customers and residential home builders in an effort to communicate strategies that would reduce energy consumption in single family homes. Information- only programs typically provided information through brochures, audits, or marketing designed to encourage end users to invest in energy efficiency improvements. As energy efficiency and DSM efforts expanded to address the commercial and industrial sector, the focus of training programs shifted to address the needs of commercial building designers, including contractors and commercial/industrial facility managers and decision makers involved in constructing and operating commercial buildings.

These efforts continued and new T&E programs emerged in the mid-1990s, in part because of the recognition that information and training could play a strong role in market transformation efforts. With the advent of energy market restructuring in the mid-to-late 1990s, emphasis shifted to market transformation as a primary DSM objective. This in turn increased support for T&E programs designed to educate key market actors. Information-only programs also continued, but they are not the focus of this review as they have typically evolved to the marketing focused programs discussed in Volume 01 Crosscutting Advertising chapter completed in Phase I (Quantum, 2005).

T&E programs for nonresidential market actors have particular value in market transformation strategies and also support resource acquisition program efforts. These programs seek to increase the capability of mid-market suppliers, distributors, and installers to sell and install energy efficient measures, leading to increased adoption by their customers. Because of this they are often seen as integral parts of a broader market transformation strategy or as a component of a resource acquisition program.

Since the mid-1990s use of the Internet has exploded among all market segments, making it a primary information source for homes and businesses and a major source of equipment and efficiency information. With the expanded use of the Internet, information components of T&E programs have shifted away from traditional printed sources to web-based sources. Websites and web portals provide new opportunities for combining information, on-line education, and training, and marketing of other related energy efficiency programs.

Curriculum design, training delivery, and evaluation appear to be the program elements most critical to training program success. Curriculum must be informed by adult learning theories and activities structured to change behavior rather than simply transmit knowledge. In addition, the effectiveness of the curriculum and training approach must actually be assessed – through evaluation designed to measure behavioral change resulting from training attendance.

2.2 PROGRAM STRATEGY AND GOALS

All six of the programs reviewed work within a market transformation paradigm, seeking to reduce long-term energy use through specific changes in practice or behavior of a variety of market actors.[2] Each of these programs has their own set of tactics designed to reduce barriers, increase knowledge and awareness, increase access to tools and guidelines for design, and project estimation tools.

Three programs offer training that is highly focused; either targeting a specific group, or focused on a specific energy efficiency strategy. The **Daylighting Collaborative** is focused on promoting specific daylighting strategies. Instead of advocating installation of specific measures, the Daylighting Collaborative uses training to encourage designers to consider activities they could undertake immediately. The Daylighting Collaborative focuses on the "first, next" step rather than only advocating the highest design level achievable. CAC is also highly focused, promoting compressed air system optimization by targeting industrial users, industry representatives, and their educators. BOC operates with a relatively focused target market (facility operations and maintenance staff), but offers training on a variety of different topics related to typical facility operations (HVAC, lighting, maintenance, indoor air quality, electrical systems).

California's **Energy Design Resources (EDR),** originally a stand alone program, was embedded in the Statewide Savings by Design program in 2004-2005 and is part of the broader statewide education and training offerings at California IOUs in 2006-2008. Savings by Design offers a variety of incentives to encourage "integrated energy design" in new commercial buildings by bringing design teams together early in the process, obtaining owner commitment, and providing the resources to assist these teams in designing high performance buildings. The process of program participation "aligns the all-too-often conflicting objectives of developers, financiers, architects, engineers, specialty consultants, building managers, leasing agents, building operators, owners, and tenants to yield a positive outcome," (Energy Design Resources, *Integrated Energy Design,* p. 2). While the goal of the larger Savings by Design program is to produce superior, energy efficient buildings, the goal of the EDR component is to support the program through accessible, relevant and technically accurate tools and information, thus EDR tools are a critical piece of achieving the savings goals of Savings by Design.

California's **Statewide Education and Training Program** is different from the other programs considered here in that it encompasses training activities at multiple locations for a broad range of service providers, designers, contractors and others.[3] A glance at the lists of seminars offered in 2006 demonstrates the diverse mix of T&E opportunities – ranging from HVAC and

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[2] The California Statewide program, represented by the Energy Centers, has been associated with market transformation strategies in the past. As the primary focus in California shifted to resource acquisition following the 2001 West Coast energy crisis, the Energy Centers respond to the needs of other incentive-based resource acquisition programs. Today the centers seek to funnel attendees into incentive programs while also seeking to motivate attendees to take action independently.

[3] The Energy Center of Wisconsin, home of the Daylighting Collaborative, also offers training on a variety of topics in a variety of locations.

compressed air to skylighting and drip irrigation. In California, the Energy Center training efforts are described as a vehicle to "collect, transfer, research, evaluate, demonstrate, and showcase energy efficiency concepts, technologies, and products for manufacturers, businesses, researchers, educational institutions, and the general public," making the Energy Center efforts less focused than the other programs reviewed. The Energy Center trainings are an important part of the California utilities' energy efficiency program efforts, addressing information-related barriers by disseminating information about specific technologies and practices to the end-users, trade allies and allied professionals. The program is not specifically designed to promote incentives available through other programs. However, an evaluation of the 2002 Statewide training program notes its effectiveness at reducing the barriers related to information costs, performance uncertainty, and information asymmetry—resulting in improved ease of participation in other nonresidential sector programs.

The **Industrial Efficiency Alliance (IEA)** is initially targeting two of the Northwest's largest industrial segments: pulp and paper and food processing. While the number of targeted segments is limited, the training offered to members of these markets is extensive. IEA combines training developed by others (for example the CAC) with additional training of its own to reach deeper into an organization or to reach staff with broader, more general skill sets. The IEA is a market transformation program, which affects the determination of metrics by which success is measured. Trainings help the program connect with organizations, recruit participants and increase market intelligence.

2.3 BARRIERS

T&E programs (or T&E components of larger programs) commonly focus on overcoming or reducing market barriers to energy efficiency adoption among targeted market actors. Information costs and performance uncertainty are the barriers most frequently addressed. Information costs are the costs (in time and resources) of learning about energy efficient opportunities, products and services which are cost-effective to the end-user. Performance uncertainty is most often associated with new technologies, and emerges from concerns over whether the technology can deliver the claimed energy and cost savings. Performance uncertainty is the reason contractors and their customers shy away from a new technology or practice they haven't seen before, due to doubts about performance claims and a desire to avoid being the first to adopt the measure. T&E programs address these barriers by providing accurate technical data and up-to-date information, as well as hands-on experience with the new technology or practice.

Other barriers that can be addressed by T&E programs include information asymmetry, organizational practices, bounded rationality, and service unavailability. The major barriers identified by these program contacts and the activities designed to overcome them are described in Table 2-1.

Table 2-1
Barriers and Related Activities

Identified Barrier	Activity
Information Cost	The cost of acquiring new information is the barrier most directly addressed by these programs. The programs address this barrier by providing comprehensive and accurate, information to the targeted market actors in a convenient, low-cost forum.
Performance Uncertainties	Offering technically accurate information about a given product or service can help overcome some uncertainty, as can hands-on training or direct experience with the product or application. Training can provide this experience directly, also, training efforts tied to incentive programs often offer an incentive for the first projects a trade ally completes – reflecting the logic that increased experience will reduce uncertainty.
Product or Service Unavailability	The impact of this barrier can be addressed through increasing the supply of energy efficient products and services in the market. T&E activities can do this by increasing the capability and willingness of existing market actors to offer the desired services.
Bounded Rationality	Bounded rationality refers to reliance on "rules of thumb" and other simplistic decision making habits that can result in less than optimal decisions. T&E can help to eliminate these habits by providing more sophisticated tools and information to support better decision making when it comes to energy-using equipment.
Information Asymmetry	This barrier is related to high information costs and performance uncertainties. It refers specifically to the fact that the sellers of energy-efficient products or services tend to have better information than their customers. Information asymmetry is best overcome by providing information in accessible, reliable formats to as many market actors as possible.
Organizational Practices	Increasing the understanding of life-cycle costs and non-energy benefits can potentially overcome barriers related to procurement practices, payback requirements, and other organizational practices that inhibit the selection of energy efficient products and services. Training programs that target O&M staff, production floor staff, and purchasing staff are seeking to change organizational practices related to facility maintenance, in order to incorporate consideration of energy efficiency in purchasing and maintenance decisions.

The habits upon which organizations and individuals rely when choosing what to install and how to design space are deeply ingrained, often driven by knowledge or experience that may be outdated. The barriers as characterized in the table above are intended to be general in nature, and may oversimplify the complexities of a specific market.

3. COMPARISON OF PROGRAM COMPONENTS

3.1 PROGRAM THEORY AND DESIGN

Articulating a program theory is particularly important for T&E programs, because T&E is often the first step in changing customer behavior that leads to adoption of energy efficiency measures. According to the California Evaluation Framework, program theory documentation for training programs "should describe in detail how the program promotes, changes, or influences energy efficiency decisions," and can be linked to an implementation theory, a market operations theory, or to a program logic model (TekMrktWorks, 2004).

The program theory should describe how the T&E experiences are expected to promote, change or influence energy efficiency decisions. In discussing the role of program theory in information and education programs, the California Evaluation Framework notes that program theory documents ideally include:

- The educational or informational subjects on which the program will focus and the efforts and activities to be undertaken;
- The specific education or information transfer methods and mechanisms that will be employed in the implementation process (audits, workshops, training classes, announcements, demonstrations, ads, etc.);
- The target market sectors, including, as appropriate, market segments or sub-segments and the geographical market areas the program is designed to reach;
- Awareness, understanding, or knowledge of goals for target markets;
- The expected effects in terms of what the recipient is expected to do or accomplish as a result of the information or education efforts;
- The timeframes in which the expected results are to be accomplished;
- The barriers that the information or education must overcome to be successful; and
- The educational goals they are planning to meet within their program's market in terms of end effects.

Integral to the development of an effective T&E program theory is a detailed understanding of the underlying baseline market conditions. A detailed baseline study provides insight into the current market capabilities and knowledge base, and help to flag where education is needed to further advance the market. For example, in Itron's (as Quantum Consulting) 2003 Market Baseline Study of the Wisconsin C&I HVAC Supply Market (Quantum Consulting, 2003), further education of HVAC contractors was identified as an effective strategy to increase efficiency adoption based on their role as key decision influencers.

Of the six programs reviewed, four have formal program theories and/or detailed program plans. The **BOC, IEA, and CAC** programs all utilized extensive strategy and planning efforts involving a stakeholder driven iterative process to design the program approach and adopt a training curriculum. NEEA required the BOC to develop a program plan that included a marketing plan, a market transformation strategy, and a strategy for becoming self-sustaining. The plans were used to implement and hone the program. CAC sought a product neutral, technically rigorous curriculum that could be endorsed or supported by the entire industry—a goal that required addressing and incorporating divergent views in the industry through collaboration. The IEA is based on extensive market research: baseline data and market characterization work informed the selection of targeted industries and strategies for the program. NEEA staff submitted a required strategic plan for the IEA to the NEEA Board of Directors for review and approval.

The **Daylighting Collaborative** developed a formal program theory almost 10 years ago, at the beginning of the program. The program theory and plan are being updated to reflect current activities, including the increasing role of the Internet in the program's clearinghouse approach. Like other organizations with developed program theories, ECW worked with key stakeholders to develop its program theory initially. This collaborative approach provided valuable input and built commitment to the program.

The two California programs were able to articulate program theories, but had nothing formal or in writing. The program theory and approach for EDR was updated in response to regulatory requirements—initially (1998) the program was focused on market transformation; in 2001, the focus became resource acquisition. In 2006, program theories are required, so the EDR staff report working on developing a program theory document for the 2006 program year.

Written program plans differ from program theories since required plans often focus on budget and expenditure details and program activities instead of cause-effect relationships governing how program interventions are expected to achieve ultimate outcomes. However, comprehensive program plans should exhibit a basic understanding of the market structure, the variety of actors involved, and how the program plans to measure success.

Market research is another valuable component of program planning, as it can help identify the concerns/desires of the targeted market. Baseline studies document the pre-program state of energy efficiency adoption and behavior and establish a base from which program effects can be measured. Baseline studies and other market research help implementers align the activities of the program with specific needs of market actors, increasing the likelihood that the program activities will be valued. Among the programs reviewed, only the IEA conducted extensive formal market research prior to implementation. The California statewide programs benefit from extensive periodic market characterization work documenting saturation of equipment, standard construction practice, and nonresidential market expectations and behaviors generally. The BOC and the CAC's stakeholder planning team included market participants and therefore benefited from their direct input into program activities and curricula.

Best Practices

Program Theory and Design
• Develop a program plan with a program theory that describes the learning objectives and expected outcomes. • Understand the specific requirements of the targeted market • Determine the levels of training needed in the marketplace and provide training that fills the gaps

- Develop a program plan with a program theory that describes the learning objectives and expected outcomes. This is particularly important for T&E programs that expect indirect or long-term market effects.

- Understand the specific requirements of the targeted market. This helps define a T&E program that is most relevant and attractive to the market. Valuable input can be obtained from an advisory group, market intelligence about specific concerns of the targeted market actors, or market/baseline studies. Research or input that reveals the primary concerns among the targeted market regarding competition, sales, and skill deficiencies is most valuable for scoping and framing the training opportunity to maximize participation.

- Determine the levels of training needed in the marketplace and provide training that fills the gaps. Training targeted to different skill levels allows attendees to get value from training experiences regardless of their skill level. Implementers may be able to determine this from market intelligence or other research available prior to launch or other research available prior to launch, or it may emerge organically after experience with delivery or from participant feedback.

3.2 PROGRAM MANAGEMENT

It is common to have complicated organizational and administrative structures around T&E programs. Once the curriculum development work is done and the delivery structure is in place, a training series can be replicated across the state, region, or country by any number of implementers working with the sponsoring organization. These training programs are often developed outside of the traditional utility program model; nonprofits, trade associations, state energy offices, and regional collaborations can all be participants in developing a specific training. Even the two California programs, both utility-funded, are largely influenced by outside firms, hired through an RFP process, to develop technical content and deliverables.

Table 3-1 provides an overview of the program management approaches of the various programs.

Table 3-1
Program Management Approaches

Program	How Implemented
Building Operator Certification	Broadly managed by a regional energy efficiency nonprofit responsible for licensing the curriculum, tracking certifications, and approving trainers. Local implementation staff may be housed at participating utilities or regional nonprofits that provide the training opportunity across 20 states.
California Statewide Education & Training	Managed and implemented locally by each implementing utility. SDG&E employs a subcontractor for seminar planning.
Compressed Air Challenge	Implemented as a nonprofit organization with a volunteer board. Sponsoring utilities and other organizations will organize and house training events in their individual territories.
Energy Design Resources	Administratively centered at SCE, with representatives at five California utilities (including SMUD) involved in issuing RFP's for design resources. Managed and implemented by each utility in 2004-05 as part of Savings by Design program, in 2006-08 EDR is embedded in utility T&E efforts.
Industrial Efficiency Alliance	Implemented by NEEA through prime contractor and major subcontractors. Project relies on frequent meetings and communication to keep all parties informed.
Daylighting Collaborative	Design, managed and implemented by the Energy Center of Wisconsin using a pool of consultants to provide technical support. The Collaborative strives to develop local infrastructure and expertise. When conducting trainings in other areas of the country the program attempts to train local trainers through "train the trainer" programs and bring in local organizations to support their goals and efforts.

BOC is implemented by the Northwest Energy Efficiency Council (NEEC) in Washington State and in California. The level of staff required varies by region or by state, but typically at least two people are required to manage and plan the BOC training program: an administrator and an on-site coordinator. NEEC continues to be involved in curriculum licensing, certification tracking, and instructor selection for all licensees. BOC is implemented by regional nonprofits in several areas of the country, including the Northeast Energy Efficiency Partnerships (NEEP) and the Midwest Energy Efficiency Alliance (MEEA).

In 2002, California's **Statewide Education and Training** program was coordinated at a statewide level. At that time, the utilities sought to develop a consistent energy-efficiency message, reduce costs related to seminar development, and expand overall seminar offerings. In 2006, the program's administration was decentralized, with each of the four investor owned utilities and SMUD responsible for coordination and implementation within their own service territories. Most implemented these courses at their own training centers using their own staff as trainers. All of the utilities but SDG&E have training centers that are geographically separate from the utility headquarters, something that offers them scheduling and logistical freedom, but occasionally leads to difficulty communicating and connecting the training staff with overall utility decision making. SDG&E offers training events at utility headquarters and at non-utility sites, such as conference facilities or hotels. Having T&E staff at utility headquarters facilitates

communication between program staff and the utility, but also constrains the types of seminars that SDG&E can offer and limits its ability to obtain and house loaned equipment useful for hands-on experience and demonstration.

Compressed Air Challenge is a voluntary collaboration of manufacturers, distributors, and their associations; industrial users; facility operating personnel and their associations; consultants; state research and development agencies; energy efficiency organizations; and utilities. Trainings are implemented through contractors and collaborative relationships with utilities and other implementation organizations. The CAC program is run by a volunteer board and a half-time executive director. The board is responsible for setting policy and developing training products and meets twice a year. An executive committee meets more frequently.

Energy Design Resources is centered administratively at SCE, but the program is implemented at five other California utilities. It is a web-based program, offering a suite of on-line tools to those interested in designing and building energy efficient commercial and industrial buildings in California. The EDR website offers resources by topic, building type and by resource type (publication, software, and training). EDR also offers virtual workshops and an EDR University course. EDR also provides on-site seminars designed to complement the Savings By Design program. The overall reach of the EDR effort is tied to Savings By Design as well as the broader statewide T&E efforts.

The **Industrial Efficiency Alliance** is run by NEEA through prime subcontractor ECOS Consulting. The training director is housed at ECOS. The program has a somewhat complicated management structure since there are directors for each market segment and for each of the critical systems (motors, pumps, compressed air, and refrigeration). Contacts report NEEA deliberately set up this complex structure because it knew that transforming the market for the targeted sectors would require trainers with credibility and existing relationships, who can leverage these relationships to make direct contact with an organization tied to their industry.

The **Daylighting Collaborative** was initially funded by Wisconsin's electric utilities. Additional trainings were funded as part of the statewide Wisconsin Focus on Energy's High Performance Buildings program. Focus on Energy never provided direct funding to the program and has since stopped supporting the Daylighting Collaborative trainings, deciding instead to develop trainings independently (these trainings were not completed). Currently, the Daylighting Collaborative funding level is much more limited than it was previously, since it is no longer supported by the statewide program. To augment staff resources, the Daylighting Collaborative employs a pool of subcontractors to act as technical consultants. These consultants provide "second look" design assistance ranging from a general review of an overall plan to recommendations that answer very specific questions such as the appropriate depth of a light shelf or how to choose the appropriate glazing. This supports the goal of transferring knowledge to the marketplace through actual practitioners as well as developing local expertise. The Collaborative is currently restructuring to provide a comprehensive national clearinghouse and training calendar, using a direct marketing strategy to supplement any public funding.

Regardless of the amount or source of staff and program support, the accessibility and relevance of these programs to their targeted markets is central to ultimate success. Successful programs tap into the network of relationships that exist in trade associations or other networks

to leverage these connections and expand the reach of the program beyond the limited program resources within which most programs operate.

Best Practices

Program Management: Project Management
• Build a management or advisory board that includes members of the targeted industry and other stakeholders, then work to build consensus throughout the team. • Use a cooperative approach to partnering with trade organizations, utilities, or other organizations • Develop local capacity to implement programs; do not rely solely on outside experts

- Build a management or advisory board that includes members of the targeted industry and other stakeholders, then work to build consensus throughout the team. A stakeholder team can provide guidance on the goals, needs, and approach is important to success. Involvement of stakeholders is the best strategy for receiving feedback about training program relevance and leveraging existing industry communication networks.

- Use a cooperative approach to partnering with trade organizations, utilities, or other organizations. This will increase the commitment of these organizations to support the training and increases the likelihood that the training program will receive valuable feedback about potential improvements. Calling upon program sponsors, participants, and other stakeholders to assist with program design development, oversight and other non-management tasks minimizes the need for paid staff and contractors to fill these roles.

- Develop local capacity to implement programs; do not rely solely on outside experts. Developing local capacity can help overcome time limitations on the part of experts, and supports market transformation goals by developing a network of skilled efficiency expertise. Local trainers may benefit from increased trust of attendees because of their knowledge of local building codes, climate issues, and political considerations. Building local expertise and a network of qualified trainers requires a well developed tested curriculum that can be implemented without significant alteration on the part of the trainer. Programs that build local training capacity typically establish competitive recruitment processes and rigorous training for the trainers themselves.

3.3 REPORTING AND TRACKING

Tracking program activity and performance is an important part of program management, but can be challenging for T&E programs. Tracking should reflect the activities of the program, yet because these programs tend to have a somewhat unique activities, audiences, and objectives, there is no single tracking approach that is clearly superior. Most tracking strategies focus on activity tracking (capturing the courses offered, number of students for each course, etc.). The simplest reporting and tracking strategies involve counting website hits and/or seminar attendees and tracking and recording contact information. More complex programs employ sophisticated calculators to estimate program induced energy savings, and have databases

capable of tracking repeat participants, size and type of participant businesses, hard-to-reach characteristics, and customer satisfaction survey responses. These complex approaches are not widely used.

BOC developed a database to track the number of students, the number of courses taught, the professional and educational organizations endorsing or collaborating with the program, and the number of commercial and industrial facilities endorsing the program. NEEC also tracks the number of certifications issued. The number of enrollees is also tracked because a BOC course will not be scheduled unless there is a reasonable assurance that it will be full.

Each of the participating California IOUs has a different method for tracking participants in the **Statewide Education and Training** program. The utilities report continuously improving their database systems over time to more completely meet the needs of the program staff. While the individual databases are adequate for general program tracking, difficulties in extracting accurate lists of seminar participants for the 2002 evaluation suggests that the systems could be improved further to facilitate data requests for evaluation and regulatory reporting purposes. Contacts at PEC indicate that by 2006 the functionality of the database had improved and the two PGE-sponsored energy centers now benefited from an integrated database system.

The **CAC** relies on sponsors to promote and host trainings across the country and tracks the number of hosted trainings and the attendees in a database. With DOE assistance, the program also tracks feedback received from survey forms distributed to attendees. Sponsors are responsible for reporting the attendees list to the CAC. Relying on sponsor- reported attendees creates occasional challenges since sponsors do not always realize how critical it is that they be able to track attendance accurately for the CAC's purposes. In response to this issue the CAC board is working to communicate to sponsors the importance of accurately tracking and reporting attendee information.

Energy Design Resources maintains lists of training attendees, people who have downloaded software, and electronic lists of website members and newsletter recipients. Since the program has been tied to Savings by Design, many on the EDR lists are likely Savings by Design participants. The lists are generated by website visitors who voluntarily submit their email address to EDR, complete on-line surveys and sign into the EDR website in order to access the electronic design resources (including publications and software tools available on-line).

NEEA developed the **Industrial Tracking System** as a project specific data tracking tool designed to collect all relevant data related to contacts, organizations and activities associated with the effort. The ITS includes call sheets that allow linking between organizations, people, locations and relationships. Training events and attendees are also tracked using the ITS. The ITS is intended to provide a data tracking system capable of mapping and linking the web of relationships that exist in the targeted market segments. The ITS is web-based, so that staff can log into it from any location and update information easily, however use of the ITS was inconsistent in the first year of the project. According to a 2006 MPER (Quantec, 2006), the ITS is primarily used as a data storage or project archive rather than an active project tracking mechanism. Contacts confirm that a second tracking sheet called the "pipeline report" is the most comprehensive and up-to-date list of all the companies touched by the program and their characteristics.

The **Daylighting Collaborative** relies upon its tracking data to estimate the overall awareness and use of daylighting in general and cooling load avoidance daylighting specifically by the design community. The program tracks the numbers of trainings and attendees and estimates the building projects in Wisconsin and surrounding states that have incorporated the principles of cooling load avoidance daylighting as a result of the program. The program also tracks requests for information from the website, using it as a proxy to estimate market interest.

Table 3-2 provides a summary of program tracking activities.

Table 3-2
Reporting and Tracking

Program	Tracking Information
Building Operator Certification	Number of students, courses taught, professional and educational organizations endorsing or collaborating with program, number of certifications, status of continuing education requirements
California Statewide Education & Training	Each center tracks trainings offered and attendee contact information, customer satisfaction responses, working to incorporate tracking of business characteristics.
Compressed Air Challenge	The number of hosted trainings and attendee characteristics. DOE tracks satisfaction/feedback from participant survey forms.
Energy Design Resources	Numbers of website hits and on-line trainings
Industrial Efficiency Alliance	All relevant data related to contacts, organizations, and activities associated with the effort. Entries are linked so that the connections between people and organizations can be tracked.
Daylighting Collaborative	Number of training sessions, participants, and website activity

All programs operate with some form of tracking system. The scope and accuracy of those systems varies depending upon how important tracking accuracy is considered among staff, the usability of the system, and whether or not tracking system verification is assigned to a specific person. Ideally, tracking systems reflect all of the critical outcomes of a training program and are designed to support a wide variety of evaluation activities.

Best Practices

Program Management: Reporting and Tracking
• Identify the key data required to track and accurately report program activities and success indicators early in the program process, but be prepared to adjust databases as refinements become clear. • Carefully document the tracking system. • Create systems for electronic upload of data. • Communicate to sponsors or training hosts the importance of accurately recording attendee information and providing it to the organization in a timely manner

- Identify the key data required to track and accurately report program activities and success indicators early in the program process, but be prepared to adjust databases as refinements become clear. It may not be possible to identify all the key data requirements at the beginning of a program; however efforts should be made to identify and track those data fields that are obvious. The tracking system should be sufficiently flexible and streamlined to allow program staff to easily access program information and to add new tracking fields as needed.

- Carefully document the tracking system. Careful documentation, including database structure, data field definitions and screening criteria, and data entry and analysis procedures will help mitigate problems stemming from staff turn-over, especially when the system must serve a variety of users with varying computer skill levels.

- Create systems for electronic upload of data. Especially for training activities that occur away from headquarters or other central buildings, a system by which trainers and program staff can remotely upload information into a tracking system increases the likelihood that all data will be tracked in the same system.

- Communicate to sponsors or training hosts the importance of accurately recording attendee information and providing it to the organization in a timely manner. When T&E programs are implemented in multiple service territories or are coordinated by multiple organizations, the administrative organization relies upon the records of others to determine the reach of the program. Unless the importance of the data is communicated clearly, the sponsor or training host may fail to track and report attendee numbers and contact information accurately, undermining reporting and evaluation efforts.

3.4 CURRICULUM DEVELOPMENT AND DELIVERY

Perhaps the most important component of T&E programs is the curriculum itself. Ultimately, the true value of T&E programs to both participants and sponsoring organizations is derived from the curriculum and effective delivery of it. Our assessment of curriculum development and delivery includes findings from in-depth interviews with contacts at each of the reviewed

programs, and findings from a review of secondary literature addressing adult education, adult learning theory, other best practice reviews of training program efforts, and program theory that included training as a critical program component (Anderson, 2004; GDS Associates, 2004; Knowles, 1987; Salas, 2001; Speck, 1996; Tannenbaum et. al. 2006) Our review of secondary literature found a logical relationship between education, training, and information and the potential for ultimately influencing standard practice.

Adult learning theories indicate that education, training and information must be credible and relevant to the daily work environment in which the targeted market actors operate if it is to be adopted. Valid specific technical content provides the primary value of educational programs that offer new information and tools to adults in established careers in specialized fields.

To be effective, the information delivered must be credible, useful, current, and adapted to the needs of the targeted market. The information offered by each of the reviewed programs meets these criteria. Table NR7- provides brief summaries of the information or knowledge delivered by the various program media.

Table NR7-
Information Provided

Program	Information
BOC	Emphasis in energy efficient building systems maintenance and trouble shooting. Systems include HVAC, lighting, indoor air quality and electrical.
California Statewide Education & Training	Information about energy efficient equipment, usage, and maintenance practices (varies by target market)
CAC	Information about controlling compressed air systems for efficiency, cost savings, increased productivity, and improved reliability.
Energy Design Resources	Informational, design, and programmatic tools related to energy efficient building design practices
NEEA/IEA	A variety of training opportunities are offered. IEA offers some nationally developed curricula (including CAC), and other industry-specific "shop floor" trainings that are shorter and personalized for the participating company.
Daylighting Collaborative	Information about energy-efficient, daylighting design practices

In addition to content, the way a specific education or training experience is structured and delivered is key to its success in reaching its audience. Training and adult learning theories both stress the importance of providing feedback, demonstrating and providing direct, concrete experiences, and creating opportunities for trainees to practice skills (Salas, 2001). Rules of thumb among accelerated learning specialists dictate that 70% of the activity be done by the student, and only 30% done by the trainer (Anderson 2007). Given the technical nature of energy efficiency trainings, it may not be possible to achieve this ideal mix of lecture and activity but every effort should be made to keep the lecture component to less than 50-60%.

Speck (1996) provides several other components of effective professional development:

- Trainers need to acknowledge that adult learners are self directed and connect to the material through their life experiences
- Training should be structured to protect the ego, provide support and reduce fear of judgment during learning
- Trainers must accommodate the diverse set of experiences, knowledge, self-direction, interests, and competencies that come with adults
- Trainers will have to counteract adult tendencies to resist learning activities that are perceived as an attack on their competence through providing some control over aspects of their learning

Effective training programs also seek feedback from attendees about their experiences based on these principles. The evaluation findings are then incorporated to further refine training quality and confirm expectations of behavioral effects.

The two primary components of training content, curriculum development and trainer selection, are reviewed by program below.

Curriculum development:

To develop the curriculum for **BOC**, NEEC convened a committee of building operations professionals, training professionals, utility or energy program experts, and representatives from energy efficiency nonprofits or government organizations. The process took about two years to complete. Subject matter specialists created specific modules and reviewed the content, while a specialist in adult education worked to refine the curriculum. The curriculum was tested and refined and after about four years of use, was finalized and licensed. To further impart the relevance of the BOC curriculum to attendees, the program also includes an in-facility project assignment which participants complete following the classroom training. The assignment engages participants in the direct application of information and concepts presented in the training to their facility. Project assignments are a required aspect of the BOC credential and include energy benchmarking activities, an HVAC systems review, and a lighting survey.

In the California **Statewide Education and Training** program, decisions about which courses to offer are usually made independently at each of the four participating IOUs. Working with end-use experts and informed by attendee feedback and their own research, the staff develop a list of likely training topics for the year. Utility staff members review the list of likely training topics and assess whether or not they have the in-house expertise to conduct the training directly; if not, Energy Center staff rely on their experience and connections with professional societies and practice to identify external contacts with the necessary expertise. Courses that are offered repeatedly tend to be provided in-house using material already developed and tested. New technology courses on the other hand, are often developed rapidly by external consultants to communicate the information as quickly as possible.

Developing the **CAC** curriculum involved a stakeholder committee and the participation of professional adult educators. Technical experts developed the content; however developers

considered it equally important that the training program limit reliance on lectures. CAC designers brought in professional educators who educated developers about the principles of adult learning. A primary concern was to develop interactive trainings and avoid long slide shows. Ultimately, the CAC curriculum incorporated small group exercises in each major section, question and answer sessions, and frequent breaks.

EDR was originally developed by experts in energy efficiency design and training, and is continually expanded. Currently, EDR curricula are typically developed after a Request for Proposals is issued or after ideas are proposed by a consultant. Proposals are reviewed by each of the participating utilities who decide whether or not it should be funded. This decision is based on: (1) the reputation of the consultant, (2) the ability of the consultant to present a class, and (3) the quality and accuracy of the technical material. The ability of the consultant to present the class includes an assessment of the teaching itself and the consultant's effectiveness at relating to others. Reviewers look for a combination of training activities (lecture, small group, hands-on activities) but the subject matter is also important. Ultimately, the training is expected to address a relevant topic and facilitate the portfolio's overall goal achievement.

The **IEA** depends on two sets of curricula. The first is developed externally and sponsored by a national group (for example the CAC, or trainings from USDOE or the Refrigerating Engineers & Technicians Association) that target staff with relatively high level of experience or responsibility. After realizing that offering these trainings were reaching only 10% or less of the production staff, the IEA staff developed a second curriculum, consisting of "shop floor"/introductory level trainings. Curricula for the introductory trainings are developed through a peer review process. Shop floor trainings are shorter (1-2 hours long), and are personalized for the host company.

ECW has a series of requirements for each proposed training program, and these are applied to the **Daylighting Collaborative**. All training efforts at ECW are managed in-house and begin with identified behavioral impact objectives. After the desired behavioral changes are defined, the subject matter experts are called in to help develop the specific technical content. Throughout the process ECW works with stakeholders to rein in the tendency to fill every information gap by keeping the topics focused on the "first, next" thing an attendee could do. Subject matter experts are considered important partners in the process and are passionate about their topic, but may not have access to the structured activity that would best impart understanding or improve retention. In these cases, the adult education and training experts at ECW will monitor and adjust curriculum to assure the quantity of content is realistic and that some portion of the activities will be completed by the student.

Trainer Selection

For **BOC,** the trainer selection process involves several steps. NEEC works year-round to build a strong pool of qualified instructors through open recruitment and applicant screening. NEEC reviews resumes, checks references and looks for previous training experience. For NEEC, it is important that trainers have more than subject matter expertise—while both subject matter expertise and training experience are important, previous training experience is prioritized. NEEC has offered two "train the trainer" events and provides orientation to new trainers. The program also supports instructors through hosted quarterly calls for partner organizations and instructors. Call participants are given an opportunity to discuss successful practices and

provide feedback about the curriculum. Call topics are frequently organized along broad topics or subjects (for example HVAC or environmental health) but any instructor can participate in any of the calls.

The primary consideration for trainer selection at the **California Energy Centers** is the credibility of the presenter and their ability to teach effectively. Trainers are typically selected because of relevant professional practice or because of their reputation for professional expertise.

The **CAC** selects trainers through a posted public announcement advertised in compressed air publications, associations and at trade events. The CAC executive director screens the applications for expertise. The remaining applications are reviewed by a committee of instructors and compressed air experts. Reviewers are looking for extensive real life experience with compressed air systems and good training credentials. Selected applicants must pass a written test followed by an oral interview. Those selected are required to attend a "train the trainers" orientation focused on adult learning techniques. Finally, new instructors are required to shadow an existing instructor—the existing instructor is responsible for authorizing them to be official trainers. Contacts report that the extensive process ensures commitment and quality on the part of the trainers.

EDR reviews training proposals and selects trainers based on their subject matter expertise and previous training experience. Staff will consider the proposer's skill in presenting the material and relating well to attendees, but there are no formal requirements beyond the proposal review.

At NEEA, **IEA** trainers are selected based on education and training credentials. All of the trainers used by NEEA have earned either PhDs or are DOE-certified trainers. The program's technical director conducts the shop floor level trainings. Trainers are required to be open to feedback and engaging to attendees.

At the **Daylighting Collaborative**, scores from previous training evaluation forms are considered when selecting trainers. Low scores may not necessarily exclude someone, however. If a trainer has extensive subject matter expertise, is viewed by attendees as an expert and is easy to work with but needs to work on content delivery, ECW staff will provide assistance and tools to help improve training skills. ECW also provides "train the trainer" events throughout the state to increase the training capacity of local experts.

The programs reviewed here represent the benefits of long-term commitment to training programs and prioritizing curriculum improvement. They incorporate the principles of adult learning and utilize the highest level of subject matter expertise to create highly effective T&E programs. When these programs are also set up to further the personal or professional goals of the attendees through certification, continuing education units, or increased advancement or profit opportunities, they reach the widest possible audience.

Best Practices

Curriculum Development and Content Delivery
• Defining and targeting desired behavioral outcomes results in more powerful program effects. • Provide relevant, credible information to attendees. • When possible, link training content to required professional continuing education (CEU) credits. • Employ technical experts for development of technical training content. • Employ curriculum experts to work with content experts to assure that the information is presented in an effective format for learning. • Train the trainers to improve the quality and consistency of trainings.

- Defining and targeting desired behavioral outcomes results in more powerful program effects. Training efforts involving work-related scenarios and hands-on learning are more likely to create change among adult learners. Defining the desired behavioral and learning objectives during the curriculum development process helps focus training content on the most important topics.

- Provide relevant, credible information to attendees. Providing information that is current, from a credible source, and that demonstrates tangible benefits to the attendee and/or their company increases the likelihood that attendees will transfer the new information to the work environment through real behavioral change.

- When possible, link training content to required professional continuing education (CEU) credits. This will provide value to participants by aligning the training with professional growth opportunities and professional obligations. Working with professional associations to certify that trainings meet their content requirements also provides opportunities for relationship development, communication, and market feedback.

- Employ technical experts for development of technical training content. The use of recognized experts to develop the technical content will help to assure the information is accurate, current, and practical. Experts may be in-house staff, advisory boards, or outside consultants.

- Employ curriculum experts to work with content experts to assure that the information is presented in an effective format for learning. Sound pedagogical practices must be built-in to training material to ensure that lessons and information are meaningful and communicated effectively.

- Train the trainers to improve the quality and consistency of trainings. By improving the skills of trainers and clarifying the expectations of the sponsoring organization, trainers will more effectively and consistently deliver the training content. Regular

communication opportunities also offer opportunities for continuous improvement and feedback as trainers compare experiences and discuss successful or unsuccessful practices. Curriculum experts and others with knowledge of adult learning should also be used to train the trainers so that they can be more effective in their delivery of the material.

3.5 MARKETING & OUTREACH

Marketing and outreach activities are key to effectively reaching the target audience. Marketing and outreach activities for T&E programs are particularly important in targeting and recruiting the right training participants. Since training programs must be viewed as credible and relevant to a specific group, the marketing approach needs to highlight the course's credibility and relevance in order to attract the desired number and types of participants. This requires training developers to work closely with representatives from the targeted industry or trade group (to assure the content addresses work-related problems), and to tap into the existing communication network in the industry. After the course is developed, packaging the opportunity and communicating it is the work of marketing and outreach.

An important tool used for both market research and later to support evaluation of T&E programs are baseline studies that help understand the initial conditions of the market – the energy efficiency issues and characteristics of target markets. These studies need to include sufficient specificity to assess the program-specific behaviors that are targeted by the program. The California Evaluation Framework (TekMktWorks, 2004) suggests that for T&E programs, baseline studies include:

- The size and composition of target markets;
- Pre-program awareness or knowledge levels;
- Pre-program information and education sources;
- Extent of exposure to and use of pre-program education or information sources;
- Pre-program status of the target market relative to the intended results of the program; and
- Relative pre-program adoption and behavior patterns.

With sufficiently precise information about the targeted behavior, program implementers can confidently target the program at inception and later use subsequent studies to again assess knowledge or behavior.

Table 3-3 summarizes the target market of each of the reviewed programs.

Table 3-3
Targeted Trade Allies or Market Participants

Program	Market Actors Targeted
BOC	Facility operations and maintenance staff and their supervisors
California Statewide Education & Training	Architects, heating, ventilation and air conditioning (HVAC) engineers, electrical engineers, lighting designers, building owners, facility managers, and facility engineers.
CAC	Industrial users of compressed air. Also targets compressor industry: suppliers, manufacturers, and distributors of compressed air equipment and services.
Energy Design Resources	Architects, engineers, lighting designers, developers, builders, and building operators.
NEEA	The Pacific Northwest industrial sector, specifically the pulp and paper and food processing industry. Targeted companies include 28 pulp and paper plants and 575 food processing companies.
Daylighting Collaborative	Building design and construction professionals, including architects, lighting designers, engineers and contractors; also building owners, facility managers, and other decision makers.

3.6 MARKETING TACTICS

BOC benefits from endorsements by influential employers, accreditation by institutions such as the Department of Labor and Industry and community colleges, and educational partnerships with leading facility management associations such as International Facility Management Association, National School Plant Management Association, and the local chapters of the Society for Healthcare Engineering. BOC also relies on the marketing efforts of sponsoring organizations, including regional energy efficiency nonprofits, to spread the word about the opportunity. Other marketing vehicles include membership and participation by NEEC in facility association meetings, annual conferences and trade shows, partnerships with utilities and placement of articles in trade association and employer newsletters. The program also manages a website and has developed extensive mailing lists through which potential participants are notified of upcoming training opportunities. BOC efforts include one relatively unique marketing and recruitment activity—a preliminary introductory letter to market the courses to supervisors. In this letter, they are informed about the upcoming training opportunity and invited to a breakfast meeting during which the training opportunity is described, the value of the training to their organizations is demonstrated, and any questions are, answered.

California's **Statewide Education & Training** program targets a broad range of market actors and relies on a corresponding variety of methods to market training opportunities. Methods include: comprehensive mailings to a large distribution list compiled for each center, using either direct mail or e-mailed information; distribution of other collateral (brochures, targeted publications); and dissemination of course information via account representatives. Websites

are also useful, and the two PG&E sponsored Energy Centers are served by consolidated, unified websites. Collaborations with third parties and associations (AIA, BOMA, Illuminating Engineers) provide some of the most useful marketing, since these organizations often have more credibility with members than the utility. PEC representatives report that email promotions are the most effective strategy for encouraging sign ups for specific classes, while the print calendar and brochure offer more general marketing value.

CAC trainings are primarily marketed through utilities and other sponsors, but events are also listed on the CAC website, or in conference exhibits. The program has also increasingly relied on its website to disseminate CAC program information and collateral, such as brochures, handbooks, technical information, and a Best Practices manual. CAC, like EDR and the Daylighting Collaborative, seeks to be a clearinghouse of consistent, credible, and product-neutral information.

Over its lifetime, EDR has been promoted independently, as part of the Savings by Design program, and as part of the Statewide Education and Training program. EDR targets those involved in the design and building of nonresidential new construction, including engineers, architects and energy consultants. Its tools are specifically designed to inform these key decision influencers about strategies to make the new commercial building more energy efficient. Other potential EDR targets include lighting designers, building owners and facility managers, although EDR does not reach them as effectively. EDR provides an extensive set of resources for building designers on its website, including design briefs, guidelines, case studies, modeling software, virtual workshops, and information on codes and standards.

Training opportunities are just one aspect of a broader effort to promote the **IEA** to the targeted market segments in the Northwest (food processing and pulp and paper).

Training is considered one method of marketing and recruiting participants to the IEA program. The IEA training courses are marketed through trade associations and utility connections. Other marketing strategies include articles in respected trade journals, brochures, a published training calendar, and conference presentations. IEA provides an extensive set of resources on its website including a training calendar, articles, on-line resources, and technology-specific literature.

For the **Daylighting Collaborative** program, ECW relies primarily on marketing via professional organizations with relationships to key trade allies. Marketing methods include brochures, website information, some limited direct mail and direct outreach efforts, and presentations at conferences or seminars. Articles in professional publications read by the targeted audience (primarily architects and engineers) are also used.

Effective T&E program marketing needs to clearly communicate the value of the training to its potential audience. Marketing messages need to be on target, be phrased in a way that reaches its target market, and to emphasize the course's benefits in terms of professional development or improved job performance.

Best Practices

Program Management: Marketing and Outreach
• Market the program to the specific profession targeted. • Emphasize the value of the training to the target audience. If possible, personalize the marketing message. • Partner with local community, government, and trade organizations associated with the target market to increase program awareness and participation. • Utilities can integrate training needs into account management plans: enroll managed accounts into training courses when they are offered.

- Market the program to the specific profession targeted. Effective program marketing has a clearly defined target market and develops messages that address specific on-the-job concerns associated with that profession.

- Partner with local community, government, and trade organizations associated with the target market to increase program awareness and participation. Successful programs use local, regional, or national trade associations to reach the targeted market. True collaboration and communication with these groups increases the likelihood a training effort will tie into real business concerns for a given profession. Becoming certified to offer continuing education credits when required by professional organizations also improves the marketability of training.

- Utilities can integrate training needs into account management plans: enroll managed accounts into training courses when they are offered. Proactive identification of training needs as part of account management plans will help to ensure that training related needs are met.

- Integrate marketing and tracking activities to identify future attendees. Gathering names and conducting targeted recruitment helps T&E programs identify potential attendees. This allows program sponsors to hold off scheduling training events until they are likely to be well-attended. This helps avoid the costly prospect of poorly attended trainings.

3.7 PARTICIPATION PROCESS

Ease of participation is critical to achieving high levels of participation in training activities. Keys to maximizing participation in T&E programs are *simplicity* (offering a simple enrollment or sign up process), *convenience* (offering the training at a convenient time or location), and *relevance* (offering training that is directly related to work experience).

BOC participation is open to anyone; however most attendees are facility operations and maintenance staff referred to the program by their supervisors. The program is targeted toward building operators, not supervisors, but recruitment requires contacting supervisors and convincing them of the value of the course. Supervisors are encouraged to attend the training to

demonstrate the value of the course series to their organization. Participants must fill out an application and pay the course fee prior to attending.

Three of the four utilities in the California **Statewide Education and Training** program have permanent centrally located education facilities (Energy Centers) which offer a variety of specialized, high quality technical services and resources, in addition to meeting and teaching facilities. A portion of seminars are offered in outlying and remote areas of the state, but the core program relies on seminars conducted at the energy centers in order to take advantage of the permanent displays and demonstrations. Training sessions are usually open to all customers of each investor-owned utility as well as market actors residing or working within the service territory. Course schedules and registration are available online through the websites of each of the utilities. There is usually no fee associated with the Energy Center trainings. In recent years, PGE's Energy Centers have begun offering courses online. Online courses allow training delivery at a lower cost and can enable participation in remote or outlying areas.

Participating in **CAC** trainings is relatively straightforward for attendees, since the hosting organizations are often utilities. Utilities are able to promote the opportunity directly to their customers, and are often able to identify the most relevant contacts to recruit. Participation is open to anyone, however people do not normally sign up without prior specific experience or a job-related need. There is a charge for CAC courses; however, standard fees are often reduced through sponsor subsidy.

Energy Design Resources participants are building owners, architects, engineers, designers, contractors, builders, developers, and energy consultants working in nonresidential new construction in California. Often they are referred to the EDR program by the Statewide Savings By Design program, or through contact with other T&E resources of the participating utilities. EDR offers a wide array of information to meet the varied interests and professional training needs of the diverse group of target participants. The ultimate goal of EDR is to improve the design and construction of new commercial buildings in California. Given the complex nature of the market and the many barriers that must be overcome to make energy-efficiency a priority in non-residential new construction, it is imperative that EDR resources be straightforward and helpful. A 2003 evaluation of EDR noted that it was reaching a narrower audience than desired and that its impact could grow if EDR tools were promoted in conjunction with the Savings By Design program and the utility energy centers. These changes were made in 2003. Most of the information available through EDR is free to participants.

The **IEA**, which provides trainings throughout the Northwest, works with local utilities to identify training needs and obtain participant leads (either individuals or companies), then follows up with recommended participants to assess their interest in the course. The IEA also provides financial and marketing support. As a public organization, NEEA strives to provide open training opportunities and events, holding them in public locations or at company facilities open to other attendees. There are no specific requirements for participation, although prerequisites may be assigned for highly technical courses. Specific trainings may be offered to companies that have committed to partnering with the IEA program—these trainings are often company specific and are designed to encourage broader participation and commitment to energy efficiency among all levels of company staff. IEA trainings are subsidized by NEEA, and often the local utility will cover the difference between the subsidy and the cost of the training.

If an organization is considered fully "engaged" with the program, trainings are provided at no charge.

The **Daylighting Collaborative** has no requirements for participation. Participants are generally recruited through contact with a network of representatives who speak at conferences, write articles for trade magazines, or act as sources for writers and researchers. ECW charges a fee for all trainings as a way to increase commitment and perception of value.

The programs reviewed here have minimal requirements for participation, and most charge a fee to attendees to increase their commitment to taking the course. Participation in training programs typically builds over time, as a program's reputation spreads via word of mouth, and as its name recognition and acceptance build. These programs leverage professional and trade ally relationships to market the course and recruit potential new participants. Ultimately, the course's relevance to prospective participants is key to achieving high levels of participation. Training events with highly relevant content and delivery may be able to overcome complicated participation processes and inconvenient locations, but T&E efforts that lack relevance to their targeted market are unlikely to sustain high participation levels regardless of how easy it is to participate.

Best Practices

Program Management: Participation Process
• Keep participation simple. • Match location and scheduling to the work schedule of the target audience. • Augment recruiting with trade allies. • Maintain accurate contact lists. • Consider charging for courses.

- Keep participation simple. A streamlined, accessible registration process makes it more likely that prospects will enroll in the training opporutnity. For programs that rely heavily on website information dissemination, this means providing an intuitive, interactive website that allows visitors to quickly find the information they seek.

- Match location and scheduling to the work schedule of the target audience. Provide training locations that are within a reasonable driving distance. Schedule trainging to accommodate the needs of the target audience to maximize attendance. Convenience can also be enhanced through web-based training and inforamtion dissemination, on-site demonstrations, and on-the-spot technical support.

- Augment recruiting with trade allies. Encourage key market actors – trade allies, trade associations, and/or local utility contacts – to recruit others and disseminate information about the training opportunity. This faciliates word of mouth recruitment and adds credibility to the training as colleagues discuss the training with each other.

- Maintain accurate contact lists. Track down new contact information and replace bad email addresses whenever possible. Update the system when addresses and phone numbers change.

- Consider charging for courses. When participants are required to pay for training (even modest fee) it increases their commitment to attending and reinforces the value of the course. Tannenbaum et. al (2006) describe several California Energy Center trainings in which registration was high, but attendance was low, noting that "courses offered for free are perceived as having less value than those for which there is a charge."

3.8 PROGRAM EVALUATION AND OUTCOMES

Many T&E programs are not evaluated thoroughly or regularly. T&E programs tend to focus on tracking numbers of participants and their satisfaction with the training experience, but do not necessarily evaluate the training's effectiveness in changing workplace behavior or organizational practice. In part, this is due to the challenges in measuring retention and the expected resulting behavior change.

The ultimate measure of a T&E program's effectiveness is whether or not the newly acquired skills, knowledge, or attitudes are being used in the typical, everyday environment of the learner. For a specific program, pre- and post- tests can determine if knowledge has been acquired, but the more important question is whether or not the knowledge is actually used in everyday professional decisions. Furthermore, even if the information is used in daily professional decisions, evaluators must then determine whether this use is attributable to the program or to external factors. External factors may include regional increases in interest in energy efficiency and sustainability, concerns over global warming or rising energy prices.

T&E programs that are specifically designed to complement other program services and incentive programs are particularly challenging to evaluate. In these cases, evaluators may be asked to determine if it was the training, the other services, or the incentives that ultimately lead to the behavior change? Regardless of the difficulties in evaluating their impacts, the low cost of many T&E programs and their logical link to changes in participant behaviors make them important components of a DSM portfolio, irrespective of whether substantial savings can be attributed to the training program itself. Therefore it is critical that the T&E program effectively address the information, search cost, and market barriers that inhibit the adoption of energy efficiency measures. It is also important that program components are designed to facilitate participants' abilities to gain experience in the field with their new knowledge and understanding. This is the path to transforming markets and putting the training to use in everyday practice.

Evaluations provide valuable feedback to program managers, allowing programs to improve in response to lessons learned and experience gained. Regular evaluations provide T&E programs with the guidance they need to be able to improve the training content or delivery approach. Comprehensive evaluation efforts identify key issues that can be explored more fully in subsequent evaluation efforts, and ultimately provide implementers with extensive feedback about important aspects of the program. Basic process and satisfaction information gathered through early evaluations can be used in subsequent evaluations to more precisely measure behavior change among attendees and estimate energy savings resulting from the training.

Donald Kirkpatrick (1994) developed one of the most cited strategies for assessing training effectiveness. His four-tiered model provides a framework for evaluating the effectiveness of adult learner T&E programs. Kirkpatrick's four tiers are sequential, with data acquired from each tier used to inform evaluation work at the next level. The four tiers are:

- ***Reactions,*** measuring participants' responses to the training,
- ***Learning,*** measuring the changes in knowledge, skills, or attitudes resulting from the training,
- ***Transfer,*** measuring the extent to which the participants' behaviors have changed as a result of the training, and
- ***Results,*** measuring organizational impacts from the training.

If one has conducted a baseline study at the outset or for marketing purposes, it is easier to assess whether knowledge, awareness, or behavior has changed. If it has, one can conclude that something has changed, but attributing the change to the program services (attribution) requires more rigorous work. The evaluation must determine, as precisely as possible, the sources for the changes observed and assess whether the program efforts contributed to the change. To do this, the evaluator must identify what other external factors might have led to the changes and determine their role in the participant's changed behavior. One of the most effective means for assessing program effects is to conduct site visits of projects designed, installed, or maintained by participants and nonparticipants. For example, for training focused on design this might entail reviewing design drawings by participants completed before and after their training to see whether or not the concepts in the training programs are being incorporated into actual projects.

BOC benefited early in implementation from extensive evaluation efforts supported by NEEA. The evaluations were grounded in Kirkpatrick's four tier approach and sought to understand the program for the learners, trainers, and the sponsoring organizations. Seven MPERs were completed between program launch in 1998 and PY 2001 (coinciding with the period during which NEEA provided major funding for the program). These evaluations identified areas needing improvement and demonstrated high satisfaction among participants. The curriculum and course requirements evolved in response to early feedback, improving the course series to the point where it was well suited to the audience. Program staff reported that they have eagerly awaited evaluation results, particularly those identifying opportunities to improve the program, and providing ideas for packaging the course for employers and for certification. A 2003 retrospective of NEEA estimated that BOC certification could be expected to result in saving 5-10% of a building's electricity use (Summit Blue, 2003). Subsequent impact evaluation work completed for California and for the Northeast identified behavior change and estimated the energy impact resulting from the training.

The evaluation of the 2002 California **Statewide Education & Training** program was extensive, and included both an assessment of program effectiveness and a process evaluation. These components were supported by a participant survey, a target market survey, in-depth interviews with program staff, and a review of program filings and materials. Statewide participant survey results indicated that the program's seminars were effective in reducing

relevant market barriers, including information costs, performance uncertainty, and information asymmetry. The survey results also provided evidence that the program resulted in changes in behavior for well over half of its participants. Reinforcing this conclusion were participant survey findings that future purchase decisions would be influenced by the program (KEMA-Xenergy, 2002).

The evaluation of the 2003 California Statewide program used a case study approach to examine one training at each of the six energy centers operating statewide. This evaluation also included a participant satisfaction survey and a best practices assessment focused on identifying strategies for improving the marketing, delivery, and evaluation of the courses offered. The best practices review resulted in recommendations to: improve the reach of marketing efforts beyond the existing channels; adjust the course design and implementation to focus more on attaining action or behavioral change rather than information transfer; and expand the scope of evaluation beyond satisfaction with the course to assessing the course's impact on the participants' subsequent behaviors. The participant survey found high overall satisfaction levels and indications that workshop attendees are better able to specify energy efficient solutions and purchases. A set of course-specific recommendations was also generated for each of the six reviewed trainings. The best pracitces review was particularly helpful in framing the recommendations because it allowed evaluators to frame deficiencies based on three basic principles (Wirtshafter Associates 2005):

- Successful marketing starts with development of courses focused on the needs of a specific audience, marketed directly to them, and conveying the specific value of the course.

- Principles of adult learning clearly indicate that the focus of the classes should move beyond information transfer to behavioral outcomes through empowering attendees to take specific action.

- Evaluation acitivites provide critical feedback that needs to inform training design and delivery, and it is important to measure behavioral change resulting from training expereiences.

A 2003 evaluation of the **CAC** found the program was highly cost effective, was clearly reaching its target audiences, that attendees found the sessions to be both useful and of high quality, and that a high portion of end-users reported making significant capital and/or operating improvements to their compressed air system since attending the CAC. Those who implemented the improvements achieved high levels of energy savings. The evaluation included an analysis of the attendee database as well as surveys of end-user and vendor attendees. Evaluators recommended CAC staff develop case studies and examples of success with small and medium-sized systems and include information on the cost and energy savings associated with common measures. Evaluators also recommended developing a unit in the advanced course focused on communicating the business case for high efficiency compressed air approaches among vendors in order to more clearly articulate the commercial value of the training for vendors (Lawrence Berkeley National Laboratory and Xenergy Inc. 2004).

An evaluation of **EDR** was conducted in 2003 to determine which of the program's design assistance tools are used the most, who is using the tools, how the tools are used, the extent to

which they are used, and which tools are of most interest to each of the target market actor groups. The evaluation found that engineers and energy consultants appear to be the primary users of many of the program's tools. It also found many of the tools are underutilized, particularly by architects, but also by building owners, developers, and lighting designers. Simple lack of awareness is one of the major reasons for this underutilization (Opinion Dynamics Corporation, 2003). Since the time of the evaluation utility staff members have worked to more actively to promote EDR to this wider audience.

NEEA consistently invests in early and on-going evaluation efforts for its initiatives, and the **IEA** is no exception. The IEA has been evaluated via two MPER's in the program's first 18 months, with a third expected in the first half of 2007. The first MPER outlined the background, rationale, and market transformation hypothesis underlying the program and described the strategies, goals, and targets on which the program was based. The evaluations also document the IEA's development and implementation processes and assess its performance in terms of market effects and energy savings. The training component of IEA was found to be successful and well-received by industrial firms, trade allies, utilities, and other market partners alike. Evaluators are developing a process by which they will assess and document energy savings associated with specific training events. This analysis is expected in MPER #3, to be published in March 2007.

The **Daylighting Collaborative** follows up with architects and engineers who attend training sessions to:

- identify any reasons they have not designed or implemented projects,
- determine what additional barriers they have encountered, and
- identify how those barriers might be addressed.

The program also continuously seeks qualitative feedback from participants. Post-training evaluations assess the application of both envelope and mechanical design techniques to measure their impacts on energy savings; however there are no funds available for independent evaluation. ECW annually analyzes the education and training on-site evaluations to assess overall participant satisfaction, key trends, and sector differences. ECW uses this analysis to compare specific training design and implementation methodologies across topic areas and target markets (Anderson, 2004).

An interim program evaluation was completed two years after the inception of Collaborative. Feedback was qualitative in nature, and helped to focus the messaging of the program and services provided. The evaluation focused in large part on how to improve delivery of technical assistance, which has been also provided by the program, made available only to training participants to encourage continuing education and professional development within the design community.

Table 3-3 shows the measured effects resulting from each of the programs, and the method of measuring those effects.

Table 3-3
Program Effects (Knowledge Gained/Behavior Changed & Method of Measuring)

Program	Knowledge Gained/Behavior Changed	Method of Measuring
Building Operator Certification	85% of enrollees reported the program helped them save energy, 84% improved occupant comfort, and 60% made indoor air quality improvements at their facilities. 93% of students reported applying concepts taught in the course. Over half of students had shared concepts with co-workers.	Participant surveys conducted as part of process and impact evaluations in 2005 and 2006
California Statewide Education & Training	Have affected the decision making of more than half of attendees.	Participant survey (Incorporated into 2002 process and impact evaluation).
Compressed Air Challenge	Program estimated savings from CAC-driven compressed air improvements are 168,703 MWh per year. 76% of facilities made compressed air system improvements since attending the training.	Participant survey and analysis conducted as part of a 2004 evaluation.
Energy Design Resources	75% of visitors have read at least one publication, used at least one software tool, or participated in at least one training offered by EDR	Evaluation to determine which design assistance tools are used the most, how and to what extent the tools are used, and which tools are of most interest to each group of market actors.
Industrial Efficiency Alliance	Attendees rated their course experiences highly and felt they left the training better able to engage in dialogue and take actions in system efficiency changes. Half of respondents had made some system changes as a result of the training. 69% thought they would make future system changes.	Attendee survey (completed as part of a 2006 MPER)
Daylighting Collaborative	Daylighting, along with "natural light" and "outside views," are now common design objectives. Daylighting has become part of the vernacular of the design community, and is becoming part of building design guidelines and requirements. Energy performance and energy efficiency are now associated with good daylighting design.	On-site and long-term follow-up evaluations. Evaluations measure the application of both envelope and mechanical design techniques to measure impact on energy savings.

Several important quality control and verification activities for T&E programs appropriately occur before the program activities take place and during the first year or two of implementation. Typically these activities include some mixture of the following:

- enlisting recognized experts to help develop the program,
- testing the program activities through focus groups,
- peer review of proposed curricula before the program is launched,
- hiring experts to conduct the program activities, and/or
- adopting existing, recognized standards.

Additionally, it is important to conduct evaluations of course relevance and teacher quality during the early years of implementation.

Post-event course evaluations, or "smilesheets," are one simple evaluative tool often used to determine whether trainers/teachers are connecting with students, and whether the information presented was relevant to the needs of the participants. Ultimately however, these post event surveys are not enough, evaluations should be designed to measure program effectiveness, test program theory assumptions, and provide ongoing feedback and corrective guidance for these programs on a regular basis.

Best Practices

Program Evaluation
• Invest in quality, independent evaluation early in the life of a T&E program. • An evaluability assessment may help assess readiness for evaluation among programs that have never been evaluated. • Implement evaluation activities that follow the logic of learning. • Specificity is important in measuring behavior change. • Map and leverage the word-of-mouth communication within trade allies to determine the influence of the program and whether the information provided is valued.

- Invest in quality, independent evaluation early in the life of a T&E program. First year evaluations are important for identifying the strengths and weaknesses of new programs and can provide invaluable feedback from participants after they have returned to their jobs with the new information. On-site surveys capture only immediate reaction, but are not capable of measuring longer-term behavioral or organizational impacts.

- An evaluability assessment may help assess readiness for evaluation among programs that have never been evaluated. An evaluability assessment helps to assure that evaluation results are reliable and that resources will be well spent. It assesses whether a program's target behaviors and target market are defined sufficiently to permit measurement, whether sufficient time has passed, and whether the program's influence of the target market is likely large enough to justify the cost of the evaluation.

- Implement evaluation activities that follow the logic of learning. Efforts to get immediate impressions regarding satisfaction with training content or relevance of the material should be done at the time of training, when the information is still fresh. However, documenting the effect of the program in terms of action taken may need to be delayed typically several months, until the program has had time to have an effect.

- Specificity is important in measuring behavior change. Whether conducting a baseline study, a follow-up study by survey, or on-site observation or plan review, the specific behaviors targeted by the program need to be defined and questions developed that address the behavior as precisely as possible. Lack of precision will generally lead to overestimates of behavior presence.

- Map and leverage the word-of-mouth communication within trade allies to determine the influence of the program and whether the information provided is valued. Interpersonal communication among peers is a powerful force for change; programs that are well-respected and well-known are more likely to have tapped into these networks. Evaluations can trace the effect of word-of-mouth communication to assess the reach of the program.

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