

Final Report
Measurement and Evaluation Study
of the 2003 SDG&E Energy Code
Training Program

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Executive Summary

This document is the final report for the Measurement and Evaluation Study of the 2003 SDG&E Local Energy Code Training Program. This report contains an estimation of the proportion of seminar attendees who have utilized the training knowledge gained through the seminar. Additionally, this report contains measures of program effectiveness resulting from a process evaluation.

The Local Energy Code Training Program is an education program that provides training to builders, developers, contractors, planners, architects, engineers, and other industry professionals. The topics covered by the seminars include education on new Title 24 code requirements, energy efficiency measure installation training, code and new construction software training, and energy efficient new construction sales training.

The primary objectives of this EM&V study are:

1. To quantify the number and type of seminars offered and the number of participants who attended those seminars, and
2. To determine whether participants will attempt to (or have already attempted to) implement any of the energy efficient measures or ideas suggested by the training.

The evaluation is based on 43 completed telephone surveys with program participants. A total of 64 participants were called in order to complete the 43 surveys¹, resulting in a conversion rate of 67.2%². No participants refused to complete the survey, a complete list of survey dispositions can be found on page 14, Table 17: Telephone Survey Dispositions. The survey responses have been statistically extrapolated to the program population.

Quantification of Program Offerings and Participation

Table 1 summarizes the program offerings and participation levels of the 2003 Local Energy Code Training Program. The program offered a total of 28 seminars. A total of 124 participants representing 102 firms attended these seminars. On average, each seminar had approximately 4.4 participants, representing 3.6 firms.

	# of Seminars	# of Firms	# of Participants
Advanced Manual D	4	11	16
Combined Hydronic Systems Sizing Guidelines	2	4	5
High Performance Duct Systems	5	17	21
HVAC System Air Flow & Static Pressure Diagnostics	4	8	9
Manual D Intro	5	21	26
Manual J	4	22	26
MICROPAS	1	6	6
Zoning	3	13	15
Total	28	102	124

Table 1: 2003 Local Energy Code Training Program Offerings & Participation

¹ The sample of 43 participants out of 124 achieves a relative precision of at most $\pm 20.2\%$. The relative precision of $\pm 20.2\%$ is an upper bound based on assuming exactly 50% of respondents having a particular characteristic. Therefore, all results in this report have a relative precision of approximately $\pm 20\%$ or less.

² The conversion rate is defined as the ratio of successfully completed surveys to all attempted contacts.

Findings

Nearly 65% of survey respondents state that the seminars are meeting or exceeding their expectations. The quality of both the seminar material and instructors appear to be having a positive effect on the attendees. A high proportion of respondents are planning on attending more seminars if they are offered in the future.

Approximately 56% of seminar attendees claim they have used the knowledge gained through the seminar on a project completed since the seminar. The classes appear to be well designed and informative, collaborated by a high implementation rate of the seminar curriculum.

Over 77% of seminar participants have implemented what they have learned on half or more of the related projects they have worked on. This finding further reinforces the preceding finding that the seminar coursework is effective at meeting the educational needs of the seminar participants, and that there is a need for the training that is being offered.

Better than 34% of the survey respondents report having shared the information they learned with most others within their organization that could also use the information. This finding suggests that program participants are understanding and applying the information being presented, and they feel compelled to teach others what they have learned. Furthermore, these same respondents report an adoption rate of 26.4%³ among their colleagues to whom they have passed along their knowledge. Of those who have not shared the information they learned with colleagues within their organization, 47% plan to do so in the foreseeable future.

Sixty-two percent of seminar attendees report having shared the information they learned with one or more people outside their firm. The willingness to share what was learned demonstrates the applicability of the training to the industry for which the seminar was designed. Of those that shared the training material with others, close to 23% report the information exchange led to changes in practice within the other firm.

Observations and Recommendations

Several observations were made about the 2003 Local Energy Code Training Program through the course of conducting this evaluation. Some of these observations have resulted in recommendations for the program. Our major observations are⁴:

1. The training seminars are meeting or exceeding the expectations of the participants.
2. Participants are utilizing seminar knowledge on projects, and
3. Participants are sharing (or intend to share) seminar knowledge with others with resulting design changes.

One recommendation resulting from the evaluation is that SDG&E should perhaps devote more of the implementation budget to marketing the program. Obviously the participants are finding value in the curriculum; therefore SDG&E should try to increase participation. With an average of only 4 attendees per class there appears to be room for increased participation. This of course would also lead to a more cost effective program.

³ 26.4% includes statistics for both "some use it" and "most use it".

⁴ Detailed specifics for each observation are articulated in the chapter entitled "Observations and Recommendations".

Introduction

This is the final report for the Measurement and Evaluation Study of the 2003 SDG&E Local Energy Code Training Program. In this chapter, we will describe the 2003 program as well as our general evaluation approach.

Program Overview

The Local Energy Code Training Program is an education program that provides training to builders, developers, contractors, planners, architects, engineers, and other industry professionals. The topics covered by the seminars include education of new Title 24 code requirements, energy efficiency measure installation training, code and new construction software training, and energy efficient new construction sales training.

Evaluation Overview

The primary objectives of the Local Energy Code Training Program EM&V are to:

1. Quantify the number and type of seminars offered and the number of participants who attended those seminars, and
2. Determine whether the participants will attempt to (or have already attempted to) implement any of the energy efficient measures or the ideas suggested by the training.

The study utilized electronic program tracking data to quantify the number of seminars offered and the number of participants attending those seminars. We used telephone surveys to determine whether participants have attempted to implement any of the measures or ideas suggested by the training.

Once we had quantified the number and type of seminars offered through the program and the number of participants who attended those seminars, we selected a sample of 43 participants for the telephone survey. The sample was selected from the electronic program tracking data. All results were extrapolated to the program participant population.

We used a telephone survey to determine whether participants will attempt to (or have already attempted to) implement any of the energy efficiency measures or ideas suggested by the training seminar. The survey also determined how participants heard of the program, reasons for participation, and any recommendations for improving the training. Additionally, to assess the persistence of the training efforts, the survey explored whether the information learned through training affects only a few projects or office-wide design practices as well as whether the seminar information was shared with others, either within the firm or outside of the firm, and if this sharing has led to any action on the part of the non-participant.

The statistical analysis of the data primarily consists of quantifying the number of seminars offered through the program as well as the number of participants who attended those seminars and estimating the proportion of training seminar participants who have already attempted to implement any of the energy efficient measures or ideas suggested by training. Other telephone survey responses were also analyzed.

Results

Quantification of Program Offerings and Participation

Table 2 summarizes the program offerings and participation levels of the 2003 Local Energy Code Training Program. The program offered a total of 28 seminars. A total of 124 participants representing 102 firms attended these seminars. On average, each seminar had approximately 4.4 participants, representing 3.6 firms.

Two classes offered by SDG&E, Combined Hydronic Systems & Sizing Guidelines and HVAC System Air Flow & Static Pressure Diagnostics had very low participation rates. On average, these seminars had approximately only two attendees. SDG&E should consider ways to increase participation in these classes, or consider dropping them if increased participation is unlikely.

	# of Seminars	# of Firms	# of Participants
Advanced Manual D	4	11	16
Combined Hydronic Systems Sizing Guidelines	2	4	5
High Performance Duct Systems	5	17	21
HVAC System Air Flow & Static Pressure Diagnostics	4	8	9
Manual D Intro	5	21	26
Manual J	4	22	26
MICROPAS	1	6	6
Zoning	3	13	15
Total	28	102	124

Table 2: 2003 Local Energy Code Training Program Offerings & Participation

Telephone Survey Results

Table 3 shows how participants first became aware of SDG&E's 2003 Energy Code Training Program. Forty-five percent of participants learned of the program through a letter or mailing. Approximately 19% of participants heard of the program through a friend or colleague, while just over 13% of participants learned of the program via the SDG&E website.

	% of Participants
Letter or Mailing	45.0%
Friend / Colleague	19.4%
SDG&E Website	13.3%
Other	10.5%
Referred by a Utility Account Representative	6.7%
Industry Magazine - Ad	2.6%
Don't Know / Can't Recall	2.6%

Table 3: Source of Awareness of Energy Code Training Program

Table 4 presents the incidence of participants using the knowledge gained through the seminars since attending. Approximately 56% of seminar attendees state they have used the knowledge gained through the seminar on a project completed since the seminar. At the 90% level of confidence, the relative precision of this estimate is $\pm 17.9\%$, yielding a 90% confidence interval of (46.1%, 66.3%).

	% of Participants
Yes	56.2%
No	43.8%

Table 4: Incidence of Using Seminar Knowledge Since Attending

All participants who have used the knowledge gained through the seminars were asked to indicate, among all projects where the training could be applied, the percentage of projects where the knowledge is in fact applied. As shown in Table 5, nearly 44% of participants who use what they learned, have consistently applied the knowledge to applicable projects (91-100%). An additional 33% say that they have used the seminar information in 51% - 90% of appropriate projects. In sum, over 77% of respondents who have used the seminar training report that they have applied their newly acquired knowledge in over half of all applicable projects.

	% of Participants Who Have Used Knowledge
Less Than 25%	18.2%
25% - 50%	4.7%
51% - 90%	33.2%
91% - 100%	43.9%

Table 5: Percentage of Projects Where Knowledge Could Be Applied & Is Applied Among Participants Who Have Used Knowledge

All participants who have not used the knowledge gained through the seminar were asked if they plan to do so in the foreseeable future. Table 6 displays the results. Nearly 45% of participants who haven't utilized the knowledge gained through the seminar report that they do plan to do so.

	% of Participants Who Have Not Used Knowledge
Yes	44.7%
No	22.8%
Unsure / Don't Know	32.5%

Table 6: Plans to Use Knowledge in Future Among Participants Who Have Not Used Knowledge Learned in Seminars

The respondents who indicated that they would not or were not sure if they would use the seminar knowledge cited the following reasons:

"I am semi-retired, but I might use the knowledge if I am requested to do a job."

"I am changing careers and no longer with the company."

"If I stay at my current position, I won't use it. But if I take a position with a new firm, then I most likely will use the training."

Table 7 displays the incidence of participants sharing their training with others in their firm. About 23% of participants report they have shared none or very little with others in their firm, whereas approximately 42% of participants report sharing their training with some or most of the others in their firm. About 35% of participants state that it is not applicable for them to share with others within the firm, because they are a sole proprietor, or they are the only one who can utilize the training, or because of some other reason.

	% of Participants
Shared None or Very Little	22.7%
Shared With Some	7.6%
Shared With Most	34.7%
NA - Sole Proprietor	24.4%
NA - Only One Who Can Utilize	2.7%
NA - Other Situation	8.0%

Table 7: Incidence of Sharing Training With Others in Firm

If applicable, participants were asked if they planned to share their training with more of their company staff. As shown in Table 8, where sharing within the firm is applicable, about 47% of participants state that they do plan to share their training with more of their company staff. An additional 7% state that they do not know whether they will share the information with their staff.

	% of Participants Where Sharing Within Firm Applies
Yes	46.9%
No	45.9%
Don't Know	7.2%

Table 8: Plans to Share Training With More Staff Among Participants Where Sharing With Other Is Applicable

Participants who have shared their training with others within their firm were asked if there were any resulting design changes. Table 9 presents the incidence of design changes in the work of others among participants who have shared their training within their firm. Over 62% of participants who have shared with others within their firm report that only a few (or none) are utilizing the information in their design work. Nearly 18% of participants who have shared with others within their firm report that some design changes have resulted. Together, the respondents who claim "some use it" and "most use it" comprise about 26% of the participants who shared their training with others within their firm.

	% of Participants Who Have Shared Within Firm
No Changes or Only A Few	62.0%
Some Use It	17.8%
Most Use It	8.6%
Don't Know	11.6%

Table 9: Incidence of Design Changes in Other's Work Among Participants Who Have Shared Within Firm

Table 10 displays the incidence of participants sharing their training with others outside their firm. About 36% of participants report they have shared with no one outside their firm, with 30% reporting they have shared with about 1 to 3 people outside their firm. Approximately 20% of participants state that they have shared with about 4 to 9 people outside their firm, and nearly 12% have shared with greater than 10 people. In sum, 62% of respondents claim to have shared the knowledge they gained in the workshop with *at least* one other person outside their firm.

	% of Participants
Did Not Share Information	36.2%
Shared Very Little (1 to 3 people)	30.0%
Shared With Some (4 to 9 people)	20.2%
Shared With Many (10 or More people)	11.8%
NA - Other Situation	1.8%

Table 10: Incidence of Participants Sharing Training With Others Outside Firm

Participants who have shared their training with others outside of their firm were asked if there were any resulting design changes of which they were aware. Table 11 presents the incidence of design changes in the work of others among participants who have shared their training with others outside their firm. Over 35% of participants who have shared with others outside their firm report that only a few (or none) with whom they shared the training information are utilizing the knowledge in their design work. An additional 42% report that either they do not know whether any design changes have resulted from sharing their training or that this did not apply to them. Nearly 23% report that some or most use the knowledge that they shared.

	% of Participants Who Have Shared Outside Firm
No Changes or Only A Few	35.1%
Some Use It	9.0%
Most Use It	13.6%
NA / Don't Know	42.3%

**Table 11: Incidence of Design Changes in Other's Work
Among Participants Who Have Shared Outside Firm**

Table 12 shows how the seminars met participant expectations. Nearly 29% of participants state that the seminars exceeded their expectations, with approximately 36% stating it completely met their expectations. None of the participants report the training did not meet any of their expectations.

	% of Participants
Did Not Meet Any of My Expectations	0.0%
Partially Met My Expectations	2.6%
Met Most of My Expectations	32.7%
Completely Met My Expectations	35.9%
Exceeded My Expectations	28.8%

Table 12: Participant Expectations of Training

When asked what they liked about the training, the participants offered a variety of responses:

"The presenter was very knowledgeable and conveyed the information to the participants well."

"The presenter explained the software very well and was also extremely knowledgeable about the industry and current events."

"[I liked the] small groups and lots of discussion."

"The location worked well and the instructors were knowledgeable. The Q&A session was helpful."

The participants were also helpful in providing suggestions for further improvement:

"I would like to see more material and possibly extend training into a two-day course."

"Spanish language handouts, materials, etc., would be useful."

"The course material was directed mainly at experienced people, so there should be some sort of prerequisite so the instructors and students are on the same page."

Overall, the participants seemed pleased with the seminars:

"If the money is available, they should continue to provide the seminar. It's a great benefit to the consumer and to companies like ours."

"Every course I have attended has been beneficial."

"I will be making it mandatory for my employees to attend future seminars."

"Everyone in the industry should be required to attend the seminars being that they are run by an independent source."

Demographics

Table 13 presents the participant firm's main line of business. Over 62% of participants report they are a contractor. The remaining participants are consultants, municipal/ government employees, educators/instructors, architects, and engineers. The contractors are further identified by specialization; 16 are categorized in HVAC, 5 are categorized in Refrigeration, and 7 contractors are categorized as 'Other'.

	% of Participants
Contractor	62.5%
Consulting Firm	19.2%
Municipal / Government	7.3%
Educator / Instructor	6.9%
Architect	2.6%
Engineering Firm	1.6%

Table 13: Firm's Main Line of Business

Table 14 shows some summary statistics for the number of years at the organization and current position for program participants. The mean number of years at the organization is 17 years, with a standard deviation of 12 years, and the mean number of years at the position is 17, with a standard deviation of 12 years. These summary statistics show that the program is reaching both those who are relatively new to their organization and position and those who have been at the same organization and position many years.

	Mean	Standard Deviation	Minimum	Maximum
Years At Organization	17	12	1	50
Years At Position	17	12	1	50

Table 14: Years At Organization and Position

Observations and Recommendations

This chapter presents observations made about the 2003 Local Energy Code Training Program through the course of conducting this evaluation. Recommendations to improve the program are also presented.

Participants Are Utilizing Seminar Knowledge on Projects

The program is successfully educating participants about the intended measures and techniques. Overall, about 56% of participants report utilizing the training knowledge on a project since attending the seminar. Nearly 44% of participants who have used the training knowledge have applied the knowledge to 91% - 100% of applicable projects. These two results suggest that approximately 25% of participants ($56\% * 44\% = 25\%$) are using the seminar knowledge on 91 – 100% of applicable projects.

Participants Are Sharing (or Intend to Share) Seminar Knowledge With Others With Resulting Design Changes

Not only are program participants utilizing the knowledge they gained through the seminars, but participants are also sharing the knowledge, which has reportedly resulted in design changes on the part of the non-participant. Nearly 35% of participants report sharing their training with most of their firm, and approximately 26% of participants who have shared within the firm report that at least some of the non-participants with whom they have shared use the knowledge in their own work. Additionally, 47% of those who have not shared their knowledge plan to do so in the foreseeable future. Nearly 23% of participants who have shared with others outside their firm report that one or more people are utilizing the information in their design work. Forty-two percent do not know whether design changes are occurring due to sharing.

Recommendation to Increase Participation

One recommendation resulting from the evaluation is that SDG&E should perhaps devote more of the implementation budget to marketing the program. Obviously the participants are finding value in the curriculum; therefore SDG&E should try to increase participation. With an average of only 4 attendees per class there appears to be room for increased participation. This of course would also lead to a more cost effective program.

EM&V Methodology

To estimate the proportion of participants that have utilized the training knowledge since attending the seminars, RLW utilized telephone surveys with a statistically representative sample of program participants selected from the electronic program tracking data. For each program participant in the sample, we ascertained if they have already utilized the knowledge gained through the seminar.

The phone surveys also explored how participants first became aware of the program, reasons for participation, whether the information gained from training affects only few projects or office-wide design practices, whether the training seminar information has been shared with others, either within the firm or outside the firm, and if information sharing has occurred, did this lead to any actions taken by the non-participant.

Quantification of Program Offerings and Participation Levels

We used the electronic program tracking data to quantify the number of seminars offered. The electronic database also allowed us to quantify the number of participants that attended those seminars.

Sample Design

At the planning stage of the M&V evaluation for the Local Energy Code Training Program, we proposed a sample of 40 participants for the telephone survey effort. Once the number of seminars and number of participants attending each seminar were quantified, we devised our sampling strategy. Minimal information was available for each participant, and we wanted to ensure that each seminar type was represented in our sample of 40 participants. Consequently, we proportionately stratified the sample by seminar type.

For each seminar type, we calculated the percentage of all participants. Then we calculated the sample size basically by multiplying the desired sample of 40 participants by the proportion in each seminar type.

	# of Participants	Sample Size
Advanced Manual D	16	5
Combined Hydronic Systems Sizing Guidelines	5	2
High Performance Duct Systems	21	7
HVAC System Air Flow & Static Pressure Diagnostics	9	3
Manual D Intro	26	8
Manual J	26	8
MICROPAS	6	2
Zoning	15	5
Total	124	40

Table 15: Original Energy Code Training Program Sample Design

Final Sample Design

Table 16 shows the final sample design that was used to calculate the case weights. In this case, for each seminar type, the case weight is calculated by dividing the total number of participants for the seminar type by the number of participants from that seminar type in the sample. For example, for the Advanced Manual D seminar, there were a total of 16

participants, of which 8 are in our final sample, so the case weight for Advanced Manual D sample members is $16 / 8 = 2.00$.

	# of Participants	Sample Size	Case Weight
Advanced Manual D	16	8	2.00
Combined Hydronic Systems Sizing Guidelines	5	2	2.50
High Performance Duct Systems	21	7	3.00
HVAC System Air Flow & Static Pressure Diagnostics	9	3	3.00
Manual D Intro	26	8	3.25
Manual J	26	8	3.25
MICROPAS	6	2	3.00
Zoning	15	5	3.00
Total	124	43	

Table 16: Final Energy Code Training Program Sample Design

Our sample of 43 participants out of 124 achieves a relative precision of at most $\pm 20.2\%$. The relative precision of $\pm 20.2\%$ is an upper bound based on assuming exactly 50% of respondents having a particular characteristic. Therefore, all results in this report have a relative precision of approximately $\pm 20.2\%$ or less.

Telephone Survey Instrument Design

We developed a questionnaire for the evaluation that obtained a variety of information including:

- How participants heard of the training program,
- The reasons for program participation,
- Whether the participant has already attempted to implement any of the energy efficient measures or ideas suggested by the training,
- Whether the participant plans to implement any of the energy efficient measures or ideas suggested by the training,
- Whether the information gained from training affects only few projects or office-wide design practices,
- Whether the training seminar information has been shared with others, either within the firm or outside the firm,
- If information sharing has occurred, did this lead to any actions taken by the non-participant,
- Training strengths and weaknesses, and
- Training satisfaction and recommended improvements.

The survey also contained a series of demographic questions. The following demographics were captured with the survey:

- Business Type,
- Title & Position, and

- Number of Years at Organization and Position.

RLW submitted the survey instrument to the SDG&E project manager and other interested parties for a final review and ultimate approval.

Telephone Survey Data Collection

Using the survey instrument described above, telephone surveys were conducted from RLW's CA office. All telephone surveyors were provided instruction on program operation, proper etiquette for contacting participants, and how to interpret participant responses.

All survey calls were tracked and any refusals or incomplete responses were recorded. Upon completing each interview, the telephone survey manager reviewed the survey for accuracy and completeness and then entered the data into an electronic database designed specifically for this survey by the project analyst.

Data were validated automatically using imbedded database functionality. The entered data were also continuously reviewed by the telephone survey manager. Prior to analysis, the project analyst thoroughly performed a quality control check on the data, identifying and correcting any illogical or unreasonable responses.

Table 17 presents the dispositions of the telephone survey data collection effort. We attempted to contact a total of 64 participants. Of these 64 participants, 43 completed a telephone survey, corresponding to conversion rate of 67.2%⁵. No participants refused to complete the survey.

	# of Participants	% of Attempted Contacts
Total	64	
Disconnected	1	1.6%
Signed Up But Did Not Attend	1	1.6%
Contact No Longer With Company	4	6.3%
Wrong Number	1	1.6%
Callback	4	6.3%
Stratum Filled	10	15.6%
Completed	43	67.2%
Conversion Rate		67.2%

Table 17: Telephone Survey Dispositions

Data Analysis

Estimating the proportion of seminar participants that have utilized the training knowledge on a project is one of the primary objectives of this study. This is a straightforward application of estimating the parameter p in a Bernoulli probability distribution. Since there was no variable available for the entire population that might be related to whether the participant has utilized the training knowledge, ratio estimation techniques are not possible. Therefore, conventional mean-per-unit estimation was used instead.

⁵ The conversion rate is defined as the ratio of successfully completed surveys to all attempted contacts.

Under mean-per-unit estimation, the parameter p is estimated as $\hat{p} = \frac{1}{N} \sum_{i=1}^n w_i * y_i$, where N is the population size, w_i is the case weight of sample participant i , and y_i is an indicator variable with a value of one if the participant has utilized the training knowledge and a value of zero otherwise. Taking into account the finite population correction factor, the associated error bound at the 90% confidence level is then calculated as $eb = 1.645 * \frac{\sqrt{\hat{p} * (1 - \hat{p})}}{\sqrt{n}} * \sqrt{1 - \frac{n}{N}}$, where n is the sample size. The relative precision at the 90% confidence level is simply the error bound, eb , divided by \hat{p} .

The project analyst also analyzed the remaining results of the telephone survey. The quantitative process survey analysis was carried out using SPSS, a commonly used statistical software package. RLW calculated weighted frequencies, and means of data, where appropriate, to provide unbiased estimates of population characteristics. Cross-tabulations of the data were not possible due to the small sample size.