Final Report

Measurement and Evaluation Study of the 2002 SDG&E Energy Code Training Program

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1. Executive Summary

This document is the final report for the Measurement and Evaluation Study of the 2002 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 offered 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.

The primary objectives of the study are to:

1. Quantify the number of type of seminars offered and the number of participants who attended those seminars, and
2. 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 telephone surveys with 39 program participants. We attempted to contact a total of 54 participants to complete 39 surveys, resulting in a conversion rate of 72.2%[1]. No participants refused to complete the survey. 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 2002 Local Energy Code Training Program. The program offered a total of 37 seminars. A total of 317 participants representing 261 firms attended these seminars. On average, each seminar had approximately 8.6 participants, representing 7 firms. .

	# of Seminars	# of Firms	# of Participants
Advanced Manual D	3	23	25
EnergyPro	2	15	32
High Efficiency HVAC Troubleshooting	2	22	28
High Performance Duct Systems	6	25	26
High Performance Windows	1	7	7
HVAC Manual D Duct Design	10	62	72
HVAC Manual J Residential Load Calculation and Equipment Selection	7	46	53
HVAC System Air Flow and Static Pressure Diagnostics	1	13	15
Hydronic System Sizing Training	1	9	12
Lighting Design	1	6	11
Title-24 Compliance using MICROPAS	1	9	9
Uniform Mechanical Code	2	24	27
Total	**37**	**261**	**317**

Table 1: 2002 Local Energy Code Training Program Offerings & Participation

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

Findings

Approximately 75% of seminar attendees state 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.

Nearly 40% of seminar participants have implemented what they have learned on nearly all of the related projects they have worked on. This finding further reinforces the preceding finding that the seminar coursework is well thought out, and that there is a need for the training that is being offered.

Better than 50%[2] of the survey respondents report having shared the information they learned with others within their organization that could also use the information. This finding suggests that program participants are understanding and applying the information being presented, evidenced by the fact that they are able to, and compelled to teach others what they have learned. Furthermore, these same respondents report a high adoption rate (60%) among their colleagues whom they have passed along their knowledge to.

Seventy percent of seminar attendees report having shared the information they learned with one or more people outside their firm. More evidence that the training coursework is directly applicable to the industry in which the seminar was designed. Of those that shared the training material with others, a remarkable 40% report the information exchange having lead to changes in practice within the other firm.

Observations and Recommendations

Several observations were made about the 2002 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 are[3]:

1. Electronic program tracking data should be kept,
2. The Training Seminars Are Meeting The Expectations Of The Participants,
3. Participants Are Utilizing Seminar Knowledge on Projects, and
4. Participants Are Sharing Seminar Knowledge With Others With Resulting Design Changes.

[2] 50% of respondents that actually have someone to share the information with in their organization.

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

2. Introduction

This is the final report for the Measurement and Evaluation Study of the 2002 SDG&E Local Energy Code Training Program. In this chapter, we will describe the 2002 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 offered 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 study are to:

1. Quantify the number of type of seminars offered and the number of participants who attended those seminars, and
2. 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 study quantified the number and type of seminars offered and the number of participants who attended those seminars. The study also determined whether seminar participants have attempted to implement any of the measures or ideas suggested by the training. Specifically, because electronic program tracking data were not available, we used hard-copy paper files of seminar attendance sign-in sheets 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 40 participants for the telephone survey. The sample was selected from the paper sign-in sheets. 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 asses 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.

3. Results

Quantification of Program Offerings and Participation

Table 2 summarizes the program offerings and participation levels of the 2002 Local Energy Code Training Program. The program offered a total of 37 seminars. A total of 317 participants representing 261 firms attended these seminars. On average, each seminar had approximately 8.6 participants, representing 7 firms. .

	# of Seminars	# of Firms	# of Participants
Advanced Manual D	3	23	25
EnergyPro	2	15	32
High Efficiency HVAC Troubleshooting	2	22	28
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HVAC Manual D Duct Design	10	62	72
HVAC Manual J Residential Load Calculation and Equipment Selection	7	46	53
HVAC System Air Flow and Static Pressure Diagnostics	1	13	15
Hydronic System Sizing Training	1	9	12
Lighting Design	1	6	11
Title-24 Compliance using MICROPAS	1	9	9
Uniform Mechanical Code	2	24	27
Total	**37**	**261**	**317**

Table 2: 2002 Local Energy Code Training Program Offerings & Participation

Telephone Survey Results

Table 3 shows how participants first became aware of SDG&E's 2002 Energy Code Training Program. Nearly 40% of participants became aware of the program through a letter or mailing. Approximately 30% of participants learned of through the program though a friend or colleague, while just over 10% of participants learned of the program through the SDG&E website.

	% of Participants
Letter or Mailing	38.2%
Friend / Colleague	29.0%
SDG&E Website	12.1%
Other	5.4%
Business / Professional Organization	5.1%
Industry Magazine - Ad	5.1%
Trade Show	5.1%

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 75% 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 ± 14.6%, yielding a 90% confidence interval of (60.9%, 90.1%).

	% of Participants
Yes	75.5%
No	24.5%

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 40% of participants who have used the knowledge have applied the knowledge to 91% - 100% of applicable projects. Approximately 25% of participants who have used the knowledge have applied the knowledge to only less than 25% of applicable projects.

	% of Participants Who Have Used Knowledge
Less Than 25%	24.6%
25% - 50%	18.2%
51% - 90%	17.8%
91% - 100%	39.5%

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. Just over 50% 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	54.3%
No	45.7%

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

Table 7 displays the incidence of participants sharing their training with others in their firm. About 20% of participants report they have shared none or very little with others in their firm, while over 25% of participants report sharing their training with most of their firm. Just under half of participants state that it is not applicable for them to share with others within the firm, either because they are a sole proprietor, they are the only one who can utilize the training, or because of some other reason.

	% of Participants
Shared None or Very Little	21.0%
Shared With Some	5.6%
Shared With Most	27.6%
NA - Sole Proprietor	33.9%
NA - Only One Who Can Utilize	2.8%
NA - Other Situation	9.1%

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, about 60% of participants where sharing within the firm is applicable state that they do plan to share their training with more of their company staff.

	% of Participants Where Sharing Within Firm Applies
Yes	61.3%
No	38.7%

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 of which they were aware. Table 9 presents the incidence of design changes in others work among participants who have shared their training with others within their firm. Over 60% of participants who have shared with others within their firm report that most of the others are utilizing the information in their design work. Nearly 25% of participants who have shared with others within their firm do not know if any design changes have resulted.

	% of Participants Who Have Shared Within Firm
No Changes or Only A Few	-
Some Use It	11.6%
Most Use It	64.6%
Don't Know	23.8%

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 33% of participants report they have shared with no one outside their firm, with nearly 20% reporting they have shared with about 1 to 3 people outside their firm. Over 20% of participants state that they have shared with greater than 10 people outside their firm.

	% of Participants
Shared With No one	33.5%
Shared Very Little (1 to 3 people)	18.7%
Shared With Some (4 to 9 people)	19.6%
Shared With Many (10 or More people)	22.8%
NA - Other Situation	5.4%

Table 10: Incidence of 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 others work among participants who have shared their training with others outside their firm. Nearly 50% of participants who have shared with others outside their firm report that most of the others are utilizing the information in their design work. Nearly 40% of participants who have shared with others within their firm report that some of the others are utilizing the information in their design work.

	% of Participants Who Have Shared Within Firm
No Changes or Only A Few	14.3%
Some Use It	38.3%
Most Use It	47.4%

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 30% of participants state that they completely met their expectations, with approximately 45% stating it completely met their expectations. Only 2.2% of participants reported the training did not meet any of their expectations.

	% of Participants
Did Not Meet Any of My Expectations	2.2%
Partially Met My Expectations	8.0%
Met Most of My Expectations	16.8%
Completely Met My Expectations	44.1%
Exceeded My Expectations	28.9%

Table 12: Participant Expectations of Training

Demographics

Table 13 presents the participant firm's main line of business. Almost half of participants report they are an HVAC contractor. The remaining participants are primarily architects, refrigeration contractors, consultants, or municipal / government employees.

	% of Participants
HVAC Contractor	48.6%
Other	15.6%
Municipal / Government	8.2%
Consulting Firm	7.8%
Architect	7.3%
Refrigeration Contractor	5.4%
Other Contractor	4.3%
Developer	2.7%

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 15 years, with a standard deviation of 14 years, while the mean number of years at the position is 14, with a standard deviation of 14 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	15	14	1	64
Years At Position	14	14	1	64

Table 14: Years At Organization and Position

4. Observations and Recommendations

This chapter presents observations made about the 2002 Local Energy Code Training Program through the course of conducting this evaluation. Recommendations to improve the program are also presented.

Electronic Program Tracking Data Is Needed

Electronic program tracking data were not available for this evaluation. This was a result of computer system changes that accompanied the 2002 Sempra integration process. We used paper files of seminar attendance sign-in sheets for this evaluation. Some of the paper files tracked individuals who signed up but did not attend, and others did not, making it difficult to accurately quantify the seminar attendance levels. If SDG&E has not already done so, we recommend implementing the use of an electronic database to track the program. In addition to summarizing event attendance and other quantities of interest, the electronic tracking system should have the capability of data extraction so that lists of program participants by seminar can be generated as desired.

SDG&E has indicated that in early 2003 they began utilizing electronic program tracking data services offered by ERC – Downey for the Local Energy Code Training Program. According to SDG&E, this new program tracking mechanism will enable SDG&E to achieve all items recommended in the previous paragraph.

Participants Are Utilizing Seminar Knowledge on Projects

The program is successfully educating participants about the intended measures and techniques. Overall, about 75% of participants report utilizing the training knowledge on a project since attending the seminar. Nearly 40% of participants who have used the training knowledge have applied the knowledge to 91% - 100% of applicable projects. These two results suggest that approximately 30% of participants (75% * 40% = 30%) are using the seminar knowledge on 91 – 100% of applicable projects.

Participants Are Sharing 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. Over 25% of participants report sharing their training with most of their firm, and nearly 65% of participants who have shared within the firm report that most of the non-participant with whom they have shared use the knowledge in their own work. Additionally, over 20% of participants state that they have shared with greater than 10 people outside their firm. Nearly 50% of participants who have shared with others outside their firm report that most of the others are utilizing the information in their design work.

5. 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. We used the program paper sign-in sheets to design a sample statistically representative of the program. 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

Because of computer system changes that accompanied the 2002 Sempra integration process, electronic program tracking data were not available for the evaluation of the 2002 Local Energy Code Training Program. The program was, however, able to provide hard-copy paper files of seminar attendance sign-in sheets. We used the paper sign-in sheets to quantify the number of seminars offered as well as the number of participants that attended those seminars.

There were two distinct types of paper files provided. On the first type of sign-in sheet, individuals who signed-up for the seminar but did not attend were clearly identified under a separate heading from those that signed-up and did attend. Individuals who were clearly marked as signed-up but did not attend were not counted as participants. On the second type of sign-in sheet, participants who were present either signed their name or marked their initials next to their name to denote their presence, while some names had no markings near them whatsoever. We inferred that those names without a signature or initials signed up for the seminar but did not actually attend.

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	25	3
EnergyPro	32	4
High Efficiency HVAC Troubleshooting	28	4
High Performance Duct Systems	26	3
High Performance Windows	7	1
HVAC Manual D Duct Design	72	9
HVAC Manual J Residential Load Calculation and Equipment Selection	53	7
HVAC System Air Flow and Static Pressure Diagnostics	15	2
Hydronic System Sizing Training	12	2
Lighting Design	11	1
Title-24 Compliance using MICROPAS	9	1
Uniform Mechanical Code	27	3
Total	**317**	**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 25 participants, of which 3 are in our final sample, so the case weight for Advanced Manual D sample members is 25 / 3 = 8.333.

	# of Participants	Sample Size	Case Weight
Advanced Manual D	25	3	8.333
EnergyPro	32	4	8.000
High Efficiency HVAC Troubleshooting	28	4	7.000
High Performance Duct Systems	26	3	8.667
High Performance Windows	7	1	7.000
HVAC Manual D Duct Design	72	9	8.000
HVAC Manual J Residential Load Calculation and Equipment Selection	53	6	8.833
HVAC System Air Flow and Static Pressure Diagnostics	15	2	7.500
Hydronic System Sizing Training	12	2	6.000
Lighting Design	11	1	11.000
Title-24 Compliance using MICROPAS	9	1	9.000
Uniform Mechanical Code	27	3	9.000
Total	**317**	**39**	

Table 16: Final Energy Code Training Program Sample Design

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 ultimately 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 54 participants. Of these 54 participants, 39 completed a telephone survey, corresponding to conversion rate of 72.2%[4]. No participants refused to complete the survey.

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

	# of Participants	% of Attempted Contacts
Total	**54**	
Callback	1	1.9%
Disconnected	1	1.9%
Signed Up But Did Not Attend	3	5.6%
Left Message	4	7.4%
Wrong Number	6	11.1%
Completed	39	72.2%
Conversion Rate		**72.2%**

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.

Under mean-per-unit estimation, the parameter *p* is estimated as $\hat{p} = \frac{1}{\mathrm{N}} \sum_{i=1}^{n} w_i * y_i$, 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 $\hat{p}$ divided by the error abound, eb.

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.