



TETRA TECH

KEMA 

# State of Wisconsin Public Service Commission of Wisconsin

Focus on Energy Evaluation

*Business Programs: Education and Training  
Untracked Attributable Savings*

October 29, 2010

Evaluation Contractor: Tetra Tech

Prepared by: Shawn Bodmann, Chris Dyson, Tammy Kuiken,  
and Miriam Goldberg, KEMA

Acknowledgement: Ralph Prah, Prah & Associates, contributed critical  
review and analysis.



**focus on energy**<sup>sm</sup>

*The power is within you.*



# State of Wisconsin Public Service Commission of Wisconsin

## *Business Programs: Education and Training Untracked Attributable Savings*

October 29, 2010

Copyright © 2010 Tetra Tech, Inc. All Rights Reserved.

Liaison Contact: Laura Schauer  
Tetra Tech, Inc.  
6410 Enterprise Lane, Suite 300  
Madison, WI 53719  
Tel: +1 608 316 3700  
Fax: +1 608 661 5181  
E-mail: [laura.schauer@tetrattech.com](mailto:laura.schauer@tetrattech.com)

Prepared by: Shawn Bodmann, Chris Dyson, Tammy Kuiken, and Miriam Goldberg, KEMA

Acknowledgment: Ralph Prah, Prah & Associates, contributed critical review and analysis.

*This report is the property of the state of Wisconsin, Public Service Commission of Wisconsin,  
and was funded through the Wisconsin Focus on Energy Program.*

## TABLE OF CONTENTS

<b>1.</b>	<b>Executive Summary</b>	<b>1-1</b>
1.1	Background and Purpose	1-1
1.2	Methodology	1-1
1.3	Findings	1-7
1.4	Recommendations	1-13
<b>2.</b>	<b>Methodology</b>	<b>2-1</b>
2.1	Overview and Objectives	2-1
2.2	Detailed Methodology	2-3
<b>3.</b>	<b>Findings</b>	<b>3-1</b>
3.1	Response Rates	3-1
3.2	Updated O&M Projects Savings Estimates	3-5
3.3	One-Time Projects Savings Estimates	3-6
3.4	Total UAS Estimates	3-7
3.5	Computing Total Savings for Future Courses	3-7
3.6	Other Findings	3-10
 <b>Appendices</b>		
	<b>APPENDIX A: CATI Instrument</b>	<b>A-1</b>

## 1. EXECUTIVE SUMMARY

---

### 1.1 BACKGROUND AND PURPOSE

The primary purpose of this study was to estimate per-trainee untracked attributable savings (UAS) from operations and maintenance (O&M) projects<sup>1</sup> resulting from classes provided by the Focus on Energy Education and Training (E&T) program. These UAS are the E&T-attributable portion of energy savings from projects that were implemented at the building or facilities of the trainees' companies and do not appear in the WISeerts database.

In 2008, KEMA conducted an E&T UAS study that included process and impact evaluations of the Focus on Energy E&T program.<sup>2</sup> The impact evaluation component of the 2008 study resulted in a recommendation to the Public Service Commission of Wisconsin (PSCW) for additional energy savings to be credited to the Focus Business Programs for its E&T activities. Since that 2008 study, changes in program delivery, updated and expanded course offerings, and emphasis on O&M projects have made it necessary to update UAS estimates to reflect this greater emphasis on O&M courses.

Secondary purposes of the study were to estimate total E&T UAS estimates for 2010 and to provide a methodology for making similar estimates for courses offered in future years. Due to a shift in course offerings towards O&M-focused courses and a limited evaluation budget, we focused on O&M project savings estimates for this round of evaluation.

According to Nancy Giere Associates, implementers of the E&T program training, all courses contain some O&M component, but some courses are more focused on O&M than others. KEMA worked with Nancy Giere Associates to identify courses that were more- and less-O&M focused. This report provides separate UAS estimates for each type of course. These separate UAS estimates should be more representative estimates for future UAS projections than estimates published in previous evaluations that did not separate by course focus.

### 1.2 METHODOLOGY

There were several research tasks for this evaluation, each with several sub-tasks:

1. Conduct a computer aided telephone interview (CATI) survey to discover potential untracked, attributable O&M projects. The subtasks for this task included:
  - a. Collect 2008 and 2009 course offering information and training counts from the program.

---

<sup>1</sup> This report uses the terms "O&M projects" and "one-time projects" throughout. O&M projects involve changes in routine operations, building management practices, or equipment maintenance practices. Examples include inspecting equipment more often, cleaning equipment more often, and using equipment on a different schedule. One-time projects involve changes to the facility's energy-using equipment. Examples include installing a different type of lighting or installing a new boiler.

<sup>2</sup> Christopher Dyson, Ken Agnew, Miriam Goldberg, and Claire Palmgren, KEMA, Inc. *State of Wisconsin, Focus on Energy Evaluation, Business Programs: Impact Evaluation of Education and Training Program*. November 15, 2008.

- b. Filter trainees to remove program and utility company staff. Also ensure people who took multiple courses appeared only once in the sample.
  - c. Identify courses with more and less O&M focus.
  - d. Draw a sample of trainees from 2008 and 2009 courses for participant surveys.
  - e. Make survey calls.
2. Conduct an engineering review of projects discovered in the CATI. The subtasks for this task included:
    - a. Filter the list of projects found in the CATI surveys, based on program attribution, whether the project was tracked in WISeerts, and whether the project was an O&M project.
    - b. Draw a sample of potential projects for engineering reviews to confirm project type, attribution, and estimate energy savings for these projects.
    - c. Estimate 2010 E&T UAS for O&M projects using the data collected in engineering review.
  3. Calculate per-trainee savings for O&M projects for more- and less-O&M-focused courses. The subtasks for this task included:
    - a. Aggregate engineering estimates to more- and less-O&M-focused course level using data from step 2.
    - b. Calculate 2010 O&M total UAS based on per-trainee UAS and 2009 course attendance (after the filtering applied in step 1).
  4. Reanalyze data on 2004–2007 courses (originally reported in the 2008 E&T UAS report) to provide estimates of per-trainee savings for one-time projects for the more- and less-O&M-focused courses. The subtasks for this task included:
    - a. Split 2004–2007 courses into more- and less-O&M-focused categories and recalculate per-trainee UAS estimates for one-time projects for each course category.
    - b. Estimate 2010 E&T UAS for one-time projects based on 2006–2007 course attendance (as reported in 2008) and 2008–2009 course attendance (after the filtering applied in step 1), and the per course type estimates (step 4a).
  5. Calculate total 2010 E&T UAS by summing the 2010 E&T UAS for O&M projects (Step 3) and 2010 E&T UAS for one-time projects (Step 4).

### 1.2.1 CATI survey of trainees

The first step in the evaluation was to conduct a computer-aided telephone interview (CATI) survey of a sample of E&T course trainees. The objective of the survey was to collect enough information about O&M projects that resulted from the training to inform follow-up calls that would estimate the energy savings from untracked and attributable projects. We surveyed trainees who took courses in 2008 and 2009 to ensure enough completions to calculate the estimates.



To obtain a CATI sample, KEMA filtered the course rosters provided by Nancy Giere Associates for all 2008 and 2009 courses. The rosters contained 2,046 trainees. The filtering process began by using variables in the course rosters to remove:

- All trainees with a status of “No-Show” or “Cancel” (346 trainees).
- All trainees with participant type of “Focus on Energy” or “Staff” (219 trainees).
- All trainees with state not equal to “WI” (63 trainees).
- All trainees from a company KEMA identified as an energy company (Alliant Energy, Focus on Energy, Madison Gas & Electric, Marshfield Utilities, WECC, Wisconsin Public Service, WPS, WPPI Energy, Xcel Energy: 13 trainees).

KEMA then inspected the database and removed duplicate entries for trainees that took more than one course. Trainees who took more than one course were assigned to the course that had the fewest number of trainees. The exception was trainees who took both building operator certification (BOC) level I and level II courses. KEMA created a separate category for these trainees. This deduplication process resulted in the following removals:

- Duplicate entries of trainees that took more than one course in 2008 (90 entries).
- Duplicate entries of trainees that took more than one course in 2009 (59 entries).
- Duplicate entries of trainees that took one course in 2008 and one in 2009 (55 entries).
- Duplicate entries of trainees in BOC level I and II courses (nine entries).

Finally, KEMA removed trainees who did not list their phone numbers (six trainees). This resulted in a final population of 1,186 trainees from 2008 and 2009 courses. Table 1-1 summarizes the trainee filtering process.

Table 1-1. Trainee Filtering Process

Description	2008 Courses	2009 Courses	Total
Initial course counts	1,133	913	2,046
STATUS = "No-Show" or "Cancel"	184	162	346
PARTICIPANT TYPE = "Focus on Energy" or "Staff"	107	112	219
STATE ≠ "WI"	22	41	63
Utility name in "Company"	5	8	13
Took multiple 2008 or 2009 courses	90	59	149
Took course in 2008 and 2009 <sup>3</sup>			55
Duplicates due to merging BOC I and BOC II trainees			9
Missing phone numbers			6
Total entries removed	408	382	860
Final population	683	503	1,186

KEMA set an overall quota of 201 CATI completes (17 percent response rate) based on the following information.

- CATI response rates from the 2008 E&T UAS study
- The number of CATI responses that generated a completed engineering review of an O&M project from the 2008 E&T UAS study
- The number of completed engineering reviews KEMA wanted for the current study (30 to 35).

KEMA conducted a telephone survey of the 1,186 Focus trainees between July 1 and July 21, 2010. We dialed 997 trainees and completed 189 surveys for an overall response rate of 19 percent. One hundred seventy-six (18 percent) of the dialed trainees refused to take the survey. We failed to contact 479 (48 percent) of the dialed trainees despite calling at least eight times and failed to contact 153 (15 percent) of the dialed trainees for other reasons such as incorrect phone numbers or the trainee no longer worked at the dialed phone number. One hundred eighty-nine trainees (16 percent) were not dialed because the quota for that course was already filled. Table 1-2 summarizes the CATI dispositions.

<sup>3</sup> At this point, KEMA merged the 2008 and 2009 courses. Therefore, all removals after this point are listed for the total only.

Table 1-2. CATI Dispositions

Disposition	Trainees	Percent Dialed
Completes	189	19%
Refused	176	18%
Not complete, dialed 8 or more times	479	48%
Not complete, eligibility unknown	153	15%
Total dialed	997	100%
Never dialed (quota filled)	189	
<b>Total</b>	<b>1,186</b>	

### 1.2.2 Engineering review

The purpose of the engineering calls was to collect enough technical information to allow the engineer to estimate energy savings from the project. The specific data that the engineers collected varied on a case-by-case basis as dictated by the needs of the particular project. Secondary objectives of the engineering calls were to obtain better descriptions of the projects and to more accurately assess whether they were tracked O&M projects. Finally, engineering calls also collected attribution data when it was missing from the CATI data.

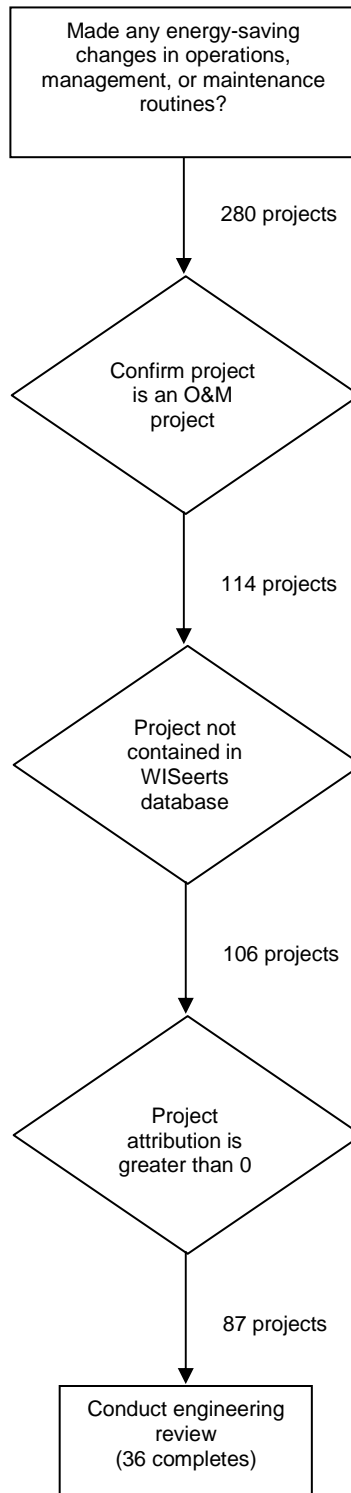
The CATI survey identified 280 projects that were potentially untracked, attributable projects. The engineering review determined whether these projects were O&M projects, untracked, and attributable. This process resulted in 87 attributable, untracked, O&M projects. KEMA divided the projects into eight engineering strata based on the O&M focus of the course taken by the CATI respondent and the size of the respondent's company. KEMA set quotas for each of the engineering strata based on the number of projects within each strata and the variability of the engineering estimates in those strata in the 2008 E&T UAS report. Engineers completed estimates for 36 (41 percent) of these projects. Table 1-3 summarizes the number of projects and engineering completes within each of these eight strata. Figure 1-1 shows a flowchart of the filtering process.

Table 1-3. Disposition and Engineering Completions of CATI Identified Projects by Strata

O&M Focus	Company Size	CATI-Identified Projects	O&M Projects	Untracked O&M Projects	Attributable, Untracked O&M Projects	Quota	Engineering Completes
More	Small	77	33	33	25	5	4
	Medium	76	27	26	25	5	5
	Large	48	18	18	15	10	10
	Unknown	13	6	4	3	2	1
Less	Small	8	4	4	3	2	3
	Medium	17	6	5	1	2	1
	Large	40	20	16	15	6	12
	Unknown	1	0	0	0	0	0
<b>Total</b>		<b>280</b>	<b>114</b>	<b>106</b>	<b>87</b>	<b>32</b>	<b>36</b>



Figure 1-1. Filtering Chain for CATI-identified Energy Saving Projects



### 1.2.3 Calculation of UAS

The primary goal of this study is to compute a *per-trainee* estimate for untracked, attributable O&M project savings. To do so, KEMA gathered savings data for individual projects. To extrapolate from the project level to the per-trainee level, KEMA followed these steps:

1. Calculate net project savings by multiplying gross project savings (as estimated by the engineering review process) by a project attribution factor. Project attribution was primarily based on the trainee's responses to the CATI survey (occasionally these attribution factors were adjusted based on new information uncovered in the engineering review).
2. Extrapolate net savings from the individual project level to the engineering strata level.
3. Divide total engineering strata savings by the number of CATI respondents in each engineering strata.
4. Extrapolate the CATI respondent savings to the entire post-filtering trainee population.
5. Compute total savings for more- and less-O&M-focused courses.
6. Divide total savings by the number of post-filtering trainees in each type of course.

## 1.3 FINDINGS

### 1.3.1 Attributable untracked O&M projects

KEMA calculated the average attribution of the 106 untracked O&M projects discovered in the CATI. This average was weighted based on the number of completed CATI surveys and number of trainees within a particular course, so that they accurately represent the post-filtering population of trainees. The weighted average attribution of the projects that occurred after participants took the course was 65 percent.

### 1.3.2 UAS for CY10

Table 1-4 shows the total UAS estimates for CY10. There are three savings metrics: kilowatt hours (kWh), kilowatts during the peak period<sup>4</sup> (kW), and therms.

---

<sup>4</sup> For non-weather dependent measures (e.g., lighting), this is the average usage on weekdays from June 1 to August 31 between 1 pm and 4 pm. For weather dependent measures (e.g., HVAC), this is the maximum usage during the hottest day of the summer.

Table 1-4 Total Untracked Attributable Savings for CY10

Savings	O&M Projects		One-Time Projects		Total
	Less O&M Focus	More O&M Focus	Less O&M Focus	More O&M Focus	
kWh	2,707,516	7,254,391	3,826,705	1,970,030	15,758,642
kW	845	776	366	341	2,328
Therm	43,179	3,342,470	3,175,331	24,969	6,585,949

For CY10, KEMA estimated total O&M project UAS of about 10 million kWh, 1,600 kW, and 3.4 million therms. These savings are equivalent to about 20,000 kWh, 3 kW, and 6,700 therms per trainee. Table 1-5 summarizes the total and per-trainee O&M UAS for CY10.

Table 1-5. O&amp;M Project Untracked Attributable Savings for CY10

	Less O&M Focus	More O&M Focus	Total
Number of 2009 trainees	99	404	503
Total kWh savings	2,707,516	7,254,391	9,961,907
Total kW savings	845	776	1,621
Total therm savings	43,179	3,342,470	3,385,649
kWh/trainee	27,349	17,956	19,805
kW/trainee	8.53	1.92	3.22
Therms/trainee	436	8,273	6,731

Contrary to expectations, for the E&T program as a whole, the per-trainee O&M savings (kWh and kW) estimates for less-O&M-focused courses was higher than the per-trainee O&M savings for more-O&M-focused courses. This occurred for two reasons. First, an attendee of the less-O&M-focused courses completed a large compressed-air project that increased total kWh and kW savings. Second, there were fewer attendees in the less-O&M-focused courses. This reduced the denominator in the per-trainee computation, which increased the resulting per-trainee estimate.

Examining the data by company size and course O&M focus reveals a more nuanced situation. It appears that the combination of company size and course O&M focus affects per-respondent savings. Savings (kWh, kW) per CATI respondent from small- or medium-sized companies was larger for more-O&M-focused courses than for less-O&M-focused courses. However, savings (kWh, kW) per CATI respondent for large companies was larger for less-O&M-focused courses than for more-O&M-focused courses (Table 1-6).

**Table 1-6. Per CATI Respondent Savings by Company Size and Course Focus**

Company Size	Small		Medium		Large		Unknown	
	Less	More	Less	More	Less	More	Less	More
kWh/respondent	201	1,987	463	5,566	105,867	50,192	0	0
kW/respondent	17.6	0.2	0.1	1.9	11.8	4.1	0	0
Therms/respondent	105	2,973	0	1670	1,577	22,022	0	214
Number of CATI respondents	12	57	16	42	19	32	1	10
Total kWh	2,406	113,278	7,400	233,792	2,011,478	1,606,134	0	0
Total kW	211.3	9.6	2.0	80.5	223.3	130.8	0	0
Total therms	1,262	169,477	0	70,139	29,956	704,691	0	2,136

Unfortunately, it is impossible to retain the company size dimension when extrapolating to the total trainee population. We cannot retain the company size dimension because we only have this information for the CATI respondents, and it does not exist in the course rosters. If the course rosters included a measure of company size, such as annual energy usage, floor space, or number of employees, future evaluations could include the company size dimension when extrapolating to the trainee population level or estimate savings based on size units rather than trainees. This would likely produce more accurate savings estimates. KEMA recommends adding a company size variable to the course rosters (see Section 1.4).

### 1.3.3 Calculating UAS for future courses

A secondary goal of this study was to provide a methodology for computing UAS for future courses. The 2008 report established a methodology for estimating UAS for one-time projects based on averages of trainee counts and savings estimates from the previous four years. The four-year average lessens the effect of year-to-year fluctuations in course attendance as well as other factors that may affect the likelihood of implementing projects after training courses that would result in UAS. Because of the four-year average, to compute total savings for a particular year, one must know the number of attendees in less- and more-O&M-focused courses for the latest year, one year before, two years before, and three years before. The following steps can be followed to compute savings in future evaluations:

1. Obtain course rosters for the latest year and the three previous years.
2. Filter the rosters to remove no shows, cancellations, and utility employees. Assign trainees with duplicate courses to the course with the lowest overall attendance, then remove the other entries for those trainees.
3. Divide the courses into more- and less-O&M-focused categories. Table 1-7 categorizes the courses offered since 2004. This table can be used to identify the O&M focus of future courses. If a course does not appear on this list, the evaluator should work with Nancy Giere Associates, or the current implementor of the training program, to identify whether the course is more- or less-O&M-focused.
4. There will be eight categories: more- and less-O&M focused courses for each of the four years. Count the number of (post-filtering) trainees in each of these categories.
5. Multiply the number of trainees in each of the eight categories in step 4 by the per-trainee one-time savings estimates that correspond to those categories. Table 1-8



summarizes the per-trainee savings estimates for each year, course type, and project type.

6. Sum the eight products calculated in step 5 to compute total one-time project savings.
7. Multiply the number of trainees in less- and more-O&M-focused courses in the latest year by the per-trainee O&M savings estimate that corresponds to each category. O&M savings only use the latest year.
8. Sum the two products calculated in step 7 to compute total O&M project savings.
9. Sum the sums from step 6 and step 8 to compute total savings.

Table 1-7. More- and Less-O&M Focused Courses Offered 2004–2009<sup>5</sup>

Less-O&M-focused courses	More-O&M-focused courses
Best Practices in Industrial Lighting	Building Operator Certification
Best Practices in Industrial Lighting Efficiency	Building Operator Certification - Level II
Bottom Line Results	Commercial Practical Energy Management
Compressed Air Best Practices	Energy Efficient Swimming Pool Operation and Maintenance
Compressed Air Leak Detection	Energy Efficient Swimming Pool Operation and Maintenance
Compressed Air Systems Best Practices Training	Hotel Energy Management
Fan System Assessment (Co-Sponsored by the Department of Energy)	Industrial Practical Energy Management
Fan System Assessment (Sponsored by U.S. Department of Energy)	Practical Energy Management - Commercial
Fan System Specialist Qualification (Co-Sponsored by the Department of Energy)	Practical Energy Management - Industrial
Industrial Refrigeration Best Practices	Practical Energy Management Implementation Series
Industrial Ventilation Systems Best Practices Overview	Preventative Operations and Maintenance - Schools and Government
Industrial Ventilation Systems Best Practices Training	School's Practical Energy Management
Pumping System Assessment	Smart Strategies for Healthcare
Pumping System Specialist Qualification	Smart Strategies for Hotels
Pumping System Specialist Qualification (Co-Sponsored by U.S. Department of Energy)	
Retrocommissioning for Large Commercial Buildings	
Steam Specialist Qualification (Co-Sponsored by U.S. Department of Energy)	
Steam System Assessment (Co-Sponsored by U.S. Department of Energy)	
Steam System Specialist Qualification	
Steam Systems Assessment (Sponsored by U.S. Department of Energy)	
Steam Systems Best Practices for Industrial Customers	
Steam Systems Best Practices for Schools & Government	
Steam Systems Best Practices Training	
Strategic Business Solutions: Surviving the Energy Price Shock	

<sup>5</sup> This list represents the titles of all courses offered from 2004 through 2009. Course names may have changed slightly during that period. For the analyses conducted for this report, KEMA collapsed courses of like names together when they occurred in the same year. Table 2-1 lists the course titles used in the analyses for this report.

**Table 1-8. Per-trainee Savings Estimates by Course, Year, and Project Type**

Project Type	Course Focus	Metric	Latest Year Minus 3	Latest Year Minus 2	Latest Year Minus 1	Latest Year
One-time	Less O&M	kWh	7,534	2,117	2,401	7,379
		kW	0.73	0.20	0.23	0.69
		Therms	6,959	1,509	2,139	4,299
	More O&M	kWh	1,767	1,864	1,199	1,246
		kW	0.31	0.30	0.21	0.23
		Therms	24	17	15	19
O&M <sup>6</sup>	Less O&M	kWh				27,349
		kW				8.53
		Therms				436
	More O&M	kWh				17,956
		kW				1.92
		Therms				8,273

### 1.3.4 O&M project persistence and other findings

The CATI survey asked respondents what year their course-influenced O&M projects started, and if those changes were still in effect. On average, respondents indicated that 86 percent of the course-influenced O&M projects were still in effect at the time of the CATI survey (July 2010). Table 1-9 summarizes the percentage of O&M projects that are still active by the year in which they started. These results suggest that the assumption that O&M projects will last at least into the year after the course was taken is not unreasonable. This finding and potential limitations are discussed in more detail in Section 3.6.

**Table 1-9. Active O&M Projects by Year of Project Initiation**

O&M Project Start Year	Total O&M Projects	Number Still Active (July 2010)	Percentage Still Active (July 2010)
Before 2008	2	2	100%
2008	21	21	100%
2009	69	58	84%
2010	11	10	91%
Don't know	11	7	64%
Total	114	98	86%

KEMA examined the correlations between the number of courses taken, course duration, the number of O&M projects implemented, and each of the net savings metrics (kWh, kW, and

<sup>6</sup> Per-trainee savings for O&M projects are only estimated for a single year. Therefore estimates only appear in the last column of the table.



therms). None of the correlations were statistically significant at a 90 percent confidence level.

#### 1.4 RECOMMENDATIONS

KEMA recommends that Focus on Energy be credited with additional savings of 15,758,642 kWh, 2,328 kW, and 6,585,949 therms in CY10 (Table 1-4).

KEMA also recommends that the program add a measure of company size to the E&T course rosters. KEMA recommends using annual energy use (kWh) as the company size metric. If this is unavailable, then floor space (square feet) or number of employees are the next best estimates. A measure of company size would allow future evaluations to normalize project savings results by the company size metric and produce savings estimates based on that metric. There is evidence from this evaluation that trainees from small or medium companies may have higher savings from more-O&M-focused courses whereas trainees from large companies may have higher savings from less-O&M-focused courses. Using this metric to scale up to the total trainee population would yield more accurate population-level savings estimates than the per-trainee results reported in this and the 2008 E&T UAS report. Computing estimates by a company size variable would also help moderate the effect of unusually large projects.<sup>7</sup>

---

<sup>7</sup> In response to an early draft of this report, the program has tentatively agreed to attempt to gather some kind of company size data from course attendees in the future. The exact details have yet to be determined.



## 2. METHODOLOGY

---

### 2.1 OVERVIEW AND OBJECTIVES

The primary purpose of this study was to estimate per-trainee untracked attributable savings (UAS) from operations and maintenance (O&M) projects resulting from classes provided by the Focus on Energy Education and Training (E&T) program. These UAS are the E&T-attributable portion of energy savings from projects that were implemented at the building or facilities of the trainees' companies and do not appear in the WISeerts database.

In 2008, KEMA conducted an E&T UAS study that included process and impact evaluations of the Focus on Energy E&T program.<sup>8</sup> The impact evaluation component of the 2008 study resulted in a recommendation to the Public Service Commission of Wisconsin (PSCW) for additional energy savings to be credited to the Focus Business Programs for its E&T activities. Since that 2008 study, changes in program delivery, updated and expanded course offerings, and emphasis on O&M projects have made it necessary to update UAS estimates to reflect this greater emphasis on O&M courses.

In the 2008 E&T UAS study, estimates for 2008 O&M project UAS were based on a single year of courses (2007) because the savings were assumed to occur in the year following the training.<sup>9</sup> While we considered this a reasonable approach for estimating O&M project UAS for 2008, it could cause difficulties in terms of projecting O&M project UAS for future years. First, we learned that the E&T program in 2008 and 2009 appeared to have a larger proportion of O&M-focused courses than had been the case during the 2004–2007 E&T program cycle. Therefore, if we simply projected the O&M UAS estimates for 2010 based on the 2007 E&T class mix, we would likely underestimate the level of O&M UAS.

Another issue was the length of the historical data stream that was used to project UAS from the E&T program for future years. In the 2008 E&T UAS study, the UAS for one-time projects were estimated based on a four-year (2004–2007) average of trainee counts and savings estimates. This four-year average accounted for the possibility that one-time projects could take longer than a single year to implement. The four-year average increases the likelihood that such multi-year projects are included in the estimates. It also lessened the effect of year-to-year fluctuations in course mix, course attendance, and other factors that could skew our estimates of UAS from the E&T program in future years. However, while our UAS projections for the one-time projects were based on a four-year data stream, our UAS projections for O&M project was based on only a single year of historical data (2007).

---

<sup>8</sup> Christopher Dyson, Ken Agnew, Miriam Goldberg, and Claire Palmgren, KEMA, Inc. *State of Wisconsin, Focus on Energy Evaluation, Business Programs: Impact Evaluation of Education and Training Program*. November 15, 2008.

<sup>9</sup> One argument for making this assumption is that O&M projects are usually low-cost activities that are not as constrained by the capital availability barriers that often cause multi-year delays in one-time projects. Therefore, they are more likely to be implemented soon after the training course. In addition, because O&M projects usually rely on a change in behavior and standard practices, it is reasonable to assume that if these O&M projects happen at all, they are more likely to happen soon after the “champion” of the O&M project has taken the course rather than later.

Because of these concerns, as well as a limited evaluation budget, we focused on O&M project savings estimates for this round of evaluation. In place of a complete update of the 2008 E&T UAS study, in the CY10 detailed evaluation plan (DEP)<sup>10</sup>, KEMA proposed an update to the O&M UAS estimate to better account for the increase in O&M offerings. As noted, in 2008 and 2009, the majority of courses focused on O&M projects. If Focus on Energy continues to offer high proportions of O&M-focused courses, then estimates from the current study should yield more representative UAS estimates for future projections.

We applied the updated per-trainee O&M UAS estimates and the per-trainee one-time project UAS from the 2008 E&T UAS study to 2009 class attendance records to project energy savings for CY10. We also show how these recent UAS estimates can be used to project UAS for future years, assuming similar course offerings and program delivery.

Nancy Giere Associates administers the E&T program. The evaluation began with a discussion with Nancy Giere Associates about what courses they conducted in 2008 and 2009 and the content of those courses. This discussion revealed that all courses feature some discussion of O&M changes, and that some courses feature more O&M discussion than others. Nancy Giere Associates identified which courses offered since 2004 were more-O&M-focused and less-O&M-focused. Table 2-1 lists the 2008 and 2009 courses, categorized by less- and more-O&M-focus.

**Table 2-1. 2008–2009 Courses by Course Focus**

Less-O&M-Focused Courses	More-O&M-Focused Courses
Best Practices in Industrial Lighting	Building Operator Certification - Level I
Compressed Air Best Practices	Building Operator Certification - Level II
Fan System Assessment	Commercial Practical Energy Management
Fan System Specialist Qualification	Energy Efficient Swimming Pool O&M
Industrial Ventilation Systems Best Practices Training	Industrial Practical Energy Management
Pumping System Assessment	Preventative O&M - Schools & Gov't
Pumping System Specialist Qualification	School's Practical Energy Management
Retrocommissioning for Large Commercial Buildings	Smart Strategies for Grocery
Steam Specialist Qualification	Smart Strategies for Healthcare
Steam System Assessment	Smart Strategies for Hotels
Steam Systems Best Practices for Industrial Customers	
Steam Systems Best Practices for Schools & Gov't	

<sup>10</sup> David Sumi, Bryan Ward, and Lark Lee, PA Consulting Group, Miriam L. Goldberg, Bobbi Tannenbaum, J. Ryan Barry, and Tammy Kuiken, KEMA Inc., Lynn Hoefgen, and Tom Mauldin, NMR Group, Inc. *State of Wisconsin, Focus on Energy Evaluation, Evaluation Contract Year 2010, Detailed Evaluation Plans*. April 1, 2010

## 2.2 DETAILED METHODOLOGY

This round of evaluation used similar protocols, data collection instruments, and methods as the 2008 E&T UAS study. The primary differences between the methodology of the current study and the methodology of the 2008 E&T UAS study are that the current study divides courses into two categories (more- and less-O&M-focused) and the current study gathers per project estimates only for O&M projects. Per direction from the PSCW, this study focused on estimating per-trainee savings from O&M projects for the 2008 and 2009 trainees. We included the 2008 trainees to ensure a sample large enough to attain the number of completions we needed. The general analysis process was:

1. Conduct a computer aided telephone interview (CATI) survey to discover potential untracked, attributable O&M projects.
  - a. Collect 2008 and 2009 course offering information and training counts from the program.
  - b. Filter trainees to remove program and utility company staff. Also ensure people who took multiple courses appeared only once in the sample.
  - c. Identify courses with more and less O&M focus.
  - d. Draw a sample of trainees from 2008 and 2009 courses for participant surveys.
  - e. Make survey calls.
2. Conduct an engineering review of projects discovered in the CATI.
  - a. Filter the list of projects found in the CATI surveys, based on program attribution, whether the project was tracked in WISEerts, and whether the project was an O&M project.
  - b. Draw a sample of potential projects for engineering reviews to confirm project type, attribution, and estimate energy savings for these projects.
  - c. Estimate 2010 E&T UAS for O&M projects using the data collected in engineering review.
3. Calculate per-trainee savings for O&M projects for more- and less-O&M focused courses.
  - a. Aggregate engineering estimates to more- and less-O&M-focused course level using data from step 2.
  - b. Calculate 2010 O&M total UAS based on per-trainee UAS and 2009 course attendance (after the filtering applied in step 1).
4. Reanalyze data on 2004–2007 courses (originally reported in the 2008 E&T UAS report) to provide estimates of per-trainee savings for one-time projects for the more- and less-O&M focused courses
  - a. Split 2004–2007 courses into more- and less-O&M-focused categories and recalculate per-trainee UAS estimates for one-time projects for each course category.

- b. Estimate 2010 E&T UAS for one-time projects based on 2006–2007 course attendance (as reported in 2008) and 2008–2009 course attendance (after the filtering applied in step 1), and the per course type estimates (step 4a).
5. Calculate total 2010 E&T UAS by taking the sum of the 2010 E&T UAS for O&M projects (Step 3) and 2010 E&T UAS for one-time projects (Step 4).

### 2.2.1 CATI survey of trainees

#### A. OBJECTIVE

The first step in the evaluation was to conduct a Computer-Aided Telephone Interview (CATI) survey of a sample of E&T course trainees. The primary objective of the survey was to generate a list of O&M projects that are potentially producing UAS. The CATI survey involved:

- **Finding out if any O&M projects resulted from the course.** We provided the CATI surveyors with O&M project definitions and examples to help them distinguish O&M projects from one-time projects.
- **Finding out if the project might be untracked.** This involved collecting basic “what, where, when” information on the projects as well as information about whether the project received financial incentives or other assistance from Focus. This information could help the engineers determine whether or not it was a tracked project already claimed in WISEerts.
- **Finding out if the project might be attributable to the E&T program.** This involved making sure that the project had begun after the course was taken and asking the trainees a battery of program attribution questions.

In addition to collecting this information to help screen O&M projects for their UAS potential and inform the subsequent engineering review, we also collected information about O&M project persistence, which the PSCW staff had expressed special interest in. Other information collected by the CATI survey is summarized in later sections.

#### B. SAMPLING

KEMA prepared the CATI sample based on rosters received from Nancy Giere Associates for all 2008 and 2009 courses. KEMA filtered the course rosters using an approach very similar to what we used in the 2008 E&T UAS study to eliminate no shows, WECC, Focus on Energy, and utility company staff, and include trainees who took multiple courses only once.

The rosters began with 2,046 trainees. The filtering process began by using variables in the course rosters to remove:

- All trainees with a status of “No-Show” or “Cancel” (346 trainees).
- All trainees with participant type of “Focus on Energy” or “Staff” (219 trainees)
- All trainees with state not equal to “WI” (63 trainees).

- All trainees from a company KEMA identified as an energy company (Alliant Energy, Focus on Energy, Madison Gas & Electric, Marshfield Utilities, WECC, Wisconsin Public Service, WPS, WPPI Energy, Xcel Energy: 13 trainees).

KEMA then inspected the database and removed duplicate entries for trainees who took more than one course. Trainees who took more than one course were assigned the course that had the fewest number of trainees. The exception was trainees who took both BOC level I and level II courses. KEMA created a separate category for these trainees. This deduplication process resulted in the following removals:

- Duplicate entries of trainees that took more than one course in 2008 (90 entries).
- Duplicate entries of trainees that took more than one course in 2009 (59 entries).
- Duplicate entries of trainees that took at least one course in 2008 and at least one in 2009 (55 entries).
- Duplicate entries of trainees in BOC level I and II courses (nine entries).

Finally, KEMA removed trainees who did not list their phone numbers (six trainees). This resulted in a final population of 1,186 trainees from 2008 and 2009 courses. Table 2-2 summarizes the trainee filtering process.

**Table 2-2. Trainee Filtering Process**

Description	2008 Courses	2009 Courses	Total
Initial course counts	1,133	913	2,046
STATUS = "No-Show" or "Cancel"	184	162	346
PARTICIPANT TYPE = "Focus on Energy" or "Staff"	107	112	219
STATE ≠ "WI"	22	41	63
Utility name in "Company"	5	8	13
Took multiple 2008 or 2009 courses	90	59	149
Took course in 2008 and 2009 <sup>11</sup>			55
Duplicates due to merging BOC I and BOC II trainees			9
Missing phone numbers			6
Total entries removed	408	382	860
Final population	683	503	1,186

KEMA set an overall quota of 201 CATI completes (17 percent response rate) based on the following information.

- CATI response rates from the 2008 E&T UAS study
- The number of CATI responses that generated a completed engineering review of an O&M project from the 2008 E&T UAS study

<sup>11</sup> At this point, KEMA merged the 2008 and 2009 courses. Therefore, all removals after this point are listed for the total only.



- The number of completed engineering reviews KEMA wanted for the current study (30 to 35).

The next step in the sampling process was to create CATI strata and assign quotas to those strata. KEMA split the 2008 and 2009 courses into those that had more O&M focus and those that had less O&M focus as identified by Nancy Giere Associates (Table 2-1). Next, we set quotas for each less-/more-O&M-focused category based on the incidence rates of O&M projects from the 2004–2007 courses<sup>12</sup>. Within each category, we set quotas for completed calls for individual courses based on the percentage of the total trainee hours in that category accounted for by the individual course. Thus, we sampled more participants from courses that resulted in a greater number of O&M projects in the 2008 E&T UAS study, longer courses, and courses with more trainees. These decisions were made to maximize our chances of finding as many O&M projects as possible from the fewest number of CATI surveys. The final results were weighted to ensure accurate statistical representation of the overall population. Table 2-3 summarizes the sampling plan.

---

<sup>12</sup> The incident rate was based on the number of O&M projects that resulted from each type of course based on data collected for the 2008 E&T UAS study.

Table 2-3. Sampling Plan for CATI Surveys

Course Year	Less O&M Focused Courses	Number of Filtered Trainees	Trainee Hours	Quota
2008	Best Practices in Industrial Lighting	43	64.5	1
2009	Best Practices in Industrial Lighting	25	37.5	1
2008	Compressed Air Best Practices	52	416	10
2009	Compressed Air Best Practices	16	128	3
2009	Industrial Ventilation Systems Best Practices Training	38	304	7
2008	Steam Systems Best Practices for Industrial Customers	21	168	4
2008	Steam Systems Best Practices for Schools & Government	24	192	4
2008	Fan System Assessment	18	144	3
2009	Fan System Assessment	4	32	1
2008	Fan System Specialist Qualification	2	16	0
2009	Fan System Specialist Qualification	4	32	1
2008	Pumping System Assessment	26	208	5
2009	Pumping System Specialist Qualification	1	8	0
2009	Steam System Assessment	6	48	1
2009	Steam Specialist Qualification	5	40	1
2008	Retrocommissioning for Large Commercial Buildings	17	136	3
	<b>Total</b>	<b>302</b>	<b>1,974</b>	<b>46</b>
Course Year	More O&M Focused Courses	Number of Filtered Trainees	Trainee Hours	Quota
2008	Building Operator Certification	50	3200	35
2009	Building Operator Certification	51	3264	36
2009	Building Operator Certification - Level II	27	1728	19
2008	Energy Efficient Swimming Pool Operation and Maintenance	53	424	5
2008	Commercial Practical Energy Management	34	136	1
2009	Commercial Practical Energy Management	60	240	3
2008	Industrial Practical Energy Management	63	252	3
2009	Industrial Practical Energy Management	132	528	6
2008	School's Practical Energy Management	121	968	11
2009	School's Practical Energy Management	55	440	5
2008	Smart Strategies for Grocery	7	56	1
2008	Smart Strategies for Healthcare	14	112	1
2009	Smart Strategies for Healthcare	12	96	1
2008	Smart Strategies for Hotels	16	128	1
2009	BOC I & II <sup>1</sup>	9	1152	9
2008	Preventative Operations and Maintenance - Schools and Gov't	122	976	14
2009	Preventative Operations and Maintenance - Schools and Gov't	58	464	6
	<b>Total</b>	<b>884</b>	<b>14,164</b>	<b>155</b>

<sup>1</sup> The sampling plan resulted in a quota for BOC I & II that was greater than the total number of participants. Therefore, we set the quota for this course to the total number of participants and put the remaining quota into the Preventative Operations and Maintenance courses.



### C. INFORMATION COLLECTED BY CATI SURVEY

As noted, KEMA designed the CATI survey to collect enough basic information to (1) help evaluators determine if the project was already listed in the Focus WISEerts database, and (2) help engineers perform follow-up interviews to collect detailed project information for calculating savings. The basic information collected by the CATI included:

- Descriptions of O&M projects
- Whether O&M projects received financial assistance
- Attribution to the course for O&M projects
- Persistence of O&M projects
- Descriptions of one-time projects
- Descriptions of future projects.

There were separate question sequences for O&M projects, one-time projects, and future projects. Because O&M projects are the focus of this evaluation, that sequence was the most detailed. It included information about whether the project received Focus assistance (financial or non-financial), a series of questions to assess attribution of the project towards the course, and a series of questions to determine whether the trainee was still implementing those changes. The sequences for one-time and future projects were included for consistency with the 2008 E&T UAS study to avoid biasing responses. We also wanted to collect information about as many O&M projects as possible and knew that KEMA engineers could follow-up on any projects that the CATI callers miscategorized. However, because we were unlikely to use detailed information on one-time or future projects and to minimize respondent fatigue, we only collected descriptions and implementation dates of the one-time and future projects. A copy of the CATI instrument is included as Appendix A.

The CATI survey gathered data for up to three of each type of project (i.e., O&M project, one-time project, and future projects). KEMA trained the CATI operators to assign projects to the three categories. This identification determined which sequence of follow-up questions the operator asked about the project. Most of the time, the operators made accurate assignments, based on subsequent judgment of KEMA engineers. For the cases where the assignment was not accurate, KEMA engineers gathered the missing CATI data during the engineering review process.

#### 2.2.2 Engineering review

##### A. DESCRIPTION

The primary purpose of the engineering calls was to collect enough technical information to allow the engineer to estimate energy savings from the project. The specific data collected varied on a case-by-case basis as dictated by the needs of the particular project. Another important objective of the engineering calls was to get a better description of the projects to more accurately assess whether they were tracked and whether they were really O&M projects. Finally, engineer calls also collected attribution data when it was missing from the CATI data.



## B. SAMPLING

KEMA based the engineering sample on all O&M and one-time projects discovered in the CATI. We considered both types of projects to ensure that we included all of the discovered O&M projects in the engineering sample, even if they were misidentified as such by the CATI operators.

KEMA divided the CATI-discovered projects into eight strata. One dimension of the strata was whether the project resulted from a more- or less-O&M-focused course. The other dimension of the strata was the size of the trainee's company, based on number of employees. KEMA split company sizes into small (50 or fewer employees), medium (51 to 300 employees), large (over 300 employees), and unknown (if the trainee did not provide the information to the CATI). These company size strata are the same as those used in the 2008 E&T UAS study.

KEMA assigned quotas for completed engineering calls to each of the eight strata based on the number of CATI-identified projects in each stratum and the variability of the O&M savings estimates in the 2008 E&T UAS data. KEMA found that the variability of the O&M savings estimates from the 2008 E&T UAS data was greater for the larger companies, so we set our quotas higher for those strata. Table 2-4 summarizes the sampling plan for the engineering calls.

**Table 2-4. Sampling Plan for Engineering Calls**

O&M Focus	Company Size	Number of CATI-identified Projects	Quota
More	Small	77	5
	Medium	76	5
	Large	48	10
	Unknown	13	2
Less	Small	8	2
	Medium	17	2
	Large	40	6
	Unknown	1	0
Total		280	32

## C. PROJECT MATCHING PROCESS

The 2008 E&T UAS study found the process of trying to match the projects identified by the CATI survey with those listed in the program tracking databases to be very challenging. For this 2010 study, KEMA tried to simplify the project matching process. Engineers determined if the project was tracked by comparing the project descriptions, address, and date of project implementation from the CATI survey to all project information contained in the WISEerts tracking database for the respondent's company. Engineers identified projects as untracked, possibly tracked, or tracked.

During this process, engineers also assessed whether the project was accurately classified as an O&M project by the CATI operators. Engineers identified projects as O&M, possibly O&M, or not O&M.

Engineers made follow-up calls to projects that were untracked or possibly tracked and O&M or possibly O&M. If they identified a project as definitely tracked or definitely not O&M, they did not call about that project. During the follow-up calls, engineers attempted to collect enough information to confirm whether possibly tracked projects were tracked and whether possibly O&M projects were O&M.

### 2.2.3 Calculating net energy savings

The current study used the same methodology as the 2008 E&T UAS study to calculate attribution and net savings. The 2008 E&T UAS study used the simplest version of the historical Focus Business Programs (BP) net-to-gross methodology to calculate program attribution. We used this simple version of the net-to-gross methodology in past Focus BP impact evaluations in situations where we were working with incomplete project information. This simplified approach was appropriate for use in the 2008 E&T UAS study because that study was working with “untracked” projects. Therefore, when such a study fields a CATI survey it has no pre-knowledge of the kinds of projects that might have resulted from the E&T courses. In fact, the same CATI survey first finds out what the projects occurred and then a few minutes later asks the trainees a series of questions to determine if the projects are attributable to the program.<sup>13</sup>

This is a very different situation than that faced by our impact evaluations of tracked projects. In the evaluations of tracked projects, we begin with a certain amount of project information. We collect some of this information from the program tracking databases and we collect additional information through our document requests for project files. For the CATI surveys, this project information allows us to pre-program the CATI surveys to ask questions about program effects on measure quantity, efficiency, and timing that are more precise because they are customized to the particular measure. Other project information such as what financial incentives were received, what the project cost to implement, and whether the project was identified by a Focus audit can also help the engineers make a more informed judgment as to whether a given project is attributable to the program or not.

The 2010 E&T UAS study not only faced the challenge of having no program information before the program attribution questions were asked, it also focused on a class of energy-efficient projects—O&M projects—that are more difficult to characterize or categorize in a standardized manner than one-time projects. This would have made it even more difficult to pre-program the CATI to ask customized questions about program effects on measure quantity, efficiency, and timing. Therefore, we once again opted for a simplified net-to-gross approach.

---

<sup>13</sup> Another reason for using this approach was at the time the 2008 E&T UAS study was being fielded, the evaluation team along with the PSCW and the Focus BP implementers were working on developing a revised and more sophisticated net-to-gross methodology that incorporated changes to the approach to estimating acceleration effects, etc. Because this new methodology was still under development, we really had no choice but to use an historical net-to-gross method in the 2008 E&T UAS study.



This simplified approach bases initial attribution ( $A_1$ ) on the likelihood of the measure being implemented absent the program. It gives additional credit to the project for any acceleration effects. Table 2-5 shows how initial attribution was determined based on the likelihood question.

**Table 2-5. Initial Attribution Based on Likelihood of Project Implementation in Absence of Program Effect**

If you had not taken the training course, how likely would you have undertaken this energy-saving project? Would you say you would have been ...				
Very Likely	Somewhat Likely	Not Very Likely	Very Unlikely	Don't Know/Refused
$A_1 = 0\%$	$A_1 = 50\%$	$A_1 = 90\%$	$A_1 = 100\%$	

If  $A_1$  equaled 100 percent, then KEMA set the final attribution ( $A$ ) at 100 percent. If  $A_1$  was less than 100 percent, then KEMA applied acceleration effects. The program credit for the accelerated savings was calculated as:

$$A_2 = (m^*/48) * A_1$$

where

$$m^* = \min(m, 48)$$

$m$  = number of months by which the course accelerated the implementation.

CATI survey questions asked whether the project timing would have been earlier, the same, or later without the program; and if later, how many months later. If the measure would have been installed at the same time or earlier, then number of months ( $m$ ) was set at zero. If a respondent did not answer (don't know or refusal) either of the timing questions, the number of months by which the program rebate accelerated the implementation was set at 48.

The final program attribution factor ( $A$ ) for the project was based on the summation of the initial program attribution factor ( $A_1$ ) and the acceleration effect ( $A_2$ ):

$$\text{If } A_1 = 100\% \text{ then } A = 100\%, \text{ else } A = A_1 + A_2 = A_1 + (m^*/48) A_1$$

If this equation resulted in an attribution over 100 percent, KEMA set the attribution to 100 percent. KEMA then multiplied the gross project energy savings estimates calculated by the engineers by the attribution factor ( $A$ ) to arrive at net energy savings:

$$\text{Net Energy Savings} = \text{Gross Energy Savings} * A$$

### 2.2.4 Calculating O&M savings

The primary goal of this study is to compute a *per-trainee* estimate for untracked, attributable O&M project savings. To do so, KEMA gathered data at the project level. To extrapolate from the project-level to the per-trainee level, KEMA followed these steps:

1. Extrapolate net savings from the individual project level to the engineering strata level.

2. Divide total engineering strata savings by the number of CATI respondents in each engineering strata.
3. Extrapolate the CATI respondent savings to the entire trainee population.
4. Compute total savings for more- and less-O&M-focused courses.
5. Divide total savings by the number of trainees in each type of course.

KEMA engineers computed net energy savings for a subset of the projects discovered in the CATI as described in the previous section. KEMA weighted these energy savings according to the total number of untracked, attributable O&M projects discovered in the CATI in each of the eight engineering strata (course O&M focus by company size). We then summed the weighted savings within each strata to arrive at total per engineering strata savings:

$$\text{Total Engineering Strata Savings} = S_{\text{eng}} = \sum (P_i * W_{\text{es}})$$

where:

$P_i$  = Net savings of a particular project

$W_{\text{es}}$  = Engineering strata weight =  $\frac{\# \text{ untracked, attributable O\&M Projects (CATI)}}{\# \text{ engineering completes}}$

The next step was to convert the total engineering strata savings into a per CATI respondent estimate. To compute a per CATI respondent savings estimate, KEMA divided the total engineering strata savings by the number of CATI respondents within each engineering stratum.

$$\text{Per CATI Respondent Savings} = S_{\text{cati}} = \frac{S_{\text{eng}}}{n_{\text{es}}}$$

where

$n_{\text{es}}$  = Number of CATI respondents in a particular engineering stratum.

The next step was to convert the per CATI respondent savings into a total savings estimate for each type of course. To compute total course type savings, KEMA multiplied the per CATI savings of each CATI respondent by that respondent's CATI weight. The CATI weight was computed by dividing the total number of trainees by the number of CATI completes in each course. KEMA then summed the weighted CATI respondent savings within each of the course types.

$$\text{Total Course Type Savings} = S_{\text{total}} = \sum (S_{\text{cati}} * W_{\text{cati}})$$

where

$W_{\text{cati}}$  = CATI strata weight =  $\frac{\# \text{ trainees in course}}{\# \text{ CATI completes in course}}$

KEMA computed separate Total Course Type Savings estimates for the 2009 courses that were more-O&M-focused and for the 2009 courses that were less-O&M-focused. The last step was to compute savings per-trainee. To do so, KEMA divided each Total Course Type Savings estimate by the total number of trainees in each type of course.

$$\text{Savings per-trainee} = S_{\text{train}} = \frac{S_{\text{total}}}{N_{\text{O\&M}}}$$

where

$N_{\text{O\&M}}$  = Total post-filtering number of trainees in the 2009 more- or less-O&M-focused courses.

### 2.2.5 Estimating savings for one-time projects

A secondary goal of the current study is to estimate the savings from one-time projects for the trainees in the 2009 courses. Unlike the 2008 E&T UAS study, the current study did not collect savings data for one-time projects. Instead, KEMA used the one-time savings data from the 2008 E&T UAS study to estimate savings for the 2009 course trainees.

The first step in calculating this estimate was to compute separate per-trainee savings for the more-O&M-focused courses and the less-O&M-focused courses, as identified by Nancy Giere Associates. KEMA split the 2008 E&T UAS study project savings data by this variable. Within each of these subsets of data, KEMA recomputed the per-trainee savings estimates using the same methodology as originally used in the 2008 E&T UAS study. This technique resulted in a per-trainee savings estimate for each metric for each of the previous four years for each type of course. The next step was to multiply the per-trainee savings estimates by the number of trainees in each type of course for each year (2006 through 2009). The sum of those products is the estimated 2010 savings from one-time projects based on a rolling average savings for the last four years.

### 3. FINDINGS

---

#### 3.1 RESPONSE RATES

##### 3.1.1 CATI

KEMA conducted a telephone survey of the 1,186 Focus trainees between July 1 and July 21, 2010. We dialed 997 trainees and completed 189 surveys for an overall response rate of 19 percent. One hundred seventy-six (18 percent) of the dialed trainees refused to take the survey. We failed to contact 479 (48 percent) of the dialed trainees despite calling at least eight times and failed to contact 153 (15 percent) of the dialed trainees for other reasons such as incorrect phone numbers or the trainee no longer worked at the phone number. One hundred eighty-nine trainees (16 percent) were not dialed because the quota for that course was already filled. Table 3-1 summarizes the CATI dispositions. Table 3-2 shows the post-filtering trainee population, CATI quotas, and CATI completes for each 2008–2009 course.

**Table 3-1. CATI Dispositions**

Disposition	Trainees	Percent Dialed
Completes	189	19%
Refused	176	18%
Not complete, dialed 8 or more times	479	48%
Not complete, eligibility unknown	153	15%
Total dialed	997	100%
Never dialed (quota filled)	189	
<b>Total</b>	<b>1,186</b>	

Table 3-2. CATI Completes by Strata

2008 Course Title	O&M Focused	Number of Filtered Trainees	Quota	CATI Completes
Best Practices in Industrial Lighting	Less	43	1	1
Compressed Air Best Practices	Less	52	10	10
Fan System Assessment	Less	18	3	2
Fan System Specialist Qualification	Less	2	0	0
Pumping System Assessment	Less	26	5	5
Retrocommissioning for Large Commercial Buildings	Less	17	3	3
Steam Systems Best Practices for Industrial Customers	Less	21	4	4
Steam Systems Best Practices for Schools & Government	Less	24	4	5
Building Operator Certification	More	50	35	17
Commercial Practical Energy Management	More	34	1	7
Energy Efficient Swimming Pool Operation and Maintenance	More	53	5	5
Industrial Practical Energy Management	More	63	3	3
Preventative Operations and Maintenance - Schools and Government	More	122	14	21
School's Practical Energy Management	More	121	11	13
Smart Strategies for Grocery	More	7	1	1
Smart Strategies for Healthcare	More	14	1	1
Smart Strategies for Hotels	More	16	1	2
<b>2008 Total</b>		<b>683</b>	<b>103</b>	<b>100</b>
2009 Course Title	O&M Focused	# Filtered Trainees	Quota	CATI Completes
Best Practices in Industrial Lighting	Less	25	1	1
Compressed Air Best Practices	Less	16	3	3
Fan System Assessment	Less	4	1	2
Fan System Specialist Qualification	Less	4	1	1
Industrial Ventilation Systems Best Practices Training	Less	38	7	9
Pumping System Specialist Qualification	Less	1	0	0
Steam Specialist Qualification	Less	5	1	2
Steam System Assessment	Less	6	1	0
BOC I & II	More	9	9	5
Building Operator Certification	More	51	36	18
Building Operator Certification - Level II	More	27	19	10
Commercial Practical Energy Management	More	60	3	11
Industrial Practical Energy Management	More	132	6	7
Preventative Operations and Maintenance - Schools and Government	More	58	6	13
School's Practical Energy Management	More	55	5	6
Smart Strategies for Healthcare	More	12	1	1
<b>2009 Total</b>		<b>503</b>	<b>98</b>	<b>89</b>

### 3.1.2 Engineering

The purpose of the engineering calls was to collect enough technical information to allow the engineer to estimate energy savings from the project. The specific data that the engineers collected varied on a case-by-case basis as dictated by the needs of the particular project. Secondary objectives of the engineering calls were to obtain better descriptions of the projects and to more accurately assess whether they were tracked O&M projects. Finally, engineering calls also collected attribution data when it was missing from the CATI data.

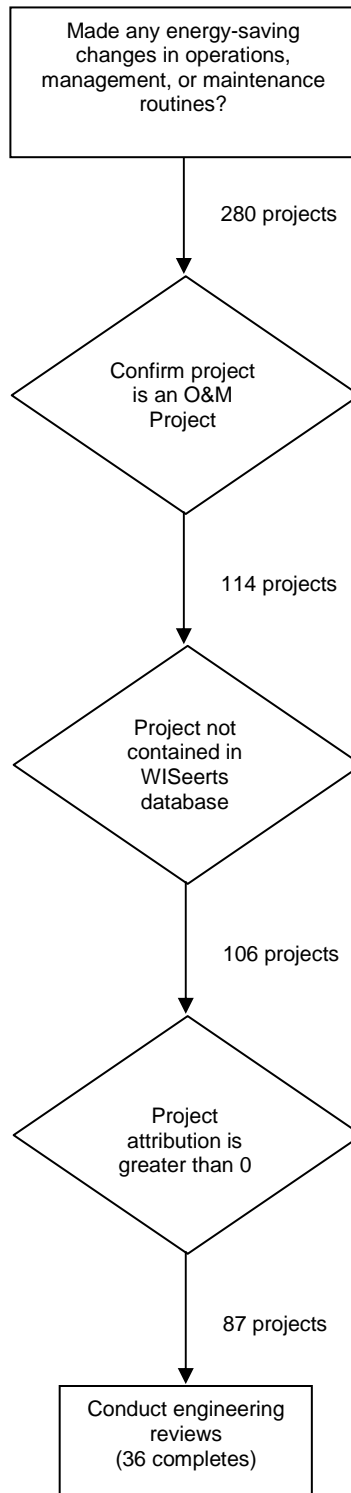
The CATI survey identified 280 projects that were potentially untracked, attributable projects. The engineering review determined whether these projects were attributable, untracked, and O&M projects. This process resulted in 87 untracked, attributable, O&M projects. Engineers completed estimates for 36 (41 percent) of these projects. KEMA divided the projects into eight engineering strata based on the O&M focus of the course taken by the CATI respondent and the size of the respondent's company. Table 3-3 summarizes the number of projects and engineering completes within each of these eight strata. Figure 3-1 shows a flowchart of the filtering process.

**Table 3-3. Disposition and Engineering Completions of CATI Identified Projects by Strata**

O&M Focus	Company Size	CATI-Identified Projects	O&M Projects	Untracked O&M Projects	Attributable, Untracked O&M Projects	Quota	Engineering Completes
More	Small	77	33	33	25	5	4
	Medium	76	27	26	25	5	5
	Large	48	18	18	15	10	10
	Unknown	13	6	4	3	2	1
Less	Small	8	4	4	3	2	3
	Medium	17	6	5	1	2	1
	Large	40	20	16	15	6	12
	Unknown	1	0	0	0	0	0
<b>Total</b>		<b>280</b>	<b>114</b>	<b>106</b>	<b>87</b>	<b>32</b>	<b>36</b>



Figure 3-1. Filtering Chain for CATI-identified Energy Saving Projects



### 3.1.3 Attributable untracked O&M projects

KEMA calculated the average attribution of the 106 untracked O&M projects discovered in the CATI. This average was weighted based on the number of completed CATI surveys and number of trainees within a particular course ( $W_{cati}$  as described in Section 2.2.4), so that they accurately represent the population of trainees. The weighted average attribution of the projects that occurred after participants took the course was 65 percent.

## 3.2 UPDATED O&M PROJECTS SAVINGS ESTIMATES

For CY10, KEMA estimated total O&M project UAS of about 10 million kWh, 1,600 kW, and 3.4 million therms. These savings are equivalent to about 20,000 kWh, 3 kW, and 6,700 therms per trainee. Table 3-4 summarizes the total and per-trainee O&M UAS for CY10.

**Table 3-4. O&M Project Untracked Attributable Savings for CY10**

	Less O&M Focus	More O&M Focus	Total
Number of 2009 trainees	99	404	503
Total kWh savings	2,707,516	7,254,391	9,961,907
Total kW savings	845	776	1,621
Total therm savings	43,179	3,342,470	3,385,649
kWh/trainee	27,349	17,956	19,805
kW/trainee	8.53	1.92	3.22
Therms/trainee	436	8,273	6,731

Contrary to expectations, the per-trainee O&M savings (kWh and kW) estimates for less-O&M-focused courses was higher than the per-trainee O&M savings for more-O&M-focused courses. This occurred for two reasons. First, an attendee of the less-O&M-focused courses completed a large compressed-air project that increased total kWh and kW savings. Second, there were fewer attendees in the less-O&M-focused courses. This reduced the denominator in the per-trainee computation, which increased the resulting per-trainee estimate.

Examining the data by company size and course O&M focus reveals a more nuanced situation. Table 3-5 shows the per-CATI-respondent savings by course O&M focus and company size. Based on these estimates, it appears that the combination of company size and course O&M focus affects per-respondent savings. Savings (kWh, kW) per CATI respondent from small- or medium-sized companies was larger for more-O&M-focused courses than for less-O&M-focused courses. However, savings (kWh, kW) per CATI respondent for large companies was larger for less-O&M-focused courses than for more-O&M-focused courses.

**Table 3-5. Per CATI Respondent Savings by Company Size and Course Focus**

Company Size	Small		Medium		Large		Unknown	
	Less	More	Less	More	Less	More	Less	More
kWh/respondent	201	1,987	463	5,566	105,867	50,192	0	0
kW/respondent	17.6	0.2	0.1	1.9	11.8	4.1	0	0
Therms/respondent	105	2,973	0	1670	1,577	22,022	0	214
Number of CATI respondents	12	57	16	42	19	32	1	10
Total kWh	2,406	113,278	7,400	233,792	2,011,478	1,606,134	0	0
Total kW	211.3	9.6	2.0	80.5	223.3	130.8	0	0
Total therms	1,262	169,477	0	70,139	29,956	704,691	0	2,136

Unfortunately, it is impossible to retain the company size dimension when extrapolating to the total trainee population. We cannot retain the company size dimension because we only have this information for the CATI respondents, and it does not exist in the course rosters. If the course rosters included a measure of company size, such as annual energy usage, floor space, or number of employees, future evaluations could include the company size dimension when extrapolating to the trainee population level or estimate savings based on size units rather than trainees. This would likely produce more accurate savings estimates. KEMA recommends adding a company size variable to the course rosters (see Section 1.4).

### 3.3 ONE-TIME PROJECTS SAVINGS ESTIMATES

Table 3-6 summarizes the total untracked attributable savings from one-time projects for the 2009 trainees. As discussed in the detailed methodology section, course attendance from the four previous years is necessary to compute one-time savings. This table uses trainee counts from 2006 to 2009 to calculate one-time savings for the four previous years. The 2006 and 2007 trainee counts came from the 2008 E&T UAS study. All trainee counts are after the filtering process was applied. The trainee counts in this table confirm that trainees have shifted towards more-O&M-focused courses over the past four years. As expected, more-O&M-focused courses result in lower one-time project savings than less O&M focused courses.

**Table 3-6. One-Time Project Savings for CY10 by Course Type**

Course Type	Metric	Course Year Savings/Trainee				Total Savings
		2006	2007	2008	2009	
Less O&M Focus	Number of filtered trainees	287	211	203	99	800
	KWh	7,534	2,117	2,401	7,379	3,826,705
	KW	0.73	0.20	0.23	0.69	366
	Therms	6,959	1,509	2,139	4,299	3,175,331
More O&M Focus	Number of filtered trainees	267	225	480	404	1,376
	kWh	1,767	1,864	1,199	1,246	1,970,030
	kW	0.31	0.30	0.21	0.23	341
	Therms	24	17	15	19	24,969

### 3.4 TOTAL UAS ESTIMATES

Table 3-7 shows the total UAS estimates for CY10.

**Table 3-7 Total Untracked Attributable Savings for CY10**

Savings	O&M Projects		One-Time Projects		Total
	Less O&M Focus	More O&M Focus	Less O&M Focus	More O&M Focus	
kWh	2,707,516	7,254,391	3,826,705	1,970,030	15,758,642
kW	845	776	366	341	2,328
Therm	43,179	3,342,470	3,175,331	24,969	6,585,949

### 3.5 COMPUTING TOTAL SAVINGS FOR FUTURE COURSES

A secondary goal was to provide a methodology for computing UAS for future courses. The 2008 report established a methodology for estimating UAS for one-time projects based on averages of trainee counts and savings estimates from the previous four years. The four-year average lessens the effect of year-to-year fluctuations in course attendance as well as other factors that may affect the likelihood of implementing projects after training courses that would result in UAS. Because of the four-year average, to compute total savings for future courses that occurred in a given year, one must know the number of attendees in less- and more-O&M-focused courses for the given year, one year before, two years before, and three years before. The following steps can be followed to compute savings in future evaluations:

1. Obtain course rosters for the latest year and the three previous years.
2. Filter the rosters to remove no shows, cancellations, and utility employees. Assign trainees with duplicate courses to the course with the lowest overall attendance, then remove the other entries for those trainees.

3. Divide the courses into more- and less-O&M focused categories. Table 1-7 categorizes the courses offered since 2004. This table can be used to identify the O&M focus of future courses. If a course does not appear on this list, the evaluator should work with Nancy Giere Associates, or the current implementor of the training, to identify if the course is more- or less-O&M-focused.
4. There will be eight categories: more- and less-O&M focused courses for each of the four years. Count the number of (post-filtering) trainees in each of these categories.
5. Multiply the number of trainees in each of the eight categories in step 4 by the per-trainee one-time savings estimates that correspond to those categories. Table 1-8 summarizes the per-trainee savings estimates for each year, course type, and project type.
6. Sum the eight products calculated in step 5 to compute total one-time project savings.
7. Multiply the number of trainees in less- and more-O&M-focused courses in the latest year by the per-trainee O&M savings estimate that corresponds to each category. The O&M savings estimates uses only the latest year.
8. Sum the two products calculated in step 7 to compute total O&M project savings.
9. Sum the sums from step 6 and step 8 to compute total savings.

Table 3-8. More- and Less-O&amp;M Focused Courses Offered 2004–2009

Less-O&M-focused courses	More-O&M-focused courses
Best Practices in Industrial Lighting	Building Operator Certification
Best Practices in Industrial Lighting Efficiency	Building Operator Certification - Level II
Bottom Line Results	Commercial Practical Energy Management
Compressed Air Best Practices	Energy Efficient Swimming Pool Operation and Maintenance
Compressed Air Leak Detection	Energy Efficient Swimming Pool Operation and Maintenance
Compressed Air Systems Best Practices Training	Hotel Energy Management
Fan System Assessment (Co-Sponsored by the Department of Energy)	Industrial Practical Energy Management
Fan System Assessment (Sponsored by U.S. Department of Energy)	Practical Energy Management - Commercial
Fan System Specialist Qualification (Co-Sponsored by the Department of Energy)	Practical Energy Management - Industrial
Industrial Refrigeration Best Practices	Practical Energy Management Implementation Series
Industrial Ventilation Systems Best Practices Overview	Preventative Operations and Maintenance - Schools and Government
Industrial Ventilation Systems Best Practices Training	School's Practical Energy Management
Pumping System Assessment	Smart Strategies for Healthcare
Pumping System Specialist Qualification	Smart Strategies for Hotels
Pumping System Specialist Qualification (Co-Sponsored by U.S. Department of Energy)	
Retrocommissioning for Large Commercial Buildings	
Steam Specialist Qualification (Co-Sponsored by U.S. Department of Energy)	
Steam System Assessment (Co-Sponsored by U.S. Department of Energy)	
Steam System Specialist Qualification	
Steam Systems Assessment (Sponsored by U.S. Department of Energy)	
Steam Systems Best Practices for Industrial Customers	
Steam Systems Best Practices for Schools & Government	
Steam Systems Best Practices Training	
Strategic Business Solutions: Surviving the Energy Price Shock	

**Table 3-9. Per-trainee Savings Estimates by Course, Year, and Project Type**

Project Type	Course Focus	Metric	Latest Year Minus 3	Latest Year Minus 2	Latest Year Minus 1	Latest Year
One-time	Less O&M	kWh	7,534	2,117	2,401	7,379
		kW	0.73	0.20	0.23	0.69
		Therms	6,959	1,509	2,139	4,299
	More O&M	kWh	1,767	1,864	1,199	1,246
		kW	0.31	0.30	0.21	0.23
		Therms	24	17	15	19
O&M <sup>14</sup>	Less O&M	kWh				27,349
		kW				8.53
		Therms				436
	More O&M	kWh				17,956
		kW				1.92
		Therms				8,273

### 3.6 OTHER FINDINGS

#### 3.6.1 Persistence of O&M projects

The CATI survey asked respondents what year their course-influenced O&M projects started, and if those changes were still in effect. On average, respondents indicated that 86 percent of the course-influenced O&M projects were still in effect at the time of the CATI survey (July 2010). Table 3-10 summarizes the percentage of O&M projects that are still active by the year in which they started. These results suggest that the assumption that O&M projects will last at least into the year after the course was taken is not unreasonable. In addition, the results from the 2008 projects suggest that some O&M projects can persist longer.

**Table 3-10. Active O&M Projects by Year of Project Initiation**

O&M Project Start Year	Total O&M Projects	Number Still Active (July 2010)	Percentage Still Active (July 2010)
Before 2008	2	2	100%
2008	21	21	100%
2009	69	58	84%
2010	11	10	91%
Don't know	11	7	64%
Total	114	98	86%

<sup>14</sup> Per-trainee savings for O&M projects are only estimated for a single year. Therefore estimates only appear in the last column of the table.

About 20 percent (23 out of 114) of the O&M projects persisted for at least two years. Ten percent (12 out of 114) persisted for less than two years. For the remaining 70 percent, there is not enough information to determine whether they will persist for at least two years.

These results should be interpreted with caution. We drew survey respondents from courses that occurred in 2008 and 2009. The survey reminded participants what date they took the course and asked them about any O&M changes that occurred because of the course. Because of these limitations, the number of discovered O&M projects that started before 2008 is very small. The survey also limited respondents to reporting a maximum of three changes. The high level of reported persistence could be due to a tendency to remember currently active changes more readily than inactive changes.

RLW Analytics conducted a study in 2005<sup>15</sup> that investigated the persistence of energy saving changes resulting from BOC courses two and four years after the course. The RLW study found that about 43 percent (ranging from 6 to 77 percent depending on project type) of the course-attributable O&M changes persisted for two years. After four years, the rate of persistence was about the same as it was at two years. RLW concluded that a five-year lifetime was a reasonable assumption for O&M changes resulting from BOC courses. However, based on the data presented, KEMA disagrees with this interpretation. KEMA's interpretation of the RLW data is that the median lifespan of an O&M project is about two years because about half of the projects persisted this long and half did not. The RLW results also suggest that if a change persists for at least two years, it is likely to continue persisting for several more years.

#### A. EFFECTS OF MULTIPLE COURSES AND COURSE LENGTH

KEMA examined the correlations between the number of courses taken, course duration, the number of O&M projects implemented, and each of the net savings metrics (kWh, kW, and therms) for the trainees with whom we completed CATI surveys and engineering reviews. None of the correlations were statistically significant at a 90 percent confidence level. Small sample size and restriction of range for courses taken and number of O&M projects prevented us from finding significant correlations involving those variables. Seventy-nine percent of the 2008 and 2009 trainees with whom we completed CATI surveys took a single course (Table 3-11). The maximum number of courses taken was four. Eighty-nine percent of the trainees with whom we completed an engineering review implemented a single O&M project (Table 3-12). The maximum number of O&M projects by a single trainee was eight.

---

<sup>15</sup> RLW Analytics. *Impact and Process Evaluation Building Operator Training and Certification (BOC) Program, Final Report*. Prepared for Northeast Energy Efficiency Partnerships. June 2005. Found online at: [http://www.theboc.info/pdf/Eval-BOC\\_NEEP\\_2005.pdf](http://www.theboc.info/pdf/Eval-BOC_NEEP_2005.pdf).



Table 3-11. Number of Courses Taken, by CATI Completes

Number of Courses	Number of CATI Completes	Percentage of CATI Completes
1	150	79%
2	31	16%
3	7	4%
4	1	1%
<b>Total</b>	<b>189</b>	<b>100%</b>

Table 3-12. Number of O&amp;M Projects, by Engineering Completes

Number of O&M Projects	Number of Engineering Completes	Percentage of Engineering Completes
1	24	89%
2	2	7%
8	1	4%
<b>Total</b>	<b>27</b>	<b>100%</b>

**APPENDIX A: CATI INSTRUMENT**

---

## Reaching the Trainee

**R1.**

Hello, may I please speak with <TRAINEE>? I'm calling from Braun Research on behalf of the Wisconsin Focus on Energy program. We are not trying to sell you anything.

- [Contact available] ..... 1 [SKIP TO R3]
- [Contact still at phone number but currently unavailable] ..... 2 [SKIP TO R5]
- [Contact not at phone number].....3

**R2.**

Did <TRAINEE> leave <COMPANY\_ORG>?

- [Yes] ..... 1
- [No] ..... 2 [SKIP TO R2C]
- [Don't know].....-97 [THANK AND TERMINATE]
- [Refused] .....-98 [THANK AND TERMINATE]

**R2A.**

Do you know what company or organization <TRAINEE> is working for now?

- [Yes] ..... 1
- [No] ..... 2 [THANK AND TERMINATE]
- [Don't know].....-97 [THANK AND TERMINATE]
- [Refused] .....-98 [THANK AND TERMINATE]

**R2B.**

Please tell me the name of the company or organization and which state it is located in.

[RECORD COMPANY/ORGANIZATION AND STATE. If they are retired, record 'retired']

- Don't know.....-97
- Refused .....-98



**R2C.**

Do you have an alternative phone number for this person?

- [Yes] ..... 1
- [No] ..... 2 [THANK AND TERMINATE]
- [Don't know].....-97 [THANK AND TERMINATE]
- [Refused] .....-98 [THANK AND TERMINATE]

**R2D.**

Please tell me what this phone number is.

- [RECORD PHONE NUMBER] \_\_\_\_\_ [THANK, END CALL, TRY NEW NUMBER]
- Don't know.....-97 [THANK AND TERMINATE]
- Refused .....-98 [THANK AND TERMINATE]

**R3.**

Hello, my name is \_\_\_\_\_ and I'm calling from \_\_\_\_\_ on behalf of the Focus on Energy Program. According to our records, in <TRAINING\_YEAR> you took a <TRAINING\_COURSE> training course that was administered by the Wisconsin Focus on Energy Program. Do you recall taking this training course?

- [Yes] ..... 1
- [No] ..... 2 [SKIP TO R7]
- [Don't know]..... -97 [SKIP TO R7]
- [Refused] ..... -98 [SKIP TO R7]

**R4.**

We are calling to find out why you took the <TRAINING\_COURSE> training course and how it may have influenced your workplace activities. Do you have a few minutes to answer some questions? Your responses will be kept confidential. [IF TRAINEE ASK HOW LONG THE SURVEY WILL TAKE, SAY ABOUT 10 MINUTES]

- [Yes] ..... 1 [SKIP TO R7]
- [No] ..... 2
- [Don't know]..... -97
- [Refused] ..... -98 [SKIP TO R6]

**R5.**

Is there a more convenient time when I can call you back?

- [Yes] ..... 1 [RECORD TIME AND CALL BACK STARTING AT R1]
- [No] ..... 2 [SKIP TO R6]
- [Don't know]..... -97 [SKIP TO R6]
- [Refused] ..... -98 [SKIP TO R6]

**R6.**

Thank you very much for your time today. Those are all the questions I have.

- [Trainee no longer available/Refused]..... 1 [END INTERVIEW]



**R7.**

What's your current job title?

- [RECORD JOB TITLE] \_\_\_\_\_
- [Don't know].....-97
- [Refused] .....-98

**R8.**

How many years have you worked for <COMPANY\_ORG>?

- [RECORD YEARS] \_\_\_\_\_
- [Don't know].....-97
- [Refused] .....-98

**R81.**

Do you have regular access to data on the energy consumption in your facility?

- [Yes] ..... 1
- [No] ..... 2
- [Don't know].....-97
- [Refused] .....-98

[IF R3=1 SKIP TO P1]

**R9.**

Thank you very much for your time today. Those are all the questions I have.

- [Trainee does not recall course] .....[END INTERVIEW] 1

**P1.**

What was your main reason for taking <TRAINING\_COURSE> in <TRAINING\_YEAR>?

[DO NOT READ RESPONSES, ONLY ALLOW ONE RESPONSE]

- [To increase the energy efficiency of my company/organization] ..... 1
- [To reduce the energy costs of my company/organization] ..... 2
- [To get an accreditation/certification]..... 3
- [To get new skills/knowledge working with equipment ..... 4
- [To help me sell energy-efficient products]..... 5
- [To increase the comfort levels in the buildings of my company/organization] ..... 6
- [To learn how my company/organization can use renewable energy] ..... 7
- [To help the environment/reduce global warming]..... 8
- [To increase my knowledge for my energy consulting practice]..... 9 [THANK AND TERMINATE]
- [Other] [RECORD] \_\_\_\_\_ ..... 10
- [Don't know].....-97
- [Refused] .....-98



**P11.**

Does your organization have a person whose job responsibilities include managing the energy use of your location?

- [Yes] ..... 1
- [No]..... 2 [Skip to ES19]
- [Don't know]..... -97 [Skip to ES19]
- [Refused] ..... -98 [Skip to ES19]

**P12.**

What is that person's name?

- [RECORD NAME] \_\_\_\_\_
- [Don't know].....-97
- [Refused] .....-98

## Energy Saving Changes in Operations and Maintenance

**ES19.**

Has <COMPANY\_ORG> made any energy-saving changes in its routine operations, building management practices, or equipment maintenance routines at its Wisconsin locations since you took the Focus on Energy <TRAINING\_COURSE> training course in <TRAINING\_YEAR>? Examples of this kind of change are things like inspecting equipment more often, cleaning equipment more often, or using equipment on a different schedule than you used to.

- [Yes] ..... 1
- [No] ..... 2 [SKIP TO ES41]
- [Don't know]..... -97 [SKIP TO ES41]
- [Refused] ..... -98 [SKIP TO ES41]

**ES20.**

Please provide a very brief summary of this [IF THIS IS NOT THE FIRST CHANGE, SAY "SECOND," "THIRD," ETC.] change?

[If they mention multiple changes, say: "ok, let's take them one at a time," then ask ES20A – ES35G for the first change and then repeat questions for second change, etc]

- [RECORD DESCRIPTION] \_\_\_\_\_ [SKIP TO ES22]
- [Don't know].....-97
- [Refused] .....-98



**ES20AA.**

Which of the following best describes this change? Would you say it was: [READ UNBRACKETED RESPONSES ONLY. ONLY ALLOW ONE RESPONSE. REPEAT CHOICES IF NECESSARY]

- A replacement of existing equipment? ..... 1
- A modification of existing equipment? ..... 2
- A new construction project? ..... 3
- A building expansion project?..... 4
- Or an ongoing change to your operations or maintenance procedures?5 [Skip to ES20A]
- [Other] [RECORD RESPONSE] \_\_\_\_\_ 6 [Skip to ES20A]
- [Don't know]..... -97 [Skip to ES20A]
- [Refused] ..... -98 [Skip to ES20A]

**ES20AB.**

We'll talk about that kind of project later. Right now I want to ask about changes to your routine operations, building management practices, or equipment maintenance routines. Examples of this kind of change are things like inspecting equipment more often, cleaning equipment more often, or using equipment on a different schedule than you used to. You might also think of these as low-cost or no-costs projects. Have you made any changes like this since taking the <TRAINING\_COURSE> training course in <TRAINING\_YEAR>?

- [Yes] ..... 1 [GO BACK TO ES20]
- [No] ..... 2 [SKIP TO ES41]
- [Don't know]..... -97 [SKIP TO ES41]
- [Refused] ..... -98 [SKIP TO ES41]

**ES20A.**

Are you familiar enough with this project to answer some questions?

- [Yes] ..... 1 [SKIP TO ES22]
- [No] ..... 2
- [Don't know]..... -97
- [Refused] ..... -98

**ES21.**

Who at <COMPANY\_ORG> would be familiar with this change?

- [RECORD NAME AND PHONE #] \_\_\_\_\_ [SKIP TO ES36]
- [Don't know]..... -97 [SKIP TO ES36]
- [Refused] ..... -98 [SKIP TO ES36]



**ES22.**

About what month and year did you implement this change?

ES22\_a. [RECORD MONTH]

ES22\_b. [RECORD YEAR]

[Don't know]..... -97 [BRACKET TO GET BEST GUESS]  
[Refused] ..... -98

**ES23.**

Were the facilities where you implemented this energy-saving change in your operations or maintenance routines in Wisconsin?

[Yes] ..... 1  
[No].....2  
[Don't know].....-97  
[Refused] .....-98

**ES23A.**

Did you use any of the information you learned in the <TRAINING COURSE> course when planning this change?

[Yes] ..... 1  
[No] ..... 2  
[Don't know].....-97  
[Refused] .....-98

**ES24.**

Do you think you received a rebate, a price discount, or any other financial assistance for this energy-saving change in your operations or maintenance routines?

[Yes] ..... 1  
[No] ..... 2 [SKIP TO ES26]  
[Don't know].....-97 [SKIP TO ES26]  
[Refused] ..... -98 [SKIP TO ES26]



**ES25.**

Do you think the rebate, price discount, or the majority of any other financial assistance was paid for by Focus on Energy?

- [Yes] ..... 1
- [No] ..... 2
- [Don't know].....-97
- [Refused] .....-98

**ES26.**

Do you think you received any assistance, other than financial, from Focus on Energy for this energy-saving change?

- [Yes] ..... 1
- [No] .....2 [SKIP TO ES27A]
- [Don't know].....-97 [SKIP TO ES27A]
- [Refused] .....-98 [SKIP TO ES27A]

**ES27.**

What was the nature of this assistance? [DO NOT READ. ALLOW MULTIPLE RESPONSES]

- [Energy savings information] ..... 1
- [Project cost information] ..... 2
- [Technology information] ..... 3
- [Helping sell the project to management] ..... 4
- [Helping find a vendor/contractor]..... 5
- [Other] [RECORD RESPONSE] \_\_\_\_\_ ..... 6
- [Don't know].....-97
- [Refused] .....-98

**ES27A.** [IF (ES24 = 2 OR ES25 = 2) AND ES26 = 2 (the got no help from Focus) THEN SKIP TO ES28]

If you had not received help from the Focus on Energy Program, how likely would you have been to undertake the energy saving change? ...Would you say you would have been ...[READ UNBRACKETED RESPONSES]

- Very likely ..... 1
- Somewhat likely ..... 2
- Not very likely ..... 3
- Or very unlikely..... 4
- [Don't know].....-97
- [Refused] .....-98





**ES28.**

Did the Focus on Energy <TRAINING\_COURSE> training course that you took in <TRAINING\_YEAR> influence this change in any way?

- [Yes] ..... 1
- [No] ..... 2 [SKIP TO ES30]
- [Don't know]..... -97 [SKIP TO ES30]
- [Refused] ..... -98 [SKIP TO ES30]

**ES29.**

How did this training course influence this change?

- [RECORD RESPONSE] \_\_\_\_\_
- [Don't know]..... -97
- [Refused] ..... -98

**ES30.**

If you had not taken the training course, how likely would you have made this energy saving change in your operations and maintenance routines? Would you say you would have been ...[READ UNBRACKETED RESPONSES]

- Very likely ..... 1
- Somewhat likely ..... 2
- Not very likely ..... 3
- Or very unlikely..... 4
- [Don't know]..... -97
- [Refused] ..... -98

**ES31**

If you had not taken this training course, how different might the timing have been for this energy-saving change? Would you say you would have undertaken it at the same time, earlier, or later?

- [Same time] ..... 1 [SKIP TO ES34]
- [Earlier] ..... 2 [SKIP TO ES34]
- [Later] ..... 3
- [Never] ..... 4 [SKIP TO ES34]
- [Don't know]..... -97 [SKIP TO ES34]
- [Refused] ..... -98 [SKIP TO ES34]

**ES32**

How many months later?

- [RECORD # OF MONTHS]\_\_\_\_\_
- [Don't know]..... -97 [BRACKET TO GET APPROX. MONTHS]
- [Refused] ..... -98



**ES33.**

Why do think that you would have undertaken this change later if you had not taken this training course?

- [RECORD RESPONSE] \_\_\_\_\_
- [Don't know].....-97
- [Refused] .....-98

**ES34**

If you had not taken the training course, how different would have been the amount of energy savings from this change in your operations or maintenance routines? Would you say that it would have produced the same amount of energy savings, less energy savings, or more energy savings without the training course?

- [The same amount of energy savings] ..... 1 [SKIP TO ES35A]
- [Less energy savings]..... 2
- [More energy savings] ..... 3 [SKIP TO ES35A]
- [Don't know].....-97 [SKIP TO ES35A]
- [Refused] .....-98 [SKIP TO ES35A]

**ES35.**

Why do you think the change would have produced less energy savings if you had not taken the training course?

- [RECORD RESPONSE] \_\_\_\_\_
- [Don't know].....-97
- [Refused] .....-98

**ES35A.**

Is this change in your operations and maintenance routines something you're still doing?

- [Yes] ..... 1
- [No]..... 2 [Skip to ES35E]
- [Don't know].....-97
- [Refused] .....-98

**ES35B.**

How does your company ensure that these new operations and maintenance practices remain part of your routine activities?

- [RECORD DESCRIPTION] \_\_\_\_\_
- [Don't know].....-97
- [Refused] .....-98



**ES35C.**

Can you anticipate anything in the near future that would cause you to stop these new practices?

- [Yes] ..... 1
- [No] ..... 2 [SKIP TO ES36]
- [Don't know]..... -97 [SKIP TO ES36]
- [Refused] ..... -98 [SKIP TO ES36]

**ES35D.**

What would these be? [ALLOW MULTIPLE RESPONSES]

- [We couldn't see enough energy savings]..... 1
- [The person doing/managing these practices got too busy].....2
- [The person doing/managing these practices left the company].....3
- [We simply forgot about it].....4
- [Other reasons] [RECORD].....5
- [Don't know].....-97
- [Refused] .....-98

[IF ES35A not equals 2 SKIP TO ES36]

**ES35E.**

About what month and year did you *stop* doing it? [if necessary, it = the change in operations and maintenance routines]

ES35E\_a. [RECORD MONTH]

ES35E\_b. [RECORD YEAR]

- [Don't know]..... -97 [BRACKET TO GET BEST GUESS]
- [Refused] .....-98



**ES35F.**

Why did you stop doing it? [if necessary, it = the change in operations and maintenance routines]

[ALLOW MULTIPLE RESPONSES]

[We couldn't see enough energy savings]..... 1

[The person doing/managing these practices got too busy].....2

[The person doing/managing these practices left the company]..... 3

[We simply forgot about it]..... 4

[Other reasons] [RECORD].....5

[Don't know].....-97

[Refused] .....-98

**ES35G.**

What are you doing now instead of these practices?

[Nothing] .....1 [Confirm whether this is really going back to the old way of doing it]

[We went back to the old way of doing it] ..... 2

[We implemented a different energy saving change]..... 3

[We no longer have applicable equipment] ..... 4

[Other] [RECORD] .....5

[Don't know].....-97

[Refused] .....-98

**ES36.**

Has <COMPANY\_ORG> made any other changes in its routine operations, building management practices, or equipment maintenance routines at its Wisconsin locations since you took the Focus on Energy <TRAINING\_COURSE> training course in <TRAINING\_YEAR>?

[Yes] ..... 1 [REPEAT QUESTIONS ES20-ES35G FOR NEW CHANGE]

[No] ..... 2

[Don't know].....-97

[Refused] .....-98



[If ES41 through ES45 have already been asked (respondent went back to ES20 from ES1A) then skip to ES1]

**ES41.**

Is <COMPANY\_ORG> *planning* to make any energy-saving changes in its routine operations, building management practices, or equipment maintenance routines at its Wisconsin locations as a result of the Focus on Energy <TRAINING\_COURSE> training course in <TRAINING\_YEAR>?

- [Yes] ..... 1
- [No] ..... 2 [SKIP TO ES1]
- [Don't know]..... -97 [SKIP TO ES1]
- [Refused] ..... -98 [SKIP TO ES1]

**ES42.**

Please provide a very brief summary of this [IF THIS IS NOT THE FIRST CHANGE, SAY "SECOND," "THIRD," ETC.] planned change? [IF THEY MENTION MULTIPLE CHANGES, SAY: "OK, LET'S TAKE THEM ONE AT A TIME," THEN ASK ES42 – ES45 FOR THE FIRST CHANGE AND THEN REPEAT QUESTIONS FOR SECOND CHANGE, ETC]

- [RECORD DESCRIPTION] \_\_\_\_\_ .....
- [Don't know]..... -97
- [Refused] ..... -98

**ES43.**

About what month and year did you think you will implement this change?

ES43\_a. [RECORD MONTH]

ES43\_b. [RECORD YEAR]

- [Don't know]..... -97 [BRACKET TO GET BEST GUESS]
- [Refused] ..... -98



**ES44.**

Are the facilities where you intend to implement this energy-saving change in your operations or maintenance routines in Wisconsin?

- [Yes] ..... 1
- [No].....2
- [Don't know].....-97
- [Refused] .....-98

**ES45.**

Has <COMPANY\_ORG> planned any other changes in its routine operations, building management practices, or equipment maintenance routines at its Wisconsin locations since you took the training course?

- [Yes] ..... 1 [REPEAT QUESTIONS ES41-ES45 FOR NEW CHANGE]
- [No] ..... 2
- [Don't know].....-97
- [Refused] .....-98

## End Users Identifying EE Spillover Projects

**ES1.**

Since you took the Focus on Energy <TRAINING\_COURSE> training course in <TRAINING\_YEAR> has <COMPANY\_ORG> completed any energy-saving projects in your Wisconsin buildings? By energy-saving projects I mean something like the installation of energy-saving equipment or a new construction or retrofit project that saves energy?

- [Yes] ..... 1
- [No] ..... 2 [SKIP TO F1]
- [Don't know].....-97 [SKIP TO F1]
- [Refused] .....-98 [SKIP TO F1]



**ES2.**

Please provide a very brief description of this project.

[IF THEY MENTION MULTIPLE PROJECTS, SAY: “OK, LET’S TAKE THEM ONE AT A TIME,” THEN ASK ES1A – ES18 FOR THE FIRST PROJECT AND THEN REPEAT QUESTIONS FOR SECOND PROJECT, ETC.]

[RECORD DESCRIPTION] \_\_\_\_\_ [SKIP TO ES4]

[Don’t know].....-97

[Refused] .....-98 [SKIP TO ES4]

**ES1A.**

Which of the following best describes this energy-saving project? Would you say it involves: [READ UNBRACKETED RESPONSES ONLY. ONLY ALLOW ONE RESPONSE. REPEAT CHOICES IF NECESSARY]

- A replacement of existing equipment? ..... 1
- A modification of existing equipment? ..... 2
- A new construction project? ..... 3
- A building expansion project?..... 4
- Or an ongoing change to your operations or maintenance procedures? ..... 5
- [Other] [RECORD RESPONSE] \_\_\_\_\_ ..... 6
- [Don’t know].....-97
- [Refused] .....-98

[If ES1A = 5 and there are less than 3 repeats of ES20, go to ES20A.  
If ES1A = 5 and there are 3 repeats of ES20, skip to ES18]

**ES1B.**

What type of energy-using equipment did the project involve? [DO NOT READ. ALLOW MULTIPLE RESPONSES]

- [Lighting] ..... 1
- [Heating/Cooling/HVAC] ..... 2
- [Motors/Variable Speed Drives (VSDs)/ Pumps] ..... 3
- [Fans/Ventilation]..... 4
- [Compressed Air]..... 5
- [Steam Systems] ..... 6
- [Refrigeration]..... 7
- [Changes in Manufacturing Processes]..... 8
- [Swimming Pool Motors]..... 9
- [Other] [RECORD RESPONSE] \_\_\_\_\_ ..... 10
- [Other] [RECORD RESPONSE] \_\_\_\_\_ ..... 11
- [Don’t know].....-97
- [Refused] .....-98



**ES4.**

About what year was this project completed?

- [RECORD YEAR] \_\_\_\_\_ [SKIP TO ES5]
- [PROJECT IS STILL ONGOING] ..... 1
- [Don't know]..... -97 [BRACKET TO GET BEST GUESS, SKIP TO ES5]
- [Refused] ..... -98 [SKIP TO ES5]

**ES4B.**

About what year do you expect this project to be completed?

- [RECORD YEAR] \_\_\_\_\_
- [Don't know]..... -97 [BRACKET TO GET BEST GUESS]
- [Refused] ..... -98

**ES5.**

Were the facilities where you implemented this energy-saving change in your operations or maintenance routines in Wisconsin?

- [Yes] ..... 1
- [No]..... 2
- [Don't know]..... -97
- [Refused] ..... -98

**ES5A.**

Did you use any of the information you learned in the training course in planning this project?

- [Yes] ..... 1
- [No] ..... 2
- [Don't know]..... -97
- [Refused] ..... -98

**ES18.**

Has <COMPANY\_ORG> implemented any other energy-saving projects in its Wisconsin locations since you took the training course in <TRAINING\_YEAR>?

- [Yes] ..... 1 [REPEAT QUESTIONS ES1A-ES18 FOR NEW PROJECT]
- [No] ..... 2
- [Don't know]..... -97
- [Refused] ..... -98





## Firmographics

### F1.

Finally I would like to collect some information about your company or organization.  
 What are the principal activities of your company or organization at your location?

[DO NOT READ RESPONSES. ONLY ALLOW ONE RESPONSE]

- [Agricultural: e.g., production crops, livestock, agricultural services]..... 1 [SKIP TO F3]
- [Water or wastewater treatment facility]..... 2 [SKIP TO F3]
- [Industrial: manufacturing/industrial process] ..... 3
- [Warehouse nonrefrigerated]..... 4 [SKIP TO F3]
- [Warehouse refrigerated]..... 5 [SKIP TO F3]
- [Education: including preschool, daycare] ..... 6 [SKIP TO F3]
- [Food service: e.g., restaurant, bar, fast food, cafeteria] ..... 7 [SKIP TO F3]
- [Food sales: e.g., grocery store] ..... 8 [SKIP TO F3]
- [Enclosed mall] ..... 9 [SKIP TO F3]
- [Strip mall] ..... 10 [SKIP TO F3]
- [Retail excluding enclosed or strip mall:  
     e.g., auto dealership, showroom, store] ..... 11 [SKIP TO F3]
- [Public order and safety: including courthouse, probation office, jail] ..... 12 [SKIP TO F3]
- [Nursing home/Assisted living (Skilled nursing)]..... 13 [SKIP TO F3]
- [Lodging: e.g., hotel/motel/inn/resort, dormitory/fraternity/sorority]..... 14 [SKIP TO F3]
- [Lodging: residential] ..... 15 [SKIP TO F3]
- [Health care inpatient: e.g., hospital] ..... 16 [SKIP TO F3]
- [Health care outpatient: e.g., doctor/dentist office, clinic]..... 17 [SKIP TO F3]
- [Laboratory] ..... 18 [SKIP TO F3]
- [Religious worship] ..... 19 [SKIP TO F3]
- [Public assembly:  
     incl. theater, nightclub, library, museum, gym, bowling alley]..... 20 [SKIP TO F3]
- [Service:  
     e.g., auto service/repair, dry cleaner/laundromat, repair shop, post office]21 [SKIP TO F3]
- [Office/Professional: including bank, government]..... 22 [SKIP TO F3]
- [Other] [SPECIFY]\_\_\_\_\_ 23 [SKIP TO F3]
- [Don't know]..... -97 [SKIP TO F3]
- [Refused] ..... -98 [SKIP TO F3]



**F2.**

Briefly describe what kind of manufacturing is done at your location?

[Textile manufacturing] .....	1
[Wood manufacturing] .....	2
[Plastics manufacturing] .....	3
[Food manufacturing] .....	4
[Metal manufacturing] .....	5
[Goods manufacturing] .....	6
[Assembly].....	7
[Other] [SPECIFY] .....	96
[Don't know].....	-97
[Refused] .....	-98

**F3.**

How many full-time employees work for your organization at your location?

[RECORD NUMBER OF EMPLOYEES]_____	
[Don't know].....	-97
[Refused] .....	-98

**F4.**

How many part-time employees work for your organization at your location?

[RECORD NUMBER OF EMPLOYEES]_____	
[Don't know].....	-97
[Refused] .....	-98

**F5.**

What is the total enclosed square footage of the space your organization occupies at your location? Your best estimate is fine.

[RECORD # SQ FT] .....	_____
[Don't know].....	-97 [BRACKET]
[Refused] .....	-98

**F6.**

At your location, does your organization [READ LIST]...

Own all of the space it occupies? .....	1
Lease all of the space it occupies?.....	2
Or own some and lease some of the space? .....	3
[Don't know].....	-97
[Refused] .....	-98



**F7.**

Does your organization operate at a single location, at multiple locations, or is it a franchise organization?

- [Single location] ..... 1 [THANK AND TERMINATE SURVEY]
- [Multiple locations—not including franchise organization] ..... 2
- [Franchise organization] ..... 3
- Don't know..... -97 [THANK AND TERMINATE SURVEY]
- Refused ..... -98 [THANK AND TERMINATE SURVEY]

**F8.**

Is your organization headquartered in Wisconsin?

- [Yes] ..... 1
- [No] ..... 2
- [Don't know]..... -97
- [Refused] ..... -98

[THANK AND TERMINATE SURVEY]