PA Consulting Group

KEMA

State of Wisconsin Public Service Commission of Wisconsin

Focus on Energy Evaluation

Renewables: Impact Evaluation
January through September CY09

March 22, 2010

Evaluation Contractor: PA Consulting Group Inc.

Prepared by: Miriam L. Goldberg, Bobbi Tannenbaum, Ben Jones, and Brian Bak, KEMA Inc.

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State of Wisconsin Public Service Commission of Wisconsin

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1. EXECUTIVE SUMMARY

This report presents the results of the impact evaluation of the statewide Focus on Energy Renewables program (Program). We completed the impact evaluation on measures installed January 1, 2009, through September 30, 2009, which is the first nine months of contract year 2009 (CY09). The principal objective of the impact evaluation was to determine the energy and demand offset attributable to the program. In this report, we sometimes refer to energy and demand offset by renewable energy systems as savings.

KEMA completed participant surveys and engineering reviews to calculate adjustment factors used to determine an overall realization rate. The realization rate is the percentage of program-tracked savings (demand and energy) that is achieved and attributable to the program. We will apply these factors, when finalized, to the population of projects completed from January 1 through December 31, 2009, in the upcoming semiannual report.

The adjustment factors estimated from the data collection and analysis include:

- **Gross savings adjustment factor.** This factor adjusts tracked gross savings for installation and engineering verification of savings estimates. Applying the gross savings adjustment factor to tracked gross savings produces the estimate of verified gross installed savings.
- **Attribution factor.** This factor adjusts verified gross savings for program attribution.
- **Realization rate.** This factor combines the gross savings adjustment factor and the attribution factor. (It is the ratio of net savings to tracking gross savings.)

KEMA analysts called participants in November and December of 2009 to complete the interviews. We had an overall survey response rate of 90 percent, with 89 percent for nonresidential respondents and 92 percent for residential. In addition, we completed vendor (supply side) interviews related to three projects.

KEMA completed interviews representing 95 percent of tracked kWh offset and more than 99 percent of therms. These included all eligible biogas[1] and biomass projects, 26 percent of solar electric, 21 percent of solar hot water, and 88 percent of wind projects.

1.1 ENERGY SAVINGS RESULTS

1.1.1 Gross savings adjustment factor

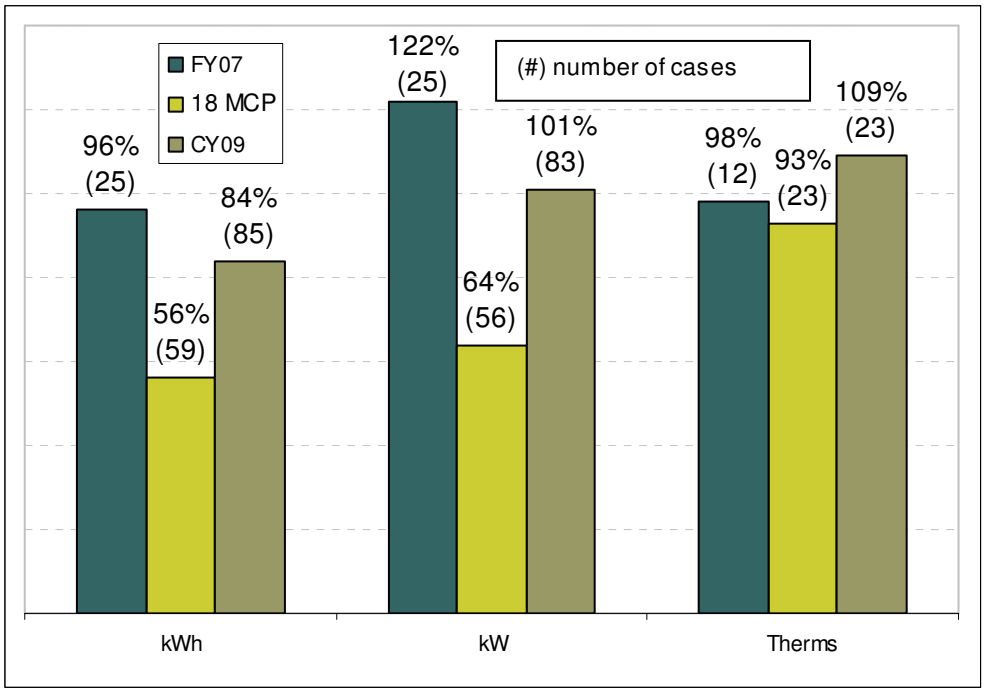
We confirmed installation for 100 percent of the projects sampled.

Verified gross savings are 84 and 101 percent, for kWh and kW respectively, but the variation among individual projects was substantial. Verified gross therm savings are 109 percent of program tracked therm savings Overall, the verified gross savings factors (relative to tracked savings) for CY09 are less than 100 percent for electrical energy (kWh) and over 100 percent for electrical demand (kW) and therms. This is a significant improvement over the 18 MCP (see Figure 1-1).

[1] One biogas project had no tracked savings (it saved LPG), so it was ineligible for a survey.

KWh verified gross adjustments are less than 100 percent due to a misinterpretation of a key input in calculating biogas savings. In addition, a substantial underestimate of the parasitic load for one large biomass project contributed to the low kWh adjustment factor. The Program's calculation of energy production from wind systems is improving, but consistently overestimates offsets. Solar electric and solar hot water had verified gross ratios approaching 100 percent.

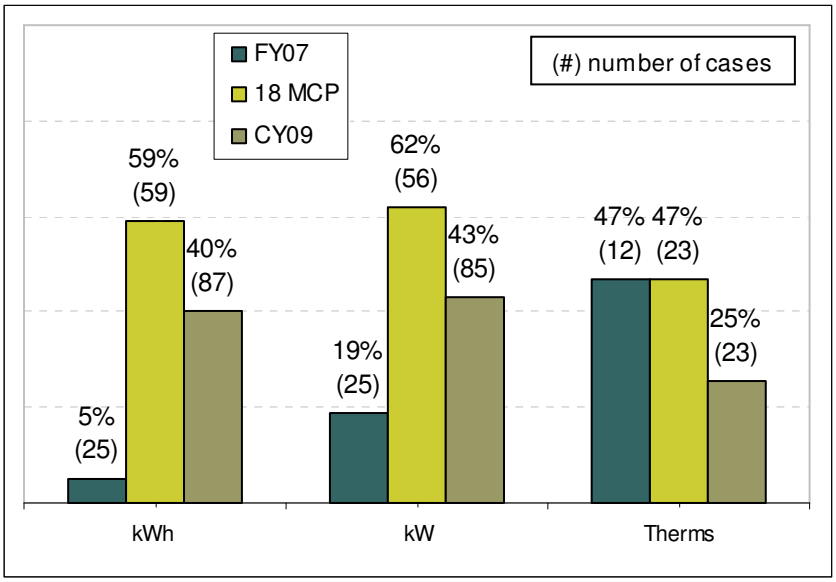
Figure 1-1. Overall Verified Gross Adjustment Factors CY09 and Past Evaluations



1.1.2 Attribution adjustment factors

Attribution is the percent of tracked savings that is directly attributable to the program. We used participant and vendor self-report surveys to estimate attribution. The CY09 attribution factors for the program overall are 40, 43, and 25 percent for kWh, kW, and therms, respectively, as shown in Figure 4-3. This represents a substantial decrease in attribution.

Figure 1-2. Overall Program Attribution
CY09 and Past Two Evaluations



1.1.3 Net energy impacts

We calculate the net energy impacts based on an overall realization rate. The realization rate combines the effect of the gross savings adjustment factors and the attribution factors. The CY09 realization rates for the program overall are 34, 43, and 28 percent for kWh, kW, and therms, respectively, as shown in Table 1-1.

Table 1-1. Overall Adjustment Factors
CY09

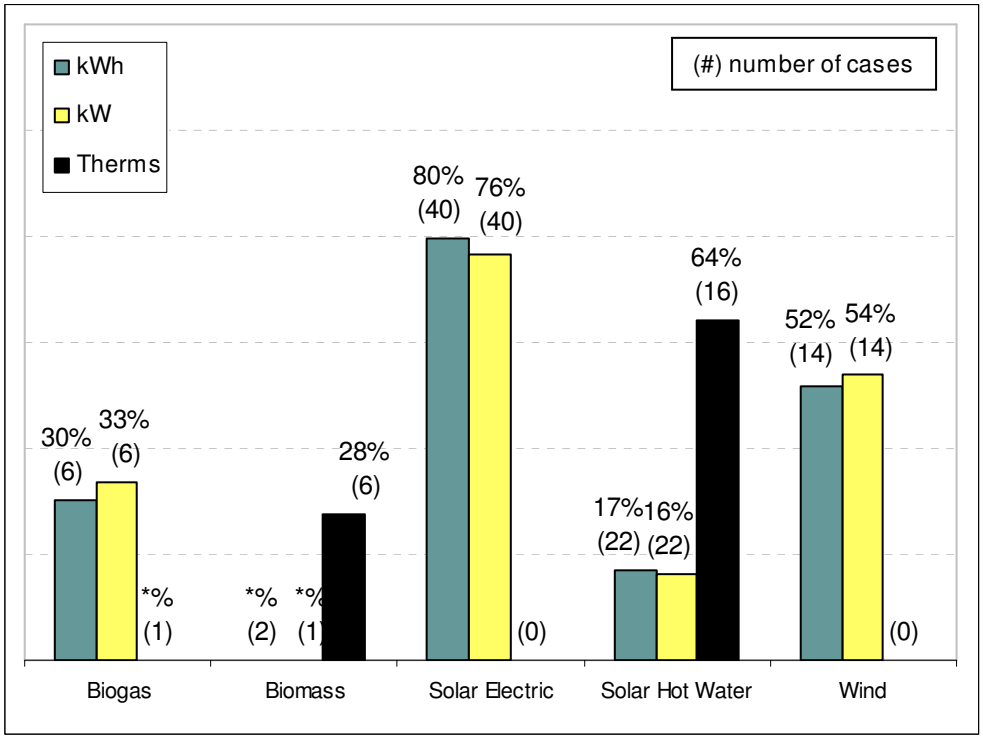
Adjustment Factor	kWh				kW				Therms			
			Margin of Error (90% confidence)				Margin of Error (90% confidence)				Margin of Error (90% confidence)	
	n[a]	Estimate	CY09	Extra-polated	n[a]	Estimate	CY09	Extra-polated	n[a]	Estimate	CY09	Extra-polated
Installation Rate	86	100%	± 0.0%	± 0.0%	85	100%	± 0.0%	± 0.0%	23	100%	± 0.0%	± 0.0%
Engineering Verification Factor	85	84%	± 0.2%	± 16.6%	83	101%	± 0.5%	± 12.8%	23	109%	± 0.0%	± 0.3%
Gross Savings Adjustment Factor	85	84%	± 0.2%	± 16.6%	83	101%	± 0.5%	± 12.8%	23	109%	± 0.0%	± 0.3%
Attribution Factor	87	40%	± 0.8%	± 34.9%	85	43%	± 1.9%	± 27.5%	23	25%	± 0.0%	± 0.9%
Realization Rate	85	34%	± 0.7%	± 30.0%	83	43%	± 1.9%	± 28.3%	23	28%	± 0.1%	± 1.0%

[a] The gross savings adjustment factor and the realization rate are not calculated directly but are products of other adjustment factors. Therefore, sample sizes reflect the minimum sample size used in calculating these two adjustment factors.

Realization rates are the combined effect of verified gross factors and self-reported attribution. The realization rates vary by technology, as do the reasons for rates below 100 percent. Solar electric has the highest realization rate, roughly equal to attribution due to high verified gross saving factors. Biomass and biogas have low realization rates resulting mostly from low attribution rates. Wind has mid-range realization rates due to the combined effects of

verified gross adjustment (~ 68 percent) and attribution (78 percent). Solar hot water (SHW) has a low realization rate for kWh and kW for two reasons. First, there is low attribution for SHW projects offsetting electricity. Second, there is high attribution for SHW projects offsetting therms that have parasitic electric loads. The solar hot water realization rate for systems offsetting therms are mid-range, due mostly to attribution. We show technology level realization rates in Figure 1-3.

Figure 1-3. Realization Rates by Technology



*Ratios not reported to protect respondent confidentiality

1.1.4 Total impacts

We report the total impacts for the first nine months of the CY09 Renewable Program in Table 1-2 below.

Table 1-2. Total Impacts CY09 Renewable Program

Tracked Savings			Verified Gross Savings			Net Savings		
kWh	Peak kW	Therms	kWh	Peak kW	Therms	kWh	Peak kW	Therms
18,711,469	2,320	4,907,171	15,650,627	2,339	5,349,792*	6,310,350	1,004	1,363,598

*Includes 3,000 therms of untracked savings from solar space heating.

1.2 RECOMMENDATIONS

We recommend that the program consider requiring calculation and documentation of all parasitic loads in the application form. We also suggest taking into consideration parasitic load when determining whether to fund a project. The program may want to consider the overall impacts of a project (not just addressing a single fuel) so that parasitic loads for biomass projects do not create substantial electric loads.

Finally, we also recommend that the program institute a calculation review process prior to approval of large biogas and biomass projects. The program should institute an internal calculation review process for all projects above a certain pre-determined limit. A second set of eyes should eliminate most calculation errors, as well as missing documentation and parasitic load calculations. More accurate production estimates will improve program realization rates.

In general, we continue to encourage the program to document fully the calculations and assumptions used to determine renewable energy production. This is imperative when the program uses calculation approaches or assumed values that differ from the Standard Calculation guidelines. We recognize that there are advances in knowledge and technology for renewable energy systems (e.g., wind and biogas) that may improve either the calculation approach or the default values. If this information is included in project files, we can use this information in our evaluations.

2. INTRODUCTION

This report presents the results of the impact evaluation of the statewide Focus on Energy Renewables program (Program) measures implemented in the first nine months of the calendar year 2009 contract period (CY09).[2] The principal objective of the impact evaluation was to determine the energy and demand offset attributable to the program. In this report, we refer to energy and demand offset by renewable energy systems as savings. The analysis calculates a set of adjustment factors that are used to determine evaluation verified gross and net energy savings for the statewide Focus on Energy Renewable program. Since the start of the program, the evaluation team has implemented at least one round of data collection and document review annually to estimate net energy savings for the Renewables Program (the Program). This round of evaluation uses a revised survey instrument.

In this section, we summarize the evaluation approach and describe the organization of the remainder of the report.

2.1 OVERVIEW OF APPROACH

KEMA uses the statistical procedure of ratio estimation to develop estimates of evaluation verified gross and net impacts. There are three basic steps to the process.

- **Verify energy savings for a sample of program participants.** KEMA estimated energy savings under current conditions for a sample of participants that installed renewable energy systems during the first nine months of CY09. A KEMA engineer conducted detailed engineering reviews to verify program-tracked gross savings. Program tracking data, project documentation, input from customer interviews, meters or inverter readings, and secondary resources were used for the engineering reviews.
- **Determine program attribution for a sample of program participants.** KEMA staff conducted interviews with a sample of program participants to verify project installation, to collect detailed information for the engineering review, and to determine the program's impact on the decision to install a renewable energy system (at that time and of that size). If participants had self-reported program attribution of less than 75 percent and they indicated that the vendor influenced their decisions, KEMA completed a survey with the vendor. We used the vendor survey to determine the program's impact on the vendor's actions for that project.
- **Expand sample results to the population of customers.** The sample results obtained above were expanded to the population by calculating the ratios of verified-to-tracked (gross savings adjustment factor) and attributable-to-verified (attribution factor) for the sample. Untracked space heating savings from solar hot water systems were then added to the total savings.[3]

[2] The CY09 contract period refers to program implementation between January 1, 2009, and December 31, 2009. This impact evaluation looks at projects installed in the first nine months of CY09: January 1, 2009, through September 30, 2009.

[3] Although the program provides incentives for and tracks only solar hot water savings, some solar hot water projects resulted in energy savings from space heat. We quantified these savings separately.

The adjustment factors estimated from the data collection and analysis include:

- **Gross savings adjustment factor.** This factor adjusts tracked gross savings for installation and engineering verification of savings estimates. Applying the gross savings adjustment factor to tracked gross savings produces the estimate of verified gross savings.
- **Attribution factor.** This factor adjusts verified gross savings for program attribution.
- **Realization rate.** This factor combines the gross savings adjustment factor and the attribution factor. (It is the ratio of net savings to tracking gross savings.)

2.2 ORGANIZATION OF REPORT

This report contains three additional sections and five appendices.

Section 3: Methodology covers the survey sampling and response rate, and discusses the key indices used to develop the realization rate.

Section 4: Energy Savings Results is a summary of the adjustment factors presented in this report, followed by the energy savings results. The CY09 results are provided for kWh, kW, and therms for the first nine months of the program year.

Section 5: Summary and Conclusions summarizes the findings and makes some recommendations to improve realization rates.

Following Section 5 are five appendices:

Appendix A: Participant Survey. A copy of the participant survey.

Appendix B: Selected Survey Results. We report the results of the direct attribution questions and provide open-ended responses provided by respondents in support of their answers.

Appendix C: Additional Detail for Sampling and Results. A summary of the sampling methodology is included in Section 2. Appendix E adds additional detail regarding the use of the MBSS sampling system. The completed analysis is based on a sample that represents 95 and more than 99 percent of electric and therm savings, respectively.

Appendix D: Ratio Estimation Methodology. A detailed discussion of the ratio estimation method is provided in Appendix D.

Appendix E: Attribution Analysis Methodology. A detailed discussion of the attribution method is provided in Appendix E.

3. METHODOLOGY

3.1 SURVEY SAMPLING AND RESPONSE RATE

This Renewables impact evaluation is based upon projects installed in the nine-month period from January 1 through September 30, 2009. In November 2009, KEMA selected a sample of projects completed in this period to develop estimated program impacts. The sample was selected to be representative of the program as a whole and of individual technology/sector combinations, (e.g., solar electric/residential). We will apply the results of the analysis to all projects completed in 2009 for program year results in the next semiannual report. We completed participant surveys and engineering reviews on this sample of projects.

In this section, we discuss the population characteristics, our sampling approach, and survey response rates. We also describe the key indices used to develop a final realization rate for the program savings.

3.1.1 Sample population

The Renewable Energy program has a large number of small projects (as measured in energy savings or offset) and a few very large projects that represent a substantial amount of energy savings (offset). Solar projects (both electric and hot water) constitute 90 percent of the completed projects during the first nine months of CY09 (see Table 3-1), but account for eight and one percent of electric and therm savings, respectively (see Table 3-1). Biogas and biomass projects represent five percent of the projects completed, but represent 94 and 99 percent of the electric and therm energy savings, respectively.

Table 3-1. Population of Projects by Technology and Customer Type

Technology	N	kWh	Peak kW	Therms	Percent of Overall			
					N (%)	kWh (%)	Peak kW (%)	Therms (%)
Nonresidential Projects								
Biogas	8	17,507,821	1,871	1,929	3%	94%	81%	0%
Biomass	6	-498,735	-98	4,873,677	2	-3	-4	99
Solar Electric (PV)	62	665,436	261	0	20	4	11	0
Solar Water Heating	32	-3,344	0	26,211	11	0	0	1
Wind	3	57,813	6	0	1	0	0	0
All Nonresidential	**111**	**17,728,991**	**2,040**	**4,901,817**	**37%**	**95%**	**88%**	**100%**
Residential Projects								
Solar Electric (PV)	98	600,489	238	0	32	3	10	0
Solar Water Heating	80	99,912	10	5,354	26	1	0	0
Wind	14	282,077	31	0	5	2	1	0
All Residential	**192**	**982,478**	**279**	**5,354**	**63%**	**5%**	**12%**	**0%**
All Projects	**303**	**18,711,469**	**2,320**	**4,907,171**	**100%**	**100%**	**100%**	**100%**

3.1.2 Sample stratification

KEMA designed the sample to achieve precision within ±10 percent at the 90 percent confidence level for the program, for each of three savings types (kWh, kW, and therms). We stratified projects by technology, sector, and by size. We stratified by technology and sector to improve precision at the technology and sector level, which are of interest at a programmatic level. We stratified by size in order to get a range of project sizes, while optimizing precision for the overall savings. We determined project size by estimating utility avoided costs from tracked project savings. This allowed us to put all savings types into a common unit (dollars).[4] KEMA used Model Based Statistical Sampling (MBSS) to develop our sample design. MBSS produces an optimally allocated sample by maximizing precision based on the population and the expected variance in the population.

We show the stratification cells in Table 3-2. This table also shows the population within each stratum, the range of avoided costs, the percent of avoided costs within the stratification cell, and the target number of completed surveys from each stratification cell. The resulting target completes included 48 nonresidential and 47 residential projects from a population of 111 nonresidential and 192 residential projects.

Table 3-2. Stratification of the Population

Technology	Size	Population					Target
		N	Min AC ($)	Max AC ($)	Avg AC ($)	Percent of Total AC (%)	
Nonresidential Projects							
Biogas	S	3	0	87,816	29,830	1.6%	3
Biogas	M	1	98,180	98,180	98,180	1.8	1
Biogas	L	4	149,975	264,097	198,918	14.5	4
Biomass	S	3	2,322	5,028	3,632	0.2	3
Biomass	M	2	6,194	8,996	7,595	0.3	2
Biomass	L	1	4,291,818	4,291,818	4,291,818	78.4	1
Solar Electric	S	35	153	837	512	0.3	6
Solar Electric	M	17	854	1,747	1,300	0.4	6
Solar Electric	L	10	1,804	3,578	2,499	0.5	6
Solar Hot Water	S	19	54	404	177	0.1	4
Solar Hot Water	M	6	412	907	752	0.1	3
Solar Hot Water	L	4	1,014	1,409	1,255	0.1	3
Solar Hot Water	XL	3	2,126	4,184	3,239	0.2	3
Wind	S	2	911	999	955	0.0	2
Wind	L	1	1,331	1,331	1,331	0.0	1
All Nonresidential		**111**	**0**	**4,291,818**	**48,578**	**98.4%**	**48**

[4] Utility avoided costs are the combined dollar value to a WI utility of the kWh, kW, and therms saved.

Technology	Size	Population					Target
		N	Min AC ($)	Max AC ($)	Avg AC ($)	Percent of Total AC (%)	
Residential Projects							
Solar Electric	S	40	77	422	318	0.2%	6
Solar Electric	M	26	427	669	535	0.3	6
Solar Electric	L	19	699	935	809	0.3	5
Solar Electric	XL	13	987	1,816	1,307	0.3	5
Solar Hot Water	S	41	-33	125	76	0.1	4
Solar Hot Water	M	23	125	187	148	0.1	4
Solar Hot Water	L	16	191	357	262	0.1	3
Wind	S	4	84	579	345	0.0	4
Wind	M	2	810	810	810	0.0	2
Wind	L	8	1,107	3,821	1,601	0.2	8
All Residential		**192**	**-33**	**3,821**	**445**	**1.5%**	**47**
Renewables Program		**303**	**-33**	**4,291,818**	**18,078**	**100%**	**95**

3.1.3 Data collection and response rate

KEMA analysts completed participant surveys to verify the project equipment characteristics and installation and to determine participant self-reports of project attribution to the program. The survey included a series of questions that addressed all aspects of program offerings and their influence on the decision to install the renewable energy system, as well as some general satisfaction questions. The survey instrument is included in Appendix A. Appendix B includes selected responses from the survey with cross tabulations by attribution results.

KEMA completed engineering reviews on the sample projects to determine a verified gross installed savings (offset) for each of the sample projects. We based the engineering review on the project paperwork, participant responses, and other secondary responses. We discuss the engineering reviews in more detail in Section 4.2.

KEMA analysts called participants in November and December of 2009 to complete the interviews. We called each participant a minimum of six times before we randomly sampled a replacement project for completion. We had an overall survey response rate of 90 percent, with 89 percent for nonresidential respondents and 92 percent for residential. In addition, we completed vendor (supply side) interviews related to three projects. Consistent with recent Focus Renewables impact evaluations, we completed vendor surveys when participants indicated the vendor played a substantial role in the decision to install the system *and* attribution was 75 percent or less. [5] [6]

[5] We found no cases in which participant attribution was between 75 and 100 percent and the respondent indicated vendor influence.

[6] This approach is consistent with the 18 MCP and varies somewhat from the BP approach.

KEMA completed interviews representing 93 projects (see Table 3-3) that represented 95 percent of tracked kWh offset and more than 99 percent of therms. These included all eligible biogas[7] and biomass projects, 26 percent of solar electric, 21 percent of solar hot water, and 88 percent of wind projects.

Table 3-3. Completed Surveys by Technology and Customer Type

Technology	Pop N	Target N	Comp. N	Completes: Percent of Overall Population Savings kWh (%)	Peak kW (%)	Therms (%)
Nonresidential Projects						
Biogas	8	8	7	93.6%	80.6%	0.0%
Biomass	6	6	6	-2.7	-4.2	99.3
Solar Electric (PV)	62	18	19	1.5	4.9	0.0
Solar Water Heating	32	13	13	0.0	0.0	0.4
Wind	3	3	3	0.3	0.3	0.0
All Nonresidential	111	48	48	92.7%	81.6%	99.7%
Residential Projects						
Solar Electric (PV)	98	22	22	0.8	2.7	0.0
Solar Water Heating	80	11	11	0.1	0.1	0.0
Wind	14	14	12	1.3	1.2	0.0
All Residential	192	47	45	2.3%	4.0%	0.0%
All Projects	**303**	**95**	**93**	**95.0%**	**85.5%**	**99.7%**

We calculated case weights for each completed survey to report responses to individual questions. (These responses are included in Appendix B.) We calculated the case weight based on the ratio of the strata population to the number of completed surveys (projects) in the strata. For example, we completed six surveys from the 40 small residential solar electric projects completed in the first nine months of CY09 (see Table 3-2). The case weight for each of these completed surveys equals 40/6 = 6.67. We describe ratio weights used for estimating VGI, attribution, and realization rates in Appendix D.

3.2 DESCRIPTION OF KEY INDICES

This impact analysis determines the energy and demand savings attributable to the Renewable Energy program.

Direct impacts are the energy and demand savings of projects implemented through and tracked by the Program. For the Renewable Energy program, we consider energy produced by renewable energy systems that displaces electrical or natural gas as savings. Direct impacts are the portion of these impacts that are attributable to the program.

[7] One biogas project had no tracked savings (it saved LPG), so it was ineligible for a survey.

Indirect impacts are energy and demand savings attributable to the Program but not tracked by them. These impacts could result from market effects or untracked direct savings. The Renewable program currently has no documented market effects.[8] We found untracked savings for solar hot water projects that resulted in space heat savings in the previous evaluation.

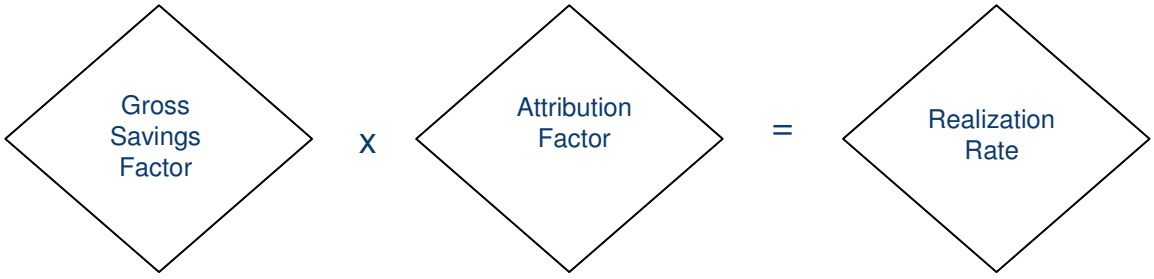
The program reports its estimate of gross savings due to each tracked project. For solar electric, wind, and electricity generating biogas projects, the gross savings is the annual energy generated. For biomass, solar hot water, and thermal biogas projects the gross savings is the difference between participant energy with and without the renewable project. The impact analysis for a measure determines two key adjustment factors to the program-reported gross savings:

- **The gross savings adjustment factor.** This is the ratio of gross savings as verified by the evaluation team to the program-reported savings. This factor adjusts tracked gross savings for installation and engineering verification of savings estimates. Applying the gross savings adjustment factor to tracking gross savings produces the estimate of verified gross savings.
- **The attribution factor.** This is the ratio of the total savings attributable to the program to the verified gross savings.

The two factors are combined, resulting in a realization rate:

- **Realization rate.** This is the ratio of net savings to tracked gross savings.

Figure 3-1. Realization Rate Calculation



We calculated the verified gross savings and program attribution at the technology (and sector) level and overall for the Renewable program. (We do not report all attribution factors at the technology/sector level to protect respondent confidentiality.) We determined the gross savings adjustment factor for each technology by selecting a sample of completed projects for that technology and conducting an engineering review of the program savings estimates for those projects.

We determine attribution using self-reports from participants and, when appropriate, vendors. This approach relies on responses to survey questions asking participants or their vendors what they would have done in the absence of the program. The accuracy of estimates based

[8] KEMA is completing qualitative supply-chain research on the biogas market to address potential market effects.

on self-reported data depends on the ability (and likely inclination) of the respondent to give accurate answers, as well as on the validity of the statistical sampling and estimation process.

The impact analysis begins with the savings estimates tracked by the Renewable program. The analysis provides the following information:

- Savings estimates by technology (and sector) as reported in the program tracking system maintained by WECC.
- Gross savings adjustment factors.
- Attribution adjustment factors.
- Verified gross savings developed by applying the gross adjustment factors to the savings estimates from the program tracking system.
- Verified net savings developed by applying the attribution adjustment factors to the verified gross savings.

4. ENERGY SAVINGS RESULTS

4.1 PROGRAM-TRACKED (GROSS) SAVINGS

4.1.1 Program activities

In this section, we discuss the projects implemented for the period from January 1, 2009, through September 30, 2009, the first nine months of the 2009 contract period (CY09). In the first nine months of CY09, the Focus program completed 303 renewable energy measures; 111 nonresidential and 192 residential measures.[9]

For the second consecutive evaluation, the program increased the participation rate for all technology types (except biomass). On an annualized basis, the Renewable program increased participation by 35 percent: 54 percent in the nonresidential sector and 25 percent in the residential sector. Biogas, residential wind, and nonresidential solar water heating experienced the greatest participation increases. The mix of projects remained similar to the 18 MCP. Solar electric systems still comprise the largest number and greatest percentage of projects, comprising 53 percent of all installations. Solar water heating retains the second largest share of Renewable projects, representing 37 percent of all projects installed. Biogas, biomass, and wind together make up slightly more than ten percent of projects.

[9] This report focuses on projects that received direct financial incentives for the installation of renewable energy systems. In addition to financial incentives, the program engages in other activities to promote the adoption of renewable energy systems such as site assessments, feasibility studies, and activities to develop renewable energy markets.

Table 4-1. Projects Implemented by Type and Contract Period

Technology	Completed Projects						
	FY02–FY04 Mar 02–Jun 04	FY05 Jul 04–Jun 05	FY06 Jul 05–Jun 06	FY07 Jul 06–Jun 07	18 MCP Jul 07–Dec 08	CY09 Jan 09–Sep 09	Program To Date
Nonresidential Projects							
Biogas	1	4	7	2	6	8	28
Biomass	3	7	16	14	18	6	64
Solar Electric (PV)	6	9	9	18	78	62	182
Solar Water Heating	0	4	5	6	38	32	85
Wind Machine	4	5	1	1	4	3	18
Hydroelectric	1	1	0	0	0	0	2
Other	0	1	1	2	0	0	4
All Nonresidential	**15**	**31**	**39**	**43**	**144**	**111**	**383**
Residential Projects							
Solar Electric (PV)	60	35	48	74	133	98	448
Solar Water Heating[a]	-	-	-	-	160	80	240
Wind Machine	9	2	5	5	13	14	48
Other	0	1	1	0	0	0	2
All Residential	**69**	**38**	**54**	**79**	**306**	**192**	**738**
All Projects	**84**	**69**	**93**	**122**	**450**	**303**	**1121**

[a] Residential Solar Water Heating was included and tracked in the Focus on Energy Residential program prior to the 18 MCP. This table includes only those projects completed through the Focus Renewable Energy program.

4.1.2 Gross savings

The program tracks gross energy savings (generation) for all projects completed that receive a Cash-Back Reward or a grant that has associated energy impacts. Table 4-2 includes program-reported gross impacts by technology and segment for FY07, the 18 MCP, and CY09.

Program-reported overall gross impacts for CY09 are much higher than impacts in the 18 MCP. Program-reported gross kW and kWh savings for the CY09 are more than double the annualized 18 MCP totals. This is due to an increase in all project types that offset electricity.

Program-reported overall gross therm impacts for the 18 MCP are more than triple the annualized 18 MCP total. This is due to one large biomass project, which represents more than 98 percent of the program gross therm savings.

Table 4-2. Renewable Energy Program-tracked Gross Impacts[10]
Nonresidential by Technology

Segment	Technology	Energy Impacts	Completed			
			FY07 Jul 06– Jun 07	18 MCP Jul 07– Dec 08	CY09 Jan 09– Sep 09	Program To Date
Nonresidential	Biogas	Kilowatts	1,045	1,180	1,871	7,982
		Annual kilowatt-hours	8,238,780	10,159,791	17,507,821	67,200,558
		Annual therms	0	138,637	1,929	249,219
	Biomass	Kilowatts	0	-66	-98	-164
		Annual kilowatt-hours	0	-329,413	-498,735	-828,148
		Annual therms	684,448	2,213,364	4,873,677	10,249,723
	Solar Electric	Kilowatts	124	307	261	780
		Annual kilowatt-hours	153,422	778,759	665,436	1,710,297
		Annual therms	0	0	0	1,283
	Solar Water Heating	Kilowatts	0	-13	0	-13
		Annual kilowatt-hours	0	-19,107	-3,344	-22,451
		Annual therms	2,697	48,752	26,211	111,848
	Wind Machine	Kilowatts	90	17	6	504
		Annual kilowatt-hours	109,560	127,249	57,813	857,236
		Annual therms	0	0	0	0
	Hydroelectric	Kilowatts	0	0	0	1,300
		Annual kilowatt-hours	0	0	0	6,473,600
		Annual therms	0	0	0	0
	Other	Kilowatts	14	0	0	14
		Annual kilowatt-hours	29,973	0	0	29,973
		Annual therms	1,480	0	0	2,638
	All Nonresidential	**Kilowatts**	**1,273**	**1,425**	**2,040**	**10,404**
		Annual kilowatt-hours	**8,531,735**	**10,717,278**	**17,728,991**	**75,421,064**
		Annual therms	**688,625**	**2,400,753**	**4,901,817**	**10,614,711**

[10] Gross energy impacts are those reported in the program tracking system maintained by WECC.

Table 4-3. Renewable Energy Program-reported Gross Impacts[11]
Residential and Total by Technology

Segment	Technology	Energy Impacts	Completed			
			FY07 Jul 06– Jun 07	18 MCP Jul 07– Dec 08	CY09 Jan 09– Sep 09	Program To Date
Residential	Solar Electric[a]	Kilowatts	224	263	238	1,016
		Annual kilowatt-hours	290,398	681,074	600,489	1,958,761
		Annual therms	0	0	0	3,776
	Solar Water Heating[b]	Kilowatts	-	28	10	38
		Annual kilowatt-hours	-	140,187	99,912	240,099
		Annual therms	-	8,371	5,354	13,725
	Wind Machine	Kilowatts	40	27	31	328
		Annual kilowatt-hours	51,353	278,909	282,077	931,360
		Annual therms	0	0	0	0
	Other	Kilowatts	0	0	0	0
		Annual kilowatt-hours	0	0	0	-15,545
		Annual therms	0	0	0	2,253
	All Residential	**Kilowatts**	**264**	**319**	**279**	**1,381**
		Annual kilowatt-hours	**341,751**	**1,100,170**	**982,478**	**3,114,674**
		Annual therms	**0**	**8,371**	**5,354**	**19,754**
TOTAL	**All Projects**	**Kilowatts**	**1,537**	**1,743**	**2,320**	**11,786**
		Annual kilowatt-hours	**8,873,486**	**11,817,448**	**18,711,469**	**78,535,739**
		Annual therms	**688,625**	**2,409,124**	**4,907,171**	**10,634,465**

[a] In FY03 and FY04, "Solar Photovoltaic" included residential PV installations and projects that combined PV with solar thermal technologies. The therm savings are from the combined projects or PV installations that were off-grid and displacing fossil fuel generators on-site.

[b] Residential Solar Water Heating was included and tracked in the Focus on Energy Residential program prior to the 18 MCP. This table includes only those projects completed through the Focus Renewable Energy program.

4.2 GROSS SAVINGS ADJUSTMENT FACTORS

The gross savings adjustment factors provide a method for calculating the verified gross savings from the total program-tracked savings. The factors are the product of the installation rate and the engineering verification factor.

We confirmed installation for 100 percent of the projects sampled as part of the telephone survey.

To calculate the engineering verification factor, we first verified the gross savings of a sample of projects by reviewing their project files and completing telephone surveys with them. The telephone surveys included questions to confirm or collect information necessary for estimating project savings. We then calculated verified gross savings for each sampled

[11] Gross energy impacts are those reported in the program tracking system maintained by WECC.

project. Verified gross savings were calculated using the standard calculation approach or metered data, as discussed below.

We made one change to the verified gross savings estimation method in this round of evaluation. In previous impact evaluations, when verified gross estimates were within ten percent of Focus tracked savings we reported Focus tracked savings as evaluation verified gross savings. In this CY09 analysis, we use the evaluation engineer's calculations as verified gross estimates, regardless of proximity to Focus tracked savings. In other words, if the engineering verification results in an estimate of 103 percent of tracked savings, the 103 percent value is used.[12]

Overall, the verified gross savings factors (relative to tracked savings) for CY09 are less than 100 percent for electrical energy (kWh) and over 100 percent for electrical demand (kW) and therms. This is an improvement over the 18 MCP (see Figure 4-1). Verified gross savings are 84 and 101 percent, for kWh and kW respectively. Verified gross therm savings are 109 percent of program tracked, but the variation among individual projects was substantially greater.

Figure 4-1. Overall Verified Gross Adjustment Factors
CY09 and Past Evaluations

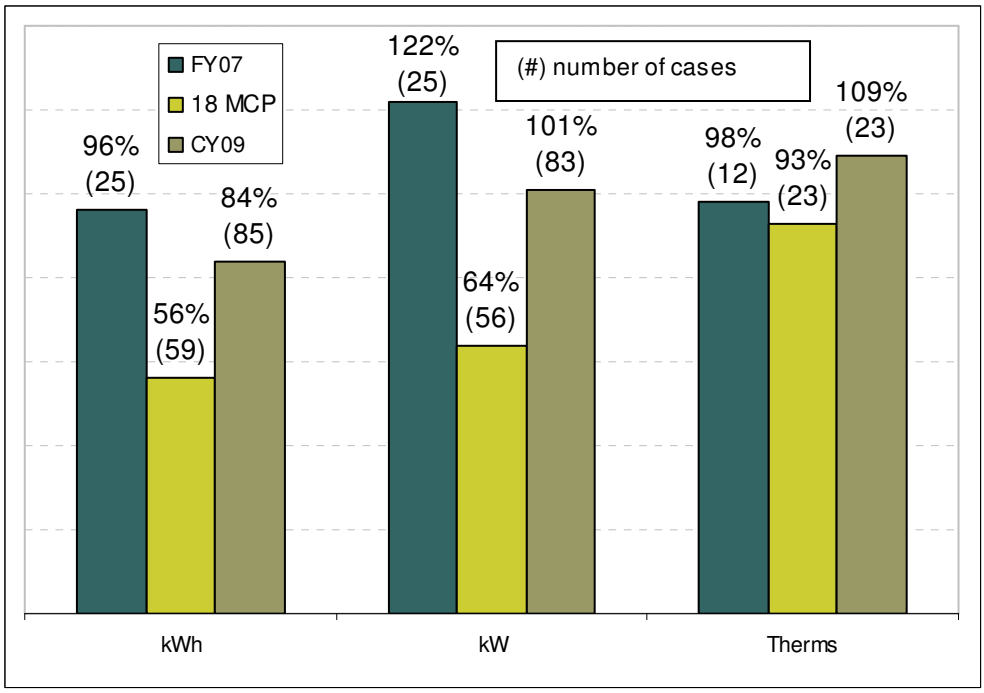


Table 4-4 shows the gross savings adjustment factors for each technology. The numbers in the table represent the portion of the tracked savings verified by KEMA. Since we confirmed installation of 100 percent of the sampled projects, the verified gross savings factors equal

[12] We made this change to be consistent with the evaluation approach used for the evaluation of Business Programs beginning with the CY09 evaluation.

the engineering verification factors (the ratio of verified savings to installed savings). KEMA estimated verification factors by calculating the savings (offset) for each project following the guidelines established in the Standard Calculation Guidelines.[13] We discuss below, by technology, how we verified the gross savings estimates for specific technologies.

Table 4-4. CY09 Gross Savings Adjustment Factors
Renewable Energy Program[14]

Technology	Gross Savings Adjustment Factor		
	kWh	Peak kW	Therm
Biogas	**88%**	**102%**	**100%**
Biomass[a]	**265%[a]**	**100%[a]**	**109%**
Solar Electric	**103%**	**101%**	
Solar Electric - Nonresidential	102%	100%	
Solar Electric - Residential	105%	101%	
Solar Hot Water	**96%**	**95%**	**91%**
Solar Hot Water - Nonresidential	79%	68%	91%
Solar Hot Water - Residential	94%	91%	97%
Wind	**67%**	**69%**	
Wind - Nonresidential	71%	74%	
Wind - Residential	66%	68%	
Overall Renew	**84%**	**101%**	**109%**

[a] Verified gross installed kWh and kW for biomass are primarily parasitic load. Values greater than 100 percent indicate greater parasitic load than tracked by the program.

A. BIOGAS

Verified energy production for biogas for CY09 is 88 percent of tracked kWh, 102 percent of tracked kW, and 100 percent of tracked therm savings (see Table 4-4). This is a substantial improvement over the 18 MCP estimates.

KEMA completed interviews and detailed engineering reviews for six biogas systems installed in the first nine months of 2009. We used two different approaches for determining the verified gross energy savings depending upon the presence of metered data.

Metered production data not available. We estimated energy production based on the methods outlined in the standard calculation manual. KEMA modified standard calculation values when project documentation or participant interviews indicated that a different value was more appropriate. (See discussion below regarding COD factors.)

[13] Bobbi Tannenbaum, Doug Kneale, Brian Dunn, KEMA, Inc. *Renewable Energy Standard Calculation Recommendations – Revised.* October 9, 2009.

[14] See Appendix C for number of observations and 90 percent confidence intervals.

Metered production data available. When an installed biogas system had six or more months of metered production, we annualized the metered production. We also estimated the annual production using the standard calculation approach. We used the higher of these two values as the verified gross savings. Five systems had six or more months of metered data, and for two of these the annualized metered data was the higher value. For the remainder of the cases we used the standard calculation results.

Both metered data and project paperwork indicate that agricultural biogas digesters vary in their ability to generate biogas from manure. This difference is represented in the factor that converts chemical oxidative destruction (COD) [15] into biogas. The standard calculation recommends using 6.3 ft^3/lb for cow manure. One system design uses (and appears to achieve) 9.2 ft^3/lb for cow manure. For systems using this design, KEMA used the higher conversion value in the standard calculations.

Focus production estimates are higher than the standard calculation results for two reasons. First, Focus used a USDA source[16] for COD production per animal per day that exceeded by 40 percent values estimated by the American Society of Agricultural Engineers[17] and cited in the standard calculation manual. We believe that the USDA mistakenly assumed that ASAE values were per animal unit and adjusted them to equal a dairy cow, which is 1.4 animal units.

Second, Focus production estimates did not adjust the lower heating value (LHV) of methane for the temperature and pressure seen in Wisconsin digesters. The program used a value of 960 BTU/ft^3 (LHV of methane at 0° C temperature and 1 ATM of pressure). KEMA used a value of 850 BTU/ft^3 (LHV of methane under typical conditions for most digesters of 35° C and 1 ATM of pressure). The revised standard calculation manual added a table of values, in addition to continuing the recommendation to adjust the LHV for temperature. This revised manual was not available until the latter half of 2009.

Focus currently underreports parasitic load. Current Focus paperwork indicates that applicants do not need to include parasitic loads of less than 1 HP. Because biogas systems generally have multiple motors running year long at high capacity, small motors can add up to substantial energy usage. These motors primarily drive pumps and regulators. For future projects, Focus should require applicants to provide load and annual operating hours for all parasitic loads relevant to the system. In addition, the program could improve biogas generation estimates with lab results indicating the COD of the waste material to be digested.

B. BIOMASS

Biomass projects completed in the CY09 had a gross savings adjustment factor for therms of 109 percent. Most projects had gross savings adjustment factors between 97 and 100

[15] COD is a measure of the energy in the substrate.

[16] USDA, *An Analysis of Energy Production Costs from Anaerobic Digestion Systems on US Livestock Production Facilities*, Table 7. October 2007.

[17] American Society of Agricultural Engineers, *Standard ASAE D384.2,* Table 1. March 2005.

percent. One large project, for which the evaluation found more savings than the Program, dominated therm savings.

Biomass projects had a parasitic kW adjustment factor of 100 percent and a parasitic kWh factor of 265 percent.[18] In other words, the program substantially underestimated the parasitic electric usage for the biomass systems, especially for the one large project. KEMA thoroughly reviewed the program documentation, discussed the issues with the Focus team, and obtained detailed engineering information from the participant to complete our analysis. The gross parasitic load for biomass projects offset the gross kWh for the solar electric projects installed during the nine-month evaluation period.

Three major factors drive the difference in verified parasitic electric usage relative to program tracked load.

Operating load (kW) of variable speed drives (VSDs). The biomass system has variable speed motors that are driving fans and pumps. The program aggregated all VSDs when determining operating load. The evaluation team disaggregated the motors and calculated kW for each of them. The largest use of VSDs is for motors driving fans that move steam. The program assumed a linear relationship between steam output and power consumption, when the real relationship is cubic.[19] Underestimates of VSD load represented the largest portion of the difference between verified and tracked savings.

Average annual operating load of drives (kWh). The program underestimated the average annual steam output of the system, which leads to an underestimate of drive loads. The program applied a summer load factor of 76 percent as the annual average load (38,000 lbs steam/hour on a 50,000 lb system). The evaluation team estimated the operating load for drives based on four years of historical boiler natural gas consumption (adjusting for boiler efficiencies) to determine monthly steam output and corresponding motor load . Based on historical data we found an average summer load of 71 percent (used for peak load) and an average annual load of 84 percent (used for annual kWh).

Baseline conditions. The program overestimated the parasitic load of the existing natural gas system. Parasitic load for the biomass system is the biomass parasitic load minus existing parasitic load (the change in parasitic load). The program estimate for parasitic load for the natural gas system did not take into account that the fan was oversized. Accounting for this reduces the historic load and increases the resulting incremental parasitic load for the biomass system.

We found estimating project load challenging due to incomplete documentation of parasitic loads. Application paperwork for biomass projects should not exclude parasitic loads of less than 1 HP. Biomass projects often use multiple motors of this size that can create substantial

[18] One CY09 biomass system offset electricity, but the parasitic loads of the other biomass systems dwarfed the savings from this project.

[19] Michael R. Lindeburg, PE., Mechanical Engineering Reference Manual for the PE Exam, Twelfth Edition, Copyright 2006

additional electric energy consumption over the course of a year. The program should strive to collect as much information as possible regarding the number, size and operating characteristics of motors contributing to parasitic load.

C. SOLAR ELECTRIC

Solar electric projects completed in CY09 have gross savings adjustment factors of 103 percent for kWh and 101 percent for kW. We completed interviews with 41 participants installing solar electric systems in CY09. We verified the production calculations for 40 of these systems using PVWatts and the calculations outlined in the Standard Calculation guidelines.

The project files contained all the information we needed to verify calculations. Individual projects had verified results that were higher or lower than Focus reported values, but were generally within ten percent of the reported values.

D. SOLAR HOT WATER

Solar hot water (SHW) projects completed in CY09 had high gross savings adjustment factors: 91 percent for therms, 96 percent for kWh, and 95 percent for kW. The lower verified relative to reported savings is due mostly to an overestimation of hot water consumption. RETScreen estimates hot water use at 16 gallons per person per day. The program paperwork often estimated hot water consumption greater than 16 gallons per person per day, without documentation to support the higher assumption.[20]

KEMA calculated solar hot water savings based on the project files and documentation, as well as survey responses, using the standard calculation approach. When the project documentation did not include RETScreen printouts or alternative calculations, we based our analysis on other information in the file (e.g., receipts), or made assumptions consistent with other completed projects. KEMA made the following assumptions or calculations when program calculation assumptions were not provided:

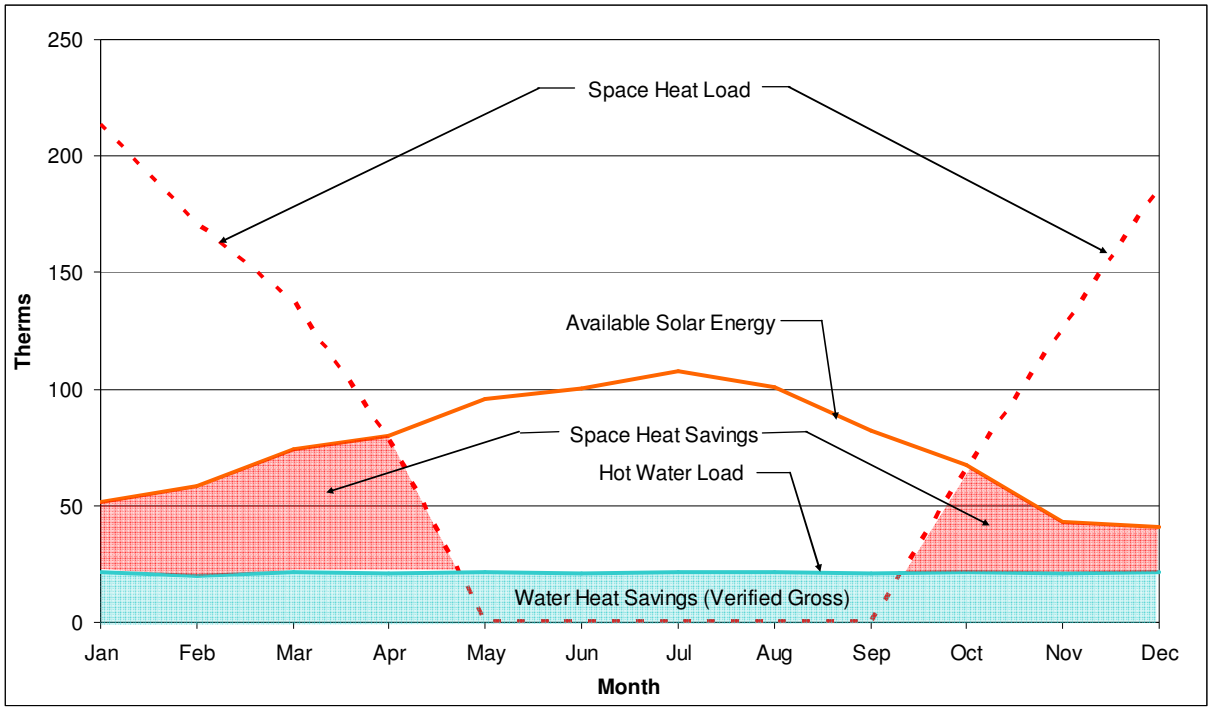
- Hot water usage proportional to occupants, as recommended by RETScreen (16 gallons per person per day), and hot water temperatures of 120 degrees F.
- Supply water temperatures recommended by RETScreen for projects.
- Heat exchanger efficiency of 85 percent efficient for systems where the paperwork or other information indicated a heat exchanger and the documentation did not include an efficiency rating.
- Parasitic load (kW and kWh) calculated based on available information. Some projects clearly indicated solar powered pumps, others indicated electric pumps and provided documentation of the load, and the remainder included receipts and other information that we used to calculate parasitic load. Parasitic kW and kWh load for SHW projects was very small relative to SHW savings.

[20] In response to a draft version of this report, Focus Program staff told us they use 20 gallons per day per person as standard usage. We will work with the program to resolve this issue.

Seven participants in the sample installed SHW systems with the intent of providing some space heating in addition to water heating. All SHW projects estimated and tracked only hot water savings. We verified the hot water usage estimates and then estimated space heating savings, which we refer to as untracked savings.

For systems providing space heating, we calculated the verified gross SHW savings based on annual water usage and estimated untracked savings due to space heat. We calculated the space heat savings as the difference between the energy available and the hot water energy savings during the heating season. (In other words, energy available during the heating seasons first goes to heat water and the remainder is for space heating.) Figure 4-2 shows water-heating savings in blue (i.e., verified gross savings) and space heating savings in red. It shows that while solar energy is available year round, excess energy from the sun can be used for space heating only during heating months, when less solar energy is available. Using this estimation method, three of the seven systems offset some space heating energy use.

Figure 4-2. Solar Space Heating Estimates



E. WIND ENERGY SYSTEMS

The gross savings adjustment factors for wind systems completed in CY09 are 67 and 69 percent for kWh and kW, respectively. This is a slight improvement over the kWh verified gross savings factor from the 18 MCP.

The kW adjustment factor decreased in CY09 because the program calculated peak kW differently than it did in the 18 MCP. In the 18 MCP the program calculated peak kW by multiplying system capacity by 0.5. For CY09 the program calculated peak kW using the standard calculation approach. The standard calculation approach is based on kWh estimates, so an overestimate in kWh will correspond to an overestimate of kW.

KEMA completed interviews and detailed engineering reviews for 14 wind systems installed in the first nine months of 2009. We used two approaches for determining the verified gross energy production, depending upon the presence of metered data.

Metered production data available. We used this approach for all CY09 installed wind system with six or more months of metered production. This was the case for nine of the fourteen sampled wind systems.

- We annualized the 2009 metered data (A)

  A= kWh_{met} = Annualized metered kWh production.

- We used the 7th Wind calculator[21] to estimate 2009 kWh production *using program documented inputs* and 2009 site average wind speed (B).

  B = kWh_{7wind} = kWh production from 7th Wind calculator using 2009 site average wind speed.

- We calculated the site specific ratio between the metered and 7th Wind estimated production (A/B). This ratio adjusts for problems with assumptions imbedded in the 7th Wind calculator, as well as problems with site specific inputs.

- We used the 7th Wind calculator to estimate average annual production *using program documented inputs*[22] and historic average site wind speed (C).[23]

  C = kWh_{avg} = Annual kWh production from 7th Wind calculator using historic average site wind speed.

- We multiplied the average annual kWh production (C) by the site-specific ratio (A/B) to determine verified gross production for that site.

Metered production data not available. We used this approach for all CY09 installed wind system with fewer than six months of metered production. This was the case for five of the fourteen sampled wind systems.

- We calculated an overall weighted adjustment factor (D) based on the site-specific ratios (A/B) calculated above.

  D = $\sum A / \sum B$ = average adjustment factor = 0.78 for CY09

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[21] For this evaluation we used 7th Wind version 10.72.

[22] KEMA's estimates using 7th Wind are always lower than the project file reports of 7th Wind estimates. Given we are using program inputs, we suspect this is due to calculation variations across versions of 7th Wind. The evaluation version (10.72) may be more current than the one used to make the original estimates. This accounts for the difference between the 0.78 adjustment ratio and the final verified gross adjustment factor.

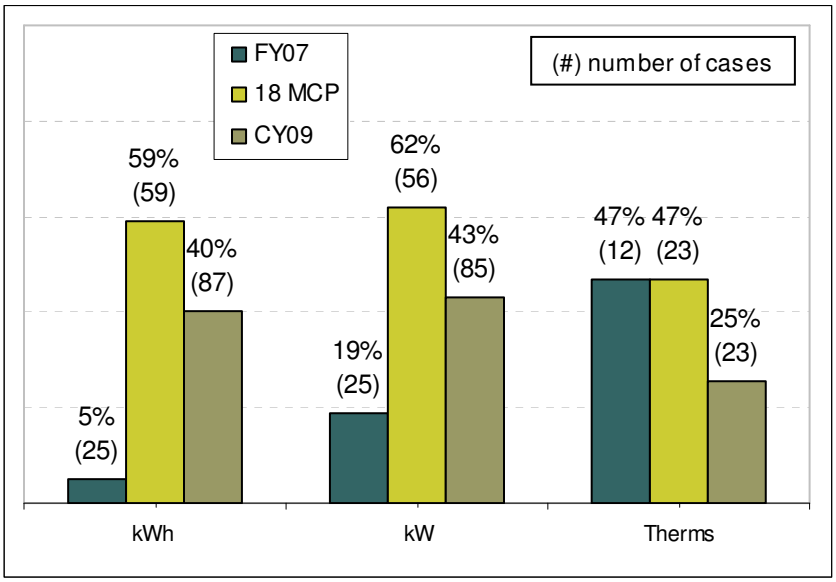
[23] We used historical site wind speed data from the Wisconsin State Climatology Office [http://www.aos.wisc.edu/~sco/] downloaded in December 2009. Nine to 14 years of data were available depending on the location.

- We used the 7th Wind calculator to estimate average annual production using historic average site wind speed (C) for each site (without metered data).
- We multiplied this estimate by the weighted average adjustment factor (D) of 0.78 to estimate average annual production.

4.3 ATTRIBUTION ADJUSTMENT FACTORS

Attribution is the percent of tracked savings that is directly attributable to the program. Participant and vendor self-report surveys were used to estimate attribution. The CY09 attribution factors for the program overall are 40, 43, and 25 percent for kWh, kW, and therms, respectively, as shown in Figure 4-3, with a comparison to 18 MCP attribution values. This represents a substantial decrease in attribution. While the majority of the projects displacing therms are solar hot water, the majority of the tracked therm savings are from biomass projects. We discuss the attribution results by technology below.

Figure 4-3. Overall Program Attribution
CY09 and Past Two Evaluations



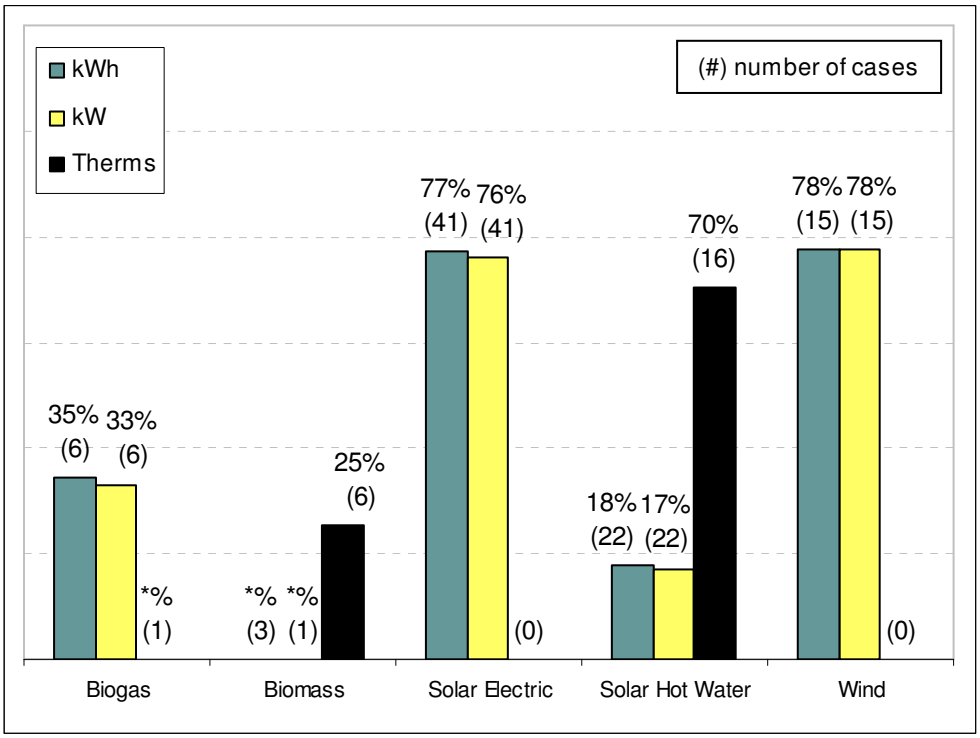
Attribution varied substantially by technology and in the case of solar hot water, by the type of energy offset. Solar electric, wind, and solar hot water offsetting therms have high attribution rates relative to biogas, biomass, and solar hot water offsetting electricity (see Figure 4-4). In general, the technologies that are the least cost effective to the end-user tend to have the higher attribution rates. Solar hot water projects clearly demonstrate this. They had much lower attribution (17 percent for kWh) when they offset electricity than the relatively high attribution (70 percent) when they offset therms. Solar hot water systems have a faster payback when offsetting more expensive electric water heating.

The low attribution for biomass projects is consistent with results in previous years and is a continuing concern to the evaluation team. Many of the sampled biomass projects have characteristics that lend themselves to low attribution. One characteristic is that the facilities have a source of biomass fuel that eliminates or reduces their need to purchase wood for their system. In other words, the fuel source is free or relatively inexpensive. Some facilities

are already burning wood and were either increasing capacity or replacing existing equipment. Finally, these projects appear to have fast paybacks or high ROIs, and thus respondents report that they would have occurred without Focus on Energy assistance.

Attribution for biogas projects has fallen to 35 percent for projects that generate electricity. Respondents reported that Focus technical and financial assistance accelerated the installation in some cases, but most agricultural respondents indicated that their choice to install a biogas system was primarily for manure management and animal bedding. In one case, the respondent indicated that the supplier influenced their decision to install a biogas system: the supplier subsequently indicated that they would not have offered the system without Focus on Energy and the project received full attribution.

Figure 4-4. CY09 Program Attribution by Technology



*Ratio not reported to protect respondent confidentiality

4.4 NET ENERGY IMPACTS

We calculate the net energy impacts based on an overall realization rate. The realization rate combines the effect of the gross savings adjustment factors and the attribution factors. The CY09 realization rates for the program overall are 34, 43, and 28 percent for kWh, kW, and therms, respectively, as shown in Table 4-5.

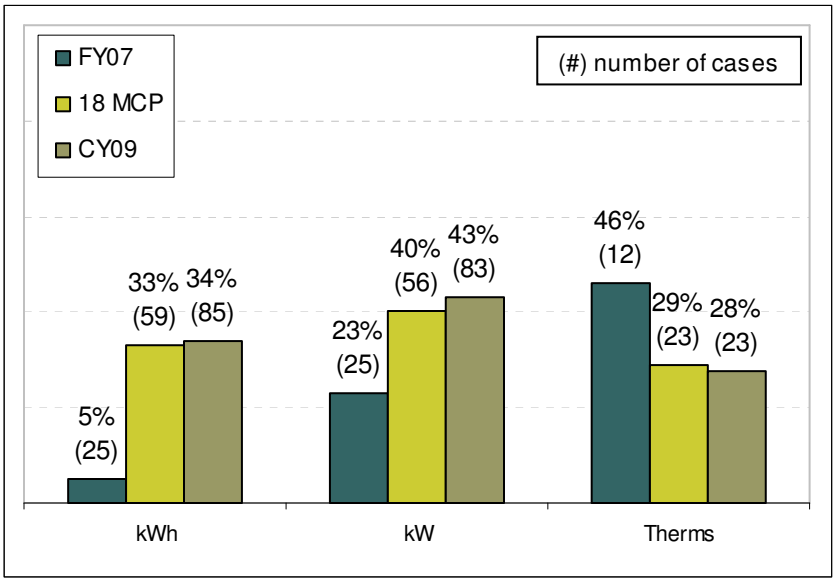
Table 4-5. Overall Adjustment Factors
CY09

Adjustment Factor	kWh				kW				Therms			
			Margin of Error (90% confidence)				Margin of Error (90% confidence)				Margin of Error (90% confidence)	
	n[a]	Estimate	CY09	Extra-polated	n[a]	Estimate	CY09	Extra-polated	n[a]	Estimate	CY09	Extra-polated
Installation Rate	86	100%	± 0.0%	± 0.0%	85	100%	± 0.0%	± 0.0%	23	100%	± 0.0%	± 0.0%
Engineering Verification Factor	85	84%	± 0.2%	± 16.6%	83	101%	± 0.5%	± 12.8%	23	109%	± 0.0%	± 0.3%
Gross Savings Adjustment Factor	85	84%	± 0.2%	± 16.6%	83	101%	± 0.5%	± 12.8%	23	109%	± 0.0%	± 0.3%
Attribution Factor	87	40%	± 0.8%	± 34.9%	85	43%	± 1.9%	± 27.5%	23	25%	± 0.0%	± 0.9%
Realization Rate	85	34%	± 0.7%	± 30.0%	83	43%	± 1.9%	± 28.3%	23	28%	± 0.1%	± 1.0%

[a] The gross savings adjustment factor and the realization rate are not calculated directly but are products of other adjustment factors. Therefore, sample sizes reflect the minimum sample size used in calculating these two adjustment factors.

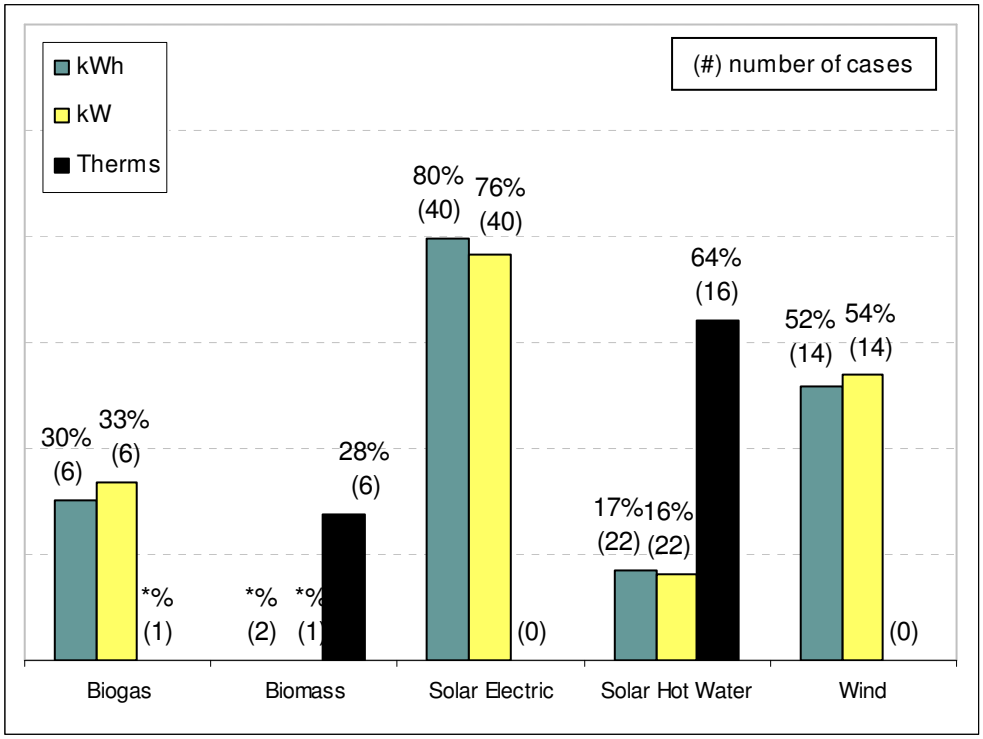
The overall realization rates for all savings types are about the same in CY09 as in the 18 MCP, as shown in Figure 4-5.

Figure 4-5. Final Realization Rates
CY09 and Past Two Evaluations



Realization rates vary by technology. The reasons for realization rates below 100 percent vary by technology. Solar electric has the highest realization rate, roughly equal to the attribution, because verified gross savings are close to the energy and demand savings. Biomass and biogas have low realization rates mostly due to low attribution rates. Wind has mid-range realization rates due to the combined effects of verified gross adjustment (~ 68 percent) and attribution (78 percent). Solar hot water (SHW) has low realization on kWh and kW for two reasons. First, there is low attribution for SHW projects offsetting electricity. Second, there is high attribution for SHW projects offsetting therms that have parasitic electric loads. Solar hot water realization rates for therms are mid-range, due mostly to attribution.

Figure 4-6. CY09 Realization Rates by Technology



*Ratios not reported to protect respondent confidentiality

Table 4-6. Realization Rates by Technology
CY09

Technology	kWh				kW				Therms			
			Margin of Error (90% confidence)				Margin of Error (90% confidence)				Margin of Error (90% confidence)	
	n[a]	CY09	CY09	Extra-polated	n[a]	CY09	CY09	Extra-polated	n[a]	CY09	CY09	Extra-polated
Overall Renew	**85**	**34%**	**± 0.7%**	**± 29.9%**	**83**	**43%**	**± 1.9%**	**± 28.2%**	**23**	**28%**	**± 0.1%**	**± 1.0%**
Biogas	6	30%	± 0.0%	± 31.7%	6	33%	± 0.0%	± 34.4%	1	[b] %	± 0.0%	± 0.0%
Biomass	2	[b] %	± 0.0%	± 82.6%	1	[b] %	± 0.0%	± 0.0%	6	28%	± 0.0%	± 0.6%
Solar Electric	40	80%	± 8.4%	± 10.4%	40	76%	± 8.5%	± 10.6%				
Solar Hot Water	22	17%	± 22.2%	± 24.5%	22	16%	± 22.4%	± 24.8%	16	64%	± 11.9%	± 16.2%
Wind	14	52%	± 3.5%	± 10.2%	14	54%	± 3.6%	± 10.8%				

[a] Realization rates are not calculated directly but are products of other adjustment factors. Therefore, sample sizes reflect the minimum sample size used in calculating the realization rate.

[b] Ratios not reported to protect respondent confidentiality

4.4.1 Untracked savings (solar hot water)

In the 18 MCP a small amount of solar space-heating savings were attributable to the program, but no net untracked savings were found for CY09. Though some CY09 systems generate space-heating savings, the program did not affect the size or the timing of these installations.

In CY09, seven sampled solar hot water projects reported that their systems included space heating. The program appropriately did not calculate or include space-heating savings in the tracking database for these projects, since the program is designed to provide incentives only for water heating. KEMA calculated a verified gross savings from space heating for all sampled projects with space heating and found 3,000 therms of gross untracked savings. When we applied the project attribution values to these savings the net untracked savings value for the sampled projects was zero therms.

4.4.2 Total impacts

We report the total impacts for the first nine months of the CY09 Renewable program are in Table 4-7 below.

Table 4-7. Total Impacts CY09
Renewable Program

Tracked Savings			Verified Gross Savings			Net Savings		
kWh	Peak kW	Therms	kWh	Peak kW	Therms	kWh	Peak kW	Therms
18,711,469	2,320	4,907,171	15,650,627	2,339	5,349,792*	6,310,350	1,004	1,363,598

*Includes 3,000 therms of untracked savings from solar space heating.

5. SUMMARY AND CONCLUSIONS

In this section, we discuss the overall findings from the Renewable impact evaluation for CY09. We then address three issues emerging from the evaluation that require further consideration.

5.1 VERIFIED GROSS INSTALLATION

KEMA verified installation for 100 percent of the projects sampled. CY09 verified gross estimates for kWh, peak kW, and therms improved over 18 MCP estimates, but the evaluation team is concerned with several issues related to the calculations.

With the exception of PV systems, we found some project documentation of estimated savings incomplete. Project documentation continued to have the following issues:

Reliance on program application materials. For most technologies, the program relies on the estimates submitted with the application materials to estimate incentives, (when based on production) and for program tracking.

Program applications do not require reporting of parasitic loads for motors under 1 HP. This has resulted in under-estimation of parasitic loads, which can be very high. Many small motors associated with biomass (and other systems) can sum to large electrical energy consumption and should not be ignored when assessing a project.

Unsupported assumptions. Some projects included assumptions without a citation for the basis of this assumption.

Unsupported calculations. For some projects, calculation methods and constants were not explained or supported with reference material. For these projects, we calculated savings using the *Standard Calculations* document referenced earlier.

Missing data. Some projects did not include data necessary for a complete evaluation of the project. This was most common for parasitic electrical loads. We used purchasing records to obtain model numbers for parasitic pumps and motors.

The Program's calculation of energy production from wind systems is improving, but continues to result in overestimation of offsets. The 7th Wind calculator includes updated manufacturer data, in addition to a built-in function to derate for inverter losses. The updated manufacturer information appears to bring the estimates closer to measured performance. The Program (and the wind industry in general) continues to improve estimation approaches for calculating site-specific wind resources.

Accurate tracking of parasitic load is becoming more important to the program. In CY09, the verified gross parasitic kWh load from biomass projects was equivalent to all of the verified gross kWh savings from the solar electric program.

The applicants (either contractors or end-users) may not be familiar with the standard calculation requirements or may be motivated to overestimate generation (offset). The Focus Renewable Energy program has a responsibility to review these calculations, especially for large or complicated projects, for two reasons. First, by providing financial assistance for the installation of the renewable energy project, as indicated in the application, the program is

tacitly approving the savings estimates. The program participants can reasonably assume that an independent third party has verified these estimates and finds them to be accurate. Second, the program itself is responsible for accurately estimating and tracking program savings consistent with the *Standard Calculations* manual. Finally, the incentives paid to participants in some cases are higher than they should be, given actual production of the systems.

Finally, several sampled solar thermal projects included space heating in their design. In CY09, the program accurately estimated the water heating savings for these projects and included only these savings in the database. This is an improvement over the 18 MCP approach.

5.2 ATTRIBUTION

The CY09 attribution factors for the program overall are 40, 43, and 25 percent for kWh, kW, and therms, respectively. This represents a decrease in attribution for electric projects relative to the 18 MCP. This is due, in large part, to low attribution for biogas projects. Therm attribution was also half that of the 18 MCP. The majority of tracked therm savings is from biomass, which had low attribution values consistent with prior years.

The program has its highest attributions on the measures that are least cost effective to the participant: solar electric, wind, and solar hot water projects that offset therms. These projects also make up a small portion of the overall program savings, though they do represent a majority of installations.

Participants who installed agricultural biogas systems often cite benefits other than energy as their motivation to install a system. Based on their responses, digesters are a cost effective waste management system that also generates energy.

5.3 REALIZATION RATES AND NET ENERGY IMPACTS

The CY09 realization rates for the program overall are 34, 43, and 28 percent for kWh, kW, and therms, respectively. The realization rates for electric projects are slightly higher than the 18 MCP, despite lower program attribution. The realization rate for therms remained at the same level this year compared to the 18 MCP, due to generally low attribution for biomass projects. Biomass parasitic load had a significant effect upon net impacts for electricity in CY09. The net negative electric savings from biomass was equivalent to the total combined net electric savings from solar hot water and wind.

5.4 RECOMMENDATIONS

We recommend that the program consider requiring calculation and documentation of all parasitic loads in the application form. We also recommend taking into consideration parasitic load when determining whether to fund a project. The program may want to consider the overall impacts of a project (not just addressing a single fuel) so that parasitic loads for biomass projects do not create substantial electric loads.

Finally, we also recommend that the program institute a calculation review process prior to approval of large biogas and biomass projects.[24] The program should institute an internal calculation review process for all projects above a certain pre-determined limit. A second set of eyes should eliminate most calculation errors, as well as missing documentation and parasitic load calculations. More accurate production estimates will improve program realization rates.

In general, we continue to encourage the program to document fully the calculations and assumptions used to determine renewable energy production. This is imperative when the program uses calculation approaches or assumed values that differ from the Standard Calculation guidelines. We recognize that there are advances in knowledge and technology for renewable energy systems (e.g. wind and biogas) that may improve either the calculation approach or the default values. If this information is included in project files, we can use this information in our evaluations.

[24] In response to a draft version of this report, Focus staff indicates that this will be a part of the process for nonresidential projects, due to the integration of renewable energy projects into Business Programs.

APPENDIX A: PARTICIPANT SURVEY

A Informed Respondent

Hello, my name is _____ and I'm calling from KEMA Consulting on behalf of the Focus on Energy Program. Focus on Energy gave you a cash back reward, grant or other assistance to install the <TYPE OF PROJECT> on your <home/business>. I need to ask you some questions about your participation in the Renewable Energy Program. This is not a sales or marketing call. Focus on Energy is required by the state of Wisconsin to conduct these types of interviews to better understand and improve the program. Your responses will be kept entirely confidential.

Are you the best person to talk to about your <household's/business's> decision to install <TYPE OF PROJECT> and your experiences with the program?

[IF NOT, GET CONTACT INFORMATION FOR CORRECT PERSON AND CALL THEM.]

I'd like to start by confirming some information. Our records show that you installed…	[Is this information correct?]	[Correct information if our records were incorrect]
A1. **<EQUIPMENT TYPE>**	[Yes]..... 1 [No] ..... 2 [Don't Know]..... 9997 [Refused]..... 9998	A1a.
A2. **<INSTALLATION MONTH AND YEAR>**	[Yes]..... 1 [No] ..... 2 [Don't Know]..... 9997 [Refused]..... 9998	A2a.
A3. **At <ADDRESS>**	[Yes]..... 1 [No] ..... 2 [Don't Know]..... 9997 [Refused]..... 9998	A3a.
A4. **It was installed by <CONTRACTOR>**	[Yes]..... 1 [No] ..... 2 [Don't Know]..... 9997 [Refused]..... 9998	A4a.

A5. **It was rated to generate _____** [depending on type of project: kW, kWh, therms]	[Yes]..... 1 [No] ..... 2 [Don't Know]..... 9997 [Refused]..... 9998	A5a.

A6. **Our records show your <TYPE OF PROJECT> project's total cost was $_____. Is that correct?**

[YES] .....1 [SKIP TO A8]

[NO].....2

[Don't know].....9997 [SKIP TO A8]

[Refused] .....9998 [SKIP TO A8]

A7. **What was your project's total cost?**

[RECORD AMOUNT] $_____
[Don't know]..... -9999997
[Refused] ..... -9999998

[IF PROJECT TYPE = SOLAR THERMAL, READ A8.]

A8. **Do you use your solar thermal system for space heating?**
[Yes]..... 1
[No] 2
[Don't Know].....9997
[Refused].....9998

A9. **Is this <TYPE OF PROJECT> still operating?**
[YES]..... 1 [SKIP TO B0]
[NO]..... 2

A9a. **Why not?**

[IF RESIDENTIAL, SKIP TO SECTION C]

B Company Processes, Respondent's Role?

[Ask Series Only For NON-residential]

B0. **Next, I have some questions about your company's decision making process and policies regarding this project.**

B1. **What was your role and involvement in the purchase of <TYPE OF PROJECT>?** [PROBES: when got involved, did you do the research, the legwork? Did you oversee the installation?]

B1a. **How did the approval or decision-making process go at your location?** [PROBES: Who was involved, process, board approval required, understand roles regarding selecting equipment and roles regarding approval of expenditures]

B2. **What purchasing policies, if any, does your organization have for this type of equipment?** [PROBES: rate of return or payback requirements, warrantee requirements, spending limits, schedules]

[IF NONE, SKIP TO C1]

B2a. **What role, if any, did these policies have in the decisions regarding the <TYPE OF PROJECT>?**

C Decision to install

Okay, now I'd like hear more about how the purchase process went, starting from when you first thought about installing <TYPE OF PROJECT>.

C1. **About when did <you/your organization> first start thinking about <TYPE OF PROJECT>?**

(MONTH, YEAR) [RECORD AS MM:YY]: _____

C2. **From where or whom did you hear about <TYPE OF PROJECT>? Anywhere else?**

[DO NOT READ OPTIONS. CIRCLE ALL THAT APPLY]

[Independent reading/research] 1
[Installer/contractor] 2
[MREA – Midwest Renewable Energy Association] 3
[Always knew about renewables] 4
[A friend or relative] 5
[Industry sources] 6
[Previous renewable system at same or other facility] 7
[Focus on Energy] 8
[From utility] 9
[Site assessor / Site assessment] 10

[Other] (describe) 9996

[Don't know / Don't Remember] 9997
[Refused] 9998

C3. **As you were making decisions about the <TYPE OF PROJECT>, who or what were your main sources of advice and information?** [PROBE: **What did they tell you?**] [RECORD VERBATIM]

C4. **What role, if any, did your contractor(s) (supplier or installer) play in your decision to install <TYPE OF PROJECT>?** [RECORD VERBATIM]

Workshops and Conferences

C5**. Did you or anyone else in your <household/company> attend a conference about <TYPE OF PROJECT>?**

[Yes] 1

[No] ..... 2 [SKIP TO C7]

[Don't know] 9997 [SKIP TO C7]

[Refused] 9998 [SKIP TO C7]

C6. **I'm going to read some statements about the extent, if any, that the conference affected your decision to install the <TYPE OF PROJECT>.**

The conference(s) was/were . . . [READ OPTIONS]

a *very important* factor in your decision to do the project 1
***somewhat important* factor in your decision** 2
made no difference in your decision 3
or made you less inclined to do the project 4

[Other, describe _____] 9996
[Don't know] 9997
[Refused] 9998

C6a. **Why do you say that?**

C7. **Did you or anyone else in your <household/company> attend a workshop about <TYPE OF PROJECT>?**

[Yes] 1

[No] ..... 2 [SKIP TO C9]

[Don't know] 9997 [SKIP TO C9]

[Refused] 9998 [SKIP TO C9]

C8. **I'm going to read some statements about the extent, if any, that the workshop affected your decision to install the <TYPE OF PROJECT>.**

The workshop(s) was/were . . . [READ OPTIONS]

a *very important* factor in your decision to do the project 1
***somewhat important* factor in your decision** 2
made no difference in your decision 3
or made you less inclined to do the project 4

[Other, describe _____] 9996
[Don't know] 9997
[Refused] 9998

C8a. **Why do you say that?**

Site Assessment or (Feasibility Study for biomass or biogas)

C9. **Did you have a <site assessment / feasibility study> done for the <TYPE OF PROJECT> at your <home / business>?**

[Yes] 1

[No] 2 [SKIP TO C15]

[Don't know] 9997 [SKIP TO C15]

[Refused] 9998 [SKIP TO C15]

C10. **Was the <site assessment / feasibility study> done by…?** [READ OPTIONS]

You, or someone else in your household/business.....1

The installer or contractor 2

A Focus On Energy approved site assessor 3

Or someone else (describe: _____) 4
[Don't know].....9997 [SKIP TO C15]
[Refused].....9998 [SKIP TO C15]

C11. **Did Focus on Energy share the cost of the <site assessment / feasibility study> with you?**

[Yes] 1

[No] 2

[Don't know] 9997

[Refused] 9998

C12. **Overall, how satisfied or dissatisfied would you say you were with the <site assessment / feasibility study>? Would you say you were:** [READ OPTIONS]

Very DISsatisfied 1

Somewhat DISsatisfied 2

Somewhat Satisfied..... 3 [SKIP TO C13]

or Very Satisfied ..... 4 [SKIP TO C13]
[Don't know].....9997 [SKIP TO C13]
[Refused].....9998 [SKIP TO C13]

C12a. **Why do you say that?**

C13. **What benefits, if any, did you get from the <site assessment / feasibility study>?** [PROBE: **Anything else?**] [RECORD VERBATIM]

C14**. I'm going to read some statements about the extent, if any, that the <site assessment / feasibility study> affected your decision to install the <TYPE OF PROJECT>. Please tell me which of the following statements best applies.**

The <site assessment / feasibility study>. . [READ OPTIONS]
was a *very important* factor in your decision to do the project 1
was a *somewhat important* factor your decision 2
made no difference your decision.....3
or made you *less* inclined to do the project 4

[Other, describe _____]9996
[Don't know] 9997
[Refused].....9998

C14a. **Why do you say that?**

Learning About Focus

C15. **What plans, if any, did you have to install <TYPE OF PROJECT> before learning about the Focus on Energy Program?** [Describe existing plans: -system type, system size, timing, cost; RECORD VERBATIM]

C16. **Before this <TYPE OF PROJECT> project, had you ever participated in the Focus on Energy Program?**

[Yes] 1

[No] 2 [SKIP TO C17]
[Don't know] ..... ….9997
[Refused]..... 9998

C16a. **What kind of Focus assistance or services did you receive at that time**?
[Rebate or grant]..... 1
[Advice]..... 2
[Other] (describe)..... 9996

[Don't Know] 9997
[Refused] 9998

C16b. **For what type of equipment?** (PROBE: type of renewable or EE measure)

[Energy Advisor(s) **-** Put in energy advisor name(s) from IS or other paperwork]

C17.From where or whom did you hear about Focus on Energy? Anywhere else?

[DO NOT READ OPTIONS. CIRCLE ALL THAT APPLY]

[Installer/contractor] 1
[MREA – Midwest Renewable Energy Association] 2
[Utility] 3
[Friend or relative or colleague] 4
[the Internet] 5
[Site assessor / Site assessment] 6

[Other] (describe) 9996

[Don't know] 9997
[Refused] 9998

Paste in from Impact Statement response to following question and use for probing.

1. Briefly explain how you or other Focus staff got involved with the customer and the project (outline how Focus on Energy services helped make this project happen).

C18. **What did you hear about Focus at that time?** [PROBE: **Anything else?**]

[RECORD VERBATIM]

Sources of Advice

C19. **At what point in the process did you first contact Focus on Energy? Was it. . .** [READ OPTIONS]

before you started considering or planning for <project>.....1

while you were considering or planning for <project> 2

after you decided to install <project>but before installation.....3

after <project> was installed 4

[Did not contact Focus].....5

[Don't know].....9997

[Refused].....9998

C20. **Next, concerning your installation of the <TYPE OF PROJECT>, approximately how many times did you have contact with Focus on Energy staff, either by phone, email, or in person?** [If respondent is unsure, probe using name of Focus staff member assigned to project]

_____ Number of times in contact with Focus staff

[If 0 times →skip to C21]

C20a. **What did you discuss with Focus on Energy staff?** [PROBE: application process, technical issues, insurance, contractors, other?]

[RECORD VERBATIM]

C20b. **How much did these conversations affect your decision to go ahead with the project? Would you say that the contacts with Focus on Energy staff**...

[READ OPTIONS]

Were a *very important* factor in your decision to do the project 1
Were a *somewhat important* factor.....2
Made no difference 3

Or made you *less* inclined to do the project 4

[Other, describe].....9996

[Don't know] 9997
[Refused].....9998

Cash Incentive

C21. **Our records show that you received an incentive of $_____ from Focus on Energy for your <TYPE OF PROJECT> project. Is that correct?**

[YES] ..... 1 [SKIP TO C23]

[NO] 2

[Don't know] ..... 9997 [SKIP TO C23]

[Refused] ..... 9998 [SKIP TO C23]

C22. **How much incentive did you receive from Focus?**

[RECORD AMOUNT] $_____
[Don't know] ..... -9999997
[Refused] ..... -9999998

C23. **Did you hear about Focus on Energy cash incentives** . . . [READ OPTIONS]

before you started considering or planning for <PROJECT> 1

while you were considering or planning for <PROJECT> 2

after you decided to install <PROJECT> but before installation 3

or after <PROJECT> was installed 4

[Don't know] 9997

[Refused] 9998

C24. **Did you receive rebates, grants, reduced financing, or tax credits from any other sources for this <TYPE OF PROJECT>?**

[Yes] 1

[No] ..... 2 [SKIP TO C25]

[Don't know] .....9997 [SKIP TO C25]

[Refused] .....9998 [SKIP TO C25]

C24a. **From what sources?** [DO NOT READ. CIRCLE ALL THAT APPLY]

[Federal tax credits] 1

[U.S. Department of Agriculture grant] 2

[Utility buyback rates / Feed-in tariff] 3

[Supplier or Manufacturer] (name) 4

[Utility grants or financing] 5

[Other] (describe) 9996

[Don't know] 9997

[Refused] 9998

C24b. **About how much**?

_____ Record $ Amount

[Don't know] 9997

[Refused] 9998

C25. **Are you aware of any *other* programs that provide financial assistance for this kind of project?**

[Yes] 1

[No] ..... 2 [SKIP TO C27]

[Don't know] ..... 9997 [SKIP TO C27]

[Refused] ..... 9998 [SKIP TO C27]

C26. **What programs are you aware of?** [DO NOT READ. CIRCLE ALL THAT APPLY]

[Federal tax credits] 1

[U.S. Department of Agriculture grant] 2

[Utility buyback rates / Feed-in tariff] 3

[Supplier or Manufacturer] (name) 4

[Utility grants or financing] 5

[Other] (describe) 9996

[Don't know] 9997

[Refused] 9998

[IF C24A *OR* C26 INCLUDES 3 (UTILITY BUYBACK RATES) OR 5 (UTILITY GRANTS OR FINANCING), ASK C27]

C27.**Where did you hear about the utility programs?** (Probe: **Anywhere else?**)

[DO NOT READ OPTIONS. CIRCLE ALL THAT APPLY]

[Independent reading/research] 1
[Installer/contractor] 2
[MREA – Midwest Renewable Energy Association] 3
[A friend or relative] 4
[Industry sources] 5
[Focus on Energy] 6
[From utility] 7
[Site assessor or site assessment] 8

[Other] (describe) 9996

[Don't know / Don't Remember] 9997
[Refused] 9998

Barriers

Paste in this section from the Impact Statement:

2. **Briefly explain your understanding of the largest customer barriers preventing the project's implementation.**

- ☐ **Payback**
- ☐ **Confidence in realizing estimated savings**
- ☐ **Unknown technology or process**
- ☐ **Lack of time/unwilling to make time to understand what energy options make sense for the facility**
- ☐ **Finding a vendor to implement equipment**
- ☐ **Lack of credibility/legitimacy. Customer needs a third party reference**
- ☐ **Permit barriers**
- ☐ **Internal bureaucracy/inability to gain decision maker's attention**
- ☐ **Lack of access to financing**
- ☐ **Competition for funding with other internal projects**
- ☐ **Lack of internal advocate**
- ☐ **Other (Please describe)**

Other _____

C28. **What types of challenges or obstacles, if any, did you encounter in the process of installing the <TYPE OF PROJECT>?** [PROBE FOR ISSUES such as insurance, installers, permits, dealing with utility connection, money, technical problems.]

[RECORD VERBATIM]

[None]..... 1 [SKIP TO C31]

C29. **How were these resolved?** [RECORD VERBATIM]

Paste in this section of the Impact Statement and use for probing. Briefly describe if and how Focus Staff involvement helped overcome the customer's barriers.

C30. **What role, if any, did Focus on Energy staff play in resolving this (these) issues?** [RECORD VERBATIM]

Final Decision

C31. **To summarize, what were the main reasons that <you/your organization> decided to go ahead with the <TYPE OF PROJECT>?** [RECORD VERBATIM]

C32. **For what reasons did you participate in the Focus on Energy Renewable program?** [RECORD VERBATIM]

C33. **What benefits, if any, did <your household/business> get from the renewable energy system that you did *not* expect when you installed it? Any others?** [RECORD VERBATIM]

D Attribution

Now that we have discussed the services and incentives you received from the Focus on Energy Renewable Program, I'd like you to think about the effect these services and financial incentives had on your decision to install <equipment type>.

[INTERVIEWER: ADDRESS INCONSISTENCIES WITH PREVIOUS RESPONSES AS THEY ARISE.]

DAT0. **Without the Focus on Energy Program, would you say the likelihood of installing the <TYPE OF PROJECT> was…** [READ LIST]

Very likely 1

Somewhat likely 2

Not very likely 3

Or very unlikely 4

[Don't know] 9997

[Refused] 9998

TIMING

DAT1a. **I'd like to know about the effect, if any, that Focus on Energy incentives and other Focus services had on your decision to install <TYPE OF PROJECT> *when you did*.**

Without Focus on Energy would you have installed <TYPE OF PROJECT> at the same time, earlier, later or never?

About the same..... 1

Earlier 2

Later 3

Or never..... 4

[Don't know] 9997

[Refused] 9998

DAT1a_O. **Why do you say that?** [RECORD VERBATIM]

[IF DAT1a ≠ 3 LATER, SKIP TO DAT3]

DAT1b. **Approximately how many months later?** [TRY TO GET A NUMBER]

[RECORD NUMBER OF MONTHS] ..... _____

[Don't know] 9997

[Refused] 9998

SIZE

Next, I'd like to know about the effect, if any, that Focus on Energy incentives and other Focus services had on the capacity of the renewable energy system you installed.

DAT3. **Without Focus on Energy, how different would the size of the <TYPE OF PROJECT> have been? Would you have installed a <TYPE OF PROJECT> with the same, lesser, or greater capacity, or not have installed anything?** [READ LIST]

Same size 1

Lesser capacity 2

Greater capacity 3

Not installed anything 4

Not Applicable 5

[Don't know] 9997

[Refused] 9998

DAT3_O. **Why do you say that?**

[IF DAT3 ≠ 2 LESS, SKIP TO DAT4]

DAT3a1. **According to Focus records, the size of your <TYPE OF PROJECT> system was _____.**

Without Focus on Energy, approximately what size system would you have installed?

DAT3a2. Size_____

DAT3a3. Units_____

DAT 3a4. [To be filled out by interviewer: calculate percent difference from installed project and complete percent response where result is: Percentage = DAT3a1 / DAT3a2 (after converting both units to kW)]

[INTERVIEWER RECORD PERCENTAGE] ..... _____

[Don't know] 9997

[Refused] 9998

DAT4. **We've just discussed the different effects that Focus on Energy had on your decisions regarding the <TYPE OF PROJECT> that you installed. I'd like you to summarize the program's influence on the timing and size of <TYPE OF PROJECT> that you installed. [**PROBE ON TIMING AND CAPACITY]

[IF RESPONSE IS INCONSISTENT WITH PREVIOUS ANSWERS, ATTEMPT TO RESOLVE. NOTE ANY FINAL INCONSISTENCIES.]

DAT7. [To be filled out by interviewer: Vendor surveys are required if the respondent indicates that the program did not have an effect on decision to install, timing, or size AND the respondent indicates that the vendor had substantial influence.

Is a vendor survey required?]

[Yes] 1

[No] 2

DAT8. [To be filled out by interviewer: Note any final inconsistencies]

DAT9. [To be filled out by interviewer: Summarize the project and impact that the program had on the purchase. If you have noted unresolved inconsistencies in DAT8, summarize what you know at this point. Be sure to cover timing, quantity, and why.]

E OVERALL SATISFACTION

E1. **Overall, how satisfied or dissatisfied are you with the performance of the <TYPE OF PROJECT>? Would you say you are:** [READ OPTIONS]

Very DISsatisfied 1

Somewhat DISsatisfied 2

Somewhat Satisfied.....3 [SKIP TO E1b]

or Very Satisfied .....4 [SKIP TO E1b]
[Don't know].....9997 [SKIP TO E2]
[Refused].....9998 [SKIP TO E2]

E1a. **Why do you say that?** [DISSATISFIED. RECORD VERBATIM, THEN SKIP TO E2]

E1b. **Why do you say that?** [SATISFIED. RECORD VERBATIM]

E2. **Next I'd like to know how satisfied or dissatisfied you are with the Focus on Energy program. Using a scale of 1 to 5, where 1 means "not at all satisfied" and 5 means "very satisfied," overall, how satisfied are you with the Focus on Energy Program?**

[1 (not at all satisfied)]....1
[2]....2
[3]....3
[4]....4
[5 (very satisfied)]....5
[Don't know]....9997
[Refused]....9998

E2a. **Why do you say that?** [RECORD VERBATIM]

E3. **Do you have any additional comments about these projects or the Focus on Energy program that they should take into account in the future?** [RECORD VERBATIM]

F Engineering Questions

These are questions specific to the technology and site developed by the reviewing engineer. These questions are developed to collect any additional information needed to verify generation/savings calculation. For PV, wind and biogas they also include questions to obtain the inverter or meter readings.

[IF NON-RESIDENTIAL SKIP TO X1]

G Demographics –for Residential Participants only

Finally, I need to ask you a few questions about your household. These questions are for classification purposes only. All of your answers are confidential.

G1. **What type of residence is the [project type] installed on. Is it a...**

[READ LIST, CIRCLE ONE OPTION]

Single family home (house on separate lot, includes modular homes) ... 1 [SKIP TO G2]

Row or townhouse (adjacent walls to another house) ..... 2 [SKIP TO G2]

A unit in a multi-family structure, 2-4 attached units (example: duplex, triplex, fourplex, or single family house converted to flats) 3

A unit in a multi-family structure, 5 or more attached units (example: apartment building, high-rise condominium, garden apartments).....4

Mobile home, house trailer ..... 5 [SKIP TO G2]

Other, please describe: _____9996

[Don't know/not sure].....9997

[Refused].....9998

G2. **In approximately what year was this residence built?** (Fill in blank)

[PUT IN FULL YEAR – Ex: 1957] Year Built.....____

[Don't know/not sure].....9997

[Refused].....9998

G3. **How many people live in this residence full-time, including yourself and any infants?**

[RECORD NUMBER] ..... _____

[Refused] 9998

G4. **What is the total enclosed square footage of your unit /house? Your best estimate is fine**.

[RECORD # SQ FT] ..... _____

[Don't know] 9997

[Refused] 9998

G5. **What was your total household income in 2008, before taxes? Was it** ...

[READ OPTIONS]

Less than $35,000 1

$35,000 to less than 50,000 2

$50,000 to less than 75,000 3

$75,000 to less than 100,000 4

$100,000 to less than 150,000 5

$150,000 to less than 200,000 6

or more than $200,000 7

[Don't know] 9997

[Refused] 9998

Those are all the questions I have for today. Thank you for taking the time to talk with me.

X Firmographics –for Non-residential only

Finally, I need to ask you a few questions about your business. These questions are for classification purposes only. All of your answers are confidential.

X1. **What is the primary economic activity at** <address>? [RECORD VERBATIM]

[Don't know/not sure] 9997

[Refused] 9998

X2. **Is your business for-profit or not-for-profit?**

[For profit] 1

[Not for profit] 2

[Don't know/not sure] 9997

[Refused] 9998

X3. **Approximately how many full-time employees do you have at this location?**

_____ Record number of FTEs

Those are all the questions I have for today. Thank you for taking the time to talk with me.

APPENDIX B:SELECTED SURVEY RESULTS

In Appendix B we include responses to questions used to determine attribution (B.1) and responses to questions used to confirm the attribution score (B.2.) Where percents are provided they represent case weighted percent of technology respondents.

Some results in this appendix are provided by overall attribution quartile, which are defined in Table B-1.

Table B-1. Attribution Quartile Definition

Overall Attribution Quartile	Project Total Attribution Score
1	Less than 25 percent
2	25 percent to less than 50 percent
3	50 percent to less than 75 percent
4	Seventy five percent to 100 percent

Verbatim responses have been modified to protect the confidentiality of respondents where necessary. Brackets such as “<>” indicate where words have been redacted or changed to protect respondent confidentiality.

B.1 ATTRIBUTION RESPONSES

After each of the DAT (direct attribution questions), we asked an open-ended question to allow the respondents to describe the rationale for their response. When the open-ended response was inconsistent with the answer given, the interviewer clarified the discrepancy with the respondent to ensure that the proper credit was given. Subsequent to the interview, a KEMA analyst reviewed the survey responses and checked for inconsistencies.

Table B-2. DAT1a: Initial Timing Attribution Question
Weighted Percent of Responses

Dat1a: Without Focus on Energy would you have installed system at the same time, earlier, later or never?		Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Attribution Quartile	Response						
1	About the same time	28.5%	16.6%	19.6%	46.1%	13.7%	29.1%
	Earlier	-	-	-	4.3%	7.8%	2.0%
	Later	14.2%	-	-	-	-	0.3%
2	Later	14.2%	16.6%	1.5%	4.8%	6.7%	3.6%
3	About the same time	-	-	4.3%	-	-	2.3%
	Later	-	-	2.0%	4.3%	18.4%	3.7%
4	About the same time	28.5%	16.6%	-	8.2%	-	4.0%
	Earlier	-	-	-	-	6.7%	0.3%
	Later	-	33.3%	20.6%	24.1%	5.8%	20.8%
	Or never	14.2%	16.6%	49.0%	7.9%	40.6%	32.0%
	Missing	-	-	2.6%	-	-	1.4%
All		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table B-3. DAT1a: Initial Timing Attribution Question
Open-ended Responses

Dat1a: Without Focus on Energy would you have installed system at the same time, earlier, later or never?	Technology Type	Why do you say that?
Same Time	Biogas	Something had to happen <> pretty quickly. The focus grant helped us upgrade. W/o focus would have <> at around the same time.
Same Time	Biogas	The project was something that we were ready to do.
Same Time	Biogas	Timed with expansion of <> operation.
Same Time	Biogas	<> funding was nearly ready and a <> expansion project was underway. All those things equaled a digester.
Same Time	Biomass	Existing <> system had a rapid turn over (tanks died about every four years). When a tank died and a <new> technology became available I went ahead with the project.
Same Time	Biomass	Went ahead as part of project
Same Time	Solar Electric	0

Dat1a: Without Focus on Energy would you have installed system at the same time, earlier, later or never?	Technology Type	Why do you say that?
Same Time	Solar Electric	Focus helped but they were not necessary.
Same Time	Solar Electric	I already had it in my mind that I wanted to do the project.
Same Time	Solar Electric	I had some money, had a recommendation for an installer from the neighbor, and retrospectively wish I had done it earlier.
Same Time	Solar Electric	I had the money so if I decided to do it I wouldn't have waited.
Same Time	Solar Electric	We already had plans to do the work.
Same Time	Solar Electric	We looked at the site assessment and what energy we use and the cost matched our available funds.
Same Time	Solar Electric	We planned on having a green building
Same Time	Solar Electric	We thought it was the right thing to do, it just also turned out to be a good investment.
Same Time	Solar Electric	While the incentive was nice, we still wanted an alternative source of energy. We were already building a new building.
Same Time	Solar Water Heating	Due to the broken panels.
Same Time	Solar Water Heating	Part of a new <> construction project.
Same Time	Solar Water Heating	The installation was timed with an addition project.
Same Time	Solar Water Heating	The sooner, the better. As soon as we determined we were going to do it, we did.
Same Time	Solar Water Heating	This is a new facility, now or never.
Same Time	Solar Water Heating	Tied to the timing of an expansion project.
Same Time	Solar Water Heating	Timed with a major remodel
Same Time	Solar Water Heating	Timed with building of house.
Same Time	Solar Water Heating	Timed with house project.
Same Time	Solar Water Heating	Timed with the building of a new home.
Same Time	Solar Water Heating	Timed with the construction of the building.
Same Time	Solar Water Heating	We had a fixed amount of money for home improvements over the year, the pot was running low and we wanted to get the SHW in.
Same Time	Wind	Because I fell in love with the idea of having wind turbines.
Same Time	Wind	I was already committed to doing it.
Earlier	Solar Water Heating	Grant application process caused some delays
Earlier	Wind	Because of the delay that happened while getting the application done <>. Otherwise it would have been the same time frame.
Earlier	Wind	<>
Later	Biogas	Focus helped to identify issues that would have delayed a successful installation.

Dat1a: Without Focus on Energy would you have installed system at the same time, earlier, later or never?	Technology Type	Why do you say that?
Later	Biogas	Given current milk prices without focus we would have had to wait.
Later	Biomass	Focus helped determine the effectiveness of the system and helped organize project deployment and funding.
Later	Biomass	Focus helped to determine which boiler to install, but the incentives really made the project move forward.
Later	Biomass	The dynamics of the NG market have significant effects on the price of BM. When NG is high, BM is relatively cheap. Based on recent NG market we would have been delayed by 18 months. The payback period reduction thanks to the focus grant (~5 years) was the biggest influence
Later	Solar Electric	Because of the price we would have had to install it later if at all.
Later	Solar Electric	Depends on if the federal government went up to 30%. Otherwise, it would be too expensive.
Later	Solar Electric	In order to complete the green building we needed a loan. The Solar project was an extra expense and would have been too much.
Later	Solar Electric	It may have been delayed because it would have been hard to approve a year ago. But they are now more popular and they are getting approved without the utility rebates.
Later	Solar Electric	It would have to make economical sense and so I would see if any other monetary source came along.
Later	Solar Electric	Sizing of system, we wanted a particular size, the rebate helped make it happen now.
Later	Solar Electric	The cost was too high and we would need the cost to go down.
Later	Solar Electric	The financial dollars are not available.
Later	Solar Electric	The technology is changing every day and in ten years maybe it would be better.
Later	Solar Electric	Without the incentive I would never have been able to do the project at the current industry price. If I did it later, it would depend on the price decreasing.
Later	Solar Electric	Without the program it doesn't pay any return, but I do it because it is a good thing to do. It is unknown what would happen to encourage me.
Later	Solar Water Heating	Customer pressure was mounting and he was unsure of how long the rebate would be available.

Dat1a: Without Focus on Energy would you have installed system at the same time, earlier, later or never?	Technology Type	Why do you say that?
Later	Solar Water Heating	I was close to my capital limits. We had lots of projects running at the same time. Without Focus asst. we would have focused on higher leverage (quicker payback) projects.
Later	Solar Water Heating	It was easier to present the family with a single chunk of expenditure. W/o the focus incentives he would have had to break the remodel into multiple stages. This would have made other vested interests less likely to agree to the expense of a RE system. In addition economic stresses would have stretched the timing out even further.
Later	Solar Water Heating	The grant made the project affordable (due to annual budget restrictions).
Later	Solar Water Heating	<>. Respondent's system timing was inline with training and respondent's perception that SHW was a growing market in WI and he wanted to get on board.
Later	Solar Water Heating	We used tax refund money for the capital investment. Without Focus we probably would have waited for the next refund check.
Later	Solar Water Heating	Would have had to arrange finances to relieve some debt prior to installation.
Later	Wind	Because I fell in love with the idea of having wind turbines, however this <> would probably have had to wait.
Later	Wind	I may have done it at some point because there is a good wind source on my land, but the cost is high.
Later	Wind	I wanted to do it and I was already involved.
Later	Wind	The focus on energy program was important because it made it more affordable
Later	Wind	We would have to save money.
Never	Biogas	The initial cost <> was more than other options w/o focus.
Never	Biomass	The buffer (meaning: incentive) helped to defray my costs. Given current energy prices (NG is currently cheap), without focus help the benefits of switching to wood would not have been good enough to justify the switch.
Never	Solar Electric	<>, I is not sure how long I would stay at the house.
Never	Solar Electric	Because of the cost of the system it would be a long payback.
Never	Solar Electric	Because the incentive was what made it possible.
Never	Solar Electric	It is not cost effective.

Dat1a: Without Focus on Energy would you have installed system at the same time, earlier, later or never?	Technology Type	Why do you say that?
Never	Solar Electric	It is too expensive to do. The tax credit helped. If there was other money from another source, maybe.
Never	Solar Electric	It would not have been cost effective.
Never	Solar Electric	Rebates made it affordable
Never	Solar Electric	The cost is too high.
Never	Solar Electric	The cost would have been too high for a non-profit organization to do something like this.
Never	Solar Electric	The incentives made it cost effective
Never	Solar Electric	The information they supplied and the rebate were instrumental in making this project happen.
Never	Solar Electric	The panels would not have paid for themselves without the rebate.
Never	Solar Electric	The payback would have been 40 years.
Never	Solar Electric	The payback would have been too long for me to enjoy the benefits.
Never	Solar Electric	The project is not affordable otherwise.
Never	Solar Electric	The rebate was a huge factor. The fact that someone would help share the cost was emotionally touching for me.
Never	Solar Electric	There is a 21 year payback as it is and panels are rated to last only 25 years.
Never	Solar Electric	This was a big investment, without the focus economic assistance (the grant) to reduce the payback we may not have done it at all.
Never	Solar Water Heating	Financing for full system cost was unavailable to us. Additional (future) financing was not an option in the foreseeable future (probed: greater than 5-10 years, response: yes)
Never	Solar Water Heating	I am able to use the focus on energy rebates with all of the efficiency and renewable projects to grab the board's attention. I'm sure that without that little carrot the board would flat out deny these proposals due to the upfront cost.
Never	Solar Water Heating	This was a coat tail project. Without the <first>, wouldn't have done the second at all. So the delay would be very similar
Never	Solar Water Heating	Without the incentives the market would not be as large. We would be less likely to install the display system if the SHW market was not as large.
Never	Wind	0
Never	Wind	It is an expensive venture and Focus was helpful in making everything go through.

Dat1a: Without Focus on Energy would you have installed system at the same time, earlier, later or never?	Technology Type	Why do you say that?
Never	Wind	It would have gone from financially ridiculous to financially impossible.
Never	Wind	The cost is too high.
Never	Wind	The wind tower was a significant investment and by timing it with the house project (something focus's money allowed) some of the costs were reduced. Without Focus's grant I wouldn't have been able to time the tower excavation with the house excavation.
Never	Wind	Without them, we would have gotten bogged down in the process.
Don't Know	Solar Electric	Costly. If the price went down, maybe I would do it at a later date.
Don't Know	Solar Electric	Focus was very predominant in the ability to do the project. I might add that they helped in the disbursement of information.

Table B-4. DAT3: Initial Size Attribution Question
Weighted Percent of Responses

Dat3: Would you have installed a system with the same, lesser, or greater capacity, or not have installed anything?		Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Attribution Quartile	Response						
1	Same size	42.8%	16.6%	19.6%	50.4%	15.6%	31.2%
	Lesser capacity	-	-	-	-	5.8%	0.3%
2	Same size	14.2%	16.6%	1.5%	4.8%	6.7%	3.6%
3	Same size	-	-	1.0%	-	12.6%	1.2%
	Lesser capacity	-	-	5.3%	4.3%	5.8%	4.7%
4	Same size	28.5%	50.0%	8.3%	24.5%	-	15.1%
	Lesser capacity	-	-	7.0%	2.1%	21.2%	5.7%
	Greater capacity	-	-	-	4.8%	-	1.7%
	Would not have installed anything	14.2%	16.6%	56.9%	8.8%	31.9%	36.1%
All		**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table B-5. DAT3: Initial Size Attribution Question
Open-ended Responses

DAT3. Without Focus on Energy, how different would the size of the project have been? Would you have installed a system with the same, lesser or greater capacity, or not have installed anything?	Technology Type	Dat3_O. Why do you say that?
Same Size	Biogas	Based on expected manure stream.
Same Size	Biogas	Based on herd size.
Same Size	Biogas	Based on the new barn's size
Same Size	Biogas	Based on waste stream.
Same Size	Biogas	The engine size was appropriate given large variations in gas flow.
Same Size	Biogas	We actually decided against focus and <contractor> recommendation and increased the <> size.
Same Size	Biomass	Based on DHW need.
Same Size	Biomass	Based on square footage <> after second construction phase (future expansion at unknown time)
Same Size	Biomass	Focus requirements (for emissions controls) required the movement up to a larger sized boiler (one with the proper re-burn equipment). W/o focus would have used a smaller (contractor advised a little too small)
Same Size	Biomass	Sized to need.
Same Size	Biomass	based on process needs.
Same Size	Solar Electric	Based on previous homes bills.
Same Size	Solar Electric	I actually ran out of roof to install the project on. This had nothing to do with Focus.
Same Size	Solar Electric	I wanted to do the same size.
Same Size	Solar Electric	It is what we wanted.
Same Size	Solar Electric	It was part of building the house no matter what.
Same Size	Solar Electric	That is the size of the roof we have.
Same Size	Solar Electric	The Focus on Energy incentive would not impact the size.
Same Size	Solar Electric	The size installed is realistic, so there would be no reason to install a larger or smaller solar panel.
Same Size	Solar Electric	We looked at the site assessment and what energy we use and the cost matched our available funds.
Same Size	Solar Electric	We planned on having a green building.
Same Size	Solar Electric	We would have done the same project.

DAT3. Without Focus on Energy, how different would the size of the project have been? Would you have installed a system with the same, lesser or greater capacity, or not have installed anything?	Technology Type	Dat3_O. Why do you say that?
Same Size	Solar Electric	We would prefer to delay instead of do a smaller size. We may have done something 20% smaller in a year if we couldn't come up with the extra cash.
Same Size	Solar Water Heating	Based on load
Same Size	Solar Water Heating	Based on load
Same Size	Solar Water Heating	Based on the contractor's assessment (bid).
Same Size	Solar Water Heating	Based on the family size
Same Size	Solar Water Heating	Based on the number of <users>.
Same Size	Solar Water Heating	Based on work with builder.
Same Size	Solar Water Heating	Designed to meet need
Same Size	Solar Water Heating	Professional (contractor) assured them that this was the size they needed.
Same Size	Solar Water Heating	Size to the family's DHW use and space heating demand.
Same Size	Solar Water Heating	Sized for need.
Same Size	Solar Water Heating	Sized to need.
Same Size	Solar Water Heating	Sized to provide hot water and some space heat.
Same Size	Solar Water Heating	The size of the system was dictated by the size of the roof available for panels.
Same Size	Solar Water Heating	The size of the system was limited by roof space. Would have put more if there was more room.
Same Size	Solar Water Heating	The system is sized to needs.
Same Size	Solar Water Heating	based on <> washing load.
Same Size	Solar Water Heating	sized for the family (we worked in the potential of expanding in the future)
Same Size	Wind	Because the percentage of what you get is based on the capacity.
Same Size	Wind	It is a popular machine, a lot in the mid west, and this important because the project is used to train on maintenance.
Same Size	Wind	It was the best size.
Same Size	Wind	There was no change from what I originally wanted.
Same Size	Wind	We would want to go with what the assessor and our consultant recommended.
Smaller	Solar Electric	Focus was part of making it bigger.

DAT3. Without Focus on Energy, how different would the size of the project have been? Would you have installed a system with the same, lesser or greater capacity, or not have installed anything?	Technology Type	Dat3_O. Why do you say that?
Smaller	Solar Electric	I couldn't have afforded more than $<>, but I don't know what size.
Smaller	Solar Electric	I may have done a smaller size with the other programs available.
Smaller	Solar Electric	It would cost less money but would still be good enough for my home.
Smaller	Solar Electric	We have an <interest>. We would do something small like a solar oven.
Smaller	Solar Electric	We may have been able to justify a smaller system with the <Utility> grants.
Smaller	Solar Water Heating	Architect did not have the experience to accurately estimate water use.
Smaller	Solar Water Heating	Initially a smaller design, but by increasing number of panels <> the funding percentage jumped and we would be much more able offset gas use.
Smaller	Solar Water Heating	Would have reduced the system size to something affordable
Smaller	Wind	Not sure what I would have done. Hard to say.
Smaller	Wind	Not sure what I would have done. This first one I may have done smaller. Hard to say.
Smaller	Wind	The site assessment showed me how a larger investment in equip (able to do so thanks to the focus assistance) made for greater production and product quality.
Smaller	Wind	We wanted to do the project so maybe we would have done something smaller.
Smaller	Wind	We would not have gotten a wind turbine. We would have gotten something like a solar hot water heater or something similar.
Larger	Solar Water Heating	Was initially interested in more space heating capability. Increase by perhaps 15%.
Nothing	Biogas	The engine capacity can't change with the overhaul, just an upgrade.

DAT3. Without Focus on Energy, how different would the size of the project have been? Would you have installed a system with the same, lesser or greater capacity, or not have installed anything?	Technology Type	Dat3_O. Why do you say that?
Nothing	Biomass	The buffer (meaning: incentive) helped to defray my costs. Given current energy prices (NG is currently cheap), without focus help the benefits of switching to wood would not have been good enough to justify the switch.
Nothing	Solar Electric	Because of the cost of the system.
Nothing	Solar Electric	Because the economics get worse as size gets smaller.
Nothing	Solar Electric	I wanted to cover the whole roof.
Nothing	Solar Electric	I wouldn't want anything smaller.
Nothing	Solar Electric	It is not cost effective.
Nothing	Solar Electric	It is still not economical.
Nothing	Solar Electric	It would be too expensive to do that, and besides, we wanted enough to handle the amount of electricity we use.
Nothing	Solar Electric	It would not have been practical to do a smaller system.
Nothing	Solar Electric	It's too costly even with the smaller size.
Nothing	Solar Electric	Mine is rather modest to begin with.
Nothing	Solar Electric	My own personal feeling is a smaller size would be fruitless.
Nothing	Solar Electric	Not worth the cost benefit.
Nothing	Solar Electric	Something smaller would be too small and not worth the payback.
Nothing	Solar Electric	The cost is too high.
Nothing	Solar Electric	The cost would have been too high for <us> to do something like this.
Nothing	Solar Electric	The labor costs would not go down even if the size is smaller. It would be charity, and if it is charity there is no reason to make it smaller.
Nothing	Solar Electric	The other grants also decrease as the size decreases.
Nothing	Solar Electric	The project would still be too costly.
Nothing	Solar Electric	We don't have that much money <>.
Nothing	Solar Electric	We would have just focused on <> other green options to make a green building.
Nothing	Solar Electric	We would not have done the system without focus.

DAT3. Without Focus on Energy, how different would the size of the project have been? Would you have installed a system with the same, lesser or greater capacity, or not have installed anything?	Technology Type	Dat3_O. Why do you say that?
Nothing	Solar Electric	We would rather keep this capacity because our goal is to replace what we are using.
Nothing	Solar Electric	Without Focus we would not have been able to pay for the project, but we also would not have the awareness and the knowledge of the technology.
Nothing	Solar Water Heating	I am able to use the focus on energy rebates with all of the efficiency and renewable projects to grab the board's attention. I'm sure that without that little carrot the board would flat out deny these proposals due to the upfront cost.
Nothing	Solar Water Heating	Sized for future homeowners (estimated 6 people, 2 adults, 4 children)
Nothing	Solar Water Heating	Without focus's building energy model we would have installed a less precisely sized system, but don't know how we would have missized the system.
Nothing	Wind	Because of the percentage given based on the generation, it wouldn't make sense to put in a smaller turbine because the cost/benefit decreases.
Nothing	Wind	I didn't know enough without Focus.
Nothing	Wind	I would have gone with a PV array or water heater.
Nothing	Wind	The cost differential for the capacity is not the deterrent. The grant is then smaller.
Nothing	Wind	This is a repair so size is not applicable.

Table B-6. DAT4: Summary of Focus Influence
Open-ended Responses

Overall Attribution Quartile	Technology Type	Dat4. I'd like you to summarize the program's influence on the timing and size of the system that you installed.
1	Biogas	Focus funds made it a little more likely to go ahead with the project. But we were already pretty likely to do it.
1	Biogas	Focus sped the process by helping identify potential issues with the gas quality and quantity as well as code and interconnection issues, however the size of the system would likely be the same without focus.
1	Biogas	The Focus program had very little influence on our decision.
1	Biomass	No influence on timing or size, but helped to reduce cost.
1	Solar Electric	Focus had no effect on the decision to install the project, it was an added benefit.
1	Solar Electric	Focus was a key factor, but we still would not have changed anything. However, I can't really say for sure.
1	Solar Electric	I think I already had the mind set that I would do it. Focus confirmed it but it was not really influential with the size or timing.
1	Solar Electric	No influence
1	Solar Electric	No influence.
1	Solar Electric	There was no effect but I might have gotten scared off with the costs.
1	Solar Electric	There was none really. But in the future we may take it into account for expanding to a larger size.
1	Solar Electric	There wasn't any influence to the timing and size of the project that we installed. If more money was made available, we would have installed a tracker.
1	Solar Water Heating	Due to the addition project the timing for installation of the system was ideal and not tied to Focus on Energy funding. The size of the system was dictated by the sqft of roof space.
1	Solar Water Heating	Focus did not impact capacity, and focus probably slowed down the installation by a small amount (perhaps 1 month)
1	Solar Water Heating	Focus had little effect on timing and size.
1	Solar Water Heating	Focus had no effect on my timing or size.
1	Solar Water Heating	Neither timing nor size were influenced by focus.
1	Solar Water Heating	No effect, although prescreening and listing of qualified installers was helpful.
1	Solar Water Heating	No influence on timing or capacity, but did find the listing of contractors very helpful.
1	Solar Water Heating	No influence.
1	Solar Water Heating	No influence.
1	Solar Water Heating	The program had no influence on size or timing.

Overall Attribution Quartile	Technology Type	Dat4. I'd like you to summarize the program's influence on the timing and size of the system that you installed.
1	Wind	I'm glad I got involved with Focus because it made the process easier. However it's effect was not huge.
1	Wind	No influence
1	Wind	<> I would have done <it> at the same time and possible the same size or <installed a smaller tower>.
2	Biogas	Focus grants helped to install the system one year ahead of time, but did not impact size.
2	Biomass	We were not very likely to install without Focus, there may have been a 1 year delay in the project.
2	Solar Electric	Without Focus we would have waited twelve months to do the same size most likely.
2	Solar Water Heating	Focus helped install sooner, but the family's size determined the system's size.
2	Wind	I would have done it anyway, and relatively soon, so only a slight difference in timing was effected by Focus.
3	Solar Electric	Focus let me maximize my money to get the size I wanted and to do it at the time I wanted.
3	Solar Electric	I knew that Focus gave a 25% rebate and I was ready to put a system in as soon as the Federal incentives were established. The Fed was the final straw with <Utility>. All of the incentives put together made it possible to do that size.
3	Solar Electric	It helped us move it along and get it approved as we were the first one.
3	Solar Electric	We may have done the project at a smaller size and within the same time frame.
3	Solar Water Heating	Financial assistance helped a lot. The incentive pushed the timing up and allowed<us> to nearly cover all of our hot water use. The certification of the installer was also very helpful and added some level of comfort to dealings with the contractor.
3	Wind	Because of Focus we were able to do it when we did and at this size. Otherwise we would have had to wait.
3	Wind	This <> one I may have waited two or more years and may have done something smaller.
3	Wind	Without Focus we would not have been able to install it at this time or at the scale we did. It would have been pushed off because of other priorities.
4	Biogas	Focus helped us pay for the system. Without them we probably wouldn't have done it at all.
4	Biogas	The Focus on energy program may have delayed the installation of the new engine. <> Capacity was increased by the ability to <install> the larger system.
4	Biogas	The focus incentive had very little influence on the size and timing of the system install.
4	Biomass	Focus allowed a much earlier install and required a larger system.
4	Biomass	Focus made the project go forward. Gas and electric are too cheap right now - without focus help I wouldn't have switched.
4	Biomass	No influence from Focus <Supplier Influenced>

Overall Attribution Quartile	Technology Type	Dat4. I'd like you to summarize the program's influence on the timing and size of the system that you installed.
4	Biomass	The system was sized to application and independent of Focus. Timing was accelerated due to payback reduction.
4	Solar Electric	Focus had a lot of influence with the incentive. It helped me do it at the time I did it in and at the size I did it.
4	Solar Electric	As soon as I found out there was money <>, I went ahead and did it. Then I knew I could <add> Federal money. The Focus money was huge because if that was not there I would not have done <it>.
4	Solar Electric	Focus did not have a direct influence on timing or size, but we are not likely to have installed the PV at all without focus assistance.
4	Solar Electric	Focus had a definite influence on the timing and the size.
4	Solar Electric	Focus had a major role. The determining factor was the info and the rebate and I would not have done it otherwise.
4	Solar Electric	Focus helped us to educate the decision makers. It helped to finance the site assessment, it was instrumental in making it feasible to install the system itself.
4	Solar Electric	Focus on energy encouraged me to build it and build it bigger.
4	Solar Electric	I don't know if I wouldn't have done it without Focus.
4	Solar Electric	I don't know. I probably would not have done the project at all without the Focus money.
4	Solar Electric	I feel that Focus on Energy was very influential, the recommendations were very good, and the incentive made it happen.
4	Solar Electric	I probably would not have done the job at all because much of the information I received from them was very helpful and it would have been hard to justify spending the money.
4	Solar Electric	I tired to get the maximum size and the best timing possible with Focus.
4	Solar Electric	I would not have done it without Focus, period.
4	Solar Electric	Once we talked with the contractor we moved right ahead, but slowed down because we heard the Federal tax credit was going up. We would not have done it if Focus was not involved. But we did need all programs to afford the project.
4	Solar Electric	The amount of the rebate determined the cost of the system.
4	Solar Electric	The program and a great influence on the size and timing of the project, as we had no information about the technology nor the funds. If the cost came down, perhaps we would not have needed the program as much.
4	Solar Electric	The program helped increase the size and do it in the time frame we liked.
4	Solar Electric	The project would not have been done at all and the size was exactly what I wanted.
4	Solar Electric	The size was more or less established by how many panels I could get on the roof. The rebate was huge in the decision to do the project at all.
4	Solar Electric	The timing was excellent because Focus offered an excellent rebate and the utility offered a 10 yr contract and the fed offered 30% rebate. Those 3 factors were critical in putting this in.

Overall Attribution Quartile	Technology Type	Dat4. I'd like you to summarize the program's influence on the timing and size of the system that you installed.
4	Solar Electric	They were certainly a component to making the project happen.
4	Solar Electric	We would not have been able to justify the cost of any system without the incentives supplied by Focus on Energy, no matter the size.
4	Solar Electric	We would not have done the project without the incentive.
4	Solar Electric	We wouldn't have done it.
4	Solar Electric	Without focus we would not have installed at all.
4	Solar Electric	Without it I don't believe I would have installed anything.
4	Solar Electric	Without the incentive we would not have installed solar panels anytime soon. We would have focused on other renewable options..
4	Solar Electric	Without the program I would not have done the project at all. Without the payback it would not have been reasonable.
4	Solar Water Heating	Focus helped install the systems a little bit earlier, but reduced the size of the system.
4	Solar Water Heating	Focus rebates and resources help contractors increase their skill and customers become aware of technologies. W/o focus the business wouldn't have installed the system at all because the demand for SHW may not be there.
4	Solar Water Heating	Focus was not influential on the system's size but the incentive helped to install the system on schedule.
4	Solar Water Heating	The focus convinced us to install now (in addition to customer pressure) but did not impact system size.
4	Solar Water Heating	The program did not impact the timing of the system as it was tied to the new construction. However Focus allowed us to size the system properly for the water use - it is unlikely that we would have been able to effectively model the how water consumption of the building without Focus's whole building energy model.
4	Solar Water Heating	The program gave his an avenue to act. Focus made it clear what to do how to do it faster. Helped with than 1 more projects at a time but did not effect the size of the system.
4	Solar Water Heating	The program made <us> aware of the system's ability to work , w/o Focus it isn't likely that <we> would have been aware of this application and so wouldn't have gone forward with the project.
4	Solar Water Heating	The program made <us> aware of the system's ability to work , w/o Focus it isn't likely that <we> would have been aware of this application and so wouldn't have gone forward with the project.
4	Solar Water Heating	The timing and size were based on other influences. But we wouldn't have installed at all due to the expense of the system.
4	Solar Water Heating	This project would not have been approved without focus.
4	Solar Water Heating	Without Focus we wouldn't have done the system within the foreseeable future. The incentive structure allowed a doubling of the system capacity.
4	Solar Water Heating	Without the guidance of Focus the system may not have been properly sized, however timing was unaffected by Focus.

Overall Attribution Quartile	Technology Type	Dat4. I'd like you to summarize the program's influence on the timing and size of the system that you installed.
4	Wind	Focus helped install the wind turbine because the S.A showed an appropriate size system and allowed me to time with the house build.
4	Wind	Focus was important in insuring that <it> was done at lease six month early, if at all, as I may have sold it as is.
4	Wind	If the money was not available it would have not been done then. Because it had to do with the percentage, we went with the size with the largest payback. We would not have been able to afford that size.
4	Wind	It was a critical component of the whole thing. Without the pieces provided by Focus, the project would never have come together.
4	Wind	It wouldn't have been done as quickly without Focus with all the hoops we had to go through and we probably would have pulled the plug on it eventually.
4	Wind	The rebate is influential. The size effects the credits. Without Focus I would not have been able to put up this size at this time.
4	Wind	The timing was not the issue, but the fact that we were getting a grant was why it happened or we would have done a project like this earlier if money was not an issue.
4	Wind	They were helpful in guiding me on the size, right fit, and with the timing we were at the mercy of the politics and availability.

B.2 QUESTION USED FOR VERIFICATION OF RESPONSES

We used responses to verification questions in two ways. First, the interviewer probed further when he or she found inconsistencies between responses. Second, after the survey was complete, an analyst compared responses to the DAT questions to responses to other questions that established the "story" being told by the survey. In cases where the respondent's answers were at odds with the DAT questions, the analyst assessed the survey as a whole to adjust attribution scores, where necessary. There were seven cases where responses to DAT4 (I'd like you to summarize the program's influence on the timing and size of the system that you installed) or other questions resulted in the analyst increasing attribution beyond the simple DAT calculation. We did not make any adjustments to calculated attribution that resulted in a lower attribution level.

After these adjustments, there remain some survey responses that appear inconsistent with the final attribution level. In these cases, the preponderance of evidence from the survey responses supported the initial overall attribution score and we made no change. We discuss these specifics below for three questions.

Contacts with Focus. We reviewed surveys with low attribution in which the respondent indicated that contact with Focus was a very important or somewhat important factor in the decision to install the project. For size, most of these respondents cited site or usage characteristics as the determinant of system size. For timing, several credited Focus with some acceleration of the project. These projects had already been given acceleration credit. Others timed the installation to coincide with other projects or funding sources. All indicated that the project would likely have gone ahead without Focus.

Table B-7. C20b: Importance of Contacts with Focus Staff on Decision to Install
Weighted Percent of Responses

C20b: Would you say that the contacts with Focus on Energy staff...		Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Overall Attribution Quartile	**Response**						
1	Were a very important factor in your decision to do the project	28.5%	16.6%	-	1.2%	-	1.4%
	Were a somewhat important factor	14.2%	-	4.6%	23.2%	-	11.3%
	Made no difference	-	-	9.9%	10.6%	15.6%	10.0%
	Refused	-	-	-	1.2%	-	0.4%
	N/A	-	-	5.0%	14.0%	5.8%	8.2%
2	Were a very important factor in your decision to do the project	-	16.6%	-	-	-	0.3%
	Were a somewhat important factor	-	-	1.5%	4.8%	-	2.5%
	Made no difference	14.2%	-	-	-	-	0.3%
	N/A	-	-	-	-	6.7%	0.3%
3	Were a somewhat important factor	-	-	3.7%	-	6.7%	2.3%
	Made no difference	-	-	2.6%	-	5.8%	1.7%
	N/A	-	-	-	4.3%	5.8%	1.9%
4	Were a very important factor in your decision to do the project	-	33.3%	19.8%	18.3%	33.6%	19.8%
	Were a somewhat important factor	28.5%	16.6%	16.0%	16.8%	13.7%	16.4%
	Made no difference	14.2%	16.6%	18.8%	5.2%	5.8%	12.9%
	N/A	-	-	17.6%	-	-	9.4%
All		**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table B-8. C23: Timing of Knowledge about Focus Incentives
Weighted Percent of Responses

C23: Did you hear about Focus on Energy cash incentives . . .		Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Overall Attribution Quartile	Response						
1	before you started considering or planning for the system	28.5%	-	-	37.8%	7.8%	15.0%
	while you were considering or planning for the system	14.2%	16.6%	15.4%	9.5%	5.8%	12.7%
	after you decided to install but before installation	-	-	1.5%	3.0%	7.8%	2.3%
	Don't know	-	-	2.7%	-	-	1.4%
2	before you started considering or planning for the system	-	16.6%	1.5%	-	-	1.1%
	while you were considering or planning for the system	14.2%	-	-	4.8%	6.7%	2.4%
3	before you started considering or planning for the system	-	-	2.0%	-	12.6%	1.8%
	while you were considering or planning for the system	-	-	4.3%	4.3%	5.8%	4.2%
4	before you started considering or planning for the system	42.8%	33.3%	61.5%	40.3%	33.8%	51.2%
	while you were considering or planning for the system	-	33.3%	10.7%	-	19.3%	7.5%
All		**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table B-9. Timing of First Contact with Focus
Weighted Percent of Responses

C19: At what point in the process did you first contact Focus on Energy? Was it. . .		Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Overall Attribution Quartile	Response						
1	before you started considering or planning	14.2%	-	-	5.2%	-	2.2%
	while you were considering or planning	28.5%	16.6%	10.5%	36.9%	7.8%	20.6%
	after you decided to install but before installation	-	-	2.5%	1.2%	7.8%	2.2%
	after the system was installed	-	-	1.5%	1.8%	-	1.4%
	Did not contact Focus	-	-	5.0%	5.2%	5.8%	4.9%
2	before you started considering or planning	-	16.6%	-	-	-	0.3%
	while you were considering or planning	14.2%	-	1.5%	4.8%	-	2.9%
	Did not contact Focus	-	-	-	-	6.7%	0.3%
3	before you started considering or planning	-	-	1.0%	-	-	0.5%
	while you were considering or planning	-	-	3.7%	-	12.6%	2.7%
	after you decided to install but before installation	-	-	1.6%	-	-	0.8%
	Did not contact Focus	-	-	-	4.3%	5.8%	1.9%
4	before you started considering or planning	-	16.6%	18.0%	17.4%	26.0%	17.8%
	while you were considering or planning	14.2%	33.3%	25.2%	17.7%	27.1%	22.5%
	after you decided to install but before installation	28.5%	16.6%	9.5%	5.2%	-	8.0%
	after the system was installed	-	-	4.1%	-	-	2.2%
	Did not contact Focus	-	-	15.2%	-	-	8.1%
All		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

B.2.1 Site assessment or feasibility studies

We reviewed surveys with low attribution that indicated that the site assessment or feasibility study was a very important or somewhat important factor in the decision to do the project. Responses indicated that the site assessment or feasibility study was necessary to get the rebate, establish the best parameters of the installation, or confirm that it was a good investment. The information provided by the site assessments and feasibility studies was

important to the installation in that it was required, but the rest of the responses indicated that other factors drove the decision to install a system.

Table B-10. C9/C14: How did Site Assessment or Feasibility Study Factor in Decision to Install Weighted Percent of Responses

C9: Did you have a site assessment / feasibility study done for the system at your home/business?			Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Attribution Quartile	C9?	C14: The site assessment/feasibility study…						
1	Yes	a very important factor in your decision to do the project	14.2%	-	-	-	5.8%	0.6%
		somewhat important factor in your decision	28.5%	-	11.5%	5.2%	-	8.7%
		made no difference in your decision	-	-	4.2%	25.6%	7.8%	12.0%
		made you less inclined to do the project	-	-	-	-	7.8%	0.4%
		Missing	-	-	2.3%	1.2%	-	1.7%
	No	N/A	-	16.6%	1.5%	14.0%	-	6.3%
	DKR	N/A	-	-	-	4.3%	-	1.5%
2	Yes	a very important factor in your decision to do the project	-	16.6%	-	-	-	0.3%
		somewhat important factor in your decision	-	-	-	-	6.7%	0.3%
		made no difference in your decision	-	-	1.5%	-	-	0.8%
	No	N/A	14.2%	-	-	4.8%	-	2.1%
3	Yes	a very important factor in your decision to do the project	-	-	5.3%	4.3%	18.4%	5.4%
		somewhat important factor in your decision	-	-	1.0%	-	-	0.5%
4	Yes	a very important factor in your decision to do the project	-	-	24.3%	4.3%	21.2%	15.7%
		somewhat important factor in your decision	14.2%	-	14.7%	23.7%	13.4%	17.6%
		made no difference in your decision	-	50.0%	25.6%	1.8%	11.7%	16.0%
		made you less inclined to do the project	-	-	1.6%	-	-	0.8%
	No	N/A	28.5%	16.6%	6.0%	10.4%	6.7%	8.4%
All			**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

B.2.2 Conference.

We reviewed all surveys with low attribution that indicated a conference was a very important or somewhat important factor in the decision to do the project. All of these respondents indicated that the conference (and tours) helped raise their awareness of the options available. Most also indicated that the conference made them more comfortable with the idea of installing a system. On other questions these respondents cited multiple other determining factors that influenced the size and timing system: timing was associated with other funding sources or construction projects, while size was determined by site conditions and anticipated usage.

Table B-11. C5/C6: Influence of Conference Attendance on Decision to Install
Weighted Percent of Responses

C5: Did you or anyone else in your household/company attend a conference about your system?			Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Attribution Quartile	C5?	C6: The conference(s) was/were…						
1	Yes	a very important factor in your decision to do the project	14.2%	-	-	5.2%	-	2.2%
		somewhat important factor in your decision	-	-	1.5%	5.2%	-	2.7%
		made no difference in your decision	-	-	6.8%	4.8%	-	5.4%
	No	N/A	28.5%	16.6%	11.2%	35.1%	21.5%	21.1%
2	No	N/A	14.2%	16.6%	1.5%	4.8%	6.7%	3.6%
3	Yes	somewhat important factor in your decision	-	-	1.0%	-	-	0.5%
	No	N/A	-	-	5.3%	4.3%	18.4%	5.4%
4	Yes	a very important factor in your decision to do the project	-	-	3.6%	14.3%	6.7%	7.6%
		somewhat important factor in your decision	28.5%	-	10.3%	-	6.7%	6.5%
		made no difference in your decision	-	16.6%	2.7%	1.2%	-	2.2%
	No	N/A	14.2%	50.0%	55.6%	24.7%	39.7%	42.3%
All			**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table B-12. C7/C12 Influence of Workshop Attendance on Decision to Install
Weighted Percent of Responses

C7: Did you or anyone else in your household/company attend a workshop about your system?			Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Attribution Quartile	C7?	C8: The workshop(s) was/were…						
1	Yes	somewhat important factor in your decision	-	-	2.7%	4.8%	-	3.2%
	No	N/A	42.8%	16.6%	16.9%	44.3%	21.5%	27.8%
	DKR	N/A	-	-	-	1.2%	-	0.4%
2	No	N/A	14.2%	16.6%	1.5%	4.8%	6.7%	3.6%
3	No	N/A	-	-	6.4%	-	18.4%	4.4%
	DKR	N/A	-	-	-	4.3%	-	1.5%
4	Yes	a very important factor in your decision to do the project	-	-	6.7%	13.4%	7.8%	9.0%
		somewhat important factor in your decision	-	-	2.7%	-	-	1.4%
		made no difference in your decision	-	-	6.3%	-	5.8%	3.7%
		made you less inclined to do the project	-	-	-	-	6.7%	0.3%
	No	N/A	28.5%	66.6%	56.5%	20.7%	32.7%	41.6%
	DKR	N/A	14.2%	-	-	6.1%	-	2.5%
All			100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

B.3 OTHER RESPONSES

Table B-13. Other sources of Financial Assistance

C24. Did you receive rebates, grants, reduced financing, or tax credits from any other sources for this <TYPE OF PROJECT>? C24a. From What Sources	Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Federal Tax Credit	0%	0%	54%	34%	66%	45%
US Department of Agriculture	29%	17%	0%	9%	7%	5%
Utility Buyback Rate/Feed-in Tariff	0%	0%	40%	0%	13%	22%
Supplier/Manufacturer	0%	0%	0%	6%	0%	2%
Utility Grants/Financing	0%	0%	13%	10%	0%	11%
Other - Donor	0%	0%	1%	0%	0%	1%
Other - City	0%	0%	0%	4%	0%	2%
None	57%	83%	14%	45%	20%	28%
Don't Know/Refused	14%	0%	7%	0%	0%	4%

Table B-14. Unexpected Benefits of System

Technology Type	C33. What benefits, if any, did ,your household/business. Get from the renewable energy system that you did *not* expect when you installed it? Any others?
Biogas	Community interest and education.
Biogas	New M+O package from engine suplier. "Bumper to bumper" on call service contract. Keeps engine running better and more consistently.
Biogas	Our manure management takes much less time now.
Biogas	We are getting more waste heat than we had expected.
Biogas	none
Biomass	Interest in the system, we're even getting drive by stop ins and giving impromptu tours of the system.
Biomass	Opportunity to add a solar thermal loop for the DHW.
Biomass	We have enough extra heat to provide DHW to the kitchen (to be installed before 2010) and heat an additional ~900sqft if space.
Biomass	none
Solar Electric	How many people talk about the fact that we have a green building.
Solar Electric	I believe I am receiving more electrical output then I thought I would.
Solar Electric	I was surprised that during the long days I received a credit on my bill.
Solar Electric	It gave me a reason to talk to people I never would meet because they stop and ask questions.
Solar Electric	It generated interest with other people.
Solar Electric	It has produced a whole lot better than we anticipated.
Solar Electric	It improved the look of the garage.
Solar Electric	It is producing better than expected.
Solar Electric	None.
Solar Electric	Nothing.

Technology Type	C33. What benefits, if any, did ,your household/business. Get from the renewable energy system that you did *not* expect when you installed it? Any others?
Solar Electric	Publicity
Solar Electric	Publicity, encouragement from other people, and entertainment watching it work.
Solar Electric	The community is impressed with the efforts.
Solar Electric	The panels have out performed on electricity.
Solar Electric	We did not expect to make more energy than we use.
Solar Electric	We gained a certain amount of recognition because of the application of the solar panels.
Solar Electric	We generated a lot of attention.
Solar Electric	We generated more and make more money from it then we expected.
Solar Electric	We have received a lot of inquiries, brought people in, and improved awareness about the technology.
Solar Electric	We received a check and not a bill.
Solar Electric	none
Solar Water Heating	Improved air quality <>, improved control of water temperature.
Solar Water Heating	It's totally cool.
Solar Water Heating	Saving more on electric DHW than expected.
Solar Water Heating	Self satisfaction of being more independent
Solar Water Heating	The expansion doubled <> production and heated space square footage but utility (gas) bill remained very nearly the same (w/i a couple of $100).
Solar Water Heating	The system helps with advertising which might lead to more customers. "only green <business like mine> in Wi"
Solar Water Heating	none
Wind	I do not know because I am currently not occupying the property. I have renters right now.
Wind	I don't get tired of looking at it.
Wind	It has generated local interest.
Wind	It is a big advertizing sign.
Wind	My electric bill is very low.
Wind	No
Wind	None.
Wind	The rebate was larger than expected based on the estimate that was given to me.
Wind	We were well covered on the press, our business is also here and so some publicity for our style of business.

Table B-15. Sources of Awareness of Focus on Energy

C17. From Where or Whom did you hear about Focus on Energy? Anywhere else?	Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
Installer/Contractor	0%	17%	22%	2%	39%	15%
MREA	14%	0%	7%	28%	15%	15%
Utility	43%	0%	11%	4%	7%	9%
Friend/Relative	57%	67%	13%	24%	15%	20%
Internet	14%	0%	13%	10%	28%	12%
Site Assessment	0%	0%	3%	0%	0%	2%
News/Media Source	0%	0%	22%	14%	0%	17%
Trade Association/Fair	0%	17%	10%	1%	0%	6%
Work in Industry	0%	0%	4%	9%	0%	5%
Other - An e-mail from Focus on Energy.	0%	0%	4%	0%	0%	2%
Other - It seems they have always been there.	0%	0%	4%	0%	0%	2%
Other - Public relations.	0%	0%	2%	0%	0%	1%
Other - Worked in the same building as WECC before they built the new one.	0%	0%	0%	5%	0%	2%
Other - From an appliance or light bulb purchase	0%	0%	0%	1%	0%	0%
Don't Know	0%	0%	3%	5%	0%	3%

Table B-16. Awareness of Other Financial Assistance

C25/C26. What other programs that provide financial assistance for this kind of project are you aware of?	Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
None	71%	100%	86%	88%	87%	87%
Federal Tax Credit	0%	0%	10%	5%	6%	8%
US Department of Agriculture	29%	0%	0%	2%	13%	2%
Utility Buyback Rate/Feed-in Tariff	0%	0%	4%	0%	6%	2%
Supplier/Manufacturer	0%	0%	0%	0%	0%	0%
Utility Grants/Financing	0%	0%	0%	4%	0%	2%
Other	0%	0%	4%	0%	0%	2%

Table B-17. Satisfaction with the Performance of the System

E1. Overall, how satisfied or dissatisfied are you with the performance of the system? Would you say you are...	Technology Type	E1ab. Why do you say that?
Very Dissatisfied	Solar Electric	I ended up getting a credit when the days were longer.
Very Dissatisfied	Solar Water Heating	Use less gas, saves money
Somewhat Dissatisfied	Solar Water Heating	It doesn't make as much hot water. Water is less hot.
Somewhat Satisfied	Biogas	Still learning about the system operation.
Somewhat Satisfied	Biogas	<It> is more efficient, quiet and doesn't require flaring or as much M+O. An online interface with inverter is very nice.
Somewhat Satisfied	Biogas	The system is operating, but not yet optimized.
Somewhat Satisfied	Biogas	The system is working, but we're still optimizing it.
Somewhat Satisfied	Biogas	We're pleased with the bedding and manure management, but the engine can be fussy.
Somewhat Satisfied	Biomass	Having trouble getting the right <mix>, which is causing a much higher M+O commitment than expected (down approx 24hr/wk).
Somewhat Satisfied	Biomass	The boiler performs as expected, savings are not as expected due to NG price reductions,.
Somewhat Satisfied	Biomass	Works well, provides plenty of heat and serves marketing function.
Somewhat Satisfied	Solar Electric	It does what we want.
Somewhat Satisfied	Solar Electric	It produces well and we have had months in the summer without a bill.
Somewhat Satisfied	Solar Electric	We want to wait until we can see how much the panel will produce for the whole year. The last couple of months it has not produced much because of bad weather.
Somewhat Satisfied	Solar Water Heating	Only problem with the system was the price, I felt it was too expensive.
Somewhat Satisfied	Solar Water Heating	We had a few issues with capacity and synchronizing backup heat source.
Somewhat Satisfied	Solar Water Heating	as expected
Somewhat Satisfied	Solar Water Heating	exceeding expectations.
Somewhat Satisfied	Wind	It is considerably nosier than we were lead to believe. We were not provided a hush tip as we were told we would be. We are satisfied with the production.

E1. Overall, how satisfied or dissatisfied are you with the performance of the system? Would you say you are...	Technology Type	E1ab. Why do you say that?
Somewhat Satisfied	Wind	The projected potential kw is not what we are getting.
Somewhat Satisfied	Wind	There have been some quirks, noise issues, and the issue with the installer has over shadowed everything.
Somewhat Satisfied	Wind	This was not running for months because when the inverters broke, they sent only one replacement.
Somewhat Satisfied	Wind	We are waiting for an upgrade of sound reduction for the turbine. At that point we will be very satisfied.
Somewhat Satisfied	Wind	We had a number of problems with the inverters. They did not work correctly from the beginning.
Very Satisfied	Biogas	It is nice to be able to use the engine's heat.
Very Satisfied	Biogas	The system is producing at or above expected output. Waste stream is consumed entirely and outputs are of consistent quality and quantity. Odor reduction is good.
Very Satisfied	Biomass	The system is overperformning and I am seeing a very significant savings on the gas bill between last march and this.
Very Satisfied	Biomass	The system works extremely well, and is expected to use much less wood than last year's use.
Very Satisfied	Biomass	providing heat, not using a foreign product and providing some local jobs (fuel from local pellet plant)
Very Satisfied	Solar Electric	Everything went well, met expectations, and everyone involved did a great job.
Very Satisfied	Solar Electric	Everything works.
Very Satisfied	Solar Electric	For two months the production of the panels has relieved electric and gas use. The excess that was produced paid for half of the electric and gas bill.
Very Satisfied	Solar Electric	I am getting payback checks from the utility.
Very Satisfied	Solar Electric	I am waiting to see if it generates the amount of energy expected.
Very Satisfied	Solar Electric	I feel like I am making a positive impact, it is green, and I think everyone should do it. It is a legacy.
Very Satisfied	Solar Electric	I feel the PV is working well, and we are getting as much or more power than we thought we would. This is mainly due to the tracking system.

E1. Overall, how satisfied or dissatisfied are you with the performance of the system? Would you say you are...	Technology Type	E1ab. Why do you say that?
Very Satisfied	Solar Electric	I have made 1kwh more than I consumed. I think that I will be financially ahead on a month but month basis.
Very Satisfied	Solar Electric	I have not experienced a winter yet, but so far I have been getting credited during the long days.
Very Satisfied	Solar Electric	I am satisfied with the installation and the contractor was good to work with.
Very Satisfied	Solar Electric	It has been working and there have been no problems.
Very Satisfied	Solar Electric	It has exceeded our expectations.
Very Satisfied	Solar Electric	It is functioning perfectly and we will get our return.
Very Satisfied	Solar Electric	It is good and it is on track with all the estimates.
Very Satisfied	Solar Electric	It is pretty good. The savings are great and we are definitely utilizing it.
Very Satisfied	Solar Electric	It is producing more than initially anticipated. It has drawn people's attention to the use of solar. It had given <us> a good image in the community.
Very Satisfied	Solar Electric	It is producing well.
Very Satisfied	Solar Electric	It is working very well and is virtually maintenance free.
Very Satisfied	Solar Electric	It is working. Twelve percent of the cost we have received back.
Very Satisfied	Solar Electric	It met my expectations.
Very Satisfied	Solar Electric	It replaces the energy we use.
Very Satisfied	Solar Electric	It works
Very Satisfied	Solar Electric	It works well.
Very Satisfied	Solar Electric	No problems for a year of it running. It has offset bills. I don't even know it is here.
Very Satisfied	Solar Electric	Paying our bills.
Very Satisfied	Solar Electric	Performing beyond expectations.
Very Satisfied	Solar Electric	Produces power even when cloudy.
Very Satisfied	Solar Electric	Satisfied so far, but I don't know how the production will be in the future.
Very Satisfied	Solar Electric	So far the extra building has not cost anything in electricity.
Very Satisfied	Solar Electric	The project is doing well.
Very Satisfied	Solar Electric	The system went in without a hitch, no underlining costs, minimal interruptions during the installation, and basically generates what we use.

E1. Overall, how satisfied or dissatisfied are you with the performance of the system? Would you say you are...	Technology Type	E1ab. Why do you say that?
Very Satisfied	Solar Electric	There were glitches with the converters, but I am pretty satisfied.
Very Satisfied	Solar Electric	There were no surprises and we got what we bargained for.
Very Satisfied	Solar Electric	They do what they are suppose to do.
Very Satisfied	Solar Electric	We are actually producing more than we thought we would.
Very Satisfied	Solar Electric	We are glad we did the project, it opened up a new market, and we feel good.
Very Satisfied	Solar Electric	We have been generating between 60-80% of the electricity needed.
Very Satisfied	Solar Water Heating	Cannot believe how small the NG bill is. It is 1/3 the size of comparable buildings.
Very Satisfied	Solar Water Heating	Currently exceeding projections
Very Satisfied	Solar Water Heating	It is a good reduction of electric bills.
Very Satisfied	Solar Water Heating	It works.
Very Satisfied	Solar Water Heating	Makes hot water to 95 deg and we only need gas to boost it a bit.
Very Satisfied	Solar Water Heating	Performs as expected, and even a little bit better in winter
Very Satisfied	Solar Water Heating	Performs as expected.
Very Satisfied	Solar Water Heating	Reduced electrical bills greater than expected. The system is fun to monitor.
Very Satisfied	Solar Water Heating	The system design is good for the size of the building, and it performs as we expected.
Very Satisfied	Solar Water Heating	The system is painless and works.
Very Satisfied	Solar Water Heating	The system performs as expected.
Very Satisfied	Solar Water Heating	The system provided 100% of the hot water in the summertime (even with house guests)
Very Satisfied	Solar Water Heating	There was a noticeable drop in the gas use. It also provides 'good PR'.
Very Satisfied	Solar Water Heating	Washes <> w/o needed much additional gas.
Very Satisfied	Solar Water Heating	We like the aesthetics of the panels and it is easy to run.
Very Satisfied	Solar Water Heating	Works as designed.
Very Satisfied	Solar Water Heating	exceeding expectations.
Very Satisfied	Solar Water Heating	huge savings.
Very Satisfied	Wind	Everything we were told that would happen, for instance production, is happening.

E1. Overall, how satisfied or dissatisfied are you with the performance of the system? Would you say you are...	Technology Type	E1ab. Why do you say that?
Very Satisfied	Wind	I am overall satisfied despite it generating less than planned.
Very Satisfied	Wind	It replaces the electricity being used, but with the repair I am not making much of a profit.
Very Satisfied	Wind	It stands up well, has not fallen, and generates power.
Very Satisfied	Wind	It works and has decreased my bills.
Very Satisfied	Wind	My bills are lower and I feel like I am contributing.
Very Satisfied	Wind	The machine is doing what it is suppose to be doing. High maintenance, but not a whole lot of problems.
Very Satisfied	Wind	When there's wind it works very well.
Don't Know	Wind	So far I have only gone through the summer months and the wind is starting to pick up.

Table B-18. Satisfaction with Focus on Energy

E2. Next I'd like to know how satisfied or dissatisfied you are with the Focus on Energy program.	E2. Why do you say that?	Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
1 (not at all satisfied)	Rebate	0%	0%	0%	4%	0%	2%
1 (not at all satisfied)	Helpful	0%	0%	0%	4%	0%	2%
1 (not at all satisfied)	Paperwork problems	0%	0%	0%	0%	0%	0%
1 (not at all satisfied)	Administrative problems	0%	0%	0%	0%	0%	0%
1 (not at all satisfied)	General Positive Feedback	0%	0%	0%	0%	0%	0%
1 (not at all satisfied)	Other	0%	0%	0%	0%	0%	0%
2	Rebate	0%	0%	0%	0%	0%	0%
2	Helpful	0%	0%	0%	0%	0%	0%
2	Paperwork problems	0%	0%	0%	0%	0%	0%
2	Administrative problems	0%	0%	0%	0%	0%	0%
2	General Positive Feedback	0%	0%	0%	0%	0%	0%
2	Other	0%	0%	0%	0%	0%	0%
3	Rebate	0%	0%	0%	0%	7%	0%
3	Helpful	0%	0%	0%	0%	0%	0%
3	Paperwork problems	0%	0%	0%	0%	0%	0%
3	Administrative problems	0%	17%	8%	0%	7%	5%
3	General Positive Feedback	0%	0%	0%	0%	0%	0%
3	Other	0%	0%	0%	0%	0%	0%

E2. Next I'd like to know how satisfied or dissatisfied you are with the Focus on Energy program.	E2. Why do you say that?	Biogas (n=7)	Biomass (n=6)	Solar Electric (n=41)	Solar Water Heating (n=24)	Wind (n=15)	Overall (n=93)
4	Rebate	0%	0%	2%	5%	0%	3%
4	Helpful	0%	0%	2%	5%	6%	3%
4	Paperwork problems	0%	17%	6%	10%	0%	7%
4	Administrative problems	0%	0%	13%	15%	0%	12%
4	General Positive Feedback	0%	0%	7%	15%	0%	9%
4	Other	14%	0%	0%	0%	0%	0%
5 (very satisfied)	Rebate	29%	17%	39%	6%	47%	27%
5 (very satisfied)	Helpful	43%	67%	28%	38%	39%	33%
5 (very satisfied)	Paperwork problems	0%	0%	0%	0%	0%	0%
5 (very satisfied)	Administrative problems	0%	0%	0%	0%	13%	1%
5 (very satisfied)	General Positive Feedback	43%	0%	27%	14%	20%	22%
5 (very satisfied)	Other	0%	0%	0%	0%	0%	0%

APPENDIX C: ADDITIONAL DETAIL FOR SAMPLING AND RESULTS

C.1 SAMPLING DETAIL

We employed a new sampling method using a tool new to KEMA to determine the sample design. The tool uses Model Based Statistical Sampling (MBSS) to develop a design that will produce the optimally allocated sample by maximizing precision based on the population and the expected variance in the population. MBSS is a statistical approach to sampling pioneered by Roger Wright that leverages information known about the population to more efficiently design a sample. The tool is a collection of modules that can help to choose appropriate sample sizes for data segments, develop efficiently stratified sample designs, draw samples, and validate sample data. This tool has been used to design samples for many impact evaluations of energy efficiency and renewable energy programs across the country.

The tool is ideal for complex sample designs with large populations and multiple analysis variables. It allows KEMA to create code that can be used by a number of people and produce consistent results. The process is more efficient and less time consuming than the previous sampling method and produces anticipated precision estimates for each group in the population.

We used the MBSS system to design a stratified random sample that would maximize our overall precision. We then tweaked the sample design to provide us with improved precisions in each of the technologies and customer groups. Projects were initially assigned to strata based on their system type and customer type (residential or nonresidential). The MBSS system determined optimal cut points to further stratify by size. We used the utility avoided cost of the savings (offset of a project to determine project size. Utility avoided costs allow us to convert electric and therm savings into a common unit: dollars. Within each strata, a target number of completed surveys were assigned based on the total savings represented by the strata and the variation in estimated savings. We assigned a random number to each project and sorted the projects by this number to determine the selection order within each stratum. Customers were contacted until either the stratum target was met or the sample population was exhausted.

Final sample dispositions by sector and technology are shown in Table C-1 below. We completed surveys for measures representing 95 percent of kWh and 99.7 percent of therms.

Table C-1. Completed Surveys Percent Savings by Technology and Sector

Technology	Pop N	Target N	Completes N	Percent Complete of Sector/Technology Population Savings kWh (%)	kW (%)	Therms (%)
Nonresidential Projects						
Biogas	8	8	7	100.0%	100.0%	100.0%
Biomass	6	6	6	100.0%	100.0%	100.0%
Solar Electric (PV)	62	18	19	43.0%	43.7%	
Solar Water Heating	32	13	13	NA*	NA*	71.8%
Wind	3	3	3	100.0%	100.0%	
All Nonresidential	**111**	**48**	**48**	**97.8%**	**92.7%**	**99.8%**
Residential Projects						
Solar Electric (PV)	98	22	22	25.9%	26.3%	
Solar Water Heating	80	11	11	21.0%	21.3%	6.8%
Wind	14	14	12	87.3%	86.8%	
All Residential	**192**	**47**	**45**	**40.4%**	**30.3%**	**6.8%**
All Projects	**303**	**95**	**93**	**95.0%**	**85.5%**	**99.7%**

* These percents cannot be calculated because they are a mix of negative and positive savings that come close to zero.

C.2 ADDITIONAL DETAILED RESULTS

Table C-2. Detailed Gross Savings Adjustments

Technology	kWh n[a]	kWh CY09	kWh Margin of Error (90% confidence) CY09	kWh Margin of Error (90% confidence) Extra-polated	kW n[a]	kW CY09	kW Margin of Error (90% confidence) CY09	kW Margin of Error (90% confidence) Extra-polated	Therms n[a]	Therms CY09	Therms Margin of Error (90% confidence) CY09	Therms Margin of Error (90% confidence) Extra-polated
Overall Renew	**85**	**82%**	**± 0.2%**	**± 16.5%**	**83**	**99%**	**± 0.5%**	**± 12.7%**	**23**	**109%**	**± 0.0%**	**± 0.3%**
Biogas	6	88%	± 0.0%	± 15.9%	6	102%	± 0.0%	± 15.8%	1	100%	± 0.0%	± 0.0%
Biomass	2	265%	± 0.0%	± 170.2%	1	100%	± 0.0%	± 0.0%	6	109%	± 0.0%	± 0.1%
Solar Electric	41	77%	± 8.0%	± 10.0%	41	76%	± 8.3%	± 10.3%	0			
Solar Hot Water	22	96%	± 30.0%	± 32.4%	22	95%	± 30.0%	± 32.5%	16	91%	± 5.8%	± 9.1%
Wind	14	67%	± 0.6%	± 2.3%	14	69%	± 0.6%	± 3.9%	0			

[a] Gross Savings Adjustments are not calculated directly but are products of other adjustment factors. Therefore, sample sizes reflect the minimum sample size used in calculating the realization rate.

APPENDIX D: RATIO ESTIMATION METHODOLOGY

KEMA used the statistical procedure of ratio estimation to develop estimates of evaluation verified gross and net impacts. There are two basic steps in the process. The first step is to verify energy savings (offsets) in a sample of participating customers. KEMA accomplished this first step via engineering reviews, customer interviews, and supplier interviews. The second step is to expand the sample results to the population of customers. This is accomplished by calculating the ratios of verified-to-reported and attributable-to-verified for the sample. The ratios are also referred to in this analysis as adjustment factors. The adjustment factors estimated from the data collection and analysis include:

- **Gross savings adjustment factor.** This factor combines the installation rate and the engineering verification factor. It corresponds to the ratio of the verified gross savings to the tracking estimate of savings.
- **Attribution factors.** This factor adjusts verified gross savings for program attribution. It is the estimated proportion of verified gross savings attributable to the Focus Renewable Program. It corresponds to the ratio of net savings to verified gross savings.
- **Realization rate.** This factor combines the gross savings adjustment factor and the attribution factor. It corresponds to the ratio of the net savings to the tracking estimate of savings.

D.1 EXPANSION OF SAMPLE RESULTS TO THE POPULATION VIA RATIO ANALYSIS

The calculation of the adjustment factors for tracking system gross and net savings uses appropriate weights corresponding to the sampling rate. The three primary adjustment factors are the installation rate, the engineering verification factor, and the attribution factor. Each of these is calculated as a ratio estimator over the sample of interest (Cochran, 1977, p.165). The formulas for these factors are given below.

Notation: The following terms are used in calculating the adjustment factors:

G_{Tj} = tracking estimate of gross savings for project *j*

G_{Ij} = tracking estimate of gross savings for project *j*, adjusted for non-installation

G_{Vj} = verified gross savings for project *j* based on engineering review

N_{Vj} = net savings determined from the survey.

w_j = weighting factor for project j used to expand the sample to the full population (case weight)

D.2 INSTALLATION RATE

The installation rate R_I is calculated from the sample as

$$R_I = \frac{\sum_{j\varepsilon} G_{Ij} w_j}{\sum_{j\varepsilon} G_{Tj} w_j}$$

D.3 ENGINEERING VERIFICATION FACTOR

The engineering verification factor R_V is calculated from the sample as

$$R_V = \frac{\sum_{j\varepsilon} G_{Vj} w_j}{\sum_{j\varepsilon} G_{Ij} w_j}$$

D.4 ATTRIBUTION FACTOR

The attribution factor R_{FR} uses data from the sample:

$$R_{FR} = \frac{\sum_{j\varepsilon} N_{Vj} w_j}{\sum_{j\varepsilon} G_{Ij} w_j}$$

D.5 STANDARD ERRORS

The ratio estimator is calculated using a SAS® macro provided by SAS for ratio estimation by domains. The procedure also returns the standard error of the estimate. The standard error is calculated using two methods.

The first method recognizes the sample as drawn from a finite population: the projects completed within the analysis period with associated energy impacts in the program-tracking database. This calculation uses the Finite Population Correction (FPC) factor. This factor is a reduction to the calculated variance that accounts for the fact that a relatively large fraction of the population of interest has been observed directly and is not subject to uncertainty. It is appropriate to apply precision statistics, such as confidence intervals, based on the standard error calculated in this manner when quantifying the results of the program during the study period only.

The second calculation treats the population of interest as essentially infinite. Thus, the projects completed to date and the sample selected from them is regarded as random instances of a virtually infinite number of projects that could have been completed under the program. In this case, the FPC is not included. It is appropriate to apply standard errors calculated in this manner when applying the verification factors developed from this study to tracked savings from other years to estimate verified savings in those years.

D.6 GROSS VERIFICATION FACTOR AND OVERALL REALIZATION RATE

The gross verification factor is the ratio of verified gross to tracking estimate of gross savings. This factor is calculated by chaining together the installation rate and the engineering verification factor:

$$R_G = R_I R_V = \left[\frac{\sum_{j\varepsilon} G_{Ij} w_j}{\sum_{j\varepsilon} G_{Tj} w_j} \right] \left[\frac{\sum_{j\varepsilon} G_{Vj} w_j}{\sum_{j\varepsilon} G_{Ij} w_j} \right]$$

This is an example of a chained ratio estimator using a nested sample. The standard error for the chained ratio is approximated by the formula

$$\mathrm{SE}(\mathrm{AB}) \simeq \mathrm{AB} \sqrt{\left[\left(\frac{\mathrm{SE(A)}}{\mathrm{A}} \right)^2 + \left(\frac{\mathrm{SE(B)}}{\mathrm{B}} \right)^2 \right]}.$$

(This formula overstates the standard error, because it ignores the correlation between the numerator of R_I and the denominator of R_V, which reduces the variance of the product.)

Likewise, the overall realization rate is calculated by chaining together the gross verification factor with the attribution factor. The same approximation formula allows (an over-estimate of) the standard error of the realization rate to be calculated from the two separate standard errors.

APPENDIX E: ATTRIBUTION ANALYSIS METHODOLOGY

This appendix provides a detailed explanation of the program attribution methodology used in this impact evaluation.

E.1 OVERVIEW OF APPROACH

The attribution analysis uses data collected from the engineering review, participant surveys, and supplier surveys. We calculate the following adjustment factors based on this data:

- **Installation rate.** This factor corresponds to the fraction of savings that were installed. Each project is assigned a binary factor that identifies whether it was installed or not installed. Adjustments to the size of the system installed for a particular project are not included in the installation rate, rather they are included in the engineering verification factor.

- **Engineering verification factor.** This is the ratio of the verified gross savings to the tracking estimate of gross savings for installed measures. The engineering verification factor includes corrections due to differences between the number of tracked and the number of verified units installed, changes in operating conditions, and errors in calculation or assumptions.

- **Attribution factors.** These factors are used to determine the proportion of the verified gross savings attributable to the Focus on Energy Renewable Program. The attribution factors are determined from the participant's responses to a battery of survey questions designed to determine how influential the Focus on Energy Renewable Program was in the decision to install a particular measure.

The two attribution factors that affect the final net savings are timing and quantity. Both attribution factors are based on responses to the attribution questions in the impact evaluation survey. The following is a brief description of each factor:

- **Timing attribution, A_T.** This measures the effect the program had on *when* the equipment was installed. The timing attribution is a linear function of the *Acceleration Period, m_a*, which corresponds to the number of months between when the equipment was actually installed and when it would have been installed in the absence of the program. For respondents who say they would have installed at the same time or earlier without the program, $m_a = 0$. For those who say they would have installed later without the program, m_a is the number of months later they say they would have installed, up to a maximum of 48.

- **Quantity attribution, A_Q.** This measures the effect the program had on the quantity of the equipment installed. The quantity attribution measures the proportion of savings attributable to the program for increasing the quantity of equipment above what would have been installed otherwise.

The complement of attribution is free-ridership. Attribution measures the portion of the savings that result because of the actions of the program. Free-ridership measures the portion of the savings that would have happened in the absence of the program. The free-

ridership equivalents of the attribution factors are used to determine program net savings. They are:

- **Timing free-ridership, f_T.** The timing free-ridership is also a linear function of the Acceleration Period, m_a, defined under Timing Attribution above.
- **Quantity free-ridership, f_Q.** This is the fraction of installed units that would have been installed without the program (free rider quantity factor). This value is also equivalent to the factor Q used in previous attribution analysis reports.

The free-ridership values are easily calculated from the attribution factors.

- $f_T = 1 - A_T$
- $f_Q = 1 - A_Q$

E.2 ATTRIBUTION ANALYSIS

The impact evaluation starts with the program-reported gross savings for a measure. This is the savings value reported by the program in the program tracking database. The verified gross savings are determined by multiplying the tracking savings by the installation rate and the engineering verification factor. The combined installation rate and engineering verification factor is referred to as the gross savings adjustment factor. These equations are illustrated in Figure E-1 and Figure E-2.

Figure E-1. Gross Savings Adjustment Factor Calculation

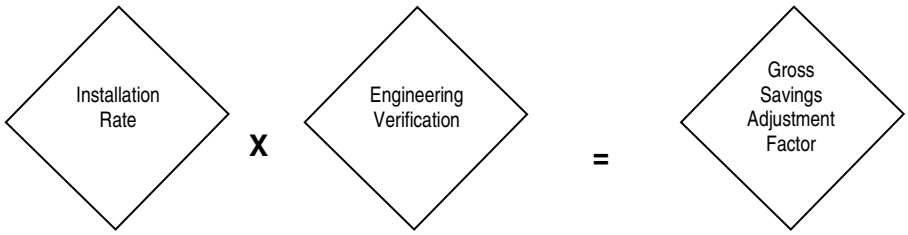
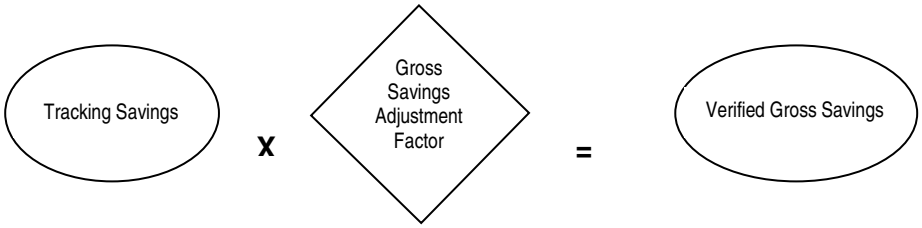
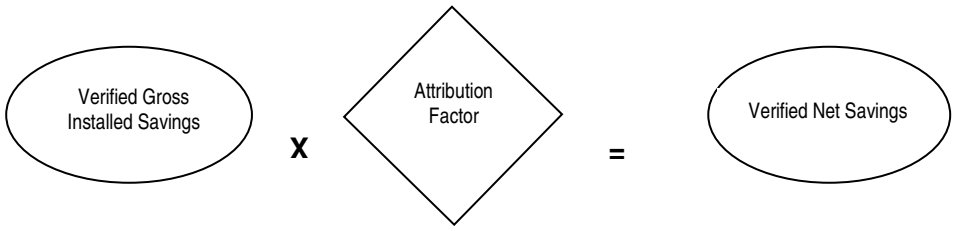


Figure E-2. Gross Savings Adjustment Factor Calculation



As shown in Figure E-3, the verified net savings for each measure are equal to the VGI savings multiplied by the overall **Attribution Factor, A**.

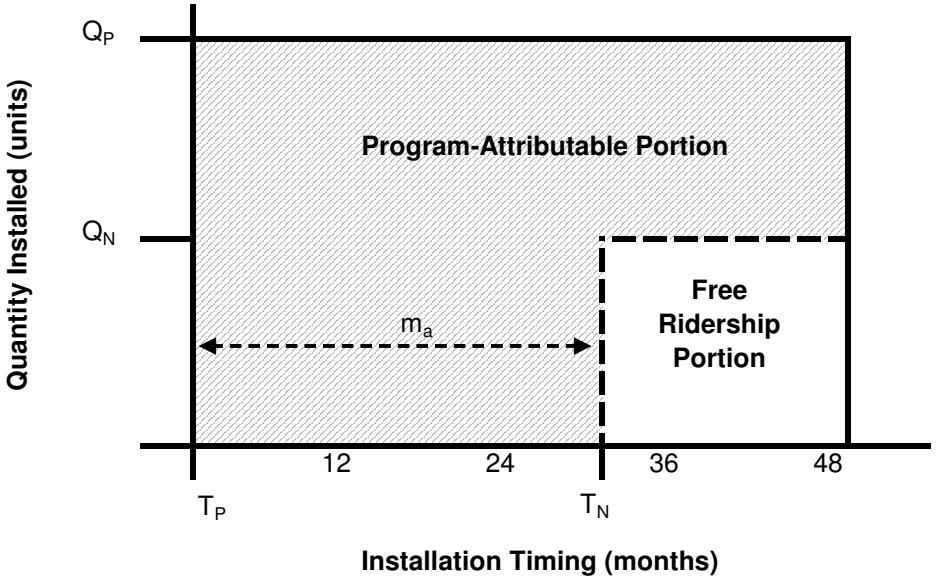
Figure E-3. Verified Net Savings Calculation



The overall attribution factor is a function of the quantity free-ridership and the timing free-ridership. The attribution factor is the fraction of VGI savings that are attributable to the program.

The relationship is illustrated in Figure E-4. Subscript **P** refers to "program-influenced" and **N** refers to "naturally occurring" (i.e. without program influence).

Figure E-4. Attribution Illustration



In Figure E-4, we see how the program-attributable portion of energy savings depends on the attributable quantity installed and the program influenced acceleration of installation.

The acceleration period can be calculated from this graph using:

$$m_a = T_N - T_P$$

The timing attribution then is calculated from the acceleration period using:

$A_T = m_a/48.$

Therefore timing free-ridership is calculated from the acceleration period using:

$f_T = 1 - A_T = 1 - m_a/48.$

The quantity attribution can also be calculated from this graph using:

$A_Q = (Q_P - Q_N) / Q_P$

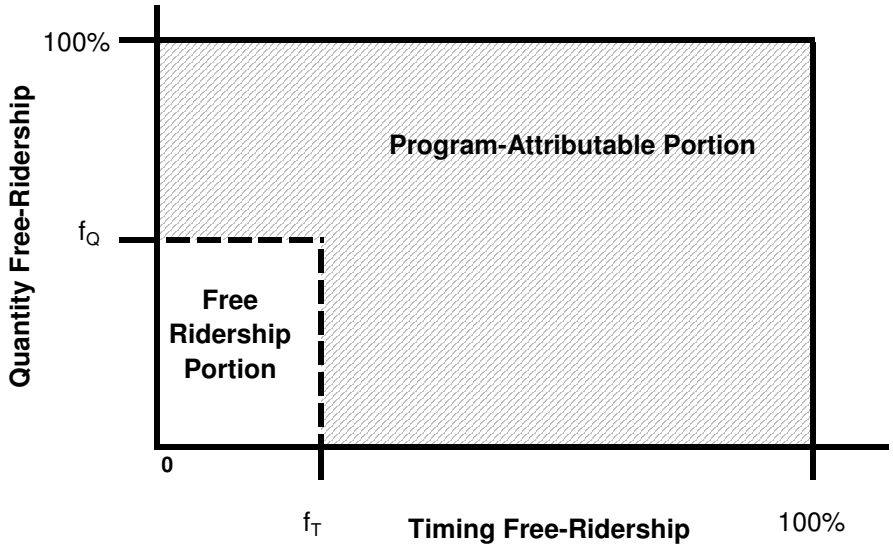
The overall attribution factor is

$A = 1 - f_Q f_T = A_Q + A_T (1- A_Q)$

Thus, if the measure was accelerated by more than 48 months, the timing free-ridership, f_T is 0 and the attribution is 1, regardless of quantity free-ridership, f_Q. If the measure was not accelerated at all, $f_T = 1$ and attribution is based solely on the quantity attribution.

Figure E-5 shows the attribution equation in graphical format.

Figure E-5. Graphical Derivation of the Attribution Equation



The net savings can be calculated

First-year net savings = VGI Savings * A

E.3 DETERMINING ATTRIBUTION PARAMETERS

The attribution factors defined in the previous section are determined from the participant responses gathered during the survey. This section provides an overview of the survey data

and how it is used to determine each attribution factor. It also includes more detailed sections for each factor that show exactly how all survey responses are handled.

E.3.1 General procedure

This section provides an overview of the attribution factors and how they are determined.

- **Timing attribution, A_T.** The timing attribution is determined directly from the acceleration period, m_a, which is in turn provided directly by the respondent. The timing attribution is equal to $A_T = m_a/48$ for values of m_a less than or equal to 48. There is no timing attribution effect for values of m_a greater than 48; in those instances we assume that the measure would never have been installed without the influence of the program.

- **Quantity attribution, A_Q.** The quantity attribution is based on the percent increase in quantity caused by the program, **Inc**, which is in turn provided directly by the respondent. The quantity attribution is equal to $A_Q = Inc / (Inc + 100\%)$.

The next few sections deal with determining the timing, efficiency, and quantity attributions on a more detailed level.

E.3.2 Detailed assignments

This section gives a detailed accounting of how the attribution factors are determined from the survey responses.

a. TIMING

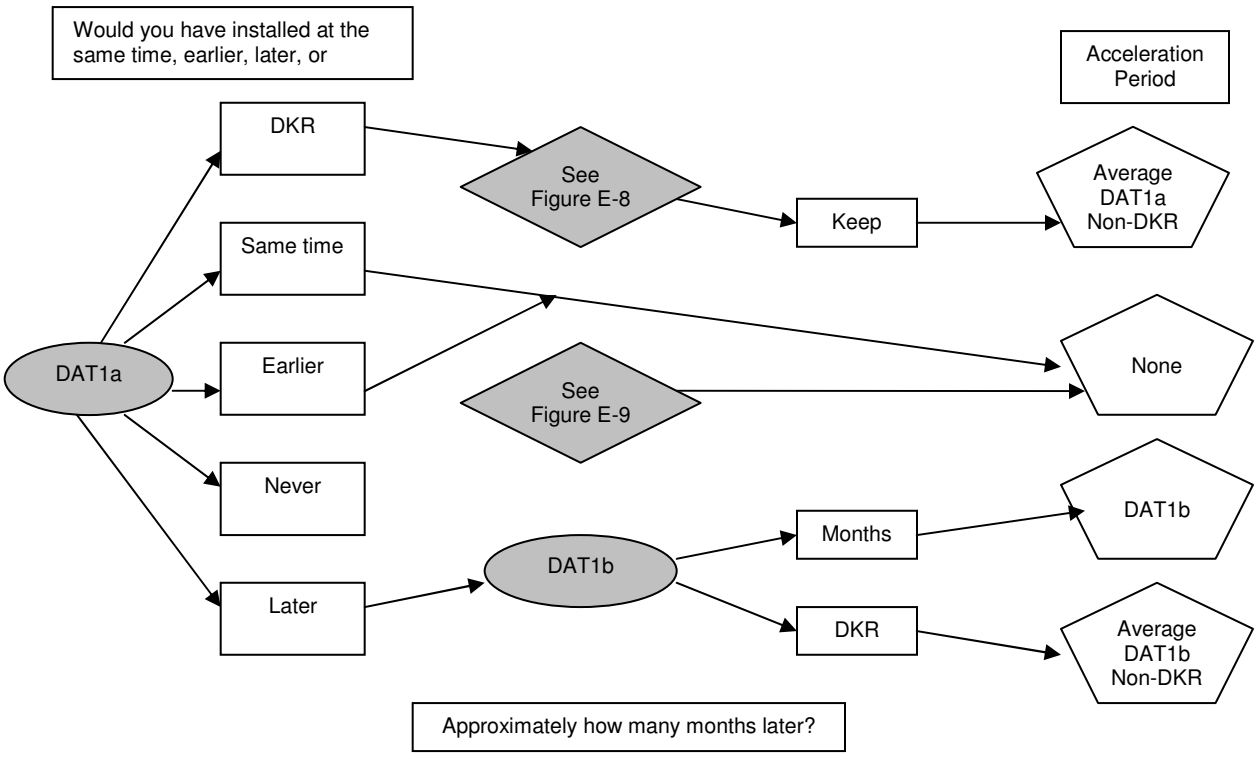
The timing attribution, A_T, is determined from the first set of attribution survey questions. These questions are used to determine whether or not Focus accelerated implementation of a measure or caused it to be implemented before it would have been without the program. The two relevant questions are DAT1a and DAT1b.

> DAT1a: "Without Focus incentives and other Focus assistance, how different would the timing have been? Would you say you would have installed (TYPE OF PROJECT] at the same time, earlier, later, or never?"
>
> DAT1b: "Approximately how many months later?" (DAT1b is only asked if DAT1a is "Later.")

b. DETERMINATION OF THE ACCELERATION PERIOD

Figure E-6 shows a decision tree for DAT1a and DAT1b. In the decision tree, "DKR" refers to "Don't Know" and "Refused."

Figure E-6. Decision Tree for the Acceleration Period



The measure is considered accelerated if the respondent indicates that the measure would have been installed less than four years later without the influence of Focus. The acceleration period is determined based on the answer to DAT1b. If the respondent is unable to answer DAT1b, the measure is assigned the average acceleration period across all accelerated measures of the same customer and project type.

If the respondent answers DAT1a with Earlier or Same Time then there is no acceleration period. If the respondent answers DAT1a with Never and the project is assigned full attribution. If the respondent answers DAT1a with Don't Know or Refused but does provide answers to inform the Quantity Attributions then the project is assigned the average Acceleration Attribution for all projects of the same customer and project type.

c. QUANTITY

Quantity Attribution, A_Q, gives the program credit for increasing the size of a renewable system beyond the size that would have been installed in the absence of the program. The two relevant questions are DAT3 and DAT3a.

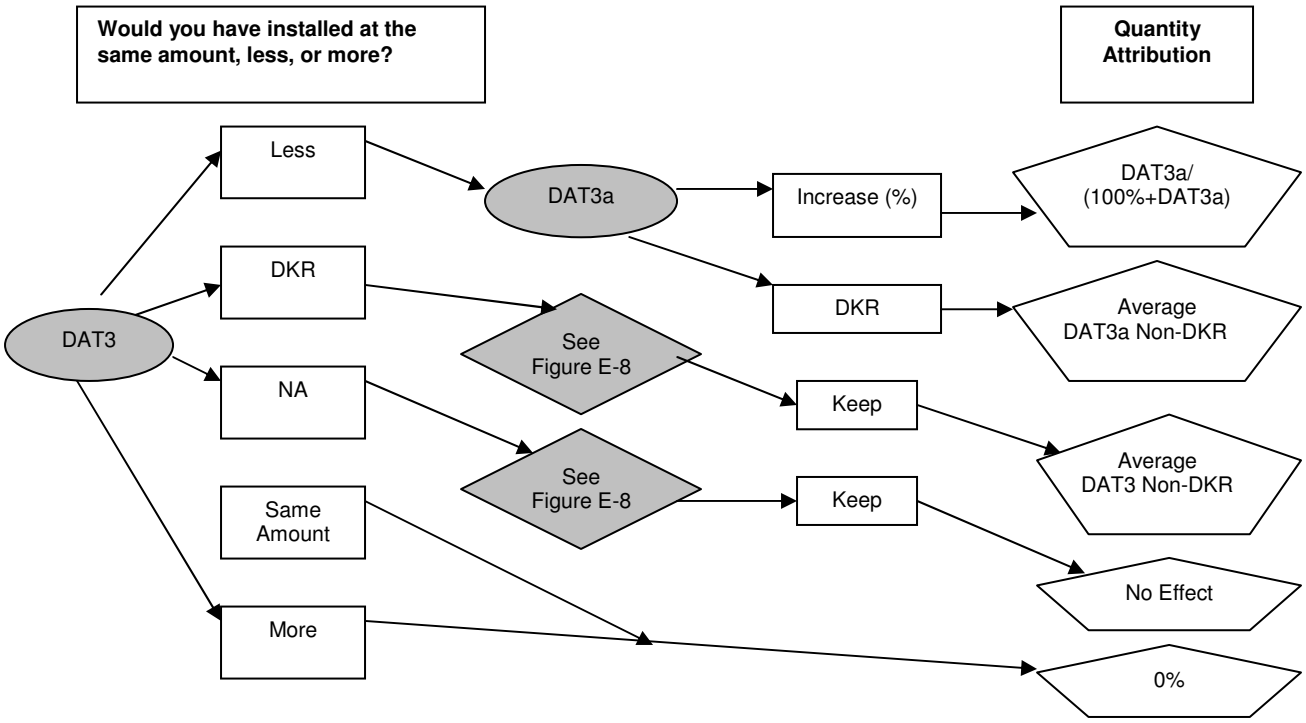
The questions below are from the round 1 survey.

> DAT3: "Without Focus on Energy, how different would the size of [PROJECT TYPE] installed have been? Would you say you would have installed the same amount, less, or more?"

DAT3a: "By what percentage did you increase the amount of [PROJECT TYPE] installed because of the Focus on Energy Program?" (DAT3a is only asked if DAT3 is "Less.")

Figure E-7 shows a decision tree for DAT3 and DAT3a.

Figure E-7. Decision Tree for Quantity Attribution



The program receives Quantity Attribution if the respondent indicates that they would have installed a smaller system without the influence of Focus. Quantity Attribution is

$$A_Q = Inc / (Inc + 100\%)$$

where

Inc = percent increase in quantity because of Focus.

If the respondent answers DAT3 with Same Amount or More then the survey skips to the next section and there is zero Quantity Attribution. If the respondent answers DAT3 or DAT3a with Don't Know or Refused but does provide answers to inform the Acceleration Period then the measure is assigned the average Quantity Effect for all projects of the same technology in the same sector.

E.3.3 What if they don't know or refuse?

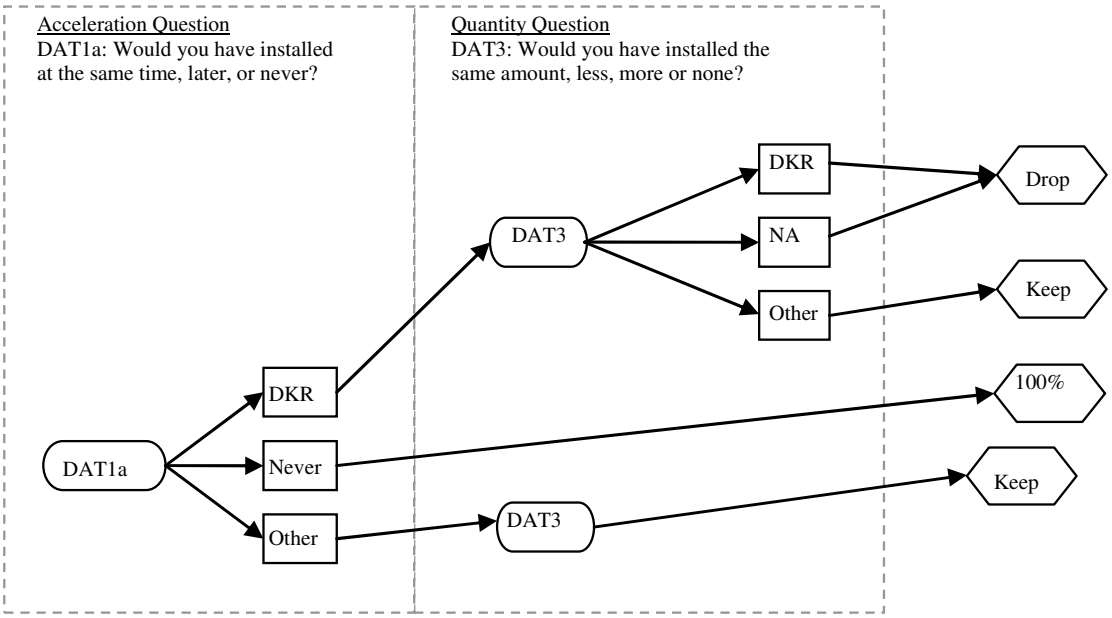
If a respondent is unwilling or unable to answer one of the attribution questions, the attribution is assigned the attribution value for the other attribution question. Some respondents are unable or unwilling to answer either of the attribution questions. If a participant is unable or unwilling to answer any of the attribution questions then the participant is dropped from the attribution analysis. However, the respondent information will still be included as part of the installation rate, engineering verification, and gross savings adjustment factors.

E.3.4 When quantity doesn't apply

Quantity questions do not apply to all measures: when only one unit of the measure could possibly have been installed through the program, and when the size of the given measure is not variable quantity becomes variable.

Figure E-8 shows a decision tree that indicates the relationship between the question responses and how they affect attribution. If a measure goes to the "Keep" decision then the ultimate resolution of each effect is shown in Figure D-5 and Figure D-6.

Figure E-8. NTG Case Retention Decision Tree for Don't Know/Refused/Not Applicable



E.4 INCORPORATING SUPPLIER EFFECT

KEMA currently determines when a supplier survey is necessary to supplement the participant survey after completing the interview. Each survey completed with a participant in our sample is reviewed to determine the effect the supplier had on the participant's decision to install a given measure relative to the program's effect. If a participant indicates that the program did not have a significant effect on their decision to install high efficiency equipment (attribution less than 75 percent) but the supplier had substantial influence then we will also complete a survey with the supplier.

E.4.1 Post-participant engineering survey analysis

The current supplier survey follows the same sequence of attribution questions that have been used for participant surveys in the past.

For measures with both participant surveys and supplier surveys the analysis will produce two separate attribution values. The first reflects the influence that Focus on Energy had on the participant's decision to install the project. The second reflects the influence that Focus on Energy had on the vendor's business practices and therefore their ability to sell the measure. We choose the higher of the two values as the final program attribution for that measure. That is, if either the supplier or the customer indicates that Focus influenced the decision to install the project, Focus is credited with influencing the decision.