

State of Wisconsin Public Service Commission of Wisconsin

Focus on Energy Evaluation

*Renewables: Impact Evaluation Report
The 18-month Contract Period*

Final Report: April 21, 2009

Evaluation Contractor: PA Consulting Group Inc.

Prepared by: Miriam L. Goldberg, Bobbi Tannenbaum, Brian Dunn,
Ben Jones, KEMA

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Liaison Contact: Dr. David Sumi
PA Consulting Group Inc.
6410 Enterprise Lane, Suite 300
Madison, WI 53719
Tel: +1 608 443 2700
Fax: +1 608 661 5181
E-mail: David.Sum@paconsulting.com

Prepared by: Miriam L. Goldberg, Bobbi Tannenbaum, Brian Dunn, Ben Jones



Contributions by:

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1. INTRODUCTION

This report presents the results of the Impact Evaluation of the statewide Focus on Energy Renewables Program measures implemented in the 18-month contract period (18 MCP)¹. 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.

1.1 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 18 MCP. A KEMA engineer conducted detailed engineering reviews to verify Program calculated tracked gross savings. Program tracking data, program documentation, and input from customer interviews were part of the engineering reviews.
- **Determine program attribution for a sample of program participants.** KEMA staff conducted interviews with a sample of program participants to verify installation, collect detailed information for the engineering review and to determine the programs impact on the decision to install a renewable energy system (at that time and of that size). If participants had an program attribution of less than 75 percent and they indicated that the vendor influenced these decisions, KEMA completed a survey with the vendor 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 net savings.

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

- **Gross savings adjustment factor.** This factor adjusts tracked gross savings for installation and changes based on the engineering review. Applying the gross

¹ The 18-month Contract Period refers to program implementation between July 1, 2007, and December 31, 2008.

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.)

1.2 ORGANIZATION OF REPORT

Section 3 of the report is a summary of the adjustments factors presented in this report followed by the energy savings results. The 18 MCP results are provided for kWh, kW, and therms for the Program overall.

Section 4 summarizes the findings and raises issues for further discussion.

Following Section 4 is a series of appendices containing:

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.

Participant survey. A copy of the participant survey.

Supplier survey. A copy of the supplier survey.

Attribution analysis method. A detailed discussion of the attribution method is provided in Appendix D.

Sampling methodology. A summary of the sampling methodology is included in Appendix E. The completed analysis is based on a sample that represents 87 and 92 percent of electric and therm savings, respectively.

2. ENERGY SAVINGS RESULTS

2.1 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 that have been implemented through the Program and are tracked by them. 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.

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

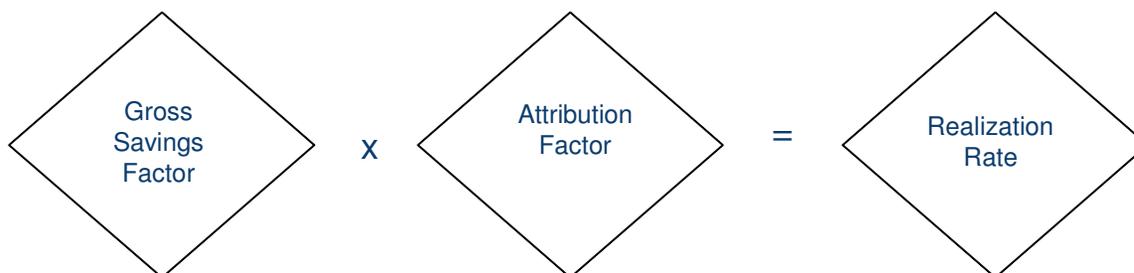
The program reports its estimate of the gross savings due to each tracked measure. The gross savings is the difference between participant energy use with the tracked measure(s) installed and participant usage without the measure(s). The impact analysis for a measure determines two key adjustment factors 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 changes based on an engineering review or metering results. 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 2-1. 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 the attribution factor at the technology 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. The sampling and data collection process will be described in Appendix E.

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 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.

2.2 PROGRAM TRACKED (GROSS) SAVINGS

2.2.1 Program activities

In this section, we discuss the projects implemented for the period from July 1, 2007, to December 31, 2008, referred to as the 18-month Contract Period (18 MCP). In the 18 MCP the program completed a total 450 renewable energy projects; 144 nonresidential and 306 residential installations were funded². This represents a substantial increase in the absolute number of systems and in the rate of installation. The increase in the absolute number of installations (328 additional projects in the 18 MCP) is due in part to a contract period that was 50 percent longer and in part to the inclusion of Residential Solar Water Heating³ (160 projects in the 18 MCP) in the Renewable Program.

The program increased the rate of installation for all technology types except Thermal Bioenergy. On an annualized basis, the Renewable program increased installations 146 percent; 123 percent in the non-residential sector and 158 percent in the residential sector. Excluding Residential Solar Water Heating, the Renewable program increased installations by 58 percent; 123 percent in the non-residential sector and 23 percent in the residential

² 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.

³ Prior to the 18 MCP Solar water heating was offered as part of the Focus on Energy Residential program.

sector. The largest increases in the rate of installation were in nonresidential Solar Water Heating, PV, and Wind Machines.

The mix of projects has changed somewhat in this 18-month period. PV systems still comprise the largest number and greatest percentage of projects, comprising 47 percent of all installations. Solar Water Heating now comprises a substantial portion of Renewable projects, representing 44 percent of all projects installed in the last 18 months. This is due mostly to the inclusion of Residential Solar Water Heating in the program, and partly due to the increase in the number of non-residential Solar Water Heating projects.

Table 2-1. Projects Implemented by Type and Contract Period

Technology	Completed Projects						
	FY02/FY03 Mar 02– Jun 03	FY04 Jul 03– Jun 04	FY05 Jul 04– Jun 05	FY06 Jul 05– Jun 06	FY07 Jul 06– Jun 07	18 MCP Jul 07– Dec 08	Program To Date
Nonresidential Projects							
Biogas	0	1	4	7	2	6	20
Thermal Bioenergy	0	3	7	16	14	18	58
Solar Electric (PV)	3	3	9	9	18	78	120
Solar Water Heating	0	0	4	5	6	38	53
Wind Machine	2	2	5	1	1	4	15
Hydroelectric	1	0	1	0	0	0	2
Other	0	0	1	1	2	0	4
All Nonresidential	6	9	31	39	43	144	272
Residential Projects							
Solar Electric (PV)	20	40	35	48	74	133	350
Solar Water Heating ⁴	-	-	-	-	-	160	160
Wind Machine	1	8	2	5	5	13	34
Other	0	0	1	1	0	0	2
All Residential	21	48	38	54	79	306	546
All Projects	27	57	69	93	122	450	818

^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.

2.2.2 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. The program-reported gross impacts are provided in Table 2-2 by technology and segment for FY06, FY07, and the 18-month Contract Period (18 MCP)—the period from July 1, 2007, through December 31, 2008.

Program-reported overall gross electric impacts for the 18 MCP are lagging behind FY07 rates despite an increase in the number of electric projects. Annualized program-reported gross kW and kWh savings for the 18 MCP are 24 and 11 percent lower than FY07 totals. The reduction in reported kW savings is due partly to a change in the definition of kW savings

for the renewable program. In previous years, the program reported the renewable system's capacity. In the 18 MCP, the program began reporting kW peak savings, which is consistent with the kW estimates for other Focus on Energy programs. The program also started tracking parasitic loads in the 18 MCP.

Program-reported overall gross therm impacts for the 18 MCP are 123 percent higher (on an annualized basis) than FY07. This is due to the large increase in therm savings from Biomass projects, which represent 92 percent of the program gross therm savings.

**Table 2-2. Renewable Energy Program-Tracked Gross Impacts⁵
Nonresidential by Technology**

Segment	Technology	Energy Impacts	Completed			
			FY06 Jul 05– Jun 06	FY07 Jul 06– Jun 07	18 MCP Jul 07– Dec 08	Program To Date
Nonresidential	Biogas	Kilowatts	1,586	1,045	1,180	6,111
		Annual kilowatt-hours	12,366,960	8,238,780	10,159,791	49,692,737
		Annual therms	75,488	0	138,637	247,290
	Thermal Bioenergy	Kilowatts	0	0	-66	-66
		Annual kilowatt-hours	0	0	-329,413	-329,413
		Annual therms	1,982,546	684,448	2,213,364	5,376,046
	Solar Electric	Kilowatts	24	124	307	519
		Annual kilowatt-hours	29,643	153,422	778,759	1,044,861
		Annual therms	0	0	0	1,283
	Solar Water Heating	Kilowatts	0	0	-13	-13
		Annual kilowatt-hours	0	0	-19,107	-19,107
		Annual therms	13,708	2,697	48,752	85,637
	Wind Machine	Kilowatts	65	90	17	498
		Annual kilowatt-hours	83,600	109,560	127,249	799,423
		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	0	14	0	14
		Annual kilowatt-hours	0	29,973	0	29,973
		Annual therms	102	1,480	0	2,638
All Nonresidential	Kilowatts	1,675	1,273	1,425	8,364	
	Annual kilowatt-hours	12,480,203	8,531,735	10,717,278	57,692,073	
	Annual therms	2,071,844	688,625	2,400,753	5,712,894	

⁵ Gross energy impacts are those reported in the program tracking system maintained by WECC.

**Table 2-3. Renewable Energy Program-reported Gross Impacts⁶
Residential and Total by Technology**

Segment	Technology	Energy Impacts	Completed			
			FY06 Jul 05– Jun 06	FY07 Jul 06– Jun 07	18 MCP Jul 07– Dec 08	Program To Date
Residential	Solar Electric ^a	Kilowatts	135	224	263	778
		Annual kilowatt-hours	177,638	290,398	681,074	1,358,272
		Annual therms	0	0	0	3,776
	Solar Water Heating ^b	Kilowatts	-	-	28	28
		Annual kilowatt-hours	-	-	140,187	140,187
		Annual therms	-	-	8,371	8,371
	Wind Machine	Kilowatts	106	40	27	297
		Annual kilowatt-hours	123,346	51,353	278,909	649,283
		Annual therms	0	0	0	0
	Other	Kilowatts	0	0	0	0
		Annual kilowatt-hours	-15,545	0	0	-15,545
		Annual therms	1,881	0	0	2,253
	All Residential	Kilowatts	241	264	319	1,102
		Annual kilowatt-hours	285,439	341,751	1,100,170	2,132,196
		Annual therms	1,881	0	8,371	14,400
TOTAL	All Projects	Kilowatts	1,916	1,537	1,743	9,466
		Annual kilowatt-hours	12,765,642	8,873,486	11,817,448	59,824,270
		Annual therms	2,073,725	688,625	2,409,124	5,727,294

^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.

2.3 GROSS SAVINGS ADJUSTMENT FACTORS

The first step of our analysis of program savings was to calculate gross savings adjustment factors. These factors provide a method to calculate the expected savings based on 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. Any identified deviations were program-tracking records and were minor and inconsequential to system savings.

To calculate the verified gross savings, we reviewed the project files and completed telephone surveys for a sample of renewable energy projects. The surveys included questions to confirm or collect information necessary to estimate program savings. We then calculated verified gross savings for each sampled project.

⁶ Gross energy impacts are those reported in the program tracking system maintained by WECC.

Overall, the verified gross savings factors for the 18 MCP are less than 100 percent and substantially lower than in CY07 (see Figure 2-2). Verified gross savings for kWh and kW is 56 and 64 percent, respectively, of the values tracked by the program. Verified gross therm savings is 93 percent of program tracked, but the variation with individual projects was substantially greater.

**Figure 2-2. Overall Verified Gross Adjustment Factors
FY07 and 18 MCP**

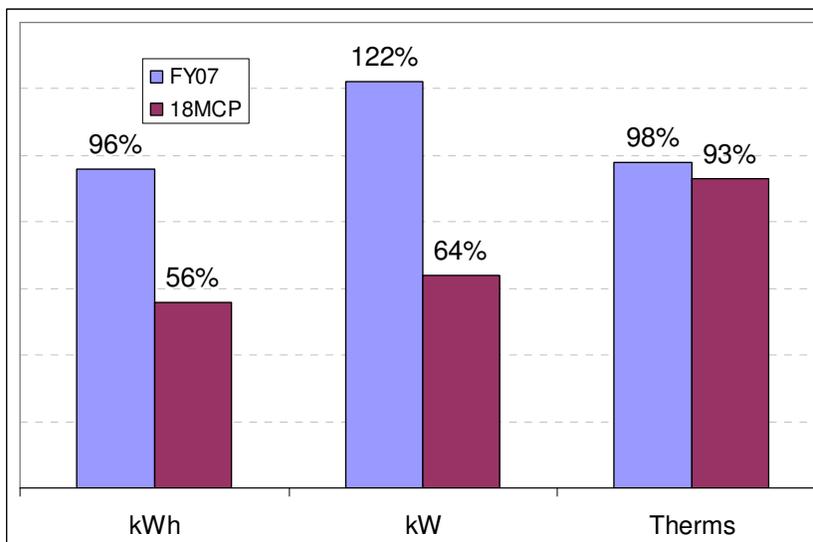


Table 2-4 shows the gross savings adjustment factors for each technology. The numbers in the table represent the portion of the tracked savings verified by KEMA. Since we confirmed installation for 100 percent of the sampled projects, the verified gross savings factors equal the engineering verification factors (the ratio of verified savings to installed savings). KEMA estimated a verification factor by calculating the savings (off set) for each project following the guidelines established in the Standard Calculation document. We used metered data for energy for wind and biogas projects when sufficient data were available. We discuss below, by technology, how we verified the gross savings estimates/

**Table 2-4. Verified Gross Savings Adjustment Factors
Renewable Energy Program**

Technology	Verified Gross Installed		
	kWh	Peak kW	Therm
Biogas	57%	56%	0%
Biomass	169%*	134%*	98%
Solar Electric	99%	99%	
Solar Electric - Residential	100%	99%	
Solar Electric - Non-residential	99%	99%	
Solar Hot Water	48%	23%	105%
Solar Hot Water - Residential	51%	26%	109%
Solar Hot Water - Non-residential	69%	30%	105%
Wind	60%	108%	
Wind - Residential	59%	128%	
Wind - Non-residential	62%	76%	
Overall	56%	64%	93%

* Biomass kWh and peak kW factors are parasitic loads and have little impact on overall savings

^a Verified gross installed kWh and kW for biomass represents parasitic load. Values greater than 100 percent indicate greater parasitic load than tracked by the program.

A. *BIOGAS SYSTEMS*

Verified energy production for biogas for the 18 MCP is 57 percent of program tracked electrical energy savings, 56 percent of tracked electrical demand savings, and zero percent of tracked therm savings (see Table 2-4). To estimate verified energy production we used metered data when these were available. Otherwise, we used the standard calculation approach developed with the Program in this contract year. Verifying program savings was challenging due to incomplete or inconsistent information in the program files.

We used annualized metered energy data to calculate verified energy production for one project where 12 or more months of data were available. To annualize the metered data, we divided the metered energy by the total days of operation then multiplied by 365 days. After one year of production, the impact of startup time will only have a small effect on the annualized production. This method provides good information on the actual operation of the biogas system.

When fewer than 12 months of metered data were available, we calculated verified savings using the standard calculation method. In these cases, we also annualized the inverter reading results and used them as a secondary check against calculated values. Due to issues with startup, we expected these annualized meter readings to be less than the calculated estimates. In these cases we found that annualized inverter readings were lower than both KEMA and Program engineering estimates, but closer to the KEMA estimates.

We estimated biogas production using the approach outlined in the *Standard Calculation Recommendation*⁷ document when metered data were unavailable or constituted less than a full-year of usage. The standard calculation uses Chemical Oxidative Destruction (COD) but can use an approximation of the COD based on volatile solids (VS). In absence of other information, we assumed VS were equal to COD.

We based the verified gross savings for the system selling gas based on the amount sold. This project, however, is no longer selling gas or using the gas productively. Since no natural gas usage was being displaced by this project at the time of the study, no natural gas is displaced and project savings are zero.⁸

Calculating verified energy savings when metered data are not available requires much information, including parasitic load and the COD content of the biogas system input. The program provided estimates of parasitic load for four projects, with detailed information for one of these. We estimated the parasitic load based on available information. The project files provided VS information for all projects but lacked documentation on the approximate COD based on VS. We assumed that COD equals VS. These assumptions, although necessary, affect the accuracy of the estimated energy production.

Poor documentation within the project paperwork further complicated calculating verified energy savings. The paperwork contained inconsistencies with the definition of volatile solids percentage. For example, one project listed volatile solids percentage as 80 percent and another similar project listed it as 4–5 percent. It is possible that one project listed the percent volatile solids based on the total solids (i.e., 80 percent) while another listed the percent volatile solids based on the total quantity of effluent (i.e., 4-5 percent). The paperwork also contained inconsistencies within the impact statement. For example, an impact statement listed multiple energy generation estimates for one project with no explanation for the differences. In addition to the inconsistencies, the project information provided did not include the calculations used to estimate production or the basis for the assumptions. Instead, the production estimates only included customer supplied calculation results. Using the standard calculations and information obtained from the paperwork and phone surveys, we were unable to obtain estimates consistent with Program estimates.

The Program is working to identify reasons for discrepancies between actual and estimated production. For 18 MCP projects, the Program retained a small amount of the grant until receipt of one-year's production data from the participant. This will allow the program to verify production and identify training and system adjustments needs. If the project files included clear documentation of assumptions and calculation approaches, the Program could also improve future estimation approaches.

⁷ B. Tannenbaum, D. Kneale, and B. Dunn. *Standard Calculation Recommendations" for Focus on Energy Evaluation Renewable Energy Program Final Report*, KEMA Inc. and PA Government Services Inc., 2008.

⁸ The current (and prior) impact evaluation methodology estimates savings (production) based on the production characteristics at the time of the impact study. This system did pump gas into the pipeline for 23 months prior to the evaluation.

B. BIOMASS

The biomass projects completed in the 18 MCP had a gross therm savings adjustment factor for therms of 98 percent (see Table 2-4). The verified gross therm savings were very close to the Program tracked savings for six of the sample projects and ranged from 16 percent to 100 percent for all sampled projects. Projects that provided space heating were the source of the difference between verified gross and tracked. The project files were missing much information needed to calculate heating loads. When this information was included, it was used inconsistently. Finally, boiler efficiencies and parasitic loads were missing. Gross savings adjustment factors for electrical energy and demand are deceptive. These values are driven by parasitic load and are relatively inconsequential.

As with other technologies, we used more than one approach to determine savings depending on the information available. When historical fuel usage was known, we calculated savings based on the historical usage per the *Standard Calculation Recommendation* document. This required that we normalize the portion used for space heat. We estimated the portion used for space heat for all projects that included both process and space heat. When historical usage was not provided, we estimated usage based on process or space heating loads.

We only calculated savings where the biomass system displaced natural gas or electricity. If the biomass displaced any other fuel source, the verified savings is zero. We found one project where the respondent indicated that the displaced fuel was neither electricity nor natural gas even though both were available onsite. This is likely to be rare but is a possibility for every project⁹.

Missing information hampered KEMA's estimation of space heat usage for either approach. The project files were missing room/building sizes and heights, insulation levels, and temperature set-points. We were able to obtain some of this information from survey respondents and made assumptions when the information was not available. We then used this information to estimate actual space demands and the resulting heating use.

In addition to missing information, the methods used for estimating space heat were unsubstantiated. One project estimated the heating load based on a heating load per cubic foot of space but did not provide a source for the volumetric estimate. Another project also estimated heating load based on the volume of the space even though historical fuel usage was available. Our estimates based on the parameters of the space suggest the estimating methods used for these projects were inaccurate or inapplicable for the project.

The project files were also missing boiler efficiencies. We obtained some of this information from respondents. When efficiencies were unavailable, we assumed all boilers were 80 percent efficient.

Finally, project files were missing parasitic load data or misapplied parasitic loads. We obtained parasitic load data from respondents for three projects. We also found one space

⁹ Per program requirements, each customer is required to state in writing on the application form that their project is replacing either natural gas or electricity. If a customer has access to either of these fuels, the customer will likely state that they plan to use natural gas or electricity without a Focus grant.

heating project with tracked parasitic kW and two process heating projects with zero tracked parasitic kW. Space heating systems are not operating during Wisconsin system peak and thus parasitic kW is zero. On the other hand, process heating systems are likely to operate during system peaks and thus will have parasitic kW. These are small loads, but it is important to track this information.

C. SOLAR ELECTRIC

The PV projects completed in the 18 MCP have high gross savings adjustment factors of 100 percent for residential kWh and 99 percent for residential kW, non-residential kWh, and non-residential kW (refer to Table 2-4). The project files contained all the information we needed. We used the standard calculation approach for most of the projects but we used a different approach for PV systems without inverters. These systems have limited potential for energy production and demand reduction.

KEMA calculated the verified kWh savings in one of two ways depending on the specifics of the project. For conventional grid interconnected PV systems with inverters, we followed the method outlined in the *Standard Calculation Recommendation* document. However, to calculate savings for one system without an inverter, we calculated the hourly energy production from the PV array with PVWatts and the estimated hourly consumption. We then limited the daily energy production to the daily consumption and summed the daily energy production for the year.

We also calculated the verified kW savings in one of two ways depending on the specifics of the project. For conventional grid interconnected PV systems with inverters, we followed the method outlined in the *Standard Calculation Recommendation* document. To calculate savings for one system without an inverter, we estimated the peak kW savings to be the demand at utility peak for the facility.

Systems without inverters do not provide the full potential energy (kWh) or peak demand reduction (kW). Because a system that does not have an inverter cannot dump excess energy production to the grid, any production that exceeds the load's usage is lost. In addition, peak demand reduction is limited to the demand load would have otherwise place on the utility and could be as low as zero for a load that only operates at night.

D. SOLAR HOT WATER

The solar hot water (SHW) projects completed in the 18 MCP had high therm gross savings adjustment factors: 109 percent for residential and 103 percent for non-residential (refer to Table 2-4). However, the electrical gross savings adjustment factors were low at 49 percent for residential kWh, 25 percent residential kW, 69 percent non-residential kWh, and 30 percent non-residential kW.

Verifying solar hot water projects proved to be complicated by two factors. First, in the absence of clear program values and assumptions the evaluation team made assumptions to calculate savings (off set) values. Second, some of the solar hot water systems were sized to meet partial space heating loads. The space heating load was included in program savings (off set) for one project, but not included for any of the others. The evaluation team verified track savings (water heating for all and space for one) and included the remaining space heating savings as untracked savings (see Section 2.5.1).

KEMA made the following assumptions or calculations when program assumptions were not provided:

- We assumed hot water usage proportional to occupants, as recommended by RETScreen (16 gallons per person per day), and hot water temperatures of 120 degrees F. KEMA applied these assumptions to a couple of projects¹⁰.
- We assumed supply water temperatures recommended by RETScreen for five projects¹¹.
- We selected (in RETScreen) panels of a similar size to the installed panels to estimate savings for projects when manufacturer or model numbers were not provided. Manufacturer information was not provided for one project (a repair), and model numbers were not provided for two projects.
- We based our analysis on information provided in the paperwork, survey responses, or made assumptions consistent with other completed projects only when RETScreen printouts or alternative calculations were not provided. This was the case for only two projects.
- We assumed 85 percent efficient heat exchangers for systems where the paperwork or other information indicated a heat exchanger, and the documentation did not include an efficiency.
- We assumed pump power and energy source based on information available. Pump power and energy source were not clearly documented for most projects and parasitic load for these pumps is minor relative to overall energy offsets.

Eight participants in the sample installed systems to provide space heating in addition to water heating. The program estimated and tracked space heating savings for one sampled project¹². For this project we based verified savings on what was tracked in the database. For projects that estimated and tracked only hot water savings, we verified the hot water usage estimates and included space heating savings in untracked savings.

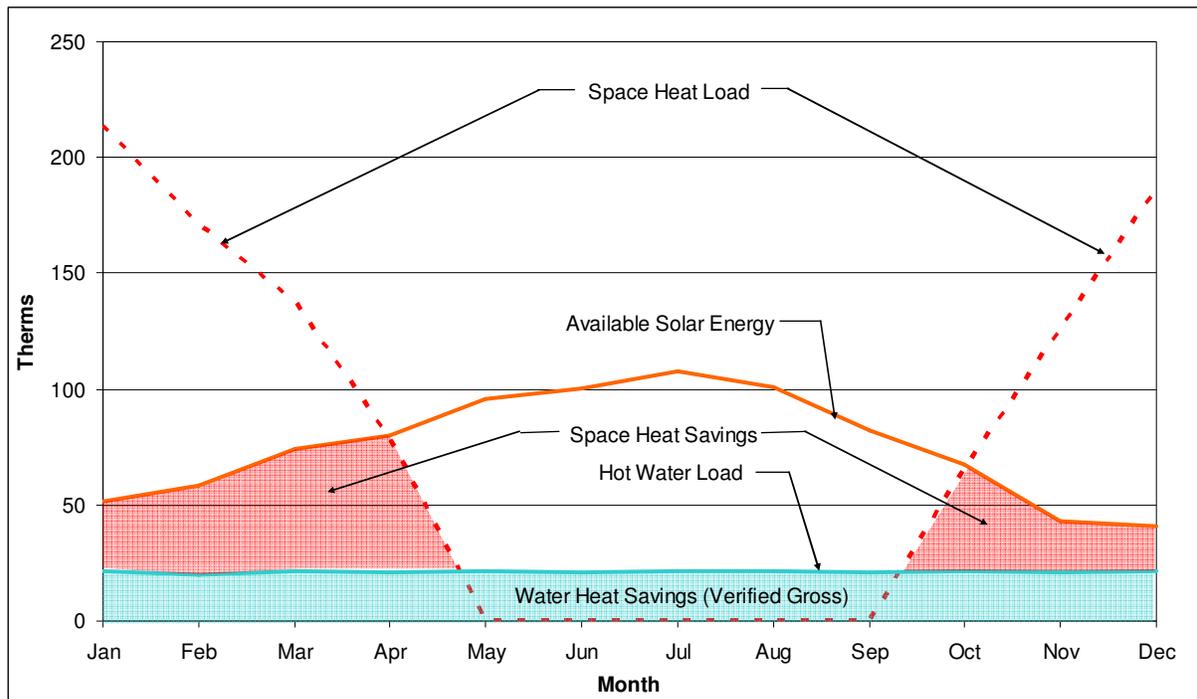
For systems providing space heating, we calculated the verified gross savings based on annual water usage and estimated untracked savings due to space heat. We calculated the space heat savings (off set) as the difference between the space heating energy available during the heating season and the hot water energy savings during heating season. Figure 2-3 shows the space heating savings and water heating savings (i.e., verified gross savings) for a solar water heating system.

¹⁰ In response to the draft of this report the program indicated that they assumed a hot water temperature of 120 degrees F for all residential projects.

¹¹ In response to the draft of this report the program indicated that they assumed 7.5 and 14 degrees C for residential and commercial projects, respectively.

¹² The Program approved this project prior to 18 MCP.

Figure 2-3. Solar Space Heating Estimates



The hot water usage rates were often inconsistent and not well documented. Most project files contained no documentation supporting the hot water load used in calculations for tracked savings. The usage exceeded RETScreen recommendations based on the number of occupants for three of the sampled projects (when the respondent did not know hot water usage). In addition, four respondents reported different hot water usage rates than those recorded in the paperwork. Only one project provided documentation for increasing the water use above the RETScreen recommendation. When usage and assumptions were not documented and the respondent did not know their approximate water usage, KEMA used RETScreen estimates of 16 gallons per day, per person.

Finally, the project files did not include documentation of some parasitic loads. The Program changed late in the 18 MCP and began tracking parasitic load. KEMA used the method outlined in the *Standard Calculation Recommendation* document and determined parasitic loads on the information available in the paperwork or from survey respondents.

E. WIND ENERGY SYSTEMS

The gross savings adjustment factors for wind systems completed in the 18 MCP are generally low at 59 percent for residential kWh, 62 percent for non-residential kWh, and 62 percent for non-residential kW. However, the factor for residential kW is high at 128 percent (refer to Table 2-4). This is consistent with previous evaluations. The energy production for systems installed through the Program in FY07 averaged 53 percent of the estimated production. To estimate verified energy production we used inverter metered data when these were available. Otherwise, we used the standard calculation approach outlined in *Standard Calculation Recommendations* document. This approach was difficult because project files were missing vital information.

Due to availability of information, we used two approaches. When possible, we used metered energy data to calculate the most accurate verified energy production. When metered energy data were unavailable or the production duration was too short, we estimated the verified energy savings based on the approach outlined in the *Standard Calculation Recommendation* document.

Using metered data presented two problems. Wind speed varies from year to year and throughout the year. As a result, the metered production for each turbine site will vary from one year to the next. In addition, metered energy production for a small part of a year will not provide useable data.

Since wind speed varies from year to year, determination of accurate expected energy production for one site based on metered data is a challenge. We need multiple years of metered data. Unfortunately, this information is not available for the sites in this evaluation. An alternative approach would be to normalize the production of each site based on actual and average wind speeds during the production period from a nearby airport. Although this approach is feasible, it would be costly to obtain and analyze the data. A final approach would be to collect wind speed data on-site. The Program is working on protocols to obtain these data from data loggers installed at each project but they are not currently available.

Fortunately, the annual variation in wind speed at multiple sites scattered across the state have an averaging effect on energy production¹³. This effect reduces the need for long-term data or normalized metering on individual sites. In addition, it is cost effective. We therefore performed our calculations assuming the averaging effect.

After addressing problems with year-to-year wind speed variations, we addressed wind speed variation throughout the year. The most accurate metered data would include a full year of production. However, this would severely limit the number of projects with useable metered data. As a compromise between accuracy and available data, we annualized metered data when production occurred for 300 days (80 percent of a year) or longer. Based on this, we had useable data from five projects in the sample. Within these projects, the metered data ranged from 24 to 141 percent of the estimate. However, the metered data only exceeded the estimates for one project. On average, the metered data was 63 percent of estimated.

To estimate verified energy and demand savings, we need average annual wind speed, a turbulence factor, wind shear, site elevation, and a power curve for the wind turbine as well as other factors. The average annual wind speed was provided for all projects. The turbulence factor was not provided for four projects and we assumed 20 percent. The site elevation was not provided for any project and we assumed 900 ft above sea level. Finally, the turbine power curve was not available for one project and we assumed a similar size turbine from the same manufacturer. This is not generally appropriate, but in absence of better information, we used this assumption only to determine the demand savings for the one project. The resulting verified demand savings exceeded the tracked savings.

¹³ Archer, Christina L. and Mark Z. Jacobson, "The Spatial and Temporal Distributions of U.S. Winds and Windpower at 80 m Derived from Measurements", http://www.stanford.edu/group/efmh/winds/winds_jgr.pdf (access 4/2/09)

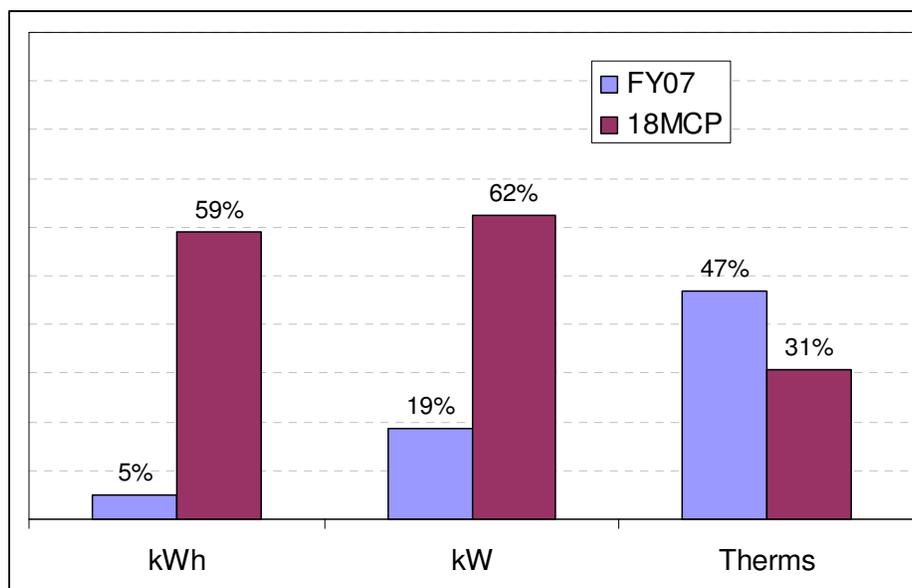
Metered kW peak demand offset is unavailable for any system in the sample and must be calculated. The Program used an estimate of 15 percent as a capacity factor for all turbines. We calculated the verified peak demand offset for each project as outlined in the *Standard Calculation Recommendation* document. Using this method, the verified peak kW demand offset was generally higher than peak demand offset tracked by the Program.

The Verified Gross Savings Adjustment Factors for Residential wind system show what may appear to be a paradox. While the verified gross energy production is 59 percent of tracked, the verified gross demand reduction is 128 percent of tracked. This may not seem possible since kWh and kW are generally related. However, kWh is an annual measure and kW is a measure only during utility peak. Therefore, a decrease in verified energy production will not necessarily equate to a decrease in verified demand reduction. We do not have data to provide a definitive reason for the discrepancy, but one possible explanation could be that icing in the winter reduced annual energy production while normal to high winds during peak increased kW demand savings.

2.4 ATTRIBUTION ADJUSTMENT FACTORS

Attribution is the percent of tracked savings that is directly attributable to the program. The 18 MCP attribution factors for the program overall are 59, 62, and 31 percent for kWh, kW, and therms, respectively. This is shown in Figure 2-4, with a comparison to CY07 attribution values. This represents a substantial increase in attribution for electric projects, and a decline in attribution for projects displacing therms. While the majority of the projects displacing therms are solar hot water, the majority of the tracked therm savings are from biogas and biomass projects. We discuss the attribution results by technology below.

**Figure 2-4. Overall Program Attribution
FY07 and 18MCP**



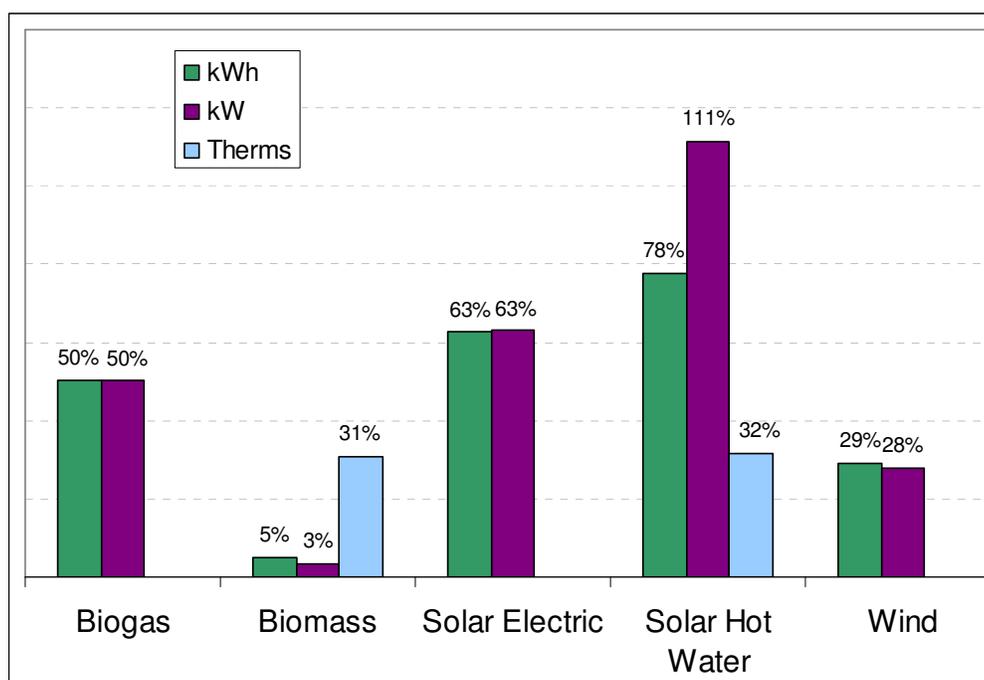
Attribution varied substantially by technology and by the type of energy off set. Solar Hot Water, Solar Electric and Biogas have high electric attribution rates relative to wind (see

Figure 2-5)¹⁴. Thermal savings for biomass, and solar hot water are low, at approximately 30 percent.

The low attribution for the biomass projects is consistent with results in previous years and should be of concern to the program. Many of the biomass projects surveyed have characteristics that lend themselves to low attribution. One characteristic is that the facilities have a substantial amount of waste wood as a byproduct of production. In other words, the fuel source is free. Another characteristic at some facilities was that they 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 respondents report that they would have occurred without Focus on Energy assistance.

Attribution for biogas projects for the 18 MCP was 50 percent, which is substantially higher than in previous years. For the 18 MCP the program substantially increased the grant amounts available for biogas projects, and several high grant projects were completed in the 18 MCP.

Figure 2-5. Program Attribution by Technology



The electric energy and demand attribution for Solar Hot Water requires some explanation. Peak demand attribution exceeds 100 percent due to the nature of the calculation. Attribution is calculated as the savings attributable to the program divided by the verified gross savings. In the case of Solar Hot Water, the verified gross savings included a substantial amount of parasitic load. The projects with higher parasitic loads (a negative savings) had low attribution

¹⁴ This is the first impact report that includes attribution and realization rates for individual technologies. This is because we the program completed and we interviewed a sufficiently large number of participants in each of the technology groups to report the results without violating respondent confidentiality.

rates, which increased the amount of electricity savings attributable to the program. For peak demand, this resulted in a peak demand savings greater than the verified gross savings.

2.5 NET ENERGY IMPACTS

The net energy impacts are calculated based on a realization rate. The realization rates combine the effect of the gross savings adjustment factors and the attribution factors. The 18 MCP realization rates for the program overall are 33 percent, 40 percent, and 29 percent for kWh, kW, and therms, respectively, as show in Table 2-5.

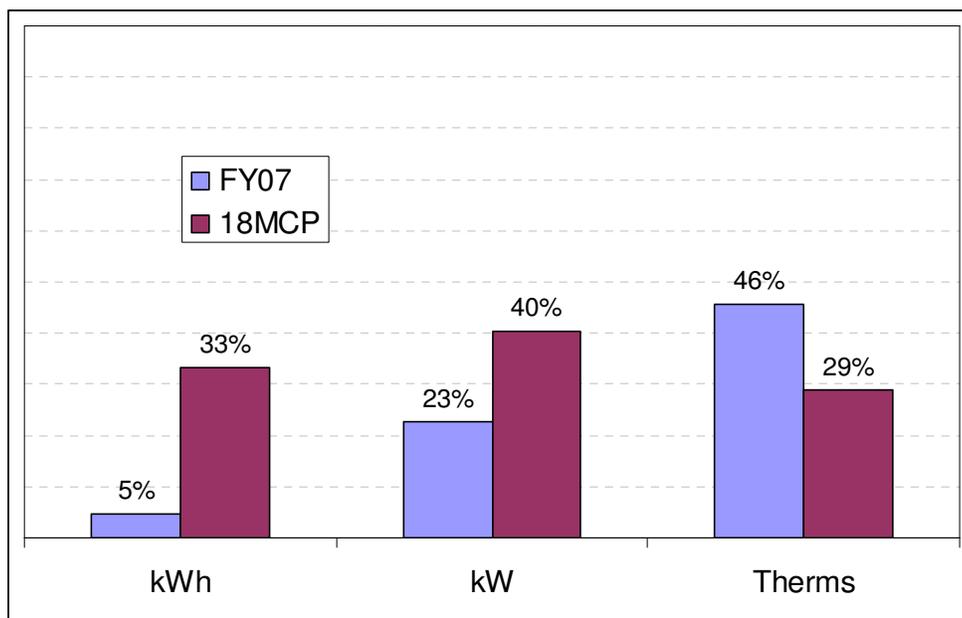
**Table 2-5. Overall Realization Rates
18 MCP**

Adjustment Factor	kWh				kW				Therms			
	n ^a	Estimate	Margin of Error		n ^a	Estimate	Margin of Error		n ^a	Estimate	Margin of Error	
			18 MCP	Extra-polated			18 MCP	Extra-polated			18 MCP	Extra-polated
Installation Rate	58	100%	+/- 0.0%	+/- 0.0%	50	100%	+/- 0.0%	+/- 0.0%	25	100%	+/- 0.0%	+/- 0.0%
Engineering Verification Factor	62	56%	+/- 2.6%	+/- 24.1%	59	64%	+/- 3.6%	+/- 22.1%	25	93%	+/- 3.7%	+/- 8.9%
Gross Savings Adjustment Factor	58	56%	+/- 2.6%	+/- 24.1%	50	64%	+/- 3.6%	+/- 22.1%	25	93%	+/- 3.7%	+/- 8.9%
Attribution Factor	59	59%	+/- 5.3%	+/- 40.2%	56	62%	+/- 7.8%	+/- 29.6%	23	31%	+/- 27.2%	+/- 43.0%
Realization Rate	58	33%	+/- 3.3%	+/- 26.6%	50	40%	+/- 5.5%	+/- 23.6%	23	29%	+/- 25.4%	+/- 40.3%

The wide margin of error for therm attribution shown in Table 2-5 reflects the fact that there was a wide range in responses to the attribution questions for a few large therm projects.

The overall realization rates for electric measures increased in the 18 MCP over FY07, as shown in Figure 2-6. The therm realization rate declined from 46 to 29 percent.

**Figure 2-6. Final Realization Rates
FY07 and 18 MCP**



Realization rates by technology varied substantially, and varied from the attribution rates. Solar Electric has the highest realization rate, roughly equal to the attribution rate, because the verified gross installation was almost equal to the tracked energy and demand savings.

Solar hot water and biogas had realization rates substantially lower than attribution due to low verified gross adjustment factors. Wind energy (kWh) is quite low, due to low verified gross adjustment factors and very low attribution.

Figure 2-7. Realization Rates by Technology

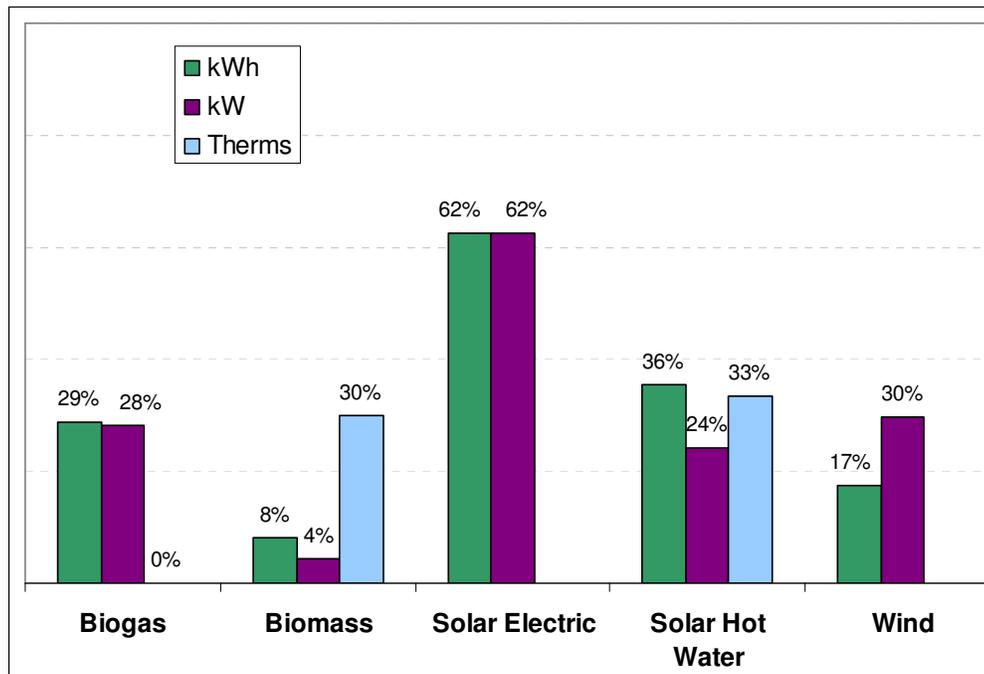


Table 2-6. Realization Rates by Technology
18 MCP

Technology	kWh				kW				Therms			
	n ^a	Estimate	Margin of Error (90% confidence)		n ^a	Estimate	Margin of Error (90% confidence)		n ^a	Estimate	Margin of Error (90% confidence)	
			Jul07-Dec08 ^a	Extrapolated			Jul07-Dec08 ^a	Extrapolated			Jul07-Dec08 ^a	Extrapolated
Overall Renew	58	33%	+/- 3.3%	+/- 26.6%	50	40%	+/- 5.5%	+/- 23.6%	23	29%	+/- 25.4%	+/- 40.3%
Biogas	4	29%	+/- 0.0%	+/- 27.9%	4	28%	+/- 0.0%	+/- 27.6%	1	0%	+/- 0.0%	+/- 0.0%
Biomass	3	8%	+/- 8.0%	+/- 12.6%	3	4%	+/- 4.9%	+/- 7.8%	8	30%	+/- 27.0%	+/- 42.7%
Solar Electric	23	62%	+/- 13.5%	+/- 14.8%	23	62%	+/- 13.9%	+/- 15.1%				
Solar Thermal	18	36%	+/- 27.9%	+/- 29.6%	11	24%	+/- 53.2%	+/- 57.8%	15	33%	+/- 21.1%	+/- 23.7%
Wind	7	17%	+/- 13.2%	+/- 16.8%	7	30%	+/- 26.2%	+/- 33.9%				

^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.

2.5.1 Untracked Savings (Solar Hot Water)

Seven sampled solar hot water projects included space heating. The program calculated and included space heating savings in the tracking database for only one of these projects. KEMA calculated a verified gross savings from space heating for all sampled projects with space

heating, applied the project attribution values to these savings and calculated a net untracked savings value for the sampled projects.

Using the results from the sampled projects, we developed a factor to apply these results to the population of solar thermal projects. We developed a net untracked saving factor by determining the untracked savings as a percent of the solar thermal kWh and therm tracked savings. These results are provided in Table 2-7. (There are no peak kW savings for space heating.) We applied this factor to the population of solar thermal projects using the same ratio estimation approach used for all factors.

Table 2-7. Solar Hot Water Untracked Savings

	Program Tracked Gross	Net Untracked Savings	% Program Tracked
kWh	121,079	7,911	7%
Therms	57,123	1,113	2%

Untracked energy savings represents seven and two percent of tracked kWh and therms, respectively, for solar thermal projects. Verified gross untracked space heating savings are greater than verified gross water heating savings. In other words, the slight majority of savings from the solar thermal water heating program is the result of solar thermal space heating.

The program does not currently provide incentives for solar space heating, presumably because solar space heating does not pass an initial benefit cost assessment. Solar space heating provides benefits only during the space heating season, which is the part of the year (and the day) when solar insolation values are at their lowest. Systems sized to meet space heating needs, in addition to water heating, will naturally have lower net-to-gross ratios since a substantial portion of the thermal energy generated will be waste heat.

Solar space heating may, however, be cost effective in some applications, when installed in conjunction with solar water heating. The incremental costs of adding solar panels to meet space heating needs may be sufficiently low so that the incremental benefits associated with space heating allow the entire system to pass benefit cost tests.

KEMA looked at the sampled project files to assess base and incremental costs. This preliminary look found, in general, higher base costs relative to incremental costs. There was, however, a high variation in these costs, and larger projects (more panels) tended to have both higher base and per panel costs. Further examination of this issue is necessary to determine the costs, incremental benefits, and thus cost effectiveness of including space heating in solar therm projects.

Program incentives for solar thermal projects are provided based on therms or kWh delivered, with a limit of 25 percent of project cost. If the incentives are *only* for the water heating portion of the savings, then water heating savings estimates must be accurate. They tended to be high for these projects, with the calculations, in some cases, assuming that all or most of the load would contribute to water heating. Since the systems were oversized for water heating purposes, some of the thermal energy is lost because it exceeds the water heating load.

Some systems had as many as seven panels in excess of RETScreen estimates for water heating needs.

2.5.2 Total Net Impacts

The total net impacts for the 18 MCP Renewable Program are reported in Table 2-8 below. We calculated the net tracked savings and then added the net untracked savings for solar space heating to arrive at the final estimates.

Table 2-8. Total Net Impacts 18 MCP Renewable Program

	Gross Tracked Savings	VGI	Net Tracked Savings	Realization Rate	Net Untracked Savings	Total Net Savings
kWh	11,817,448	6,998,114	3,914,269	33%	7,911	3,922,180
Peak kW	1,743	1,190	702	40%	0	702
Therms	2,409,124	2,219,576	684,193	28%	1,113	685,306

3. SUMMARY AND CONCLUSIONS

In this section we discuss the overall findings from the Renewable impact evaluation for the 18 MCP. We then address three issues emerging from the evaluation that require further consideration.

3.1 VERIFIED GROSS INSTALLATION

KEMA verified installation for 100 percent of the projects sampled. The verified gross installation factor incorporates KEMA's verification of the calculations used for program-tracked savings. For the 18 MCP we found low verified gross estimates for kWh and peak kW. We also found lower than in the past verified gross estimates for therms. We understand that many of these projects were completed prior to the development of the Standard Calculations and expect savings estimates to be more accurate as more completed projects use the recommended approaches.

With the exception of PV systems, we found a substantial amount of project documentation of estimated savings incomplete. Project documentation had the following issues:

Missing calculations. These are cases where final values were provided (sometimes more than one) with little or no information supporting the estimates.

Unsupported assumptions. Some projects included assumptions (e.g., therms per cubic foot) that did not include a citation for the basis of this assumption.

Wrong assumptions. For some solar water heating and one PV system savings calculations were based on what the installed system could generate, instead of what would be used. In these cases the unused energy generated would not be displacing electric or natural gas usage, and do not represent savings.

Lack of clarity for units. In at least one case it was unclear what units were being used, and appeared that within the same project folder different units were used for the same item.

Program staff responded to the draft version of this report with substantial comments regarding the documentation issues identified. The majority of the responses fell into one of two categories discussed below.

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

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 Calculation document.

Standard assumptions. The program used standard assumptions for parameter values for several technologies. In some cases these standard assumptions were not provided in the project files.

The use of standard assumptions is an acceptable practice. When standard assumptions are used, the program must provide documentation within the project files regarding the assumptions used for that project. This documentation should include the value used and a reference to supporting documentation for it. Standard assumptions have changed over time, as indicated by the program. Without this information in the project folder, the evaluators cannot determine or verify the values used by the program, and must rely upon our own assumptions and calculations.

The program's standard assumptions must be supported by reference to materials or calculations. The supporting documentation for standard assumptions does not need to be within each project folder, but should be provided to the evaluators no later than when the program provides the evaluators project files for review.

Estimation of energy production from wind systems continues to be problematic. KEMA and Renewable Program (and other) estimates tend to be consistently higher than system performance. We recommend that the program apply a factor of .65 to energy estimates from wind systems until a more accurate estimation approach is developed. Applying this factor to the projects, at least in the program tracking database, will more accurately reflect program impacts.

Finally, the 18 MCP was the first period in which the program was required to track peak kW, not system capacity. In most cases the program retroactively estimated peak kW using a factor of 50 percent of system capacity. This proved to be an overestimate of peak kW savings. The Standard Calculation document outlines calculation approaches for estimating peak kW for the technologies.

3.2 ATTRIBUTION

The 18 MCP attribution factors for the program overall are 59, 62, and 31 percent for kWh, kW, and therms, respectively. This represents a substantial increase in attribution for electric projects relative to FY07. This is due, in large part, to increased attribution for biogas projects. This represents a decline in attribution for projects displacing therms, as compared to FY07. The majority of tracked therm savings is for biogas and biomass. Biomass projects had low attribution values, which is consistent with prior years. Biogas electric projects showed an increase in attribution, which is likely due to the increased incentive levels for this technology.

3.3 REALIZATION RATES AND NET ENERGY IMPACTS

The 18 MCP realization rates for the program overall are 33, 40, and 29 percent for kWh, kW, and therms, respectively. The realization rates for electric projects represent an increase over FY07, due in part to increased program attribution. Realization rates would have been substantially higher if verified gross adjustments had been high, as they were in previous years. The realization rate for therms decreased this contract period compared to FY07, due

in part to a large project that is no longer operating, and to generally low attribution for biomass projects.

3.4 OTHER ISSUES

Two specific issues arose that require additional consideration. These are:

- Treatment of projects receiving incentives for space heating.
- PV systems that do not have inverters

Solar space heating projects. A large percent of sampled solar thermal projects included space heating. The program is aware that that space heating projects are not cost effective because the costs for the collectors goes up steadily while there are diminishing savings (offset) from space heating that is occurring during the winter (low sun) months. For these projects the program should more accurately estimate the water heating savings, as discussed in Section 2, above.

PV systems without inverters. The program provides rebates to PV installations that are connected to the grid. One sampled system was technically connected to the grid, in that the equipment served by the PV system uses electricity as a back-up when the PV cannot meet load. The program calculated savings (off set) of electricity based on the PV system capacity to generate electricity. There are times when the system generates more electricity than the equipment served would use. This electricity is “lost,” as it generates only DC and is not tied directly to the grid.

In these situations, at a minimum, the program should calculate only the energy that will be used from the system. The program should consider establishing thresholds for these projects so that projects that have a very low cost effectiveness are not provided incentives by the program.

APPENDIX A: SELECTED SURVEY RESULTS

Survey responses provided in Appendix A include responses to question used to determine attribution in section A.1 and responses to other questions in section A.2.

A.1 ATTRIBUTION RESPONSES

In this sub-section, we provide the results for the direct attribution questions. KEMA interviewers asked these questions of all respondents, after discussing the project, the project decision-making and the Program's role in the project. This included facilitation, site assessments, feasibility studies, workshops, and financial incentives.

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?

Table A-1. Responses to DAT1a

Response	Number of Responses	Weighted Percent of kWh	Weighted Percent of kW	Weighted Percent of Therms
About the Same	23	6%	11%	69%
Earlier	0	0%	0%	0%
Later	29	41%	39%	31%
Never	11	53%	50%	0%
Missing	1	0%	0%	0%

Table A-2. DAT1 Open-Ended Responses

Without Focus on Energy incentives and assistance, would you say that it was "very likely," "somewhat likely," "not very likely," or "very unlikely" that you would have installed [TYPE OF PROJECT] when you did?	
Why do you say that?	
Very Likely	Focus had little to do with the program
	We wanted to install them before we retire because our income will go down.
	Would have been the same time without Focus
	Timing was driven by constructing a new site
	Fuel prices (currently using fuel oil)
	Lack of FOE funding was not a sufficient amount of money to delay the [deleted] construction
	Logistics of a larger projects
	New construction - was planned as green
	No influence, we installed on our own timeline, not Focus's
Part of a major building remodel	

Without Focus on Energy incentives and assistance, would you say that it was “very likely,” “somewhat likely,” “not very likely,” or “very unlikely” that you would have installed [TYPE OF PROJECT] when you did?	
Why do you say that?	
	Tied to home construction scheduling
	Timed with building expansion
	Would have stuck to the plan
Somewhat Likely	I was doing so much other work: roof, furnace, chimney, water heater, it was the logical time to do PV
	New construction - have to do PV when you build the building
	To be a factor in increasing renewable energy. FOE was icing on the cake.
	Would have installed a smaller system at first to try it out. MUCH smaller at that time.
	existing boiler needed replacement
	kind of wanted it, anxious to get it installed
	older unit needed replacement soon
	the system was starting to fail, and needed attention
	without Focus primary timing motivation was the expiration of Federal tax incentives
	would have waited a little longer to measure out decision
Not Very Likely	Because without the extra money from FOE, I would had to think longer or come up with money somewhere else
	Economics would have been unattractive and I wouldn't have had info access
	Focus paying huge percent of the cost made the PV realistic for us.
	I use the income from PV. Took money from my retirement account to invest without FOE, would have been better off leaving money in 401K. I'll be making \$1,000 / month from PV
	The incentive was there and the cost of PV is so high, like you are paying for 50 years of electricity up front.
	The incentives are huge. We were looking at a system in NC, but didn't do the project because no incentives.
	The payback would have been too long without the Cash Back Rebate
	building was planned and going up, the incentive allowed the extra engineering on the roof to occur
	Focus was a major stimulus to do something we'd been considering for years
	had to wait for the utility to join FOE
	hard to say, but given approval "full steam ahead"
	insufficient money available at the time
	maybe in 10 years the cost of a system would be more affordable
	might have waited to see more federal incentives
	the initial cost would have made the C:B less positive
	wait to gather more money together
Very Unlikely	FOE money with the other incentives made the case for me
	As it was, we barely had enough money to do it. Without the money from FOE, we would not have done it.

Without Focus on Energy incentives and assistance, would you say that it was “very likely,” “somewhat likely,” “not very likely,” or “very unlikely” that you would have installed [TYPE OF PROJECT] when you did?	
	Why do you say that?
	Focus was the catalyst that got it done. FOE helped me out.
	Hefty rebate and PV was expensive. We charge our tenant for electricity and there is a long payback
	Not as soon without FOE
	a rapid farm expansion project required increasing the capacity of the system, without Focus money wouldn't have had the capital
	capital required to do it
	figures that the tank would have failed eventually (forcing a repair within the year), and that he likely would have waited and saved \$ until total failure
	found F-W for FR
	mostly tied to the federal incentives, which they didn't get in the end
	no taxes on project, needed every dime on support and needed it all at relatively the same time
	the payback was marginal without the Focus incentives; we would have waited for costs to go down or energy costs to rise
	without Focus would have struggled along with the old unit or switch back to gas
	we would have less money to complete the system in a timely manner, Focus provided a significant portion of the cost
	would have done more development work first
	would have had to come up with significantly more money
	would have procrastinated on the decision

DAT1b

Approximately how many months later would you have installed the [project type]?

Table A-3. Responses to DAT1b

Number of Months	Number of Responses	Weighted Percent of kWh	Weighted Percent of kW	Weighted Percent of Therms
<i>Weighted Average</i>	28	9.28	12.81	8.22
2	1	12%	10%	0%
6	1	0%	0%	0%
8	3	23%	18%	30%
9	1	0%	0%	0%
12	6	1%	2%	0%
15	1	0%	0%	0%
18	1	0%	1%	0%
24	2	1%	2%	0%
25	1	0%	1%	0%
36	4	1%	2%	0%
48	4	1%	3%	0%
54	1	0%	0%	0%
60	1	0%	0%	0%
120	1	0%	0%	0%
Missing (N/A)	36	59%	61%	69%

Table A-4. DAT1b Open-Ended Responses

Approximately how many months later would you have installed the [project type]?	
Months Earlier	What other factors, if any, affected your decision to install the [project type] when you did?
2	equipment lead time and utility delay
6	previous experience, relatively cheaper than other renewable options (more bang for the buck)
8	none
	the result of an accelerated farm expansion project which required more manure capacity.
	weather (construction season), had to do something within a year to the previous system
9	none
12	Other big factor was We Energies program where they pay you more. Though it was running out. The 22 cents per kWh.
	fuel cost
	need to serve emerging renewable technologist job market - the sooner the better

Approximately how many months later would you have installed the [project type]?	
Months Earlier	What other factors, if any, affected your decision to install the [project type] when you did?
	none
	saw a federal solar incentives and considered it likely that wind would come down the pike with the new administration
	the funds were available at the time
15	a recent new furnace install from Cardinal and a desire to get rid of wood mess also impacted timing decisions
18	Already putting up a building was first and foremost. New construction. Could have added PV later.
24	Electric rates keep going up. ATC spending billions on new lines. If everyone did PV, need less transmission
	Wanted to get it up right away, expect labor and panel costs would go up if I waited.
25	I'm old and I don't have much time left.
	Focus on Energy and our desire to do renewable energy.
36	none
	waiting for utility to join FOE and saving extra money to pay for the whole system at once
	wanted to install the turbine during major renovations that were occurring to the main structure
48	Having an available and motivated contractor.
	Technology was improving and it was there/ready. Installers had good recommendations.
	curiosity, "for the sake of having them", cites image
	save energy resources, do something good for the environment
54	none
60	this was new construction, it would have taken some time to get together the \$ to retrofit later on
120	none
missing (N/A)	Circumstantial; construction loan available & roll PV into the home loan
	For new construction, costs much more to wait and have to re-do the electrical wiring
	Needed a new roof. That was a lot of the timing.
	Wanted to reduce our energy costs in retirement and we're about to retire.
	We were constructing a new remote site at that time and needed it to serve more customers.
	Would have been difficult to install after construction was complete
	Her husbands death was the determining factor in the timing - he had planned the PV project and gotten the contractor
	building process, would have had to wait for building to be complete and then assessed whether the project was doable under those conditions
	due to Federal asst. requirements
	fuel prices (fuel oil vs NG w/ pipeline install (2.5 miles) vs wood - "finances were obvious")
	made a determination that it was a good time to be looking into alternative energy sources. this was one of the opportunities on the table
	none
	old boiler may not have passed DNR particulate testing - resulting in cost to repair project
	hinged on availability of components and contractors
	the impending failure of the system was the driving force behind the timing

Table A-5. Responses to DAT3

Response	Number of Responses	Weighted Percent of kWh	Weighted Percent of kW	Weighted Percent of Therms
Same Size	44	93%	83%	72%
Smaller	16	6%	14%	0%
Would not have installed	3	1%	2%	28%
Missing	1	0%	0%	0%

Table A-6. DAT3 Open-Ended Responses

Without Focus services or incentives, how different would the size of the [TYPE OF PROJECT] have been? Would you have installed a [Project type] of the same size, smaller, or larger? [READ LIST]	
	Why do you say that?
Same Size	BTU's remain the same, storage and delivery mechanism may have been reduced
	I wanted to fill the entire area we had.
	I went as large as I could go on a single pole
	Integrated with SHW
	Utility buyback program has a PV system size limit.
	Size was based on our use.
	Size was the max allowed by Utility. FOE made the whole thing possible AT ALL.
	System size was predicated on building design.
	We put as many panels as would fit on the south facing side of the roof.
	based on # cows
	based on BTUs from past process records
	based on DHW demand
	based on animal counts and whey stream
	based on demand (kiln steam 90%, space heating 10%)
	based on estimated consumption
	based on heating need
	based on previous system capacity, current family size, recommendations from contractors
	based on sqft
	component replacement only, did not consider expanding or reducing the system
	designed largely as a backup for geothermal heat pump system
	did what the site could bear, and what made sense for use
	digester is based on heard size and genset is based on potential digester gas production
	Focus had no input on the system design
	given the overhead for this project scaling it down wouldn't save much money or supply our needs
	it was the size available from the manufacturer and still eligible for the net metering agreement
need to heat a given space	
preexisting system	
process requirements	

Without Focus services or incentives, how different would the size of the [TYPE OF PROJECT] have been? Would you have installed a [Project type] of the same size, smaller, or larger? [READ LIST]	
Why do you say that?	
	size was based on building size and # of residents
	sized to herd
	smallest could get (still more capacity than use)
	space heating would have been dropped from the design
	the state of WI has a system size limit to enter into a net metering agreement at retail. Less than 10K would have been too little for needs. There are only 3 models between those two sizes avail.
	this is pretty much all that was available in the range of interest that were reconditioned
	this size is sufficient for my DHW needs and can provide some space heat, any smaller would not be satisfactory
	wanted space heat component
	we would have concentrated on a DHW only system rather than include space heating
	Because I wouldn't have spent as much. Without the FOE info, wouldn't know the efficiencies, etc.
Smaller	Because of the cost
	Half the size.
	Moneywise.
	Panels \$1000 each. More money means more panels.
	The smaller one we were looking at was going to be 80% of the cost of the one installed
	We might have put up a demonstration size one
	Without FOE, would have either been much smaller or not at all.
	Would have been less out of pocket expense.
	Would have been much smaller, just a trial size system. FOE and contractor together enabled him to get the size system he did.
	because of the reduced cost of a smaller project
	largely based on cost
	limited funds would have reduced the size of the system
	the size was determined by our need, 3 people = 2 panel domestic system
	we use less water than the initial estimate. Contractor showed that by upgrading slightly the rebate was relatively larger
Would not have installed	Wouldn't have done it at all.
	Wouldn't have done it.

Table A-7. Responses to DAT3a

Response	Number of Responses	Weighted Percent of kWh	Weighted Percent of kW	Weighted Percent of Therms
<i>Weighted Average</i>	14	0.52	0.51	0.50
0.50	6	3%	6%	0%
0.25	2	1%	1%	0%
0.75	1	1%	2%	0%
0.10	1	0%	1%	0%
0.49	1	1%	2%	0%
0.56	1	0%	1%	0%
0.68	1	0%	1%	0%
0.72	1	1%	1%	0%
Missing (N/A)	50	94%	87%	100%

Table A-8. DAT4 Open-Ended Responses

<p>RND 1 Question: We've just discussed the different effects that Focus on Energy had on your decisions regarding the [SYSTEM TYPE] that you installed. I'd like you to summarize the Focus on Energy program's influence, if any, on the timing and capacity of [SYSTEM TYPE] that you installed.</p> <p>RND 2 Question: Question: Could you please summarize how your [SYSTEM TYPE] would have been different without assistance and/or advice from Focus on Energy? (probe on timing and capacity)</p>
Didn't really have any.
Focus did not have a great influence on the size or timing of our project
Focus did not have much effect on the capacity of timing, fuel source however was important switching to NG would have required a 2.5 mi pipeline and continued use of fuel oil was too expensive)
Focus had almost no effect on the digester build.
Focus had little to no effect on timing or capacity
No influence and no bearing on the project
Thanks to FOE I could replace before total failure, professional people found through (or at) Focus gave good and trustworthy advice on the capacity of the system.
Capacity was larger than it would have been without Focus due to the money. Wanted to get it done while money from the program was available. Funding was the driving aspect.
Capacity was what we needed.
Critical. Knew what I wanted but not about vendors and how to connect with people.
FOE solidified that I was going to go through with it. I had always been looking for as much capacity as I could get.
FOE had no effect on the capacity but it was a "kick in the pants" to get moving on the project. It encouraged members to get involved sooner than later.
Focus had little effect on size or timing of the project due to other constraints (remodel)
Focus had no influence on the design of the system. Size was based on space and water heating requirements and timing was based on home construction.
Focus has little influence on timing or capacity
Focus incentives sealed the deal for us.

<p>RND 1 Question: We've just discussed the different effects that Focus on Energy had on your decisions regarding the [SYSTEM TYPE] that you installed. I'd like you to summarize the Focus on Energy program's influence, if any, on the timing and capacity of [SYSTEM TYPE] that you installed.</p> <p>RND 2 Question: Question: Could you please summarize how your [SYSTEM TYPE] would have been different without assistance and/or advice from Focus on Energy? (probe on timing and capacity)</p>
<p>Focus provided basic information on the website and at the energy fairs. Focus site assessment assistance indicated the adequacy of site. Provided valuable funds for install and helped to navigate the process from information gathering and permitting to closure and grid connection.</p>
<p>Focus provided funding which allowed a definite plan for the installation to be developed/ Funding allowed for the project to occur now rather than further down the line.</p>
<p>Focus provided the foundation to move forward with this project in a timely manner. Although size of the turbine is not incredibly Important, more generation is better.</p>
<p>Focus pushed us to decide on the pellet stove faster.</p>
<p>Heating capacity was not flexible, but the delivery system was - it may have been less sophisticated without Focus. Focus allowed us to install before a breakdown of the existing system and winter</p>
<p>Huge. Very valuable.</p>
<p>Not incredibly important. It was easier to justify doing it by spending less. Only a happy accident.</p>
<p>Smaller. Wouldn't have met all my electrical needs without Focus.</p>
<p>The financial help allowed for me to install at this time and made sure that my capacity of sufficient</p>
<p>The main resource was Larry Krom. He influenced our timing provided information and gave confidence in our own calculations by producing very similar results with his own. Answered any questions - without Larry might still be on the fence</p>
<p>The timing would have been approximately the same due to the federal tax breaks, Focus has relatively small impact. Focus had moderate impact on the size of the system (a bigger incentive may have led to a larger system).</p>
<p>Timing, because FOE had money available and it seemed feasible rather than have to wait. No influence on size.</p>
<p>Very limited effect on timing with no effect on size</p>
<p>Without Focus we would have held off on repairing the system, the size however was fixed (did not feel expansion was necessary or worth the hassle)</p>
<p>Although timing and size were not heavily effected, the decision of wood over NG was.</p>
<p>Due to another project this moved forward on that schedule, size was determined by need</p>
<p>FOE got me excited by paying for 25% which got me motivated to do it.</p>
<p>FOE had no bearing on the size and timing was mostly influenced by curiosity</p>
<p>Focus had little influence on size, but sped up the install of SHW by making it more attractive vs. other technologies</p>
<p>Focus had no effect on installation size, but did allow us to install now rather than later.</p>
<p>Focus helped to get us on the ball, but did not effect the capacity</p>
<p>Focus played a major role in the timing and size; without Focus there is a strong potential that this project wouldn't have gone forward</p>
<p>Focus was critical for timing and in fact the existence of the system. Without FOE we would have waited until the building was done and then considered install.</p>
<p>For timing, FOE was crucial: without the incentive we wouldn't have installed it. FOE had no influence on the capacity at all.</p>
<p>Helpful in making economics work and providing info [It was very clear that he wouldn't have done the project at all, ever, without FOE]</p>
<p>It wouldn't have been</p>
<p>Might have installed a system half as big in 3 to five years.</p>
<p>Smaller. And not as soon.</p>

<p>RND 1 Question: We've just discussed the different effects that Focus on Energy had on your decisions regarding the [SYSTEM TYPE] that you installed. I'd like you to summarize the Focus on Energy program's influence, if any, on the timing and capacity of [SYSTEM TYPE] that you installed.</p> <p>RND 2 Question: Question: Could you please summarize how your [SYSTEM TYPE] would have been different without assistance and/or advice from Focus on Energy? (probe on timing and capacity)</p>
<p>The incentives allowed a larger system than had initially been considered, timing was significantly affected - if we had to wait to install we would have had to wait quite a while to save up enough to retrofit this system into an existing house</p>
<p>The incentives allowed us to install the panels, without them we did not have sufficient funding</p>
<p>The rebate made it happen, and all the support from FOE throughout the process reduced the unknowns.</p>
<p>They encouraged me to do it promptly.</p>
<p>We installed when we did to try and get the federal \$, and the size was based on our family's size.</p>
<p>We waited until MG&E got their tariff approved by PSC. FOE didn't hold us up at all.</p>
<p>Without FOE, would have either installed smaller PV or not at all.</p>
<p>Without the Focus program we would have had to wait to save an additional bunch of money, it would have been smaller (no space heat) without Focus.</p>
<p>Focus did not effect our timing or capacity decisions</p>
<p>PV system would be non existent</p>
<p>Size based on current demand with allowance for future expansion. Focus allowed install before heating season.</p>
<p>The project was one of many of similar priority, it was FOE's investment, advice and connections that made it happen.</p>
<p>The project may not have gone through, potentially would have resulted in less generation power with the same manure digestion capacity</p>
<p>We wouldn't have done it at all without the rebate AND we were able to put up a bigger system because of the rebate</p>
<p>enabled us to install a system that covers the center's consumption and time the install with major renovation project on the building</p>

A.2 OTHER SURVEY RESPONSES

In this section we report results of the non-attribution related questions from the participant survey. These questions were used to identify participant experiences with the program, as well as to remind them of the full range of program services prior to the attribution sequence.

Table A-9. Responses to Question A7

Overall, how satisfied or dissatisfied would you say you are with the performance of the [type of project]? Would you say you are:						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Very dissatisfied	4%	0%	0%	7%	0%	0%
Somewhat dissatisfied	5%	0%	0%	1%	7%	39%
Somewhat satisfied	22%	20%	12%	15%	31%	22%
Very satisfied	66%	60%	88%	69%	62%	40%
Missing	4%	20%	0%	7%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Table A-10. Responses to Question A9

Prior to this [type of project] project, had you ever participated in the Focus on Energy program? What kind of Focus assistance or services did you receive at that time?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
No prior participation	57%	0%	47%	58%	59%	40%
Rebate	31%	60%	53%	24%	35%	60%
Advice	13%	40%	7%	18%	9%	0%
Other assistance	6%	0%	0%	11%	0%	16%
Missing	2%	40%	0%	0%	3%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-11. Responses to Question B2

Did you receive financial assistance such as rebates, grants, reduced financing, or tax credits from any other source for this [project type]? From what sources?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
No other \$ assistance	48%	60%	88%	30%	63%	81%
Federal tax credits	44%	0%	0%	60%	34%	0%
U.S. Dept. of Agriculture	2%	20%	12%	3%	0%	0%
Supplier/Manufacturer	0%	0%	0%	0%	0%	0%
We Energies \$ for non-profits	0%	0%	0%	0%	0%	13%
Utility buyback rates	8%	0%	0%	15%	0%	0%
Other	0%	0%	0%	0%	0%	6%
Missing	1%	20%	0%	0%	3%	0%

Table A-12. Responses to Question B2b

About how much? (Financial incentive rec'd from other sources)			
Technology	First Source	Second Source	Total Amount
Biogas			
	U.S. Dept. of Agriculture		\$76,000
Biomass			
	U.S. Dept. of Agriculture		\$30,000
Solar Electric			
	Federal tax credits		Missing
	Federal tax credits		\$17,400
	Federal tax credits		\$2,000
	Federal tax credits		\$25,000
	Federal tax credits		\$4,000
	Federal tax credits		\$6,000
	Federal tax credits	U.S. Dept. of Agriculture	\$25,000
	Federal tax credits	Utility buyback rates	Missing
	Federal tax credits	Utility buyback rates	7% per yr tax credit
	U.S. Dept. of Agriculture		\$29,000
	Utility buyback rates		Missing
	Utility buyback rates		\$500
Solar Hot Water			
	Federal tax credits		Missing
	Federal tax credits		\$10,000
	Federal tax credits		\$2,000
	Federal tax credits		Missing
	Federal tax credits		\$10,200
	Federal tax credits		\$2,000
Wind			
	We Energies \$ for non-profits		\$19,752
	We Energies \$ for non-profits		\$25,000
	Other		\$2,000

Table A-13. Responses to Question D2

From where or whom did you hear about [type of project]?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Independent reading/research	50%	60%	23%	49%	55%	39%
MREA - Midwest Renewable Energy Association	29%	40%	0%	36%	21%	55%
A friend or relative	13%	20%	0%	7%	20%	19%
Installer/contractor	32%	0%	0%	43%	23%	17%
Focus on Energy	2%	20%	0%	3%	0%	0%
Don't remember	0%	0%	0%	0%	0%	0%
Industry source(s)	12%	20%	35%	6%	17%	16%
Always knew about renewables	17%	0%	23%	30%	0%	17%
Previously existing system	3%	20%	53%	0%	3%	0%
Other	9%	20%	12%	10%	7%	0%
Missing	1%	20%	0%	1%	0%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-14. Other Responses to Question D2

From where or whom did you hear about [type of project]?	
Technology	Other Responses
Biogas	DBA
Biomass	residential applications
Solar Electric	2 prior RE projects on home 20 yrs ago Mailings from WE Energies (utility) Newspaper
Solar Hot Water	Formerly a sales rep who sold SHW systems in the late 70s and early 80s

Table A-15. Responses to Question D3

From where or whom did you hear about Focus on Energy? Anywhere else?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Internet	14%	0%	23%	9%	20%	16%
Installer/contractor	40%	20%	23%	42%	44%	0%
Utility	21%	0%	12%	22%	21%	22%
Friend/relative	18%	20%	12%	16%	20%	35%
MREA - Midwest Renewable Energy Association	31%	40%	0%	34%	28%	56%
Other	14%	40%	30%	12%	14%	16%
Missing	7%	20%	0%	9%	6%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-16. Responses to Question D4

What did you hear about Focus at that time? Anything else?						
Available Support	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Financial/rebates	84%	60%	100%	88%	80%	61%
Other services	16%	0%	0%	14%	21%	6%
Technical information	15%	20%	7%	7%	27%	6%
Rebate and tax credit info	8%	0%	0%	6%	13%	0%
Rules and buy-back rate info	0%	0%	0%	0%	0%	0%
General and contractor info	8%	0%	0%	9%	7%	17%
Other	8%	20%	0%	2%	17%	0%
Missing	2%	20%	0%	3%	0%	16%

* Totals may exceed 100% because multiple responses allowed.

Table A-17. Other Responses to Question D4

What did you hear about Focus at that time?	
Technology	Other Responses
Biogas	
	a unified, outsources DSM plan (rather than all the utilities having thier own program)`
Solar Electric	
	Vague association with EE or green building
Solar Hot Water	
	an environmental agency or company
	easy to work with
	promotion of renewables and EE

Table A-18. Responses to Question D5

Did you hear about Focus on Energy cash incentives...						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Before you started planning	63%	0%	53%	74%	52%	60%
While you were planning	31%	80%	47%	16%	48%	23%
After decision, before install	5%	0%	0%	9%	0%	17%
After installing	0%	0%	0%	0%	0%	0%
Missing	0%	20%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Table A-19. Responses to Question D6

As you were making decisions about the [type of project], who or what were the main sources of advice and information?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Installer/contractor	92%	20%	58%	100%	91%	39%
MREA - Midwest Renewable Energy Association	20%	20%	12%	21%	21%	16%
Focus on Energy	19%	60%	18%	24%	10%	45%
Self-installer	3%	0%	0%	0%	7%	17%
Site Assessor	22%	0%	0%	30%	14%	22%
Internet	8%	0%	0%	14%	0%	17%
Other	29%	40%	23%	15%	45%	44%
Missing	3%	20%	0%	0%	6%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-20. Other Responses to Question D6

As you were making decisions about the [type of project], who or what were the main sources of advice and information?	
Technology	Other Responses
Biogas	
	European travel and contacts
	other dairy farms w/ digesters
Biomass	
	other wood product producers
	wood products facilities
Solar Electric	
	Utility
	Utility We Energies
Solar Hot Water	
	a PV installer
	Lots of seminars/workshops/conferences/tradeshows (attends nearly quarterly)
	architect firm
	energy audit
	personal research
	print media
	utility
Wind	
	manufacturer
	Local technical college already had a system installed, provided significant information and assistance
	manufacturer
	print media (magazine: Home Energy)

Table A-21. Responses to Question D6a

What role, if any, did your contractor(s) (supplier or installer) play in your decision to install [type of project]?	
Technology	Other Responses
PV	
	Calculated estimated production kWh
Solar Hot Water	
	discount pricing for equip from supplier was very important
	how to reduce the difficulty in operating a totally custom system designed in the early 80s by homeowner
	information on who to contact re: energy audit
Wind	
	self installer

Table A-22. Responses to Question D7

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?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=63)	Weighted Percent (n=4)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
None	27%	0%	0%	36%	21%	0%
1 to 3	41%	0%	23%	43%	41%	55%
4 to 8	18%	0%	12%	9%	31%	16%
10 or more	13%	80%	65%	12%	7%	29%
Missing	0%	20%	0%	0%	0%	0%

Table A-23. Responses to Question D7a

What did you discuss with Focus on Energy staff?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=53)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Additional improvements	7%	60%	0%	10%	4%	0%
Technical information	15%	40%	77%	23%	0%	13%
Electrical code information	0%	0%	0%	0%	0%	0%
Insurance information	0%	20%	0%	0%	0%	0%
Incentives available from	82%	40%	77%	70%	96%	71%
Federal tax credits	4%	0%	0%	0%	9%	0%
Federal grants available	0%	0%	0%	0%	91%	100%
Other	34%	20%	0%	19%	52%	45%
Missing	5%	20%	0%	12%	0%	255%

* Totals may exceed 100% because multiple responses allowed.

Table A-24. Open Ended Responses to Question D7a

What did you discuss with Focus on Energy staff?	
Technology	Other Responses
Biogas	sundry advice
Solar Electric	Identifying contractors Permits. Problem with municipality. Problems with contractor not getting the job done. get site assessment
Solar Hot Water	Difficulty have final inspection done audit process issues or dispute with contractor list of approved contractors progress report and final report schedule a system inspection to set up a post install inspection, otherwise all rebate related
Wind	municipal barriers product delivery delay resolution, writing of reports and releases site assessor site assessor information

Table A-25. Responses to Question D7b

I'd like to know how much these conversations affected your decision to go ahead with the project. Would you say that they contacts with Focus on Energy staff . . .						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=53)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Were a very important factor in your decision to do the project	19%	40%	30%	17%	20%	13%
Were a somewhat important factor	21%	20%	23%	25%	18%	16%
Made no difference	55%	20%	35%	54%	59%	56%
Made you less inclined to do the project	0%	0%	0%	0%	0%	0%
Other, please describe	0%	0%	0%	0%	0%	0%
Missing	5%	20%	12%	4%	4%	16%
Total	100%	100%	100%	100%	100%	100%

Table A-26. Responses to Question D8

Did you have a site assessment done for the [TYPE OF PROJECT] at your [home/business]?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=4)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Yes	82%	40%	58%	91%	73%	100%
No	17%	40%	42%	9%	27%	0%
Missing	0%	20%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Table A-27. Responses to Question D9

Was the assessment done by...?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=51)	Weighted Percent (n=3)	Weighted Percent (n=5)	Weighted Percent (n=21)	Weighted Percent (n=14)	Weighted Percent (n=8)
You/Someone in household	7%	0%	40%	0%	17%	0%
The installer or contractor	54%	33%	0%	55%	63%	6%
Someone else	30%	33%	0%	38%	10%	100%
Other	6%	33%	60%	2%	10%	0%
Missing	7%	33%	0%	12%	0%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-28. Responses to Question D10

Where did you learn about your site assessor?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=51)	Weighted Percent (n=3)	Weighted Percent (n=5)	Weighted Percent (n=21)	Weighted Percent (n=14)	Weighted Percent (n=8)
Focus on Energy Website	12%	0%	0%	10%	10%	61%
Focus on Energy Staff (or other non-website)	12%	0%	0%	19%	0%	23%
Contractor/Installer	25%	33%	40%	15%	42%	0%
MREA Midwest Renewable Energy Association	18%	0%	0%	33%	0%	0%
Other	19%	33%	20%	19%	19%	16%
Missing	19%	33%	40%	14%	29%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-29. Responses to Question D11

Did Focus on Energy share the cost of the site assessment with you?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=51)	Weighted Percent (n=3)	Weighted Percent (n=5)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Yes	42%	33%	40%	58%	10%	100%
No	38%	0%	60%	8%	90%	0%
Missing	20%	67%	0%	34%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Table A-30. Responses to Question D12

Overall, how satisfied or dissatisfied would you say you were with the site assessment? (Only those with whom Focus shared costs)						
Would you say you were:						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=23)	Weighted Percent (n=1)	Weighted Percent (n=2)	Weighted Percent (n=11)	Weighted Percent (n=1)	Weighted Percent (n=8)
Very dissatisfied	0%	0%	0%	0%	0%	0%
Somewhat dissatisfied	0%	0%	0%	0%	0%	0%
Somewhat satisfied	4%	0%	0%	3%	0%	17%
Very satisfied	95%	0%	100%	97%	100%	83%
Missing	1%	100%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Table A-31. Responses to Question D12a

Why do you say that? (Only those for whom Focus shared costs)		
Technology	Level of Satisfaction	Reason
Biomass		
	Very satisfied	allowed "selling" project to board
	Very satisfied	clear and to the point
Solar Electric		
	Somewhat satisfied	
	Very satisfied	
	Very satisfied	Accurate production numbers. Numbers he gave us 99%
	Very satisfied	Did a good job and gave me a lot of info
	Very satisfied	Gave us the info we were looking for. Cost info to determine location --- s.a. was before put together a bid
	Very satisfied	He sat and talked with me for a long time. That was important.
	Very satisfied	He seemed to know his stuff.
	Very satisfied	Knowledgeable, cost as expected, on time, learned a lot
	Very satisfied	Nice analysis, accurate, made our decision easy.
	Very satisfied	no problems
Solar Hot Water		
	Very satisfied	supplied solid answers and location information
Wind		
	Somewhat satisfied	
	Very satisfied	came through promptly, thorough, produced a very nice report
	Very satisfied	it layed out the process of building the unit
	Very satisfied	matched what had been shown at the site for the previous 15 years
	Very satisfied	needed information for grants
	Very satisfied	thorough and precise, got to work with our contractor and learn to trust him
	Very satisfied	timely, informative
	Very satisfied	used as a reference doc for RFP

Table A-32. Responses to Question D13

What benefits, if any, did you get from the site assessment? Anything else? (Only those with whom Focus shared costs)						
Response	Overall Weighted Percent (n=23)	Biogas Weighted Percent (n=1)	Biomass Weighted Percent (n=2)	Solar Electric Weighted Percent (n=11)	Solar Hot Water Weighted Percent (n=1)	Wind Weighted Percent (n=8)
Provided technical info	92%	100%	100%	97%	100%	51%
Provided more reasons to install	2%	0%	0%	3%	0%	0%
Confirmed commitment to install	53%	100%	0%	54%	100%	23%
Provided access to experts	34%	0%	0%	40%	0%	29%
Increased cost/benefits knowledge	42%	100%	50%	41%	100%	6%
Increase knowledge of environmental benefits	7%	0%	0%	9%	0%	0%
Better understanding of installation process	45%	0%	0%	54%	0%	32%
Better understanding of installation challenges	6%	0%	0%	3%	0%	32%
Other	32%	0%	100%	31%	0%	45%
Missing	1%	33%	0%	1%	0%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-33. Responses to Question D14

I'm going to read some statements about the extent, if any, that the site assessment affected your decision to install the [type of project]. Please tell me which of the following statements best applies. (Only those with whom Focus shared costs)
The site assessment was...

Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=23)	Weighted Percent (n=1)	Weighted Percent (n=2)	Weighted Percent (n=11)	Weighted Percent (n=1)	Weighted Percent (n=8)
Very important	49%	100%	100%	55%	0%	28%
Somewhat important	45%	0%	0%	42%	100%	33%
Made no difference	7%	0%	0%	3%	0%	39%
Made you less inclined	0%	0%	0%	0%	0%	0%
Other	0%	0%	0%	0%	0%	0%
Missing	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Table A-34. Responses to Question D16

Did you or anyone else in your [household/company] attend a workshop about [type of project]?

Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Yes	40%	80%	12%	39%	41%	71%
No	56%	0%	88%	57%	56%	29%
Missing	4%	20%	0%	5%	3%	0%
Total	100%	100%	100%	100%	100%	100%

Table A-35. Responses to Question D19

I'm going to read some statements about the extent, if any, that the workshop affected your decision to install [type of project].
The workshop(s) was/were

Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=25)	Weighted Percent (n=4)	Weighted Percent (n=1)	Weighted Percent (n=8)	Weighted Percent (n=7)	Weighted Percent (n=5)
Very important	51%	75%	100%	69%	34%	9%
Somewhat important	32%	25%	0%	15%	48%	69%
Made no difference	9%	0%	0%	4%	17%	0%
Made you less inclined	0%	0%	0%	0%	0%	0%
Other	0%	0%	0%	0%	0%	0%
Missing	7%	0%	0%	12%	0%	22%
Total	100%	100%	100%	100%	100%	100%

Table A-36. Responses to Question D21

Did you or anyone else in your [household/company] attend a conference in Wisconsin that covered [type of project]?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Yes	29%	40%	0%	42%	16%	22%
No	70%	40%	100%	56%	84%	78%
Missing	1%	20%	0%	2%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Table A-37. Responses to Question D23

What, if any, benefits related to your [project type] did you get out of attending the conference?	
Technology	Benefits from Conference
Biogas	
	higher level interactions (w/ owner operators)
	see previous more specific and indepth info
Solar Electric	
	General knowledge of renewable energy
	Met contractor, learned about EE, tankless water heater
	More info and decision making help
	Smattering. Wasn't totally focussed on solar.
	Testimonials from guys that had PV systems.
Solar Hot Water	
	I presented at the conference
	conferences generally focus on bigger picture (global warming, carbon stuff) issues and on bigger systems (commercial type) - they don't effect homeowner too much, but it is good information
Wind	
	none- attended as presenters

Table A-38. Responses to Question D24

I'm going to read some statements about the extent, if any, that the conference affected your decision to install [type of project]. The conference(s) was/were						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=16)	Weighted Percent (n=2)	Weighted Percent (n=0)	Weighted Percent (n=8)	Weighted Percent (n=4)	Weighted Percent (n=2)
Very important	14%	50%	0%	18%	0%	0%
Somewhat important	45%	50%	0%	46%	45%	0%
Made no difference	32%	0%	0%	26%	55%	29%
Made you less inclined	0%	0%	0%	0%	0%	0%
Other	8%	0%	0%	11%	0%	0%
Missing	2%	0%	0%	0%	0%	71%
Total	100%	100%	0%	100%	100%	100%

Table A-39. Responses to Question D26

What types of challenges or obstacles, if any, did you encounter in the process of installing the [type of project]?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
None	36%	20%	58%	30%	46%	0%
Technical difficulties	31%	20%	12%	28%	34%	67%
Difficulties w/ Contractor	13%	0%	7%	13%	14%	6%
Permits/ordinance	7%	0%	0%	9%	0%	56%
Cost	12%	20%	0%	9%	17%	17%
Difficulties w/ Focus	4%	0%	0%	2%	7%	0%
Difficulties w/ Utility	13%	40%	0%	23%	0%	17%
Insurance	1%	0%	0%	2%	0%	0%
Information	3%	0%	0%	6%	0%	0%
Application process	4%	0%	0%	2%	7%	0%
Equipment availability	11%	0%	0%	19%	0%	22%
Other	6%	0%	12%	11%	0%	6%
Missing	2%	20%	12%	0%	3%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-40. Other Responses to Question D26

What types of challenges or obstacles, if any, did you encounter in the process of installing the [type of project]?	
Technology	Other Responses
Biomass	
	weather
Solar Electric	
	Excessive Paperwork
	Utility delayed grid connection over 3 months.
	manufacturer caused
Wind	
	weather

Table A-41. Responses to Question D27

How were these resolved?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=43)	Weighted Percent (n=4)	Weighted Percent (n=4)	Weighted Percent (n=17)	Weighted Percent (n=10)	Weighted Percent (n=8)
Not resolved	24%	25%	0%	25%	26%	16%
Focus incentive	6%	0%	0%	0%	18%	0%
Info from Focus	2%	0%	0%	0%	0%	39%
Assistance from Focus	12%	0%	16%	11%	13%	13%
Resolved by respondent	28%	50%	0%	18%	39%	66%
Contractor/Installer	65%	0%	28%	65%	76%	32%
Manufacturer	0%	0%	0%	0%	0%	6%
Other	12%	0%	28%	11%	13%	13%
Missing	3%	25%	28%	0%	5%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-42. Other Responses to Question D27

How were these resolved?	
Technology	Other Responses
Biomass	
	wait out the cold, slight time delay
Solar Electric	
	Utility (Alliant had drilling rig)
Solar Hot Water	
	Federal tax rebates and bank loan
Wind	
	reschedule around delays
	state asst

Table A-43. Responses to Question D29

For what reasons did you participate in the Focus on Energy Renewable program?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Financial incentives	94%	80%	100%	90%	100%	100%
Environmental values	12%	0%	0%	16%	7%	22%
Technical assistance	15%	40%	0%	23%	6%	28%
Equip. vendor included incentives in proposal	6%	0%	0%	12%	0%	0%
Help reviewing proposals	4%	0%	0%	7%	0%	0%
Other	10%	0%	0%	5%	17%	17%
Missing	1%	20%	0%	1%	0%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-44. Other Responses to Question D29

For what reasons did you participate in the Focus on Energy Renewable program?	
Technology	Other Responses
Solar Electric	promote renewable energy
Solar Hot Water	contractor information
	reduce energy costs, achieve energy independence
	trust
Wind	general wind and PV information

Table A-45. Responses to Question D30

What were the main reasons that [you/your organization] decided to go ahead with the [type of project]?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Environmental values	71%	0%	7%	76%	73%	60%
Reduce energy costs	62%	20%	65%	63%	66%	23%
Educate others about renewable energy	29%	0%	0%	48%	6%	60%
Remodeling	4%	0%	0%	7%	0%	0%
Get off electric grid	0%	0%	0%	0%	0%	0%
Building expansion	0%	0%	12%	0%	0%	0%
New construction, too expensive to get on grid	0%	0%	0%	0%	0%	0%
Replace existing equip.	15%	0%	58%	12%	17%	0%
Energy independence	9%	0%	7%	9%	7%	39%
Other	27%	80%	0%	25%	30%	38%
Missing	1%	20%	0%	2%	0%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-46. Other Responses to Question D30

What were the main reasons that [you/your organization] decided to go ahead with the [type of project]?	
Technology	Other Responses
Biogas	
	business opportunity
	genset is making heat all the time, should use it rather than waste it
	nutrient and waste stream management is payed for by the electricity sold to the grid
	waste and odor management
Solar Electric	
	Building new remote site
	Fulfill contract.
	marketing PR green image
	needed to replace roof, wanted to do at same time
	new construction
	public relations image and new construction
	stability and predictability of electricity costs.
Solar Hot Water	
	Focus rebate
	Image and public relations
	LEED cert.
	achievable cost given focus and fed asst.
	repair of existing system
	secondary (backup) space heating fuel switch
Wind	
	neat factor and energy independence
	LEED certification
	product testing

Table A-47. Responses to Question F1

What suggestions, if any, do you have on how to encourage other [households/businesses] to participate in the program? What are they?						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
None	24%	20%	18%	18%	34%	23%
Advertise	44%	0%	70%	46%	42%	23%
Be more clear	5%	0%	0%	6%	3%	23%
Better engineers	0%	0%	0%	0%	0%	0%
Increase/new \$ incentives	28%	20%	0%	37%	21%	6%
Provide calculation tools	7%	0%	0%	6%	7%	23%
Other	22%	20%	0%	16%	31%	22%
Missing	2%	40%	12%	2%	0%	16%

* Totals may exceed 100% because multiple responses allowed.

Table A-48. Other Responses to Question F1

What suggestions, if any, do you have on how to encourage other [households/businesses] to participate in the program? What are they?	
Technology	Other Responses
Biogas	upstream programs
Solar Electric	differentiate between those that are environment driven and those that just want to save money Present PV as low risk long term investment Promote via Solar Tour with better scheduling
Solar Hot Water	free site assessments, case studies, presentation of program wide energy savings bring in more contractors field people should be more tightly controlled (stick to schedule, establish a timeline to project followup activities and stick to it) green mortgage information to brokers quality control, new incentives (see comments)
Wind	e-mail links to people with existing systems kids handing out CFLs and information

Table A-49. Responses to Question F2

Is your [household/company] considering any additional renewable energy projects or considering expanding your [type of project]? What type of system are you considering?						
Response	Overall Weighted Percent (n=64)	Biogas Weighted Percent (n=5)	Biomass Weighted Percent (n=9)	Solar Electric Weighted Percent (n=23)	Solar Hot Water Weighted Percent (n=19)	Wind Weighted Percent (n=8)
No additional projects	44%	40%	70%	33%	58%	40%
Photovoltaic	28%	0%	12%	31%	24%	60%
Solar hot water	15%	0%	0%	21%	10%	6%
Wind	14%	0%	12%	25%	0%	22%
Biomass	0%	0%	7%	0%	0%	0%
Biogas	1%	20%	7%	0%	0%	6%
Other	15%	0%	18%	27%	0%	6%
Missing	7%	40%	0%	3%	11%	0%

* Totals may exceed 100% because multiple responses allowed.

Table A-50. Responses to Question F3

Next, I'd like to know how satisfied or dissatisfied you are with the Focus on Energy program.						
Response	Overall	Biogas	Biomass	Solar Electric	Solar Hot Water	Wind
	Weighted Percent (n=64)	Weighted Percent (n=5)	Weighted Percent (n=9)	Weighted Percent (n=23)	Weighted Percent (n=19)	Weighted Percent (n=8)
Not at all satisfied	0%	0%	0%	0%	0%	0%
2	3%	0%	0%	0%	7%	17%
3	4%	0%	0%	3%	7%	0%
4	26%	20%	12%	12%	45%	40%
Very Satisfied	65%	40%	88%	85%	41%	28%
Missing	1%	40%	0%	0%	0%	16%
Total	100%	100%	100%	100%	100%	100%

Table A-51. Responses to Question F4

Why do you say that? (satisfaction rating of FOE program)	
Satisfaction Level	
Technology	1 (Low) - 5 (High) Reason for Satisfaction or Dissatisfaction
Biogas	
	4 disappointed w/ rebate amount
	5 Larry Krom brings tremendous value to renewables
	5 easy to deal with (easier than USDA), Larry K is very helpful
Biomass	
	4 good thing, easy to navigate
	5 Terry great to work with, everyone was helpful and informative
	5 allowed organize thoughts and process
	5 did a very good job
	5 helps organize approach, happy to work with them
	5 more asst. than expected
	5 straight forward, purposful
	5 very smooth and helpful
	5 wodnerful job,. Helped with a tremendous # of projects
Solar Electric	
	3 Our problems were with the installer. I was hoping for more electricity. In winter, PV won't make any electricity with snow on it.
	3 Too much administrative costs
	4 2 month delay getting check from FOE.
	4 I'm satisfied. I don't know. The system is here and it is working.
	5 Also, my experiences with Home Performance, too. For this PV system only, also a 5.
	5 Because the check cleared the bank, they paid 25% of the cost. They were there, available.
	5 CBR application simple. Respond to ?s promptly. Fast approval. Reimbursement simple and prompt.
	5 Ease of the process and the financial help.
	5 Everything totally satisfactory.
	5 FOE was very supportive
	5 Helpful. Knew about PV projects. Gave good retail and supplier info.
	5 I don't see that they could do more other than give me more money.
	5 I expected 70 to 80 percent of power and we're at 94% of electricity needed.
	5 I have no basis for comparison.
	5 I remember call ing up a guy at FOE. He was at home. Was wonderful to talk. I can go on internet [FOE website] and it really helps bc so few people have PV.
	5 Not just the experience w this PV project, but others as well. They suggested technology for energy effic, shared their expertise
	5 The stuff I complain about is not major. Just because FOE exists is worth 4.5 out of 5 points.
	5 They are there. I am very aware of them. They could get their message out better.
	5 They fulfilled their promises and they're nice people
	5 They gave me \$23,000 !!!
	5 They were helpful and did what they were set up to do.
	5 They're helpful in getting the project financed through rebates.
	5 We have to do more to get people out of the Oil Mentality. We're thinking of doing a home EE audit.
Solar Hot Water	
	2 waiting for energy star check, delays and unfulfilled commitments from energy star field rep
	3 rebate could have been better, things were pretty good, prompt, didn't like inspection process (feels preferred contractors should get an expedited inspection of the system)
	4
	4 bigger incentive would be better but nothing negative to say
	4 not alot of contact, everything flowed well - a little bit more money would have been good
	4 nothing negative to say, didn't interact with them very muchy
	4 rebate
	4 slight delay w/ incentive, may have been more the installer's doing
	4 the rebate process is somewhat cumbersome and it was frustrating to not be able to get a 'green mortgage'
	5 \$ helps, professional/pleasane/informational
	5
	5 Kari heinrich was very pleasant and helpful-cooperative and a pleasure to work with
	5 easy process, fair \$
	5 good group, helpful
	5 nice, easy to work with on an EE problem in the past (difficulty with a blowerdoor analysis followup)
	5 no problems
	5 pleasant to work with, do problems/dissatisfaction
	5 very easy to work with
Wind	
	2 rebate difficulties
	4 good operation, feels that focus needs to be more critical of wind production potential
	4 provide good information and did exactly what they said they were going to do
	4 some prescriptive incentives are not as beneficial as the customs (incentives vs. cost (admin/labor); small projects (prescriptive) make it difficult to overcome the administrative costs a tthe college
	5 Mick's help with a variety of issues, the check arrived on time and in the correct amount
	5 excellent people/advise + help with projects

Table A-52. Responses to Question F5

Do you have any additional comments about these projects of the Focus on Energy program that they should take into account in the future?	
Technology	Comments
Biomass	
	always one step ahead, bring ideas to the table
	more programs specifically designed for medium sized companies
Solar Electric	
	Be exact with the numbers so people know what they're getting. Be as generous as you [focus] can be. Have Focus staff have PV and other renewables themselves.
	Don't know.
	FOE is a gift. Lucky to have Focus.
	FOE is the best program going, a model for other states, even the whole country. It is amazing for builders and remodelers because it quantifies the benefit.
	FOE needs better communication with WI Energy Star
	If they can expand it, that's good. They don't need to advertize a lot. People aren't motivated by money that's not the up-front reason, they know PV is expensive. Installers know about the Focus program.
	In WI, you're better off with wind power than solar.
	Increase the solar rebates. [means CBR's]
	Keep on going. Invite people, really invite them to get involved. Be welcoming to possible customers. On the website, too. The energy auditor and folks I spoke w on the phone. Be encouraging! You can do this! This can help! Utilities emphasized how EXPE
	More publicity. Avg person not tuned in to the availability of residential PV. The Powerhouse TV show is good.
	Most people oughta be doing 'em. PV systems.
	No
	Only thing to make FOE better would be to increase the rebates.
	Promotion is everything. Now, you have to be a geek to even know that FOE exists. Evangelism valuable.
	Tour of Solar Homes should be advert more.
	Site assessment so very important for wind: my output was too low. PV much more satisfying.
	The economic issue w utilities would get MANY more people to do renewables
	Utilities should put much more money into renewables at Focus and really ramp it up.
Solar Hot Water	
	a solar space heating incentive
	led to believe that the incentive would have arrived sooner
	none
	paying ahead for services results in a lackadaisical attitude from field people - given that everything is paid for ahead of time there is little impetus to work hard - pay for services rendered is better
Wind	
	Customer feels thatrebate calculation is dubious, rebate estimate reassessment methode should be more transparent. Feels that using different tools for building the estimated reward and the actual reward is questionable
	feels that the wind potential was exhaggerated by site assessor
	found it difficult to navigate and manage a variety of FoE programs. Had trouble navigating the website and pinpointing which programs applied tot he city and land trust collaboration
	minimize administrative expense
	none
	quality control/standards for technology/vendor/manufacturer reliability

APPENDIX B: PARTICIPANT SURVEY

[KEMA ID]

CALL LOG FOR

Focus on Energy Renewables Evaluation
CY08 – KEMA ID 20810063 – Task 3

Measure ID:

KEMA ID:

Type of project:

Type of customer (Res/Comm/Ind):

Contact Name:

Business Name:

Call Order: =

hphone: =

wphone: =

email: _____

KEMA Employee initials	Date	Time	Notes (include message left, best time to call, best way to contact, and whether survey was completed)

Interview start time: _____

Interview end time: _____

Reward Amount:

Comments:

Notes:

Renewable Energy Program Survey

Contract Year 08 Impact Instrument

Interviewer Guidelines

1. Preparation: Review Impact Statement (IS) if provided. Copy information from the IS to the gray areas below before conducting the survey.
2. Record beginning and end-time
3. Do not read responses that are in brackets.
4. Read responses that are NOT in brackets
5. Read closed-ended questions exactly as written.
6. Skip questions that are not applicable, but indicate they have been skipped by drawing a line through the question
7. Record open-ended answers verbatim, or read back to the respondent what you have recorded to make sure it captures what they meant.
8. Probe on open-ended questions to make sure you understand the issue completely.
9. Many questions have been converted from open-ended to closed-ended. If the respondents answer doesn't fit a category be sure to select "other" and record the response.
10. After completing the interview, review your notes to make sure they are legible and comprehensible to others.
11. Complete data entry within one working day of when you complete the survey.

A Informed Respondent

[As the surveyor, you should paraphrase this paragraph, using words that you're comfortable with to set the sort of tone with which you want to proceed.]

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...

- A1. [EQUIPMENT TYPE]
- A2. [INSTALLATION MONTH AND YEAR]
- A3. [AT ADDRESS]
- A4. It was manufactured by [manufacturer name] _____ and was rated to generate _____ (depending on type of project: kW, kWh, therms).

[NOTE: WE DON'T HAVE MANUFACTURER NAME FOR MANY SYSTEMS, SO BE SURE TO ASK CUSTOMER]

- A5. Is this what was installed?
 - YES.....1
 - NO.....2

(IF NO, DISCUSS AND RECORD ANY CHANGES TO THE PLANS.)

A6. Is this [TYPE OF PROJECT] operating still in operation?
 YES.....[SKIP TO A7].1
 NO.....2

A6a. Why not?

A7. Overall, how satisfied or dissatisfied would you say you are with the performance of the [TYPE OF PROJECT]? Would you say you are:

Very DISSatisfied 1
 Somewhat DISSatisfied2
 Somewhat Satisfied.....[SKIP TO A8b] 3
 Very Satisfied[SKIP TO A8b] 4
 [Don't know][SKIP TO B1] 97
 [Refused].....[SKIP TO B1] 98

A8a. Why do you say that? [dissatisfied] _____

[Poor performance]..... 1
 [Less energy than expected]2
 [Technical difficulties]3
 [Other]96
 [Don't know]97
 [Refused].....98

A8b. Why do you say that? [satisfied] _____

[Good performance] 1
 [More energy than expected].....2
 [Financial savings or income]2
 [Other]96
 [Don't know]97
 [Refused].....98

A9. **Prior to this** [TYPE OF PROJECT] **project**, had you ever participated in the Focus on Energy Program?

Yes.....1
 No.....[SKIP TO C1] 2
 [Don't know].....97
 [Refused].....98

A9a. What kind of Focus assistance or services did you receive **at that time**?

Rebate.....	1
Advice.....	2
Other (describe).....	96
[Don't know].....	97
[Refused].....	98

A9b. For what type of equipment? (probe: type of renewable or ee measure)

B Cash Incentive

B1. Our records show that you received \$_____ in financial assistance from Focus on Energy for your [TYPE OF PROJECT] project, and that the total cost of your project was \$_____. Is this correct?

YES.....	1
NO.....	2
[RECORD CORRECT AMOUNTS:_____..]	
[Don't know].....	97
[Refused].....	98

B2. Did you receive financial assistance such as rebates, grants, reduced financing, or tax credits from any other source for this [project type]?

Yes.....	1
No.....	[SKIP TO D1] 2
[Don't know].....	[SKIP TO D1] 97
[Refused].....	[SKIP TO D1] 98

B2a. From what sources?

Federal tax credits.....	1
U.S. Department of Agriculture grant.....	2
Supplier or Manufacturer (name:_____)	3
We Energies Incentives for Not-For-Profits.....	4
Other (please describe) _____	96
[Don't know].....	97
[Refused].....	98

B2b. About how much? _____ Record Amount

[Don't know].....	97
[Refused].....	98

If residential, skip to D1

C Company Processes, Respondent's Role? [Ask Series Only For NON-residential]

C1. 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?]

C1a. How did the approval or decision-making process go at your location? [Probes: Who all involved, process, board approval required, understand roles regarding selecting equipment and roles regarding approval of expenditures]

C2. What purchasing policies, if any, does your organization have for this type of equipment?
[probe: rate of return or payback requirements, warranty requirements, spending limits, schedules]

[IF NONE, SKIP TO D1]

C2a. What role, if any, did these policies have in the decisions regarding the [Project Type]?

D Decision to install

Okay, now I'd like hear how the decision-making process went, starting from when you first started thinking about [Project Type]..

D1. About when did [you/your organization] first start thinking about [TYPE OF PROJECT]?
(MONTH, YEAR) [RECORD AS MM:YY]: _____

D2. From where or whom did you hear about [TYPE OF PROJECT]?

[Independent reading/research].....	1
[MREA – Midwest Renewable Energy Association]	2
[A friend or relative]	3
[Installer/contractor].....	4
[Focus on Energy]	5
[Don't remember].....	6
[Other, please describe _____]	96
[Don't know]	97
[Refused].....	98

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

Learning about Focus

D3. From where or whom did you hear about Focus on Energy? Anywhere else? [CIRCLE ALL THAT APPLY]

[the Internet].....	1
[Installer/contractor].....	2
[Utility]	3
[Friend or relative or colleague]	4
[MREA – Midwest Renewable Energy Association]	5
[Other, please describe _____]	96
[Don't know]	97
[Refused].....	98

<p>Paste in from Impact Statement response to following question and use for probing.</p> <p>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).</p>

D4. What did you hear about Focus at that time? [RECORD VERBATIM THEN CIRCLE ALL THAT APPLY] [probe: Anything else?]

[Focus provided financial incentives/rebates available]	1
[Other services]	2
[They could provide me with technical information].....	3
[They could provide me with information about rebates or tax credits]	4
[They could provide me information about rules or utility buy-back rates]	5
[Other]	96
[Don't know].....	97
[Refused].....	98

D5. Did you hear about Focus on Energy cash incentives . . .

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
[Don't know].....	97
[Refused].....	98

D6x. 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]

[Don't know].....	97
[Refused].....	98

Sources of Advice

D6. As you were making decisions about the [TYPE OF PROJECT], who or what were the main sources for advice and information?

[Installer/contractor].....	1
[MREA – Midwest Renewable Energy Association]	2
[Focus on Energy]	3
[Self-installer]	4
[Site Assessor: GET NAME: _____]	5
[Other, please describe _____].....	96
[Don't know]	97
[Refused].....	98

D6a. What role, if any, did your contractor(s) (supplier or installer) play in your decision to install [TYPE OF PROJECT]? _____

[none]	2
[provided bid(s) only]	2
[recommended specific equipment]	3
[informed me about Focus]	4
[timing in process (influenced my planning about when to install)]	5
[Other, please describe _____]	96
[Don't know].....	97
[Refused].....	98

D7. 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]

0 →skip to D8

_____ Number of times in contact with Focus staff

D7a. What did you discuss with Focus on Energy staff? (probe: application process, technical issues, insurance, contractors, other?)

[Additional improvements]	1
[Technical information]	2
[Electrical code information].....	3
[Insurance information]	4
[Incentives available from Focus].....	5
[Federal tax credits]	6
[Federal grants available]	7
[Other 96	
[Don't know/don't remember].....	97
[Refused].....	98

D7b. I'd like to know how much these conversations affected your decision to go ahead with the project? Would you say that the contacts with Focus on Energy staff [READ LIST]

Were a very important factor in your decision to do the project	1
Were a somewhat important factor	2
Made no difference.....	3
Made you less inclined to do the project.....	4
[Other, please describe _____]	96
[Don't know].....	97
[Refused].....	98

Site Assessment or (Feasibility Study for biomass or biogas)

D8. Did you have a site assessment done for the [TYPE OF PROJECT] at your [home/business]?

Yes.....	1
No	[SKIP TO D16] 2
[Don't know]	[SKIP TO D16] 97
[Refused].....	[SKIP TO D16] 98

D9. Was the assessment done by...?

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]	[SKIP TO D16] 97
[Refused].....	[SKIP TO D16] 98

D10. Where did you learn about your site assessor?

Focus on Energy Website	1
Focus on Energy Staff.....	2
Contractor/Installer	3
Other (please describe _____)	4
[Don't Know].....	97
[Refused].....	98

D11. Did Focus on Energy share the cost of the site assessment with you?

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

D12. Overall, how satisfied or dissatisfied would you say you were with the site assessment]?
 Would you say you were:

Very Dissatisfied	1
Somewhat Dissatisfied	2
Somewhat Satisfied.....[SKIP TO D13]	3
Very Satisfied.....[SKIP TO D13]	4
[Don't know]	[SKIP TO D13] 97
[Refused].....[SKIP TO D13]	98

D12a. Why do you say that? _____

D13. What benefits, if any, did you get from the site assessment? Anything else? [RECORD VERBATIM and then CIRCLE ALL THAT APPLY]

[Provided technical information]	1
[Provided even more reasons to install]	2
[Confirmed our commitment to installing]	3
[Provided access to "experts"].....	4
[Increased our financial knowledge – costs and benefits.....	5
[Increased our knowledge of the environmental benefits].....	6
[Helped us better understand the process for installing	7
[Helped us better understand the challenges with installing	8
[Other.....	96
[Don't know]	97
[Refused]	98

D14. I'm going to read some statements about the extent, if any, that the site assessment affected your decision to install the [TYPE OF PROJECT]. Please tell me which of the following statements best applies.

The site assessment was . . . [READ LIST]

a <i>very important</i> factor in your decision to do the project	1
a <i>somewhat important</i> factor your decision.....	2
made no difference your decision	3
made you less inclined to do the project.....	4
[Other, please describe _____].	96
[Don't know]	97
[Refused].....	98

D15. Why do you say that?

[Don't know]	97
[Refused].....	98

Workshops and Conferences

D16. Did you or anyone else in your [household/company] attend a workshop about [TYPE OF PROJECT]?

Yes.....	1
No	[SKIP TO D21] 2
[Don't know]	[SKIP TO D21] 97
[Refused].....	[SKIP TO D21] 98

D17. What workshop(s) did you attend and when? [RECORD VERBATIM]

D18. What, if any, benefits did you get out of attending the workshop? [RECORD VERBATIM]

[Don't know]	97
[Refused].....	98

D19. 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 . . .

a <i>very important</i> factor in your decision to do the project	1
<i>somewhat important</i> factor in your decision.....	2
made no difference in your decision	3
made you less inclined to do the project.....	4
Other, please describe	96
[Don't know]	97
[Refused].....	98

D20. Why do you say this?

D21. Did you or anyone else in your [household/company] attend a conference in Wisconsin that covered [TYPE OF PROJECT]?

Yes.....	1
No	[SKIP TO D26] 2
[Don't know]	[SKIP TO D26] 97
[Refused].....	[SKIP TO D26] 98

D22. What, conference(s) did you attend and when? [RECORD VERBATIM]

D23. What, if any, benefits related to your [project type] did you get out of attending the conference? [RECORD VERBATIM and then CIRCLE ALL THAT APPLY]

<hr/>	
[Don't know]	97
[Refused].....	98

D24. 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 . . .

a <i>very important</i> factor in your decision to do the project	1
<i>somewhat important</i> factor in your decision.....	2
made no difference in your decision	3
made you less inclined to do the project.....	4
Other, please describe _____	96
[Don't know]	97
[Refused].....	98

D25. Why do you say this?

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 _____

D26. 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 THEN CIRCLE ALL THAT APPLY]

[None]	[SKIP TO D29] 1
[Technical difficulties]	2
[Difficulties with contractor/installer].....	3
[Permits/ordinance]	4
[Cost].....	5
[Difficulties with Focus].....	6
[Difficulties with utility]	7
[Insurance]	8
[Information]	9
[Application process]	10

[Other	96
[Don't know]	97
[Refused].....	98

D27. How were these resolved? [RECORD VERBATIM THEN CIRCLE ALL THAT APPLY]

[Not resolved]	1
[Focus incentive]	2
[Info from Focus]	3
[Assistance from Focus]	4
[Resolved by respondent].....	5
[Contractor/installer]	6
[Manufacturer]	7
[Other	96
[Don't know]	97
[Refused].....	98

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.

D28. What role, if any, did Focus on Energy staff play in resolving this (these) issues?

Final Decision

D29. For what reasons did you participate in the Focus on Energy Renewable program?
[RECORD VERBATIM THEN CIRCLE ALL THAT APPLY]

[Wanted to take advantage of financial incentives]	1
[Commitment to environment].....	2
[Wanted technical assistance]	3
[Equipment vendor included incentive in sales proposal].....	4
[Wanted help reviewing proposals]	5
[Other	96
[Don't know]	97
[Refused].....	98

D30. What were the main reasons that [you/your organization] decided to go ahead with the [TYPE OF PROJECT? [Record verbatim and then CIRCLE ALL THAT APPLY] _____

[Commitment to environment].....	1
[Wanted to reduce energy costs]	2
[To educate others on renewable energy options]	3
[Were undertaking remodeling].....	4
[Wanted to get off the electric grid]	5
[Were undertaking building expansion].....	6
[New construction and too expensive to get on the grid].....	7
[We were replacing existing equipment]	8
[Other]	96
[Don't know]	97
[Refused].....	98

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 impact these services and financial incentives had on your installation of the [equipment type].

[Interviewer: Address inconsistencies with previous responses as they arise.]

OLD1. 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]	97
[Refused].....	98

Timing

DAT1. I'd like to know about the effect, if any, that Focus on Energy incentives and other assistance had on your decision to install [TYPE OF PROJECT] when you did.

Without Focus on Energy incentives and assistance, would you say that it was "very likely," "somewhat likely," "not very likely," or "very unlikely" that you would have installed [TYPE OF PROJECT] when you did?

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

DAT1_O. Why do you say that? _____

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?

About the same	[SKIP TO DAT3]	1
Earlier.....	[SKIP TO DAT3]	2
Later.....		3
Or never	[SKIP TO DAT3]	4
[Don't know]	[SKIP TO DAT3]	97
[Refused].....	[SKIP TO DAT3]	98

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

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

DAT1b_O. What other factors, if any, affected your decision to install the [project type] when you did?

Size

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

DAT3. Without Focus services or incentives, how different would the size of the [TYPE OF PROJECT] have been? Would you have installed a [Project type] of the same size, smaller, or larger? [READ LIST]

Same size	[SKIP TO DAT4]	1
Smaller		2
Larger.....	[SKIP TO DAT4]	3
[Don't know]	[SKIP TO DAT4]	97
[Refused].....	[SKIP TO DAT4]	98

DAT3_O. Why do you say that? _____

DAT3a. Focus financial incentives or assistance, approximately what size system (in kW, or btu/h or whatever units the system is measured in.) would you have installed?

[_____ kW]
[_____ therms]

DAT 3a. [To be filled out by interviewer: calculate percent difference from installed project and complete percent response where result is: $\text{Difference} = \frac{\text{Intended capacity in kW}}{\text{installed capacity in kW}}$

[INTERVIEWER RECORD PERCENTAGE].....	_____
[Don't know]	97
[Refused].....	98

DAT4. Could you please summarize how your [SYSTEM TYPE] would have been different without assistance and/or advice from Focus on Energy? (probe on timing and capacity)

[Don't know]	97
[Refused].....	98

DAT5. [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].....	97
[No]	98

F Overall Satisfaction

Enrollment Process

F1. What suggestions, if any, do you have on how to encourage other[households/businesses] to participate in the program? [IF “yes,” PROBE] What are they? [ACCEPT MULTIPLE RESPONSES]

[None]	1
[Increase awareness/advertise]	2
[Be more clear]	3
[Have better engineers]	4
[Other, please describe _____]	96
[Don't know]	97
[Refused].....	98

Overall

F2. Is your [household/company] considering any additional renewable energy projects or considering expanding your [TYPE OF PROJECT]?

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

F2a. What type of system are you considering?

Photovoltaic.....	1
Solar DHW	2
Wind	3
Biomass	4
Biogas.....	5
Other [please specify _____]	6
[Don't Know].....	97
[Refused].....	98

F3. 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]	97
[Refused].....	98

F4. Why do you say that? [OPEN END] record verbatim.

F5. 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]

E 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, RECORD ONE NUMBER]

Single family home (house on separate lot, includes modular homes)	[SKIP TO G5]	1
Row or townhouse (adjacent walls to another house)	[SKIP TO G5]	2
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	[SKIP TO G5]	5
Other , please describe: _____		96
[Don't know/not sure].....		97
[Refused].....		98

G2. Do you own or rent this residence?

[Own/buying]	1
[Rent/lease].....	2
[Other, please describe _____]	96
[Don't know/not sure].....	97
[Refused].....	98

G3. (If G1 = 3 or 4) How many units are in your building?

[5-9 units]	1
[10-19 units]	2
[20-49 units]	3
[50+ units]	4
[Don't know/not sure].....	97
[Refused].....	98

G4. (If G1 =3 or 4 and G2 = 1) Do you own a single unit or do you own the entire building?

[Single unit]	1
[Entire building]	2
[Other, please describe _____]	96
[Don't know/not sure].....	97
[Refused].....	98

G5. In approximately what year was this residence/facility built? (Fill in blank)
 [PUT IN FULL YEAR – Ex: 1957] Year Built
 [Don't know/not sure]..... 97
 [Refused]..... 98

G6. How many **years** have you lived at this residence?
 [RECORD NUMBER. IF LESS THAN ONE YEAR, RECORD ZERO]
 [Don't know/not sure]..... 97
 [Refused]..... 98

G7. How many people live in this residence full-time, including yourself and any infants?
 [RECORD NUMBER]
 [Refused]..... 98

G8. What is the total enclosed square footage of your unit /house? Your best estimate is fine.
 [RECORD # SQ FT]
 [Don't know] 97
 [Refused]..... 98

G9. What was your total household income in 2007, 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] 97
 [Refused]..... 98

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/farm. These questions are for classification purposes only. All of your answers are confidential.

X1. How would you best describe this business/farm? Is it a . . . [Interviewer – verbatim is not as important as getting the right answer]

Dairy Farm	1
Other farm.....	2
School.....	3
Hotel or motel.....	4
Other (describe).....	96
[Don't know/not sure].....	97
[Refused].....	98

X2. Which best describes your facilities at this location? Is it:

A single, stand alone building.....	1	Skip to X4
Multiple buildings	2	
School.....	3	Skip to X4
Hotel or motel.....	4	Skip to X4
Other (describe)		Skip to X4
.....	96	Skip to X4
[Don't know/not sure].....	97	Skip to X4
[Refused].....	98	Skip to X4

X3. How many buildings do you occupy at this location?

_____ Record number of buildings

X4. 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.

E Engineering Questions

PV Systems ONLY

I am going to discuss some technical information about the system in order to confirm our information regarding your system. If you have the original site survey or design study for your system as installed, that might help you to answer these questions.

[If they do not have this information handy, attempt the questions anyway, and ask them to give their best estimate. If they don't know or refuse to answer a confirmation question, assume that our information is correct, but mark "97" or "98" in parentheses].

E1 – Are your panels facing [DEGREES from NORTH]?

- YES..... [SKIP TO E2] 1
- NO2
- [DON'T KNOW] [SKIP TO E2] 97
- [REFUSED] [SKIP TO E2] 98
- E1a. [ENTER CORRECT DEGREES FROM NORTH] _____

E2 - Are your solar panels on an automatic tracking system?

- YES..... 1
- NO [SKIP TO E5] 2
- [DON'T KNOW]97
- [REFUSED].....98

E3 – Is your tracking system SINGLE axis?

- YES..... [SKIP TO E5] 1
- NO2
- [DON'T KNOW]97
- [REFUSED].....98

E4 – [ONLY IF E3 = 2] Are both axes working on your tracking system?

- YES..... [SKIP TO E11] 1
- NO [SKIP TO E11] 2
- [DON'T KNOW]97
- [REFUSED].....98

E5 – Your tilt angle was [ANGLE] when it was installed, correct? [SKIP TO E11 AFTER RECORDING ANGLE IF SYSTEM IS SINLGE AXIS TRACKING]

- YES [SKIP TO E6] 1
- NO2
- [DON'T KNOW] [SKIP TO E6] 97
- [REFUSED] [SKIP TO E6] 98
- E5a. [ENTER CORRECT DEGREES FROM NORTH] _____

E6 –Is your tilt angle CONSTANT?

- YES..... [SKIP TO E9] 1
- NO2
- [DON'T KNOW]97
- [REFUSED].....98

E7 –Have you seasonally adjusted the tilt of your panels?

- YES..... 1
- NO [SKIP TO E9] 2
- [DON'T KNOW]97
- [REFUSED].....98

E8 –At what times since installation have you adjusted the panels, and to what angles? [They may adjust 4 times a year i.e. late spring to 28 deg, late summer to 43 deg, late fall to 58 deg and late winter to 43 deg].

[record answer in the following format: month:angle, ex: 05:28]

- 1st angle change _____
- 2nd angle change _____
- 3rd angle change _____
- 4th angle change _____

E9 –At install your system experienced no shading. Is this correct?

- YES..... [SKIP TO E10] 1
- NO2
- [DON'T KNOW] [SKIP TO E10]97
- [REFUSED]..... [SKIP TO E10]98
- E9a. [RECORD CORRECT % SHADING] _____

E10 - Has shading increased (tree growth) or decreased (tree trimming) since the design study?

- INCREASED 1
- DECREASED 2
- NO CHANGE [SKIP TO E12] 3
- [DON'T KNOW] 97
- [REFUSED] 98

E11 - What percentage has shading increased/decreased? [USE BRACKETING AND RECORD DECREASED SHADING AS **NEGATIVE** PERCENTAGES, ex: -25%]

- % SHADING CHANGE: _____
- [DON'T KNOW] 97
- [REFUSED] 98

E12 – During winter, how long, on average, does snow cover the panels after a snow fall? [USE BRACKETING; if customer can't answer this, ask how many total days snow covered the panels last winter, and record verbatim in data entry box]

- less than 1 day 1
- 1-2 days 2
- 3-4 days 3
- 5-7 days 4
- more than one week 5
- [DON'T KNOW] 97
- [REFUSED] 98

E13 – Have you added to the system since it was first installed? (ex: equipment changes such as panels or an inverter?)

- YES 1
- NO [SKIP TO E15] 2
- [DON'T KNOW] 97
- [REFUSED] 98

E14 – What have you added?

E15 – We have already established that your PV system was installed on [DATE]. Did your system begin producing electricity on the same date it was installed?

- YES.....[SKIP TO E16] 1
- NO2
- [DON'T KNOW].....[SKIP TO E16] 97
- [REFUSED].....[SKIP TO E16] 98
- E15a [RECORD PRODUCTION DATE] _____

E16 - Has there been any major down-time in the system since installation?

- YES..... 1
- NO[SKIP TO E18] 2
- [DON'T KNOW].....97
- [REFUSED].....98

E17 – When, and for how long [record as month:days (i.e. 03:7)]? _____

E18 – Is your system on the grid?

- YES..... 1
- NO2
- [DON'T KNOW].....97
- [REFUSED].....98

E19 – Does the system use batteries? [NOTE THAT ALL OFF-GRID SYSTEMS IN THIS STUDY USE BATTERIES ACCORDING TO OUR RECORDS]

- YES..... 1
- NO[SKIP TO E23] 2
- [DON'T KNOW].....97
- [REFUSED].....98

E20 – Do you use the batteries for emergency back-up?

- YES..... 1
- NO2
- [DON'T KNOW].....97
- [REFUSED].....98

E21 – How much energy do the batteries store, and what is the voltage?

- [RECORD AMP-HOURS AND VOLTAGE] _____
- [DON'T KNOW].....97
- [REFUSED].....98

E22 – Do you run [some/all] of your appliances on DC power?

- YES, ALL 1

YES, SOME	2
NO	3
[DON'T KNOW]	97
[REFUSED].....	98

E23 – How is your PV system metered? [READ CHOICES, CIRCLE ALL THAT APPLY]

READ-OUT DISPLAY ON INVERTER	1
SEPARATE UTILITY METER FOR PV ELECTRICITY	2
OTHER (describe)	

.....	96
[DON'T KNOW]	97
[REFUSED].....	98

E24 – Please tell me the total kWh production of the system since inception. [THIS IS THE MOST IMPORTANT QUESTION IN SURVEY. IF RESPONDENT CANNOT ANSWER TOTAL kWh SINCE INCEPTION, ASK FOR CURRENT READ-OUT AND DATE OF RESET. NOTE THAT SOME UTILITY METERS ARE ONE-WAY AND OTHERS TWO-WAY. BE SURE THEY ARE GIVING kWh PRODUCTION, NOT CONSUMPTION OF GRID POWER!]

kWh _____	
RESET DATE _____	
[DON'T KNOW]	97
[REFUSED]	98

E25 – Would it be okay if our Engineer called you with other questions regarding your system?

YES.....	1
NO	2
[DON'T KNOW]	97
[REFUSED].....	98

Wind Systems ONLY

I am going to discuss some technical information about the system in order to confirm our information regarding your system. If you have the original site survey or design study for your system as installed, that might help you to answer these questions.

[If they do not have this information handy, attempt the questions anyway, and ask them to give their best estimate].

E26 - Are you on the grid?

YES.....	1
NO	2
[DON'T KNOW].....	97
[REFUSED].....	98

E27- Does the system use batteries?

YES.....	1
NO	[SKIP TO E29] 2
[DON'T KNOW].....	97
[REFUSED].....	98

E28 – How much energy do the batteries store, and what is the voltage?

[RECORD AMP-HOURS] _____	
[RECORD VOLTAGE] _____	
[DON'T KNOW].....	97
[REFUSED].....	98

E29 – Was your turbine new or used when you purchased it?

NEW.....	[SKIP TO E32] 1
USED.....	2
[DON'T KNOW].....	97
[REFUSED].....	98

E30 - How long was your turbine used before you bought it? _____

[DON'T KNOW].....	97
[REFUSED].....	98

E31 - Was your turbine reconditioned before it was installed?

YES.....	1
NO	2
[DON'T KNOW].....	97
[REFUSED].....	98

E32a – How tall is your turbine? [include units]
 RECORD CORRECT HEIGHT: _____]
 [Don't Know]..... 96
 [Refused]..... 97

E32b. What is your rotor diameter? [include units and ask for diameter, not blade length]
 [ROTOR DIAMETER: _____]
 [Don't Know]..... 96
 [Refused]..... 97

E32c. What is the maximum capacity of your turbine?
 [kWh: _____]
 [Don't Know]..... 96
 [Refused]..... 97

E33 - Has there been any major down-time in the system since installation, other than times when the wind wasn't blowing strong enough to generate power?
 YES..... 1
 NO [SKIP TO E41] 2
 [DON'T KNOW] 97
 [REFUSED]..... 98

E33a – When, and for how long [(record as month:days (i.e. 03:7))]?

E34 – We have already established that the turbine was installed on [DATE]. Did the turbine begin producing power on the date it was installed?

- YES..... [SKIP TO E35] 1
 - NO 2
 - [DON'T KNOW] [SKIP TO E35] 97
 - [REFUSED]..... [SKIP TO E35] 98
- E34a. [RECORD PRODUCTION DATE] _____

E35 – Are you metering the energy you produce?

- YES..... 1
- NO 2
- [DON'T KNOW] 97
- [REFUSED]..... 98

E36 – How is your energy metered? [ACCEPT MULTIPLES]

- SEPARATE UTILITY METER FOR WIND ELECTRICITY 1
- OTHER (describe) _____ 96
- [DON'T KNOW] 97
- [REFUSED]..... 98

E37 – Please give me the total kWh produced to date. [THIS IS THE MOST IMPORTANT QUESTION ON THE SURVEY. IF THIS IS NOT WHAT THE METER IS READING, ASK THEM TO GIVE THE CURRENT READING AND DATE THAT THE METER WAS RESET]

kWh _____ Date _____

E38 – Is it okay if our engineer contacts you with further questions about your system?

- YES..... 1
- NO 2

Solar Hot Water Questions

E39 – Is the date of beginning operation the same as the date of installation?
 YES.....[SKIP TO E40] 1
 NO2
 [DON'T KNOW].....[SKIP TO E40]97
 [REFUSED].....[SKIP TO E40]98
 E39a. DATE OF BEGINNING OPERATION _____

E40 – Our records indicate that you have [NUMBER] panels on the roof. Is this correct?
 YES.....[SKIP TO E41] 1
 NO2
 [DON'T KNOW].....[SKIP TO E41] 97
 [REFUSED].....[SKIP TO E41] 98
 E40a.[ENTER Number of panels] _____

E41 – Our records indicate that your panels are facing [DEGREES from NORTH], correct?
 YES.....[SKIP TO E42] 1
 NO2
 [DON'T KNOW].....[SKIP TO E42] 97
 [REFUSED].....[SKIP TO E42] 98
 E40a.[ENTER DEGREES FROM NORTH]_____

E42 - Are your solar panels on an automatic tracking system?
 YES..... 1
 NO[SKIP TO E45] 2
 [DON'T KNOW] 97
 [REFUSED]..... 98

E43 – Is your tracking system SINGLE axis?
 YES.....[SKIP TO E45] 1
 NO2
 [DON'T KNOW] 97
 [REFUSED]..... 98

E44 –Are both axes working on your tracking system?
 YES..... 1
 NO2
 [DON'T KNOW] 97
 [REFUSED]..... 98

E45 – Your tilt angle was [ANGLE] when it was installed, correct? [SKIP TO E56 AFTER RECORDING ANGLE IF SINGLE AXIS TRACKING SYSTEM]

- YES.....[SKIP TO E46] 1
- NO 2
- [DON'T KNOW] [SKIP TO E46] 97
- [REFUSED].....[SKIP TO E46] 98
- E45a. [RECORD INSTALLATION ANGLE] _____

E46 – Is your tilt angle is adjustable?

- YES..... 1
- NO [SKIP TO E49] 2
- [DON'T KNOW] 97
- [REFUSED]..... 98

E47 –Have you seasonally adjusted the tilt of your panels?

- YES..... 1
- NO [SKIP TO E49] 2
- [DON'T KNOW] 97
- [REFUSED]..... 98

E48 - At what times since installation have you adjusted the panels, and to what angles? [They may adjust 4 times a year i.e. late spring to 28 deg, late summer to 43 deg, late fall to 58 deg and late winter to 43 deg].

[record answer in the following format: month:angle, ex: 05:28]

- 1st angle change _____
- 2nd angle change _____
- 3rd angle change _____
- 4th angle change _____

E49 – At install your system experienced no shading, is this correct?
 YES.....[SKIP TO E50] 1
 NO 2
 [DON'T KNOW].....[SKIP TO E50] 97
 [REFUSED].....[SKIP TO E50] 98
 E49a. [RECORD CORRECT PERCENTAGE].....

E50 - Has shading increased (tree growth) or decreased (tree trimming) since the site assessment?
 INCREASED 1
 DECREASED 2
 NO CHANGE[SKIP TO E52] 3
 [DON'T KNOW] 97
 [REFUSED]..... 98

E51 - What percentage has shading increased/decreased? [USE BRACKETING AND RECORD DECREASED SHADING AS **NEGATIVE** PERCENTAGES, ex: -25%]
 % SHADING CHANGE:
 [DON'T KNOW] 97
 [REFUSED]..... 98

E52 – During winter, how long, on average, does snow cover the panels after a snow fall? [USE BRACKETING; if customer can't answer this, ask how many total days snow covered the panels last winter, and record verbatim in data entry box]
 less than 1 day 1
 1-2 days 2
 3-4 days 3
 5-7 days 4
 more than one week..... 5
 [DON'T KNOW] 97
 [REFUSED]..... 98

E53 – Our records indicate that [NUMBER] storage tanks were installed, with a capacity of [gallons]. Is this correct?

- YES.....[SKIP TO E54] 1
- NO 2
- [DON'T KNOW] [SKIP TO E54] 97
- [REFUSED].....[SKIP TO E54] 98
- E53a. [Number of Tanks]_____.
- E53b. [Capacity#1].....
- E53c. [Capacity #2].....
- E53d. [Capacity#3].....

E54 - What temperature does cold water enter the system from the main?

Temperature (Degrees F) _____

E55 - What temperature is your hot water tank set at?

Temperature (Degrees F) _____

E56 – Have you added to the system since it was first installed?

- YES..... 1
- NO[SKIP TO E58] 2
- [DON'T KNOW] 97
- [REFUSED]..... 98

E57 – What have you added?

E58- Is this system installed in a year-round home/business or a seasonal home/business?

- YEAR-ROUND [SKIP TO E60] 1
- SEASONAL..... 2
- SEASON DESCRIPTION: _____

E59 - How many days per year do you use the energy [USE BRACKETING]?

NUMBER OF DAYS:_____

E60 - Has there been any major down-time in the system since installation?
 YES..... 1
 NO [SKIP TO E62] 2
 [DON'T KNOW] 97
 [REFUSED]..... 98

E61 – When, and for how long? _____
 [DON'T KNOW] 97
 [REFUSED]..... 98

E62 - [Firehouse only] - How many people stay overnight at the firehouse at any one time, and how many people use the building in the daytime?
 Number of overnight workers _____
 Number of daytime workers _____

E63 - What activities do you use hot water for as supplied by your SHW (showering, dishwasher, clothes washer, space heating, etc)?

E64 - About how much hot water do you use per month (potable/non potable?). (If they don't know that ask how much water they use per month).
 Hot water use per month _____

E65 – Does the solar hot water supply your full needs?
 YES [SKIP TO E66] 1
 NO 2
 [Don't know] 97
 [Refused]..... 98

E65a - What percentage of your hot water needs are supplied through your solar hot water system?
 PERCENTAGE: _____
 [Don't know] 97
 [Refused]..... 98

E65b - What is your supplemental source for hot water heating?

GAS	1
OIL	2
ELECTRIC	3
OTHER (describe).....	96
<hr/>	
[Don't know]	97
[Refused].....	98

E66 - Do you know how much you have saved on your fossil fuel bill since installation of the SHW system? (if they give a \$ amount, also get \$/therm, ft3 or kWh for the energy).

SAVINGS _____	
TIME PERIOD _____	
[Don't know]	97
[Refused].....	98

E67 – Is it okay if our engineer contacts you with further questions?

YES.....	1
NO	2
[Don't know]	97
[Refused].....	98

Biomass Questions

E68 - Our records show that you use [FUEL] for your [furnace/boiler]. Is this correct?

- YES.....[SKIP TO E69] 1
- NO 2
- [DON'T KNOW].....[SKIP TO E69] 97
- [REFUSED].....[SKIP TO E69] 98

E68a.Fuel Type _____

E68b. Who is the [supplier/manufacturer] of the fuel? _____

E68c - Do you know the heating efficiency of the fuel?

- YES..... 1
- NO[SKIP TO E69] 2
- [DON'T KNOW].....[SKIP TO E69] 97
- [REFUSED].....[SKIP TO E69] 98

E68d.HEATING EFFICIENCY_____

E69 - What is the moisture content of the fuel?

- Moisture content _____
- [Don't know]..... 97
- [Refused]..... 98

E70 - Do you dry the [fuel] at all before using it?

- YES..... 1
- NO[SKIP TO E83] 2
- [Don't know][SKIP TO E83] 97
- [Refused].....[SKIP TO E83] 98

E71 - How much energy does it take to dry the [fuel]?

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

E72 – Our records indicate that your system is used for [HEAT/PROCESS]. Is this still correct? [This question is especially important for Muscoda Protean Products, since they applied for a system that would be processing whey]

- YES [SKIP TO E73] 1
- NO 2
- [DON'T KNOW]..... [SKIP TO E73] 97
- [REFUSED]..... [SKIP TO E73] 98
- E72a.USE _____

E73 –What space(s) are you heating with the biomass boiler/furnace?

-
- [Don't Know] 97
 - [Refused] 98

E74 – Since installing the [boiler/furnace], has your heating behavior changed?

- YES..... 1
- NO [SKIP TO E76] 2
- [Don't Know]..... 97
- [Refused]..... 98
- E74a. How (probe, warmer, more heated space, longer hours)?

E74b. Was this part of the orig. plan, or did it occur after the installation of the biomass system?

-
- Part of Org. Plan 1
 - Occurred post install..... [SKIP TO E76] 2
 - [Don't Know]..... 97
 - [Refused]..... 98

E76 - What duration did you use the heating unit last heating season?

- Whole heating season 1
- Partial season 2
- [Don't Know]..... 97
- [Refused]..... 98

E76a - Describe the season _____

E77- Did you supplement your heating/ process with other energy sources?

- YES.....1
- NO.....[SKIP TO E79] 2
- [Don't Know]..... 97
- [Refused]..... 98

E78 - What other energy source did you use [propane, electric, etc.] , and how much did you use [kWh, therms, ft3 per heating season]

Energy Source#1 (fuel type):_____

Energy used(quantity):_____

Period of time:_____

Energy Source#2:_____

Energy used:_____

Period of time:_____

E79 – Has there been any down time in the unit?

- YES.....1
- NO.....[SKIP TO E81] 2
- [Don't Know].....97
- [Refused].....98

E79a – When and for how long was the system down? _____

E80 - How did you heat during that time?

Propane.....1

Natural Gas.....2

Other (describe)._____

_____96

[Don't Know].....97

[Refused].....98

[Answer may be in therms or ft3 for gas/propane, or kWh for electric. If they are very knowledgeable, may be able to give you BTU]

E81 - How much fuel did you use last heating season or partial season? [If they give a volumetric unit such as ft³, cord of wood, bushel of corn cob try to get a weight or the fuel's density?]

FUEL USED (units) _____
 TIME PERIOD _____
 [Don't Know].....97
 [Refused].....98

E82 – Is it okay if our engineer contacts you with follow-up questions?

YES.....1
 NO.....2
 [Don't Know].....97
 [Refused].....98

BIOGAS QUESTIONS:

E83 – Did your generator begin working on the same date it was installed?

YES.....[SKIP TO E84] 1
 NO2
 [DON'T KNOW][SKIP TO E84] 97
 [REFUSED].....[SKIP TO E84] 98

E84a.[BEGINNING GENERATION DATE]_____

E84 - Have you made any changes to the system since installation?

YES..... 1
 NO[SKIP TO E86] 2
 [Don't know][SKIP TO E86] 97
 [Refused].....[SKIP TO E86] 98

E85 - What changes have you made?

E86 - Our records indicate that you have [number] cows providing waste for the system. Is this correct?

YES.....[SKIP TO E86] 1
 NO2
 [DON'T KNOW][SKIP TO E86] 97
 [REFUSED].....[SKIP TO E86] 98

E86a. [NUMBER OF COWS] _____

E86b. Has your herd changed since the system was installed?

- YES..... 1
- NO[SKIP TO E87] 2
- [DON'T KNOW][SKIP TO E87] 97
- [REFUSED].....[SKIP TO E87] 98

E86a. [NUMBER OF COWS (if reduction make value negative)] _____

E87 - Has there been any unscheduled downtime in the system?

- YES..... 1
- NO[SKIP TO E88] 2
- [Don't know][SKIP TO E88] 97
- [Refused].....[SKIP TO E88] 98

E87a How long was the system down unexpectedly? _____ (days/months)

E89 - Do you produce energy steadily over the course of a year, or are there seasonal effects on energy production?

- YEAR-ROUND[SKIP TO E90] 1
 - SEASONAL..... 2
 - Other (describe) 96
-
- [Don't know] 97
 - [Refused]..... 98

E89a – Describe the seasonal use of the system (possible reasons: seasonal effects of the herd, weather, regular maintenance).

E90 - How much will the digester/generator be “down” for maintenance on an annual basis?

NUMBER OF DAYS _____

E91 - Have you been monitoring your electricity production since the generator came online?

- YES..... 1
- NO 2
- [Don't know] 97
- [Refused]..... 98

E92 - How much electricity have you produced? What period of time does that cover?

ELECTRICITY PRODUCED _____
 PERIOD OF TIME _____

E93 - What is the maximum and average kW you have generated?

MAXIMUM kW _____
 AVERAGE kW _____

E94 - Are you using some/all of the gas produced by the digester system on site, or are you selling it off site?

- ONSITE..... 1
- SELL TO GRID [SKIP TO E96] 2
- [Don't know] 97
- [Refused]..... 98

E95 - What are you using it for on site?

 [Don't know] 97
 [Refused]..... 98

E95a - Do you have a record of how much you use on site (percentage or volumetric)?

ENERGY USED ONSITE _____
 [Don't know] 97
 [Refused]..... 98

E95b – What do you use for heat to keep the digester at an appropriate operating temperature)?

- Source of heat:
- Electricity _____ 1
 - Gas heat _____ 2
 - Waste Heat from generator (if there is a generator on site) _____ 3
 - No digester heating system _____ 4
 - [Don't know] 97
 - [Refused]..... 98

E96 – Would it be Okay if our Engineer called you with other questions regarding your system?

- YES..... 1
- NO 2
- [Don't know] 97
- [Refused]..... 98

Geothermal Systems

E97 – Our records indicate that you use your system for both heating and cooling. Is that correct?

- YES..... [SKIP TO E98] 1
- NO 2
- HEATING ONLY 3
- COOLING ONLY 4
- [Don't know] 97
- [Refused]..... 98

E98 – What is the manufacturer and model number of your heat pumps?

MANUFACTURER _____
 MODEL # _____

E99 – Our records indicate that your heating system has [x] units with a [y] ton capacity, and your cooling system has [a] units with a [b] ton capacity, is that correct?

- YES..... [SKIP TO E100] 1
- NO 2
- [DON'T KNOW] [SKIP TO E100] 97
- [REFUSED]..... [SKIP TO E100] 98

E99a. [HEATING SYSTEM #UNITS] _____

E99b. [HEATING SYSTEM CAPACITY] _____

E99c. [COOLING SYSTEM # UNITS] _____

E99d. [COOLING SYSTEM CAPACITY] _____

E100 – Have you modified the system at all since it was installed?

- YES..... 1
- NO [SKIP TO E102] 2
- [Don't know] [SKIP TO E102] 97
- [Refused]..... [SKIP TO E102] 98

E101 – What modifications have you made?

E102 - The original design indicated that the hydronic (forced hot water) radiant heating would be supplemented by a masonry stove. How is the radiant heating supplemented by the stove:

- Not at all (0%) 1
- Only when the geothermal system is not working (1-25%) 2
- Only when demand exceeds geothermal system capacity (25-75%) 3
- Almost always (75-95%)..... 4
- The masonry stove does most of the heating (100%)..... 5
- [Don't know] 97
- [Refused]..... 98

E103 - Do you supplement heating or cooling with a conventional electric or fossil fuel source?

- YES..... 1
- NO [SKIP TO E119] 2
- [Don't know] [SKIP TO E119] 97
- [Refused]..... [SKIP TO E119] 98

E104 – What sources?

Source _____

Energy used _____

Time period _____

E105 - Under what circumstances does that occur?

E106 - What is the square footage the area of your building that you heat and cool with the geothermal system?

Square footage _____

E107 - Do you happen to know [their architect or builder may have told them] what the average R-value or U-value is for your building? [Record value as wall:ceiling, e.g. 19:30]

Wall: Ceiling Value _____ : _____

[Don't know] 97

[Refused]..... 98

E108 – Which months do you use the system for heating and cooling, and how many days do you use the system for each?

Heating months (number of days) _____

Cooling months (number of days) _____

E109 - Do you know how much electricity/year or gal/ft³ it takes to operate the geothermal system (including heatpumps, airhandlers, and ventilation)?

Energy to operate _____
Time period _____
[Don't know] 97
[Refused]..... 98

E110 – Is it okay if our engineer contacts you with additional questions?

YES..... 1
NO 2
[Don't know] 97
[Refused]..... 98

APPENDIX C: SUPPLIER SURVEY

Focus on Renewable Supplier Survey

Interviewer Name: _____

Supplier (Company) Name: _____

Contact Name: _____

Contact Phone Number: _____

Contact Log:

Call #	Date	Time	Disposition (i.e.: Complete, Left Message)
1			
2			
3			
4			
5			
6			

Customer-Project Info:

COMBID	Customer (Company) Name	Type of Project

If Project Impact Statement was provided, please review prior to contacting supplier.

Hi, my name is _____ and I'm calling from KEMA Inc. on behalf of the Public Service Commission of Wisconsin for the Focus on Energy Program. I'd like to ask you a few questions about your company's involvement with the Focus on Energy Program. According to program records Focus on Energy has helped your company supply renewable energy systems to homeowners in Wisconsin. This is not a marketing call. Focus on Energy is required by state law to conduct this type of research. Your responses will be kept confidential. The survey should take about 10 minutes.

[SET UP CALL BACK IF CURRENTLY UNAVAILABLE

Note to interviewer: Only read lists when instructed to do so. Never read "Don't Know" and "Refused." If applicable, review the Energy Advisor Survey for each project prior to administering this survey.]

1. Interaction with Focus on Energy

S1. What type of services do you offer your <measure kind> customers?

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

S2. How has your company been involved with Focus on Energy? [Contacts were provided by Focus; however if respondent is unaware of Focus or their company's involvement with Focus then ask to speak with someone familiar with Focus and their company's involvement with Focus.]

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

S3. How long has your company been involved with Focus on Energy?

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

S4. Next I'm going to read a list and ask about what ways your company has been involved with Focus. Has your company...[READ LIST. ACCEPT MULTIPLE RESPONSES. If the paperwork shows that an incentive was given for a project under discussion, don't read the first option – just circle "1".]

Sold products or services where customers got Focus rebates or incentives?	1
Received customer leads from Focus?.....	2
Used Focus marketing materials?	3
Received technical assistance or training from Focus?	4
Been introduced to new technologies by Focus?.....	5
Received any other assistance from Focus? [RECORD].....	6
<hr/>	
Don't know	-97
Refused.....	-98

S8. Thinking ONLY of Focus on Energy customer rebates and financial incentives and disregarding other services they provide, on a scale of one to five where one is "not at all helpful," and five is "very helpful," how helpful have the incentives been at convincing customers to purchase energy efficient products and services.

Not at all helpful	1
2.....	2
3.....	3
4.....	4
Very helpful	5
Don't know	-97
Refused.....	-98

The next few questions are regarding the NON-financial services that Focus on Energy offers, such as engineering and product expertise, product recommendations, energy calculation tools, marketing materials, etc... In other words, we're talking about services OTHER than rebates or incentives.

[If this question seems awkward given circumstances, feel free to reword.]

S5a. How much has the Focus on Energy program added to or improved the information you provide to your customers about energy-efficient products and services? Would you say that Focus has provided...[READ LIST. ACCEPT ONE RESPONSE]

- No new information?[SKIP TO S6] 1
- Little new information?[SKIP TO S6] 2
- Some new information?.....3
- Much new information? 4
- Don't know [SKIP TO S6] -97
- Refused..... [SKIP TO S6] -98

S5b. Briefly describe what type of information you have received from Focus?

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

S6. Excluding financial incentives, how helpful has Focus on Energy been in helping you to convince customers to purchase renewable energy products and services, on a scale of one to five, where one is "not at all helpful" and five is "very helpful"?

- Not at all helpful 1
- 2.....2
- 3.....3
- 4.....4
- Very helpful5
- Don't know-97
- Refused.....-98

S7. How important has Focus on Energy been in helping to endorse or legitimize the renewable energy products and services you sell? Use a scale of one to five, where 5 indicates “very important” and 1 indicates “not important at all”?

Not important at all	1
2.....	2
3.....	3
4.....	4
Very important.....	5
Don't know	-97
Refused.....	-98

2. Without Focus on Energy

The next few questions are about what your business would have been like if Focus on Energy had never been formed back in 2001, and had never offered financial incentives, advice, marketing campaigns, or any other services in Wisconsin.

W1a. If the Focus on Energy program had never existed, would the services (products) you provide customers be different than they are today?

Yes.....	1
No	[SKIP TO P1] 2
Don't know	[SKIP TO W2a] -97
Refused [SKIP TO W2a]	-98

W1b. How would the services you provide be different?

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

W2a. If the Focus program had never existed, would your company's sales volume of energy efficient products and services be different than it is today?

Yes.....	1
No	[SKIP TO W3] 2
Don't know	[SKIP TO W3] -97
Refused.....	[SKIP TO W3] -98

W2b. How different would it be?

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

On a scale of one to five, where one means “strongly disagree” and five means “strongly agree,” how strongly do you agree with each of the following statements?

W3. Without the existence of the Focus program, the renewable energy related products and services I provide customers would be about the same.

Strongly disagree.....	1
2.....	2
3.....	3
4.....	4
Strongly agree.....	5
Don't know.....	-97
Refused.....	-98

W4. Without the existence of the Focus program, certain renewable energy projects my customers do would not be economically feasible.

Strongly disagree.....	1
2.....	2
3.....	3
4.....	4
Strongly agree.....	5
Don't know.....	-97
Refused.....	-98

W5. The Focus program helps legitimize renewable energy products and services.

Strongly disagree.....	1
2.....	2
3.....	3
4.....	4
Strongly agree.....	5
Don't know.....	-97
Refused.....	-98

Project Specific Questions

Now I'm going to ask you a few questions about one of your customers that received help from the Focus on Energy Program sometime between July 1, 2007 and March 31, 2008.

[Mention name of customer and project information that will help the supplier remember the project. If the supplier does NOT remember this customer/project, ask if someone else might remember. If no-one remembers, then read the following statement, skip to question P3, and use the questions in italics instead.]

Ok, then I'll ask you some general questions about your <measure kind> business between July 1, 2007 and March 31, 2008.

[If more than one customer/project then indicate when responses are different.]

P1. Prior to this project had your company worked with this customer?

- Yes..... 1
- No[SKIP TO P3] 2
- Don't know [SKIP TO P3] -97
- Refused..... [SKIP TO P3] -98

P2. Prior to this project had your company sold renewable energy products or services to this customer?

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

[Focus Lead] - Put in Focus Lead name(s) from IS or other paperwork]

P3. Was this customer referred to your company by a Focus Energy Advisor? (*Were <measure kind> customers referred to your company by Focus on Energy Advisors?*)

- Yes..... 1
- No2
- Don't know-97
- Refused.....-98

P4. If your company had NOT been involved with Focus, how likely is it that you would have recommended the same products and/or services to the customer. (*If your company had NOT been involved with Focus, how likely was it that you would have recommended the same energy efficient products and services to your <measure kind> customers?*) [READ LIST]

- Very likely..... 1
- Somewhat likely2
- Not very likely.....3
- Very unlikely.....4
- Don't know-97
- Refused.....-98

P5. If your company had NOT been involved with Focus, how likely do you think the customer would have been to proceed with the project? *(If your company had NOT been involved with Focus, how likely was it that most of your customers <measure kind> customers would have proceeded with their projects?)*

- Very likely..... 1
- Somewhat likely 2
- Not very likely..... 3
- Very unlikely.....[SKIP TO P12] 4
- Don't know[SKIP TO P12] -97
- Refused.....[SKIP TO P12] -98

P6. Without the existence of Focus, how would the timing of the project have been affected? Would you say that the project would most likely have been undertaken... *(Without the existence of Focus, how would the timing of most <measure kind> projects have been affected? Would you say they would have been undertaken...)* [READ LIST]

- Same time[SKIP TO P8] 1
- Earlier.....[SKIP TO P8] 2
- Later..... 3
- Don't know..... [SKIP TO P8] -97
- Refused..... [SKIP TO P8] -98

P7. How many months later?

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

[For projects where energy efficiency does not apply, skip to question P10. The test to determine if efficiency applies is to ask yourself if there is a standard efficiency level. Items such as VFDs, heat recovery, lighting controls, steam traps, etc... do not have a standard efficiency.]

P8. Without the existence of Focus, how do you believe the level of renewable energy capacity achieved by the project would have been affected? Would the equipment efficiency have been... *(Without the existence of Focus, how would the capacity of most of your <measure kind> projects have been affected? Would the equipment efficiency have been...)* [READ LIST]

- Same.....[SKIP TO P10] 1
- Lesser 2
- Greater.....[SKIP TO P10] 3
- Don't know.....[SKIP TO P10] -97
- Refused.....[SKIP TO P10] -98

P9. Without the existence of Focus, would you say that the capacity installed would most likely have been... *(Without the existence of Focus, would the <measure kind> capacity installed by most customers have been...)*[READ LIST]

- Same amount[SKIP TO P12] 1
- Less.....2
- More3
- Wouldn't have installed any. [SKIP TO P12] -4
- Don't know.....[SKIP TO P12] -97
- Refused.....[SKIP TO P12] -98

P11. What percent of the capacity installed would have been installed?

_____ [RECORD PERCENT.]

IF P10=2 THEN P11 SHOULD BE BETWEEN 0 AND 99.

IF P10=3 THEN P11 SHOULD BE GREATER THAN 100.]

- Don't know-97
- Refused-98

P12. [CONFIRMATION QUESTION]

Could you describe in your own words what influence the program had on your decision to offer your customers these specific products or services at the time you did? *(Could you describe in your own words what influence the program had on your decision to offer customers these specific products or services at the time we're discussing?)*

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

Those are all the questions I have for you today. Thank you for your time and cooperation.

APPENDIX D: ATTRIBUTION ANALYSIS METHODOLOGY

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

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. This correction is applied only for measures installed by participants that were part of the engineering sample.
- **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.

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

D.1 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 Figures D-1 and D-2.

Figure D-1. Gross Savings Adjustment Factor Calculation

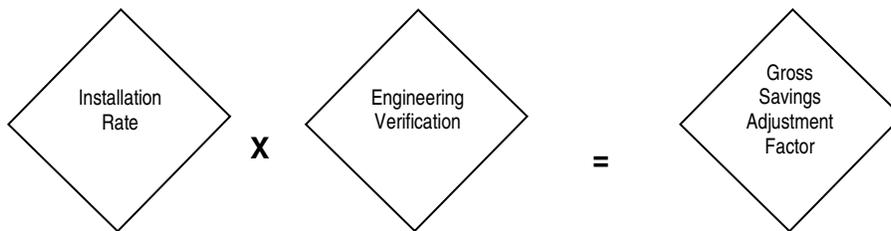
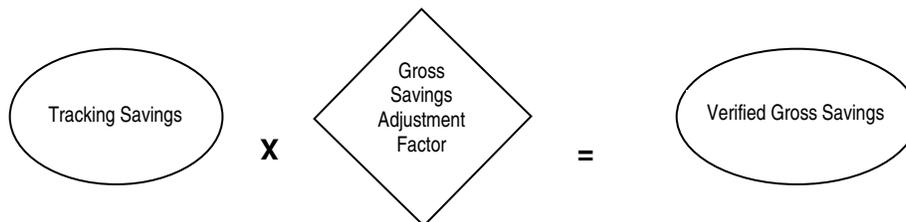
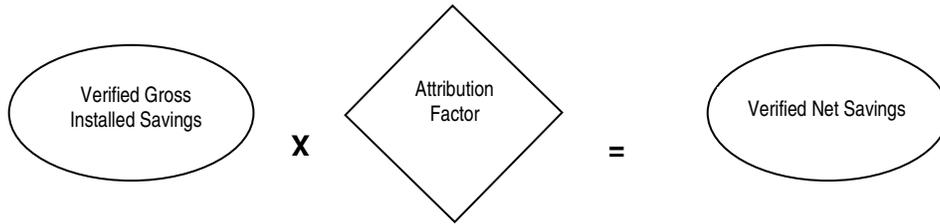


Figure D-2. Gross Savings Adjustment Factor Calculation



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

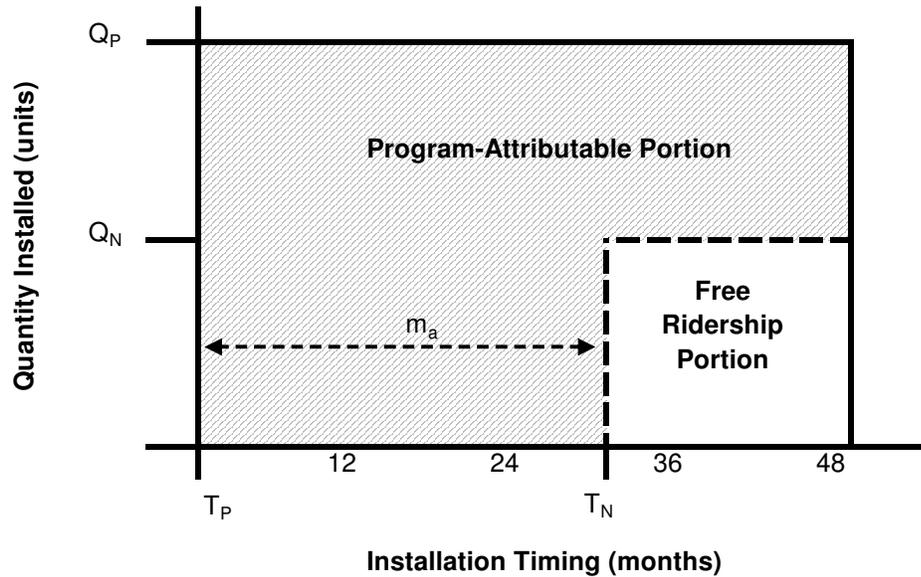
Figure D-3. Verified Net Savings Calculation



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 D-4. Subscript **P** refers to “program-influenced” and **N** refers to “naturally occurring” (i.e. without program influence).

Figure D-4 – Attribution Illustration



In Figure D-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:

$$A_Q = (Q_P - Q_N) / Q_P$$

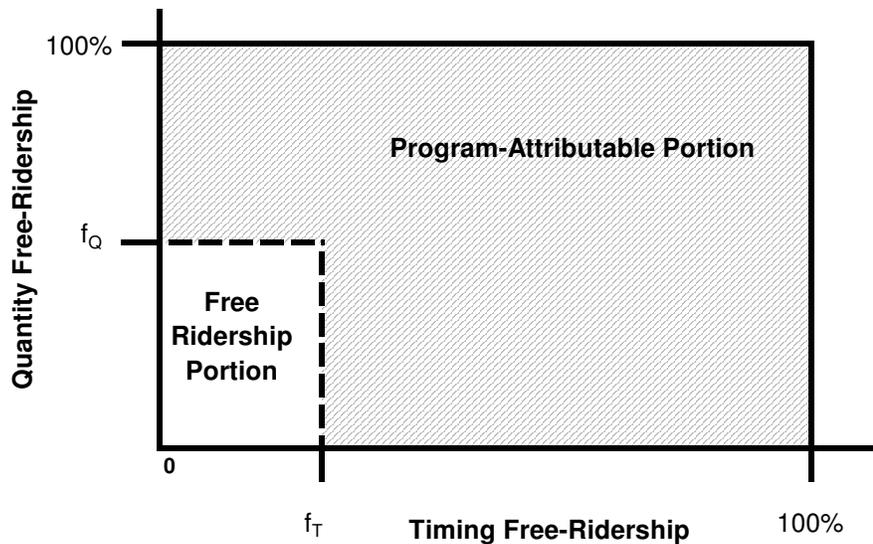
The overall attribution factor is

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

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 D-5 shows the attribution equation in graphical format.

Figure D-5. Graphical Derivation of the Attribution Equation



The net savings can be calculated

$$\text{First-year net savings} = \text{VGI Savings} * A$$

D.2 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.

D.2.1 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.

D.2.2 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.

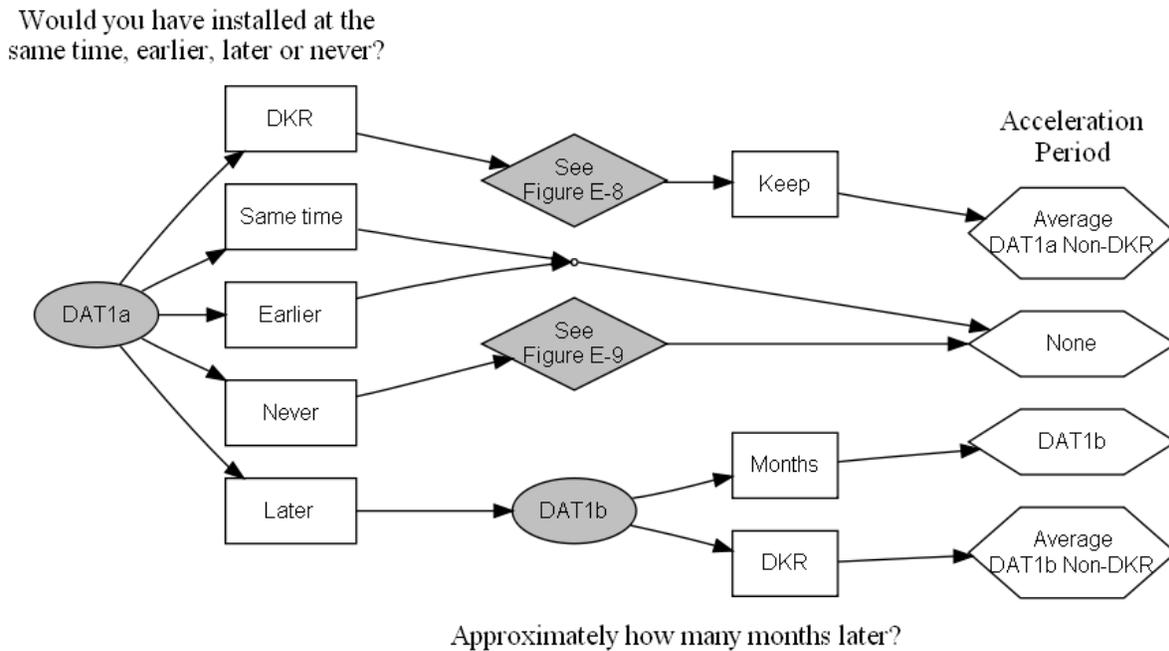
DAT1a: “Without Focus incentives and other Focus assistance, how different would the timing have been? Would you say you would have installed (TYPE OF PROJECT) at the same time, earlier, later, or never?”

DAT1b: “Approximately how many months later?” (DAT1b is only asked if DAT1a is “Later.”)

b. DETERMINATION OF THE ACCELERATION PERIOD

Figure D-6 shows a decision tree for DAT1a and DAT1b. In the decision tree, “DKR” refers to “Don’t Know” and “Refused.”

Figure D-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.

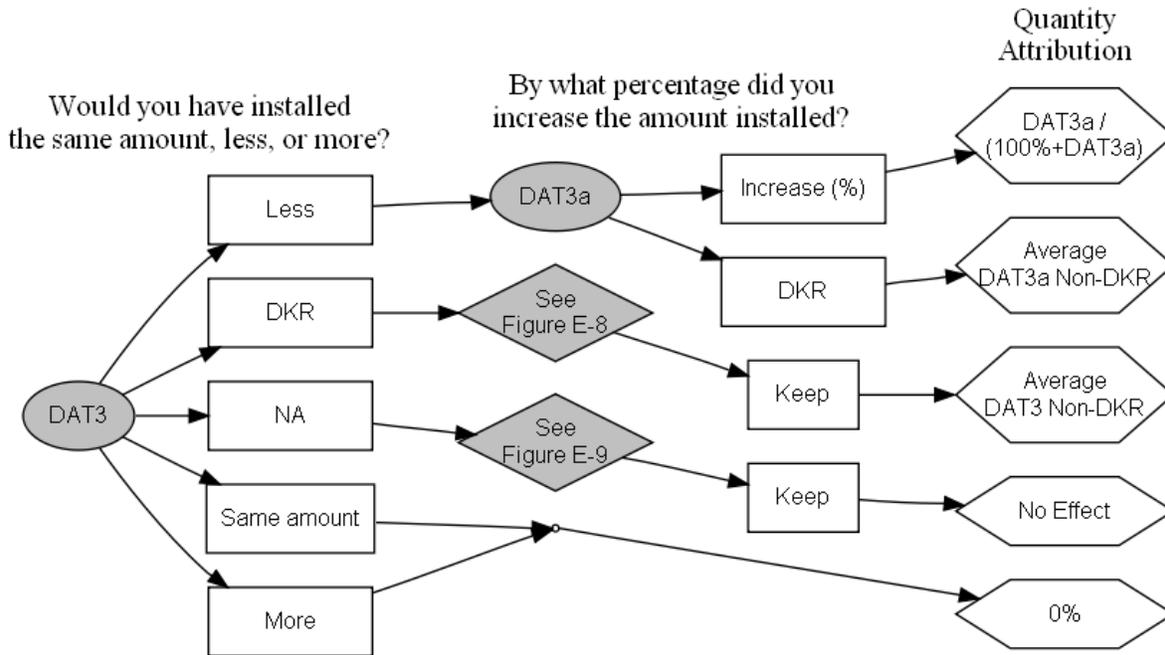
The questions below are from the round 1 survey.

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 D-7 shows a decision tree for DAT3 and DAT3a.

Figure D-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.

D.2.3 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

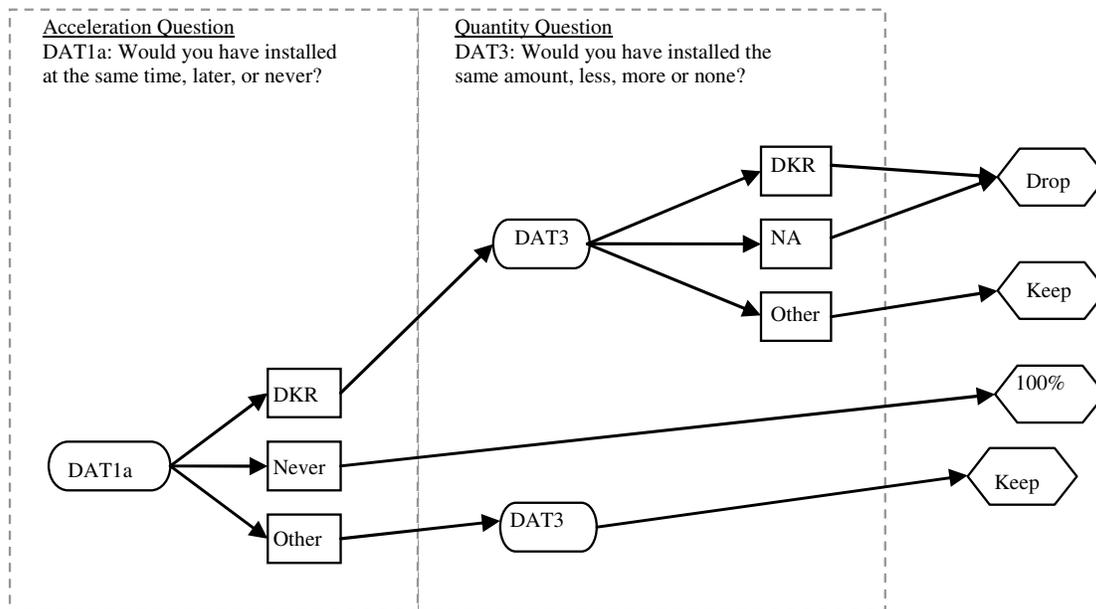
analysis. However, the respondent information will still be included as part of the installation rate, engineering verification, and gross savings adjustment factors.

D.2.4 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 D-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-6 and Figure D-7.

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



D.3 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.

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.

APPENDIX E: SAMPLING AND DATA COLLECTION METHODOLOGY

In this appendix we briefly describe the population of participants and then the sampling and weightin approached used for the impact analysis.

The Renewable Energy program is characterized by a large number of small projects (as measured in energy savings or off set) and a few very large projects that represent a substantial amount of energy savings (or off set).

Solar projects (both electric and hot water) constitute over 90 percent of the completed projects during the 18 MCP (see Tables E-1), but account for 13 and 2 percent of electric and therm savings, respectively. Biogas and biomass projects represent 5 percent of the projects completed but represent 86 and 97 percent of the electric and thermal energy savings, respectively.

We designed a stratified random sample to represent a substantial amount of the energy savings from the program, while ensuring that all technologies were represented. Projects were assigned to strata based on the their system type, customer type (residential or non-residential), and in the case of solar electric and wind projects, by their generation capacity (greater than 10kW or less than). 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.

Table E-1. Projects by Technology and Customer Type

Technology	Project Counts			Percent of Total Projects		
	Residential	Non-Residential	Total	Residential	Non-Residential	Total
Biogas	0	6	6	0%	1%	1%
Biomass	0	18	18	0%	4%	4%
Solar PV	133	78	211	30%	17%	47%
Solar Hot Water	160	38	198	36%	8%	44%
Wind	13	4	17	3%	1%	4%
Overall Renewable Program	306	144	450	68%	32%	100%

Table E-2. Tracked Gross Savings by Technology and Customer Type

Technology	Savings (Off set)			Percent of Total Population Savings (Off set)		
	kWh	Peak kW	Therm	kWh	Peak kW	Therm
Biogas	10,159,791	1,180	138,637	86.0%	67.7%	5.8%
Biomass	-329,413	-66	2,213,364	-2.8%	-3.8%	91.9%
Solar PV	1,459,833	570	0	12.4%	32.7%	0.0%
<i>Solar PV - Residential</i>	<i>681,074</i>	<i>263</i>	<i>0</i>	<i>5.8%</i>	<i>15.1%</i>	<i>0.0%</i>
<i>Solar PV - Non-residential</i>	<i>778,759</i>	<i>307</i>	<i>0</i>	<i>6.6%</i>	<i>17.6%</i>	<i>0.0%</i>
Solar Hot Water	121,079	15	57,123	1.0%	0.8%	2.4%
<i>Solar Hot Water - Residential</i>	<i>140,187</i>	<i>28</i>	<i>8,371</i>	<i>1.2%</i>	<i>1.6%</i>	<i>0.3%</i>
<i>Solar Hot Water - Non-residential</i>	<i>-19,107</i>	<i>-13</i>	<i>48,752</i>	<i>-0.2%</i>	<i>-0.8%</i>	<i>2.0%</i>
Wind	406,158	44	0	3.4%	2.5%	0.0%
<i>Wind - Residential</i>	<i>278,909</i>	<i>27</i>	<i>0</i>	<i>2.4%</i>	<i>1.6%</i>	<i>0.0%</i>
<i>Wind - Non-residential</i>	<i>127,249</i>	<i>17</i>	<i>0</i>	<i>1.1%</i>	<i>1.0%</i>	<i>0.0%</i>
Overall Renewable Program	11,817,448	1,743	2,409,124	100%	100%	100%

KEMA completed interviews representing 65 completed projects (see Table E-3). This include all biogas projects, one-half of biomass projects, ten percent of solar electric, nine percent of solar hot water and 47 percent of wind. The surveyed projects completed projects representing 87, 70 92 percent percent of overall kWh, peak kW and therm savings, respectively (see Table E-4).

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

Technology	Project Counts			Percent of Total Projects		
	Residential	Non-Residential	Total	Residential	Non-Residential	Total
Biogas	0	6	6	0%	1%	1%
Biomass	0	9	9	0%	2%	2%
Solar PV	11	12	23	2%	3%	5%
Solar Hot Water	11	8	19	2%	2%	4%
Wind	5	3	8	1%	1%	2%
Overall Renewable Program	27	38	65	6%	8%	14%

Table E-4. Completed Surveys Savings by Technology and Customer Type

Technology	Savings (Off set)			Percent of Total Population Savings (Off set)		
	kWh	Peak kW	Therm	kWh	Peak kW	Therm
Biogas	10,159,791	1,180	138,637	86.0%	67.7%	5.8%
Biomass	-329,413	-66	2,079,520	-2.8%	-3.8%	86.3%
Solar PV	195,897	76	0	1.7%	4.3%	0.0%
<i>Solar PV - Residential</i>	<i>74,670</i>	<i>28</i>	<i>0</i>	<i>0.6%</i>	<i>1.6%</i>	<i>0.0%</i>
<i>Solar PV - Non-residential</i>	<i>121,227</i>	<i>48</i>	<i>0</i>	<i>1.0%</i>	<i>2.7%</i>	<i>0.0%</i>
Solar Hot Water	4,787	-1	7,874	0.0%	0.0%	0.3%
<i>Solar Hot Water - Residential</i>	<i>10,315</i>	<i>2</i>	<i>773</i>	<i>0.1%</i>	<i>0.1%</i>	<i>0.0%</i>
<i>Solar Hot Water - Non-residential</i>	<i>-5,528</i>	<i>-3</i>	<i>7,101</i>	<i>0.0%</i>	<i>-0.2%</i>	<i>0.3%</i>
Wind	228,611	25	0	1.9%	1.5%	0.0%
<i>Wind - Residential</i>	<i>106,327</i>	<i>9</i>	<i>0</i>	<i>0.9%</i>	<i>0.5%</i>	<i>0.0%</i>
<i>Wind - Non-residential</i>	<i>122,284</i>	<i>17</i>	<i>0</i>	<i>1.0%</i>	<i>0.9%</i>	<i>0.0%</i>
Overall Renewable Program	10,259,673	1,215	2,226,031	86.8%	69.7%	92.4%

Case weights are calculated for each completed project in the sample frame based on the ratio of the strata population to the number of completed surveys (projects) in the strata. For example, the program completed 38 non-residential solar hot water projects in the 18 MCP. We completed surveys with eight of these projects. The case weight for these projects is equal to $38 / 8 = 4.75$. The case weight is used in Appendix A, Section 2 to estimate program percentages for direct survey responses. Weights are discussed further in the following section on ratio estimation.

RATIO ESTIMATION

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 (off sets) 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 sample¹⁵. 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.

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:

$$G_{Tj} = \text{tracking estimate of gross savings for project } j$$

¹⁵ The results of the *Participant Spillover Savings Study* (December 22, 2005) are added to the ratios prior to application to the population. Untracked attributable savings resulting from the Impact Evaluation of the Education and Training Program are then added to the population net savings. Unlike the added spillover savings, the untracked attributable savings resulting from the Impact Evaluation of the Education and Training Program are not included in the adjustment factors.

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)

Installation rate

The installation rate R_I is calculated from the sample as

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

Engineering verification factor

The engineering verification factor R_V is calculated from the sample as

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

Attribution factor

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

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

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.

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:

$$R_G = R_I R_V = \left[\frac{\sum_{j \in I} G_{Ij} W_j}{\sum_{j \in T} G_{Tj} W_j} \right] \left[\frac{\sum_{j \in V} G_{Vj} W_j}{\sum_{j \in I} G_{Ij} W_j} \right]$$

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

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

(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.