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**Subject** Focus on Energy Evaluation

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**ABBREVIATED FY07 BUSINESS PROGRAMS IMPACT  
EVALUATION**

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**To** Oscar Bloch,  
Public Service Commission of Wisconsin

cc Rick Morgan, MMP  
Kathy Kuntz, WECC  
David Sumi, PA Consulting Group  
Ralph Prah, Prah & Associates

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**From** Mimi Goldberg, Ryan Barry, Tammy Kuiken, Paula Ham-Su, and  
Ben Jones, KEMA

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This memo provides impact evaluation results for Focus Business Program (BP) measures implemented during FY07 (July 1, 2006, through June 30, 2007).

This memo is organized in the following sections.

1. Executive Summary
2. General Approach
3. Abbreviated Approach Methodology Discussion
4. Results
5. Adjustment Factor Components
6. Engineering Verification Findings



## Executive Summary

The impact analysis determines three adjustment factors to the savings reported by the program:

- Gross savings adjustment factor: This factor adjusts tracking gross savings for installation and changes based on engineering review. Applying the gross savings adjustment factor to tracking 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.)

The definitions of these factors and the general methods for producing them for this round were essentially the same as in the previous rounds of impact evaluation for this program area. However, a modified sampling and analysis strategy was employed to provide updated adjustment factors at modest cost. We refer to this process as the Abbreviated Impact Analysis.

The Abbreviated Impact Analysis combines data collected from a sample of small and moderate size projects from the previous period (FY06 in this case) with data collected from a small number of large update-period (FY07) projects to provide an estimate for the update-period (FY07) program. The rationale for this approach is that the fundamental program operations were not substantially different between FY06 and FY07. As a result, empirical results from FY06 projects are generally likely to be indicative of FY07 performance also. However, idiosyncratic results for very large projects can swing the overall results for any particular period. We therefore relied on the results for “modest” size projects from FY06 to project effects for corresponding projects from FY07, but directly examined the very large projects for FY07 itself.

### Key Results

Overall the Business Programs’ achieved kWh, kW, and therm realization rates of 61 percent, 66 percent, and 39 percent, respectively. The realization rate is the ratio of achieved attributable savings to gross reported savings.

- FY07 net verified energy savings amounted to 87,556,516 kWh/year, 18,878 kW/year, and 6,797,303 therms/year for Focus; and 7,401,886 kWh/year, 1,852 kW/year, and 22,246 therms/year for Wisconsin Public Service. These are the energy savings that would not have occurred in the absence of the programs.
- The FY07 attribution rates are consistent with the rates achieved for FY06. The FY07 attribution factors for the program overall are 65 percent, 69 percent, and 58 percent for kWh, kW, and therms, respectively.
- FY07 gross savings adjustment factors for kWh, kW, and therms are 93 percent, 96 percent, and 67 percent, respectively. The gross savings adjustment factor adjusts gross reported savings for installation rates, tracking system data entry errors, and errors in gross savings calculations including corrections to input assumptions.

The tables below provide the new adjustment factors together with indicators of statistical precision, the 90% confidence interval, and sample sizes. The relative error (%) indicated for each confidence interval is the relative difference between the estimated percentage and the upper or lower confidence bound, not the absolute difference. The ± amount indicated for each confidence interval is the absolute difference in the estimated percentage. For example, the Commercial kWh attribution estimate in Table 2 is 72.2 percent, the 90% confidence interval is ± 9.7 percentage points (i.e., 72.2% ± 9.7% or 62.5% to 81.9%) and the relative precision (at 90 percent confidence) is 13.4 percent (9.7%/72.2%).<sup>1</sup>

Table 1 shows the FY07 gross savings adjustment factors by sector. The gross savings adjustment factors combine the installation rates and the engineering verification factors to adjust the tracking estimate of gross savings.

**Table 1. FY07 Gross Savings Adjustment Factors by Sector**

Segment	kWh						kW						Therms								
	min	n	Gross Savings Adjustment Factor	90% Confidence Interval			min	n	Gross Savings Adjustment Factor	90% Confidence Interval			min	n	Gross Savings Adjustment Factor	90% Confidence Interval					
				Relative Error (%)	+/-	Lower Bound				Upper Bound	Relative Error (%)	+/-				Lower Bound	Upper Bound	Relative Error (%)	+/-	Lower Bound	Upper Bound
Agriculture	61		83%	20.1%	16.8%	66.5%	100.1%	59		82%	14.9%	12.2%	69.8%	94.2%	7		79%	24.3%	19.1%	59.5%	97.7%
Commercial	81		99%	3.0%	3.0%	96.1%	102.2%	77		100%	3.7%	3.7%	96.0%	103.4%	10		85%	17.7%	15.1%	70.3%	100.5%
Industrial	27		99%	1.7%	1.6%	97.2%	100.5%	24		99%	1.8%	1.8%	96.7%	100.3%	23		99%	2.0%	2.0%	97.4%	101.4%
Institutional	17		93%	6.1%	5.7%	87.4%	98.8%	14		98%	5.3%	5.2%	92.6%	103.0%	20		53%	55.2%	29.3%	23.8%	82.3%
Business Programs Overall	186		93%	4.4%	4.1%	89.1%	97.3%	174		96%	4.0%	3.9%	92.0%	99.8%	60		67%	30.5%	20.5%	46.7%	87.7%

The FY07 attribution factors by sector are provided in Table 2. The FY07 attribution factors for the program overall are 65 percent, 69 percent, and 58 percent for kWh, kW, and therms, respectively. These results are consistent with the FY06 results.

**Table 2. FY07 Attribution Factors by Sector**

Segment	kWh						kW						Therms					
	n	Attribution Adjustment Factor	90% Confidence Interval			n	Attribution Adjustment Factor	90% Confidence Interval			n	Attribution Adjustment Factor	90% Confidence Interval					
			Relative Error (%)	+/-	Lower Bound			Upper Bound	Relative Error (%)	+/-			Lower Bound	Upper Bound	Relative Error (%)	+/-	Lower Bound	Upper Bound
Agriculture	113	61%	14.5%	8.8%	51.9%	69.5%	104	55%	16.3%	9.0%	46.1%	64.1%	26	46%	23.9%	10.9%	34.7%	56.6%
Commercial	129	72%	13.4%	9.7%	62.5%	81.9%	109	77%	12.4%	9.5%	67.1%	86.0%	57	44%	29.2%	12.9%	31.4%	57.3%
Industrial	59	58%	25.4%	14.6%	42.9%	72.1%	53	54%	27.1%	14.7%	39.4%	68.7%	33	63%	24.7%	15.6%	47.5%	78.6%
Institutional	39	72%	32.7%	23.4%	48.2%	95.0%	29	85%	20.4%	17.2%	67.3%	101.8%	55	55%	42.4%	23.5%	32.0%	79.0%
Business Programs Overall	340	65%	13.5%	8.8%	56.6%	74.3%	295	69%	14.3%	9.8%	58.8%	78.4%	171	58%	20.7%	11.9%	45.6%	69.4%

<sup>1</sup> The critical value for calculating the confidence interval ± for each adjustment factor is determined using Student's t distribution and n-1 for the degrees of freedom, where n is the sample size. The critical value for the Gross Savings Adjustment Factor and the Realization Rate is determined using the degrees of freedom based on the minimum sample size for the components of the adjustment factor. These two adjustment factors are products of other adjustment factors.

Table 3 shows the FY07 realization rates by sector. The realization rates combine the effect of the gross savings adjustment factors and the attribution factors.

**Table 3. FY07 Realization Rates by Sector**

Segment	kWh						kW						Therms					
	min	Realization Rate	90% Confidence Interval				min	Realization Rate	90% Confidence Interval				min	Realization Rate	90% Confidence Interval			
			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound
Agriculture	61	51%	24.9%	12.6%	38.0%	63.1%	59	45%	22.1%	10.0%	35.2%	55.2%	7	36%	36.0%	12.9%	23.0%	48.9%
Commercial	81	72%	13.8%	9.9%	61.7%	81.5%	77	76%	12.9%	9.9%	66.5%	86.3%	10	38%	36.2%	13.7%	24.2%	51.7%
Industrial	27	57%	26.0%	14.8%	42.1%	71.6%	24	53%	27.8%	14.8%	38.4%	68.0%	23	63%	25.1%	15.7%	46.9%	78.4%
Institutional	17	67%	34.3%	22.9%	43.8%	89.5%	14	83%	21.8%	18.0%	64.6%	100.7%	20	29%	70.4%	20.7%	8.7%	50.1%
Business Programs																		
Overall	186	61%	14.2%	8.7%	52.3%	69.7%	174	66%	14.9%	9.8%	56.0%	75.6%	60	39%	37.0%	14.3%	24.4%	52.9%

Table 4 shows a summary of the adjustment factors at the portfolio level for FY06 and FY07. The differences between the FY07 and FY06 adjustment factors were not tested for statistical significance. The abbreviated approach is based on the assumption that the net-to-gross components of the Non Top-Five results for FY07 and FY06 are essentially the same. Furthermore these samples are not independent; that is, the FY07 Non Top-Five results are calculated using the FY06 Non Top-Five sample completes with sample weights based on the FY07 population.

Changes in the final FY07 results are largely driven by changes in the Top-Five results across years. Starting on page 12, the section titled, *FY07 Versus FY06 Adjustment Factor Comparison Results*, provides a statistical comparison of FY07 and FY06 Top-Five results. These results are shown at the portfolio level and not at the sector level due to small sample sizes for the Top-Five.

**Table 4. FY06 and FY07 Portfolio Level Adjustment Factors**

Adjustment Factors	FY06			FY07		
	kWh	kW	Therms	kWh	kW	Therms
Gross Savings Adjustment Factor	99%	98%	98%	93%	96%	67%
Attribution Factor	71%	70%	53%	65%	69%	58%
Realization Rate	70%	68%	52%	61%	66%	39%

### Summary of Methods

The adjustment factors shown in Tables 1 through 3 above are based on data collection and analysis of a sample of implemented projects. The data collection includes engineering interviews and decision-maker surveys with participating customers, and some onsite observations and monitoring for large projects. Site-specific analysis includes engineering review and if necessary modification of gross savings estimates, and determination of program attribution. Statistical analysis combines the individual results from the sample to generate program-level adjustment factors.

Between September and November 2007, KEMA collected data for a small sample of the largest projects completed in FY07. The five participants in each of the four sectors with the

greatest FY07 savings<sup>2</sup> in that sector were solicited to participate in the sample. Thirteen of the twenty candidates agreed to do so.

The adjustment factors shown in the tables above are based on this new data collection together with data from the previous sample of FY06 implementation. The largest projects from the FY06 sample were excluded from this analysis. This approach assumes that the net-to-gross components for all projects except for the largest are essentially the same in FY06 and FY07.

## **General Approach**

The broad approach of the impact evaluation fieldwork was similar to that used in the past. For the majority of the work we used approaches, protocols, and instruments developed in the evaluation work conducted so far. However changes in the program have resulted in some modification to the impact evaluation methodology. This section discusses these changes, after providing general descriptions of the adjustment factors used in this analysis.

The evaluation team has implemented nine rounds of data collection and a document review to estimate net energy savings for Business Programs. Each evaluation has included a telephone survey of Wisconsin Focus on Energy (Focus) Business Programs participants who installed measures in the appropriate time frame. Table 5 shows the fiscal year and the implementation time period for measures included in each round. Some fiscal years have included multiple rounds of data collection. The most recent round included measures installed between July 1, 2006, and June 30, 2007.

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<sup>2</sup> Participant savings magnitude for sampling purposes is measured as total avoided costs, based on program tracked energy savings. Total avoided cost is calculated as the sum of avoided cost for all projects completed by the participant in FY07.

**Table 5. Nine Rounds of Impact Evaluation Data Collection**

<b>Impact Evaluation Round</b>	<b>Fiscal Year of Implementation</b>	<b>Implementation Time Period<sup>a</sup></b>
1	2001-2002	April 2001 - December 2001
2	2002	January 2002 - March 2002
3	2002	April 2002 - June 2002
4	2003	July 2002 - December 2002
5	2003	January 2003 - June 2003
6	2004	July 2003 - December 2003
7	2005	July 2004 - December 2004
8	2006	July 2005 - June 2006
9	2007	July 2006 - June 2007

<sup>a</sup>Partners included in the sample frame for each round are those with implementation completed in the indicated time period

The survey addresses measure installation and characteristics (e.g., quantities, equipment efficiencies, and operating hours), program attribution, and program process issues, among other topics. Each evaluation has also included an engineering review of program documentation on how the tracking gross savings were calculated, where the tracking gross savings are the gross savings reported in the program tracking databases. Finally, on-site measurement at some participant sites to verify measure information and provide actual measured or metered data may be utilized to support gross energy savings estimates. The results of the survey, engineering review, and on-site data are combined to create several adjustment factors described below.

### ***Adjustment Factors Defined***

The adjustment factors estimated from the data collection and analysis are as follows:

- **Installation rate:** This factor adjusts the tracking estimate of gross savings for noninstallation, but does not correct for any other errors in the tracking estimate. It is the estimated fraction of tracking gross savings corresponding to measures actually installed. (For calculation of the installation rate, a measure is identified as either installed or not. Adjustments to the number of units installed for a particular measure are included in the engineering verification factor, not in the installation rate.)
- **Engineering verification factor:** This factor adjusts the tracking estimate of gross savings, after the application of the installation rate, to create verified gross savings. It is the estimated ratio of verified gross savings to tracking gross savings corresponding to measures actually installed. Verified gross savings used to estimate this ratio are based on the results of an engineering review, which includes a review of how tracking gross savings were calculated and interviews with participants. For a given measure, verified gross savings may be higher or lower than the tracking estimate of gross savings for a variety of reasons, including the wrong data were entered in the program tracking database; survey responses indicating differences in the quantities installed, equipment efficiencies, and/or operating hours; and mistakes in the calculation of the tracking estimate. (The engineering verification factor includes any correction to the numbers of units installed for a particular measure.)

- Gross savings adjustment factor: As shown in Figure 1 this factor combines the installation rate and the engineering verification factor. (It is the ratio of verified gross savings to tracking gross savings.)

**Figure 1. Gross Savings Adjustment Factor Calculation**



- Attribution factor: This factor adjusts verified gross savings for program attribution. It is the estimated proportion of verified gross savings attributable to the Focus Business Programs or the ratio of net savings to verified gross savings.

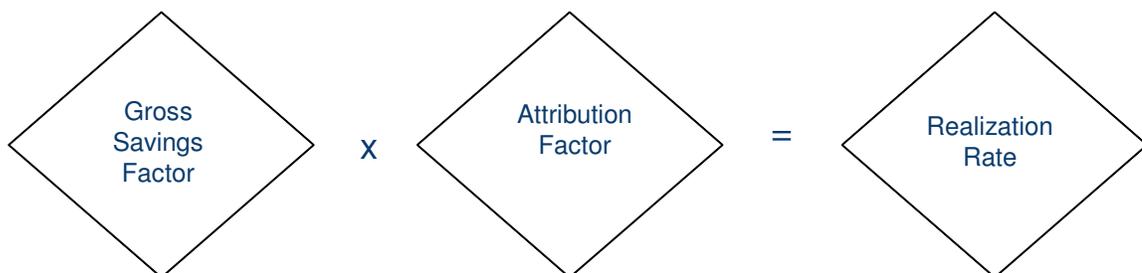
One of two methods is used to calculate net savings. One method relies on self-reports, which are used to estimate free-ridership and participant spillover (not necessarily in the same surveys). The second method is market-based and captures free-ridership, participant spillover, and non-participant spillover—without separately estimating any of them. The choice between the market-based and self-reported approaches is based on the white paper *Net-to-Gross Method Selection Framework for Evaluating Focus on Energy Program* developed by the Focus evaluation team (March 2006). Based on the criteria laid out in the white paper it was determined that a market-based approach would be used only for CFLs; all other technologies would continue to use self-reported approaches.

1. *Self-reported program response* methods rely on responses to survey questions asking end users and/or vendors what they would have done in the absence of the program support. Questions are asked on a measure-by-measure or an end use-by-end use basis using participant self-reported information about their plans and intentions. The calculation includes adjustments for the efficiency, quantity, and timing of measures that the participant may have installed in the absence of the program.
2. *Market sales-based* rely on aggregate data on total sales of a particular technology in Wisconsin, and compare this sales volume with a baseline estimate of the volume that would have been sold in the absence of the program.

Beginning with the FY06 impact evaluation, the attribution factor for CFLs is determined using a market-based approach conducted jointly for the Business and Residential programs. For FY07 the attribution factor for CFLs is 81 percent. This result is based on the *Comprehensive CFL Market Effects Study – Final Report* (June 30, 2007). This factor is 19 percentage points lower than the factor used for CFLs in the FY06 impact evaluation.

- Realization rate: As shown in Figure 2 this factor combines the gross savings adjustment factor (i.e., the installation rate and the engineering verification factor) and the attribution factor. (It is the ratio of net savings to tracking gross savings.)

**Figure 2. Realization Rate Calculation**



The adjustment factors are calculated separately for each energy unit (kWh, kW, and therms) in combination with each sector and for Business Programs overall. The calculation of the adjustment factors uses appropriate weights corresponding to the sampling rate within each stratum. The main objective in designing the sample drawn in the most recent round was to provide the best possible estimates for each of the sectors.

### ***Overview of Methodological Changes This Round***

Four substantive changes have been made to the Business Programs impact evaluation approach since the FY06 impact evaluation report was produced in March 2007. These changes include:

- Similar to the previous impact evaluation, the FY07 impact evaluation uses a market-based approach to estimate attribution for CFLs. However, new information has become available since the FY06 impact evaluation. For FY07 the attribution factor for CFLs is 81 percent. This result is based on the *Comprehensive CFL Market Effects Study – Final Report* (June 30, 2007). This factor is 19 percentage points lower than the factor used for CFLs in the FY06 impact evaluation.
- The tables presenting the adjustment factors results show the 90% confidence intervals in place of standard errors.<sup>3</sup>
- In FY06 the program implemented the Channel Initiatives and allocated energy savings from these measures to the Channels. The FY06 impact evaluation was designed and reported separately by sector and channel. In FY07 the program reverted back to allocating all energy savings to the four primary sectors. The results of the impact evaluations conducted in FY08, beginning with this one, are presented separately for each of the four primary sectors: Agricultural, Commercial, Industrial, and Institutional.

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<sup>3</sup> The confidence interval half-width (“±” difference between the interval bounds and the point estimate) is the standard error multiplied by a critical value from the t-distribution. The critical value is determined from the specified confidence level (90%) and the relevant sample size.

- This round of impact evaluation uses an abbreviated approach. This approach combines a sample of the largest projects implemented in FY07, and the sample of all but the largest of projects from the FY06 impact evaluation. This approach assumes that the net-to-gross components for all projects except for the largest are essentially the same in FY06 and FY07. A detailed discussion of the abbreviated approach is provided below under the heading, “Abbreviated Approach Methodology Discussion.”

## Abbreviated Approach Methodology Discussion

KEMA will conduct three rounds of impact evaluation during the FY08 evaluation period. The first round covers measures implemented during FY07 (July 1, 2006, through June 30, 2007). The second round will cover FY08 measures implemented during the first nine months of FY08 (July 1, 2007, through March 31, 2008). The third round will cover FY08 measures implemented between April 1, 2008, and September 30, 2008. The second round will be a full impact evaluation similar to those conducted in the previous years. The first and the third rounds are abbreviated impact evaluations, utilizing a combination of a small sample of the largest projects implemented during the period of analysis, and a larger sample of the rest of the projects collected for the prior round.

The abbreviated approach was designed to reserve the majority of the impact evaluation budget for the second round of impact evaluation that will focus on measures rebated with the FY08 incentive levels and operating strategies. The primary purpose of this initial update is to provide updated adjustment factors for the January 2008 semiannual report.

The FY07 Abbreviated Impact Evaluation uses data from the most recent *two* rounds of data collection and documentation review. The abbreviated approach combines a sample of the largest projects implemented in FY07, and the sample of all but the largest of projects from the FY06 impact evaluation. This approach assumes that the net-to-gross components for all projects except for the largest are essentially the same in FY06 and FY07.

The FY07 abbreviated approach followed these steps:

1. Classify *all* FY07 participants using FY06 sample design categories.
2. Identify the “FY07 Top-Five”. These are the five participants from each of the four sectors with the greatest FY07 savings in that sector.<sup>4</sup>
3. Attempt to complete engineering reviews and participant surveys with all twenty FY07 Top-Five participants. Use standard protocols and procedures utilized in previous impact evaluations. KEMA completed engineering reviews and participant surveys with thirteen of the twenty FY07 Top-Five participants. Additionally, on-site visits were conducted at two of these customers’ facilities.
4. Identify the “FY06 Top-Five,” using the same criteria as for FY07, and exclude these cases from the remaining analysis. Seven of the FY06 Top-Five participated in the

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<sup>4</sup> Participant savings magnitude for sampling purposes is measured as total avoided costs, based on program tracked energy savings. Total avoided cost is calculated as the sum of avoided cost for all projects completed by the participant in FY07.

FY06 sample. For the abbreviated analysis, these FY06 Top-Five cases were removed from the FY06 impact evaluation sample.

5. Assemble the FY07 abbreviated approach sample by combining the data collected for the FY07 (Top-Five, Step 3) and FY06 (Non Top-Five, Step 4) samples.
6. Calculate FY07 adjustment factors with the combined FY07 and FY06 samples (Step 5) using sample weights based on the FY07 population.

In Step 6, the cases that were originally collected for the FY06 sample were assigned to sampling strata and had sampling weights assigned based on the FY07 population. In each round of impact evaluation, KEMA defines its sample strata based on sector, size, number and complexity of projects, project funding (Wisconsin Public Service or only statewide program), and energy unit savings (therms or only electric energy savings). This detailed level sampling plan is required to produce statistically meaningful results at the sector level for each energy unit (kWh, kW, therms).

KEMA's ratio estimation technique requires at least two completed cases in each sample stratum. In each round of impact evaluation, if this criteria is not met, the sample strata with less than two completed cases are combined ("collapsed") with other strata of similar stratification variables values (e.g., sector<sup>5</sup>, size, number and complexity of project). The collapsing process regroups strata with less than two completed cases into larger groups with the most similar characteristics. These new groups have at least two completed cases and weights calculated based on the population of the collapsed strata. The sample strata with the largest projects tend to be most susceptible to collapsing due to small sample sizes. KEMA often exhausts the large project samples attempting to recruit customers to participate in the analysis. This type of collapsing was employed in the FY06 impact evaluation and the FY07 impact evaluation.

Additional collapsing of strata was required with the FY07 abbreviated approach. The abbreviated approach assumes the net-to-gross components for all projects except for the largest are essentially the same in FY06 and FY07. However the population distributions for FY06 and FY07 projects were not exactly the same. To make full use of the FY06 samples and to represent all of the FY07 population it was necessary to collapse some strata beyond the collapsing performed for the FY06 impact evaluation. There were two reasons for additional collapsing in the abbreviated approach:

1. There was a greater number of FY06 NON Top-Five sample completes than customers in the FY07 population for several strata. By definition, the sample cannot be larger than the population. These FY06 NON Top-Five sample completes were regrouped with FY07 strata with sufficient population.
2. There were two strata FY06 NON Top-Five sample completes and no corresponding population in FY07. Similar to the previous example, the population cannot be greater than the sample. Therefore these strata were also regrouped with strata with sufficient population.

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<sup>5</sup> KEMA does not collapse strata across sectors; that is, each sector is represented only by projects with program tracked energy savings allocated to that sector.

KEMA investigated the effect of the collapsing to ensure that the FY07 adjustment factors were not unduly affected by the greater collapsing required for the abbreviated analysis. We recalculated the FY06 results using the same collapsed strata as for the FY07 analysis. The results showed very little difference from those previously reported, indicating that the adjustment factors obtained in FY07 would not be substantially different had the additional collapsing not been necessary.

### **Completed Sample**

As mentioned above the FY06 NON Top-Five are used to represent the FY07 Non Top-Five in the analysis. The results of the abbreviated approach are therefore driven by changes in the Top-Five.

Table 6 provides the distribution of participants in the FY06 and FY07 Top-Five samples. KEMA completed interviews and engineering reviews with seven FY06 Top-Five and 13 FY07 Top-Five participants. Participants may show up more than once in the table because most participants' completed projects had more than one type of energy unit savings.

KEMA was able to successfully complete engineering reviews and participant surveys with participants who accounted for a large percentage of FY07 Top-Five energy savings. These fractions are provided in Table 7. FY07 Top-Five energy savings for most sectors is well represented in the sample. The one exception is kWh and kW savings for the Commercial Sector. Only one of the Top-Five Commercial Sector customers agreed to participant in the evaluation and this customer did not have reported kWh or kW savings.

**Table 6. Number of Top-Five Participants in the Sample**

Sector	FY06			FY07		
	kWh	kW	Therms	kWh	kW	Therms
Agriculture	1	0	0	4	2	4
Commercial	3	1	1	0	0	1
Industrial	0	0	1	2	2	3
Schools & Government	1	1	2	3	2	4
Total	5	2	4	9	6	12

**Table 7. Fraction of Top-Five Program Tracked Energy Savings in the Sample**

Sector	FY06			FY07		
	kWh	kW	Therms	kWh	kW	Therms
Agriculture	28%	0%	0%	99%	100%	86%
Commercial	71%	27%	60%	0%	0%	37%
Industrial	0%	0%	18%	70%	100%	58%
Schools & Government	82%	89%	34%	100%	100%	100%
Total	47%	57%	23%	59%	47%	61%

As shown in Table 8, the Top-Five account for a large fraction of total program tracked savings in FY06 and FY07. The fractions are particularly high for therms, 35 percent in FY06 and 47 percent in FY07. Savings accounted for by the Top-Five differed greatly at the sector level in a couple instances. The fractions of Schools & Government kW savings decreased from 43

percent to 3 percent; and the fraction of Agriculture therm savings increase from 16 percent to 43 percent. These differences increased the effect that the Top-Five have on the therm results for Agriculture and decrease the effect that the Top-Five have on the Schools & Government kW results. Whether this is a positive or negative change is dependent on each sectors' ability to accurately report tracked energy savings for large verses smaller projects.

**Table 8. Top-Five Energy Savings as Percent of Total Program Tracked Energy Savings.**

Sector	FY06			FY07		
	kWh	kW	Therms	kWh	kW	Therms
Agriculture	5%	4%	16%	19%	8%	43%
Commercial	13%	7%	18%	9%	9%	18%
Industrial	9%	6%	51%	4%	2%	68%
Schools & Government	9%	43%	15%	10%	3%	13%
Total	10%	12%	35%	8%	5%	47%

## Results

KEMA provides two sets of results in this section. The first set show a comparison of the FY07 and FY06 Top-Five and Non Top-Five adjustment factors results. The second set of results are the final FY07 impact evaluation results that will be used in the January 2008 semiannual report. The results tables are for kWh, kW, and therms and are presented in the following order.

1. Gross savings adjustment factor.
2. Attribution factor.
3. Realization rate.

The results tables show indicators of statistical precision, the 90% confidence interval, and sample sizes. The relative error (%) indicated for each confidence interval is the relative difference between the estimated percentage and the upper or lower confidence bound, not the absolute difference. The  $\pm$  amount indicated for each confidence interval is the absolute difference in the estimated percentage. For example, the Commercial kWh attribution estimate in Table 13 is 72.2 percent, the 90% confidence interval is  $\pm 9.7$  percentage points (i.e., 72.2%  $\pm 9.7\%$  or 62.5% to 81.9%) and the relative precision (at 90 percent confidence) is 13.4 percent (9.7%/72.2%).<sup>6</sup>

### ***FY07 Versus FY06 Adjustment Factor Comparison Results***

This section provides the adjustment factor results for the FY07 and FY06 Top-Five and Non Top-Five. The final FY07 impact evaluation results presented in the next section combine the FY07 Top-Five and the FY07 Non Top-Five results shown in Tables 9, 10, and 11. The results

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<sup>6</sup> The critical value for calculating the confidence interval  $\pm$  for each adjustment factor is determined using Student's t distribution and n-1 for the degrees of freedom, where n is the sample size. The critical value for the Gross Savings Adjustment Factor and the Realization Rate is determined using the degrees of freedom based on the minimum sample size for the components of the adjustment factor. These two adjustment factors are products of other adjustment factors.

are shown at the portfolio level and not at the sector level due to small sample sizes for the Top-Five.

The differences between the FY07 and FY06 Top-Five were tested for statistical significance at the 90 percent confidence level. Changes in the final FY07 results are largely driven by changes in the Top-Five results across years. The differences between the FY07 and FY06 Non Top-Five were not tested. The abbreviated approach is based on the assumption that the net-to-gross components of the Non Top-Five results for FY07 and FY06 are essentially the same. Furthermore these samples are not independent; that is, the FY07 Non Top-Five results are calculated using the FY06 Non Top-Five sample completes with sample weights based on the FY07 population. Minor changes in the Non Top-Five results across years are a consequence of changes in population distributions. A more notable change in the kWh and kW results is a result of the reduction in CFL attribution from 100 percent to 81 percent.

Table 9 shows the FY07 and FY06 gross savings adjustment factor comparisons. The gross savings adjustment factors combine the installation rates and the engineering verification factors to adjust the tracking estimate of gross savings. The differences between FY07 and FY06 Top-Five for kWh and the therms appear to be quite different. However, only the kWh difference is statistically significant at the 90 percent confidence level. The Non Top-Five results are very similar across years.

**Table 9. Gross Savings Adjustment Factor Comparison  
FY07 Versus FY06**

Customer Size	Fiscal Year	n	kWh					kW					Therms						
			Gross Savings Adjustment Factor	90% Confidence Interval				Gross Savings Adjustment Factor	90% Confidence Interval				Gross Savings Adjustment Factor	90% Confidence Interval					
				Relative Error (%)	+/-	Lower Bound	Upper Bound		n	Relative Error (%)	+/-	Lower Bound		Upper Bound	n	Relative Error (%)	+/-	Lower Bound	Upper Bound
Top-Five	FY06	5	100%	<0.1%	<0.1%	100.0%	100.0%	2	100%	<0.1%	<0.1%	100.0%	100.0%	3	99%	2.2%	2.1%	96.5%	100.8%
	FY07	9	77%	16.5%	12.7%	64.0%	89.3%	6	95%	12.1%	11.6%	83.8%	107.0%	12	62%	40.5%	25.0%	36.8%	86.9%
Non Top-Five	FY06	177	98%	1.6%	1.6%	96.7%	99.9%	168	97%	2.3%	2.2%	94.9%	99.4%	48	98%	3.9%	3.8%	94.5%	102.2%
	FY07	177	98%	1.9%	1.9%	96.3%	100.1%	168	96%	4.4%	4.3%	91.9%	100.4%	48	98%	3.1%	3.0%	95.0%	101.0%

The attribution factor comparisons for the Top-Five and Non Top-Five across years are provided in Table 10. The attribution factors for the FY07 Top-Five are 72 percent, 92 percent, and 59 percent for kWh, kW, and therms, respectively. These appear to be large improvements over the previous year; however the increases are not statistical significant at the 90 percent confidence level. The Non Top-Five results for kWh and kW decreased by 12 and 13 percentage points, respectively. Contributing to this reduction is the new market-based CFL attribution factor of 81 percent. This attribution factor is based on the *Comprehensive CFL Market Effects Study – Final Report* (June 30, 2007). It is 19 percentage points lower than the factor used for CFLs in the FY06 impact evaluation.

**Table 10. Attribution Factor Comparison  
FY07 Versus FY06**

Customer Size	Fiscal Year	kWh						kW						Therms						
		n	Attribution Adjustment Factor	90% Confidence Interval				n	Attribution Adjustment Factor	90% Confidence Interval				n	Attribution Adjustment Factor	90% Confidence Interval				
				Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound	
Top-Five	FY06	5	65%	43.9%	28.5%	36.4%	93.4%	2	48%	12.5%	6.0%	42.1%	54.1%	4	27%	122.8%	32.6%	-	6.0%	59.2%
	FY07	9	72%	40.5%	29.3%	43.1%	101.8%	6	92%	16.2%	14.9%	77.3%	107.1%	12	59%	37.1%	22.0%	37.3%	81.2%	
Non Top-Five	FY06	331	77%	10.6%	8.2%	69.0%	85.3%	289	78%	11.1%	8.6%	69.0%	86.2%	159	60%	18.1%	10.8%	48.8%	70.3%	
	FY07	331	65%	14.3%	9.2%	55.3%	73.7%	289	65%	14.6%	9.5%	55.6%	74.6%	159	57%	14.4%	8.2%	48.3%	64.7%	

Table 11 shows the realization rates for the Top-Five and Non Top-Five across years. The realization rates combine the effect of the gross savings adjustment factors and the attribution factors. The FY07 Top-Five realization rates for the program overall are 56 percent, 88 percent, and 37 percent for kWh, kW, and therms, respectively. There is no statistical difference in the Top-Five results across years at the 90 percent confidence level.

**Table 11. Realization Rate Comparison  
FY07 Versus FY06**

Customer Size	Fiscal Year	kWh						kW						Therms						
		n	Realization Rate	90% Confidence Interval				n	Realization Rate	90% Confidence Interval				n	Realization Rate	90% Confidence Interval				
				Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound	
Top-Five	FY06	5	65%	43.9%	28.5%	36.4%	93.4%	2	48%	12.5%	6.0%	42.1%	54.1%	3	26%	135.6%	35.5%	-	9.3%	61.7%
	FY07	9	56%	43.7%	24.3%	31.3%	79.8%	6	88%	20.2%	17.8%	70.2%	105.8%	12	37%	54.9%	20.1%	16.5%	56.8%	
Non Top-Five	FY06	177	76%	10.7%	8.1%	67.7%	84.0%	168	75%	11.3%	8.5%	66.9%	83.9%	48	59%	18.7%	11.0%	47.6%	69.5%	
	FY07	177	63%	14.5%	9.2%	54.2%	72.5%	168	63%	15.3%	9.6%	53.0%	72.2%	48	55%	15.0%	8.3%	47.1%	63.7%	

### ***FY07 Abbreviated Approach Results***

This section provides the final results of the FY07 impact evaluation. The results are provided by the overall program and each sector for kWh, kW, and therms. These results combine the FY07 Top-Five and the FY07 Non Top-Five results provided in the above tables. As mentioned in the previous section the FY07 Non Top-Five results are calculated using the FY06 Non Top-Five sample completes with sample weights based on the FY07 population. These results will be applied to program tracked energy savings in the January 2008 semiannual report.

Table 12 shows the FY07 gross savings adjustment factors by sector. The gross savings adjustment factors combine the installation rates and the engineering verification factors to adjust the tracking estimate of gross savings. The portfolio level results for kWh, kW, and therms are 93 percent, 96 percent, and 67 percent, respectively.

**Table 12. FY07 Gross Savings Adjustment Factors by Sector**

Segment	kWh						kW						Therms					
	min n	Gross Savings Adjustment Factor	90% Confidence Interval				min n	Gross Savings Adjustment Factor	90% Confidence Interval				min n	Gross Savings Adjustment Factor	90% Confidence Interval			
			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound
Agriculture	61	83%	20.1%	16.8%	66.5%	100.1%	59	82%	14.9%	12.2%	69.8%	94.2%	7	79%	24.3%	19.1%	59.5%	97.7%
Commercial	81	99%	3.0%	3.0%	96.1%	102.2%	77	100%	3.7%	3.7%	96.0%	103.4%	10	85%	17.7%	15.1%	70.3%	100.5%
Industrial	27	99%	1.7%	1.6%	97.2%	100.5%	24	99%	1.8%	1.8%	96.7%	100.3%	23	99%	2.0%	2.0%	97.4%	101.4%
Institutional	17	93%	6.1%	5.7%	87.4%	98.8%	14	98%	5.3%	5.2%	92.6%	103.0%	20	53%	55.2%	29.3%	23.8%	82.3%
Business Programs																		
Overall	186	93%	4.4%	4.1%	89.1%	97.3%	174	96%	4.0%	3.9%	92.0%	99.8%	60	67%	30.5%	20.5%	46.7%	87.7%

The FY07 attribution factors by sector are provided in Table 13. The FY07 attribution factors for the program overall are 65 percent, 69 percent, and 58 percent for kWh, kW, and therms, respectively. These portfolio level rates are consistent with the rates achieved for FY06. At the sector level the Agriculture and Commercial attribution rates are affected by the reduction in CFL attribution. Similar to the previous impact evaluation, the FY07 impact evaluation uses a market-based approach to estimate attribution for CFLs. However, new information has become available since the FY06 impact evaluation. For FY07 the attribution factor for CFLs is 81 percent. This result is based on the *Comprehensive CFL Market Effects Study – Final Report* (June 30, 2007). This factor is 19 percentage points lower than the factor used for CFLs in the FY06 impact evaluation.

**Table 13. FY07 Attribution Factors by Sector**

Segment	kWh						kW						Therms					
	n	Attribution Adjustment Factor	90% Confidence Interval				n	Attribution Adjustment Factor	90% Confidence Interval				n	Attribution Adjustment Factor	90% Confidence Interval			
			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound
Agriculture	113	61%	14.5%	8.8%	51.9%	69.5%	104	55%	16.3%	9.0%	46.1%	64.1%	26	46%	23.9%	10.9%	34.7%	56.6%
Commercial	129	72%	13.4%	9.7%	62.5%	81.9%	109	77%	12.4%	9.5%	67.1%	86.0%	57	44%	29.2%	12.9%	31.4%	57.3%
Industrial	59	58%	25.4%	14.6%	42.9%	72.1%	53	54%	27.1%	14.7%	39.4%	68.7%	33	63%	24.7%	15.6%	47.5%	78.6%
Institutional	39	72%	32.7%	23.4%	48.2%	95.0%	29	85%	20.4%	17.2%	67.3%	101.8%	55	55%	42.4%	23.5%	32.0%	79.0%
Business Programs																		
Overall	340	65%	13.5%	8.8%	56.6%	74.3%	295	69%	14.3%	9.8%	58.8%	78.4%	171	58%	20.7%	11.9%	45.6%	69.4%

Table 14 shows the FY07 realization rates by sector. The realization rates combine the effect of the gross savings adjustment factors and the attribution factors. The FY07 realization rates for the program overall are 61 percent, 66 percent, and 39 percent for kWh, kW, and therms, respectively.

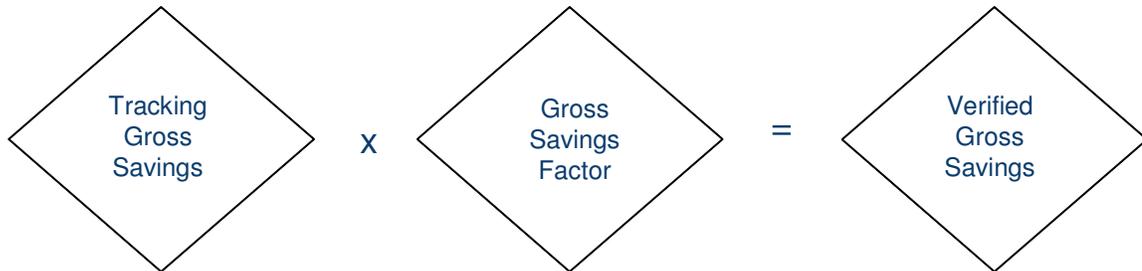
**Table 14. FY07 Realization Rates by Sector**

Segment	kWh						kW						Therms					
	min n	Realization Rate	90% Confidence Interval				min n	Realization Rate	90% Confidence Interval				min n	Realization Rate	90% Confidence Interval			
			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound
Agriculture	61	51%	24.9%	12.6%	38.0%	63.1%	59	45%	22.1%	10.0%	35.2%	55.2%	7	36%	36.0%	12.9%	23.0%	48.9%
Commercial	81	72%	13.8%	9.9%	61.7%	81.5%	77	76%	12.9%	9.9%	66.5%	86.3%	10	38%	36.2%	13.7%	24.2%	51.7%
Industrial	27	57%	26.0%	14.8%	42.1%	71.6%	24	53%	27.8%	14.8%	38.4%	68.0%	23	63%	25.1%	15.7%	46.9%	78.4%
Institutional	17	67%	34.3%	22.9%	43.8%	89.5%	14	83%	21.8%	18.0%	64.6%	100.7%	20	29%	70.4%	20.7%	8.7%	50.1%
Business Programs																		
Overall	186	61%	14.2%	8.7%	52.3%	69.7%	174	66%	14.9%	9.8%	56.0%	75.6%	60	39%	37.0%	14.3%	24.4%	52.9%

### **Evaluated Tracked Energy Impacts**

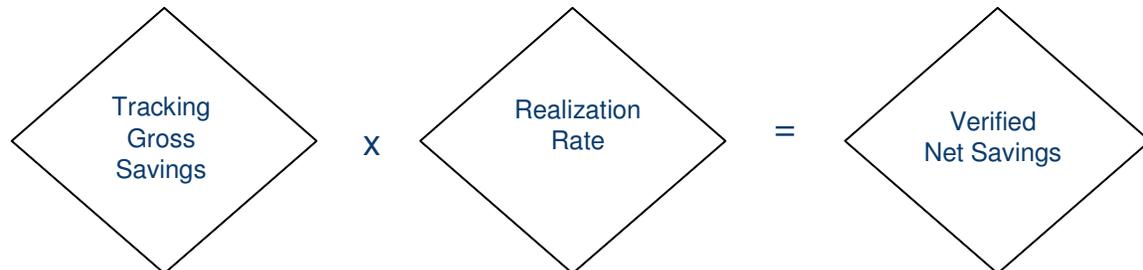
The estimates of the adjustment factors by sector are used to calculate verified gross savings and net savings. As shown in Figure 3, multiplying tracking gross savings by the gross savings adjustment factor (which is the product of the installation rate and the engineering verification factor) alone yields verified gross savings.

**Figure 3. Calculation of Verified Gross Savings**



As shown in Figure 4, evaluation verified net savings is the product of tracking gross savings by the realization rate (which is the product of the gross savings factor and the attribution factor).

**Figure 4. Calculation of Verified Net Savings**



For FY07 (July 1, 2006, through June 30, 2007), Table 15 gives tracking and verified gross savings and net savings by sector, Focus Business Programs overall, the Wisconsin Public Service Business Programs, and combined Focus and Wisconsin Public Service Business Programs. The estimates of the adjustment factors by sector reported above are used to calculate verified gross savings and net savings for this time period.

**Table 15. All Business Programs: Tracked Energy Impacts  
FY07 (July 1, 2006–June 30, 2007)**

Sector	kWh			kW			Therms		
	Tracking Gross <sup>a</sup>	Verified Gross	Net	Tracking Gross <sup>a</sup>	Verified Gross	Net	Tracking Gross <sup>a</sup>	Verified Gross	Net
<i>Rebate Billed to Focus</i>									
Agriculture	14,201,305	11,830,921	7,179,717	3,899	3,197	1,761	757,220	595,356	271,983
Commercial	41,193,748	40,849,432	29,496,805	8,764	8,740	6,693	1,480,056	1,264,036	561,175
Industrial	62,455,412	61,733,041	35,497,637	10,526	10,372	5,605	7,828,288	7,784,241	4,907,494
Institutional	23,081,621	21,489,164	15,382,357	5,830	5,700	4,818	3,590,759	1,905,073	1,056,650
<b>Total FY07 Focus (July 1, 2006 to June 30, 2007)</b>	<b>140,932,086</b>	<b>135,902,559</b>	<b>87,556,516</b>	<b>29,019</b>	<b>28,009</b>	<b>18,878</b>	<b>13,656,324</b>	<b>11,548,706</b>	<b>6,797,303</b>
<i>Rebate Billed to Wisconsin Public Service</i>									
Agriculture	1,687,974	1,406,229	853,385	592	485	267	0	0	0
Commercial	4,277,986	4,242,228	3,063,254	885	882	676	58,672	50,109	22,246
Industrial	4,788,299	4,732,917	2,721,515	928	914	494	0	0	0
Institutional	1,146,000	1,066,935	763,733	502	491	415	0	0	0
<b>Total FY07 Wisconsin Public Service (July 1, 2006 to June 30, 2007)</b>	<b>11,900,260</b>	<b>11,448,310</b>	<b>7,401,886</b>	<b>2,907</b>	<b>2,773</b>	<b>1,852</b>	<b>58,672</b>	<b>50,109</b>	<b>22,246</b>
<b>Grand Total FY07 Focus + Wisconsin Public Service (July 1, 2006 to June 30, 2007)</b>	<b>152,832,345</b>	<b>147,350,869</b>	<b>94,958,402</b>	<b>31,925</b>	<b>30,782</b>	<b>20,730</b>	<b>13,714,996</b>	<b>11,598,815</b>	<b>6,819,549</b>

<sup>a</sup> Tracking gross savings for measures installed during FY07 are from two versions of the WATTS database. The two versions of the WATTS database used are: (1) WATTS database as synchronized on August 7, 2008: measures installed in FY07 included in the sampling frame; and (2) WATTS database as synchronized on November 28, 2007 measures installed in FY07 not included in the sampling frame.

## Adjustment Factor Components

The verified gross savings combines an assessment of installation rates with validation of gross savings for those projects that were installed. Tables 16 and 17 provide the FY07 installation rate and engineering verification factors. The combined effect of these factors was reported above as the gross savings adjustment factor (installation rate X engineering verification factor = gross savings adjustment factor).

**Table 16. FY07 Installation Rates by Sector**

Segment	kWh						kW						Therms					
	n	Installation Rate	90% Confidence Interval				n	Installation Rate	90% Confidence Interval				n	Installation Rate	90% Confidence Interval			
			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound
Agriculture	114	100%	0.2%	0.2%	99.6%	100.1%	105	100%	0.3%	0.3%	99.6%	100.1%	26	98%	1.2%	1.1%	97.1%	99.4%
Commercial	131	100%	0.7%	0.7%	98.9%	100.3%	111	100%	0.8%	0.8%	98.8%	100.3%	58	99%	1.3%	1.3%	97.9%	100.5%
Industrial	59	100%	0.3%	0.3%	99.5%	100.1%	53	100%	0.2%	0.2%	99.6%	100.1%	33	100%	<0.1%	<0.1%	100.0%	100.0%
Institutional	39	100%	<0.1%	<0.1%	100.0%	100.0%	29	100%	<0.1%	<0.1%	100.0%	100.0%	57	99%	0.9%	0.9%	98.3%	100.1%
Business Programs																		
Overall	343	100%	0.2%	0.2%	99.6%	100.0%	298	100%	0.2%	0.2%	99.6%	100.0%	174	99%	0.4%	0.4%	99.0%	99.9%

**Table 17. FY07 Engineering Verification Factors by Sector**

Segment	kWh						kW						Therms					
	n	Engineering Verification Factor	90% Confidence Interval				n	Engineering Verification Factor	90% Confidence Interval				n	Engineering Verification Factor	90% Confidence Interval			
			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound
Agriculture	61	83%	20.1%	16.8%	66.6%	100.2%	59	82%	14.9%	12.2%	69.9%	94.3%	7	80%	24.2%	19.4%	60.7%	99.4%
Commercial	81	100%	3.0%	2.9%	96.6%	102.5%	77	100%	3.6%	3.6%	96.5%	103.8%	10	86%	17.7%	15.2%	70.9%	101.3%
Industrial	27	99%	1.6%	1.6%	97.4%	100.6%	24	99%	1.8%	1.8%	96.9%	100.5%	23	99%	2.0%	2.0%	97.4%	101.4%
Institutional	17	93%	6.1%	5.7%	87.4%	98.8%	14	98%	5.3%	5.2%	92.6%	103.0%	20	53%	55.2%	29.5%	24.0%	83.0%
Business Programs																		
Overall	186	93%	4.4%	4.1%	89.3%	97.5%	174	96%	4.0%	3.9%	92.2%	100.0%	60	68%	30.5%	20.6%	47.0%	88.2%

Tables 18 and 19 provide the FY07 installation rate and engineering verification factors. The combined effect of these factors was reported above in the comparison tables for the gross savings adjustment factor. The decrease in the kWh engineering verification factor, from 100 percent to 77 percent, for the Top-Five is statistically significant at the 90 percent confidence level. This result was reflected in the above reported gross savings adjustment factor results.

**Table 18. Installation Rate Comparisons  
FY07 Versus FY06**

Customer Size	Fiscal Year	kWh						kW						Therms					
		n	Installation Rate	90% Confidence Interval				n	Installation Rate	90% Confidence Interval				n	Installation Rate	90% Confidence Interval			
				Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound
Top-Five	FY06	5	100%	<0.1%	<0.1%	100.0%	100.0%	2	100%	<0.1%	<0.1%	100.0%	100.0%	4	100%	<0.1%	<0.1%	100.0%	100.0%
	FY07	9	100%	<0.1%	<0.1%	100.0%	100.0%	6	100%	<0.1%	<0.1%	100.0%	100.0%	12	100%	<0.1%	<0.1%	100.0%	100.0%
Non Top-Five	FY06	334	100%	0.2%	0.2%	99.7%	100.0%	292	100%	0.2%	0.2%	99.7%	100.1%	162	99%	1.0%	1.0%	97.8%	99.8%
	FY07	334	100%	0.2%	0.2%	99.5%	100.0%	292	100%	0.3%	0.3%	99.5%	100.0%	162	99%	1.0%	1.0%	97.5%	99.6%

**Table 19. Engineering Verification Factor Comparisons  
FY07 Versus FY06**

Customer Size	Fiscal Year	kWh						kW						Therms					
		n	Engineering Verification Factor	90% Confidence Interval				n	Engineering Verification Factor	90% Confidence Interval				n	Engineering Verification Factor	90% Confidence Interval			
				Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound			Relative Error (%)	+/-	Lower Bound	Upper Bound
Top-Five	FY06	5	100%	<0.1%	<0.1%	100.0%	100.0%	2	100%	<0.1%	<0.1%	100.0%	100.0%	3	99%	2.2%	2.1%	96.5%	100.8%
	FY07	9	77%	16.5%	12.7%	64.0%	89.3%	6	95%	12.1%	11.6%	83.8%	107.0%	12	62%	40.5%	25.0%	36.8%	86.9%
Non Top-Five	FY06	177	98%	1.6%	1.6%	96.8%	100.1%	168	97%	2.3%	2.2%	95.1%	99.5%	48	100%	3.8%	3.7%	95.8%	103.3%
	FY07	177	98%	1.9%	1.9%	96.5%	100.3%	168	96%	4.4%	4.3%	92.1%	100.6%	48	99%	2.9%	2.9%	96.6%	102.3%

## Engineering Verification Findings

The engineering review determined the verified gross savings for each measure reviewed in the engineering sample.<sup>7</sup> An evaluation engineer conducted a review of the energy savings estimates for each project installed by customers that were part of the engineering sample and completed a telephone survey. Additionally, on-site measurement and verification was conducted at two customers' facilities. The engineer used the collected information and the project paperwork to determine whether the reported savings were reasonable.

The review had two main components:

1. *Evaluation of the calculation method.* The engineer reviewed the method used to calculate the energy savings. Most energy savings estimates can be calculated in a variety of ways and still produce reasonable, though not necessarily equal, energy savings values. The engineer reviewed the method used for each project to ensure that it followed the general conventions of energy savings calculations and could produce a reasonably accurate result.
2. *Evaluation of the calculation parameters.* The engineer reviewed the parameters used in the energy savings equations to determine whether they were reasonable. Some parameters (i.e., motor power, operating hours) were verified through information gathered from the site contact over the telephone and on-site data if applicable. Other parameters were verified using secondary sources (i.e., light fixture wattage, cooling degree days).

<sup>7</sup> All measures that are reviewed by an engineer on the evaluation team are considered part of the engineering sample.

For some measures, the engineering review process produced an energy savings estimate that differed from the estimate reported by the program. The program savings estimate was judged “reasonable” if the engineering estimate was within 10 percent of the program estimate. In that case, the verified gross energy savings were set equal to the program savings. If the calculated savings were different from the program prescriptive estimate by more than 10 percent in either direction, the verified gross energy savings were set equal to the engineering review estimate.<sup>8</sup>

This section provides several tables and a chart that summarize the differences between program tracked and evaluation verified gross energy savings. KEMA completed surveys with 13 participants that account for 79 different installed ‘projects.’<sup>9</sup> A small number of participants account for the majority of projects. Three sample participants account for two thirds of these projects. Furthermore six sample participants account for 91 percent of installed projects in the sample.

The first series of tables show the degree of difference between the program tracked energy savings estimate and the verified energy savings estimate for each project that was part of the engineering review. A separate table is provided for projects with kWh, kW, and therm savings. If a project has more than one type of energy savings it will be represented in each relevant table.

As shown in Table 20, 26 of the 49 projects with kWh program tracked energy savings did not receive an engineering adjustment. Projects with therm savings were much more likely to receive an engineering adjustment with 29 out of 39 projects receiving adjustments. Most of the adjustments to the program energy savings estimates resulted in a decrease in energy savings. However, adjustments were made to increase as well as decrease energy savings.

**Table 20. Degree of Difference between Program and Verified kWh Savings**

Percent Change	# of Projects		
	Verified > Reported	Verified < Reported	Total
Not Installed	N/A	N/A	0
None	N/A	N/A	26
10% to 20%	0	6	6
20% to 30%	0	1	1
30% to 50%	2	1	3
50% to 100%	0	4	4
100% or Greater	3	6	9
<b>Total</b>	<b>5</b>	<b>18</b>	<b>49</b>

<sup>8</sup> Calculated savings less than 10 percent different from the program were also set to engineering review estimate if one of the three potential energy unit (kWh, kW, therms) calculations for the same measure was 10 percent different from the engineering review estimate.

<sup>9</sup> Where a ‘project’ is equivalent to one unique WATTSMmeasure ID.

**Table 21. Degree of Difference between Program and Verified kW Savings**

Percent Change	# of Projects		
	Verified > Reported	Verified < Reported	Total
Not Installed	N/A	N/A	0
None	N/A	N/A	25
10% to 20%	6	1	7
20% to 30%	0	0	0
30% to 50%	2	1	3
50% to 100%	0	3	3
100% or Greater	1	3	4
<b>Total</b>	<b>9</b>	<b>8</b>	<b>42</b>

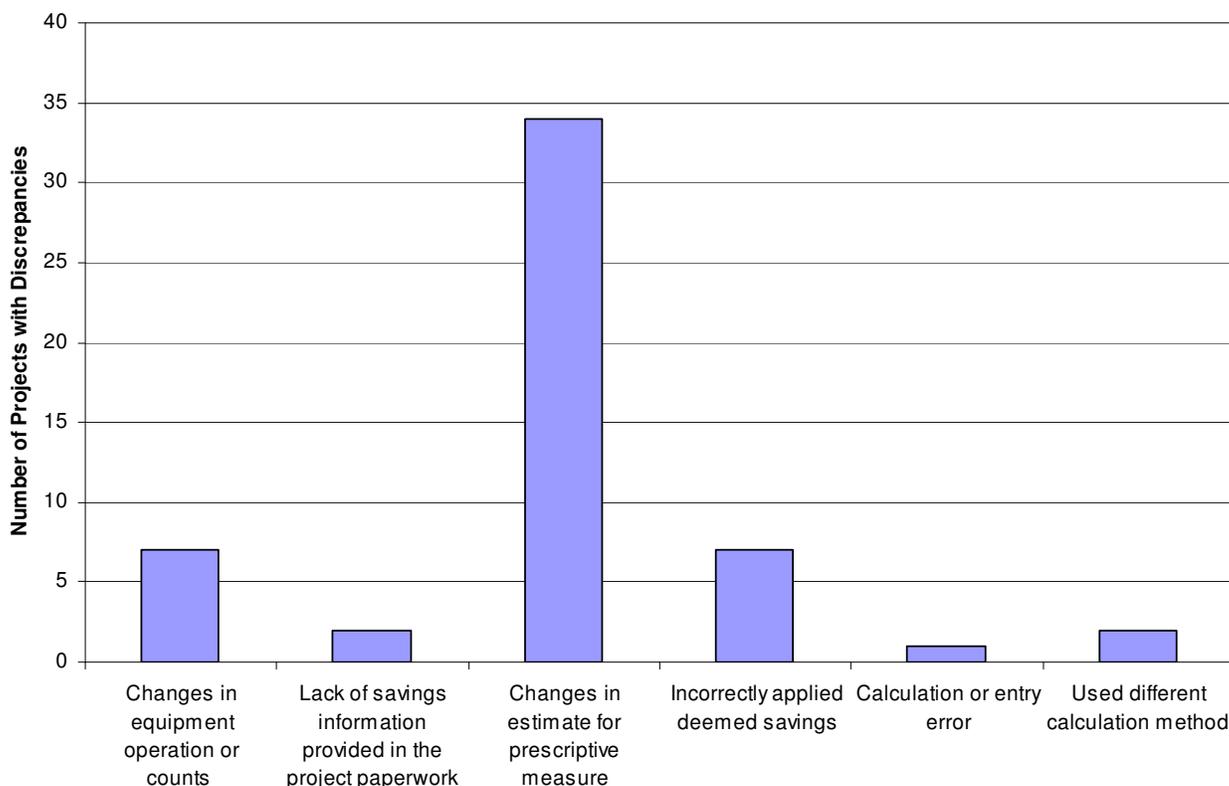
**Table 22. Degree of Difference between Program and Verified Therm Savings**

Percent Change	# of Projects		
	Verified > Reported	Verified < Reported	Total
Not Installed	N/A	N/A	0
None	N/A	N/A	10
10% to 20%	0	0	0
20% to 30%	0	13	13
30% to 50%	2	2	4
50% to 100%	0	11	11
100% or Greater	1	0	1
<b>Total</b>	<b>3</b>	<b>26</b>	<b>39</b>

The energy savings estimates were adjusted for 49 of the 79 projects in the sample. Figure 5 provides a high level explanation for the engineering adjustments; and Table 23 shows a more detailed description of the discrepancies between the program and verified savings for each category in Figure 5.

Twenty-eight of the 39 projects that received an adjustment that decreased program reported energy savings were because of “changes in estimate for prescriptive measures.” The large number of discrepancies in this category does not appear to be evidence of a systemic problem. First, 21 out of the 28 projects are for only one type of measure (boiler service buy-down) at only two participant sites. The discrepancies are a result of inaccurate assumptions used for a non-deemed measure. Second, four of these discrepancies are for measures that assumed an average fuel mix for a domestic hot water (DHW) system but the evaluation changed the savings to match the actual fuel mix found at the site. The remaining three discrepancies are the result of updating baseline assumptions for a non-deemed measure.

Assessing the impact of adjustments based on project count can be misleading because the effect of an adjustment on the overall engineering factor is dependent on the percentage of savings represented by the project. A single large project with a large discrepancy can have a larger effect on the engineering adjustment factor than 25 smaller projects with small discrepancies. For this round of evaluation, there are approximately 8-10 natural gas projects and 5-10 electric projects that had the greatest effect on the overall engineering adjustment.

**Figure 5. Number of Projects with Discrepancies between Program and Verified Savings****Table 23. Detailed Description of Discrepancies between Program and Verified Savings**

Discrepancies	# of Projects		
	Verified > Tracked	Verified < Tracked	Total
<b>Changes in equipment operation or counts</b>			
Change in equipment count		3	3
Change in equipment operation	1	3	4
<b>Lack of savings information provided in the project paperwork</b>			
Not enough information to recreate savings estimate	2		2
<b>Changes in estimate for prescriptive measure</b>			
Changed to actual conditions on site		21	21
Changed to reflect actual fuel used on site	4 <sup>a</sup>	4 <sup>a</sup>	8
Changed assumed baseline efficiency	2	3	5
<b>Incorrectly applied deemed savings</b>			
Rounding errors changed savings values	6		6
Calculated custom savings for deemed measure		1	1
<b>Calculation or entry error</b>			
Verified savings equal to other savings in the documentation		1	1
<b>Used different calculation method</b>			
Used different calculation method		2	2
<b>Total</b>	<b>15</b>	<b>38</b>	<b>53</b>

<sup>a</sup> Savings increased for one fuel and decreased for another.

Table 24 summarizes the sources of discrepancies found between verified gross savings and program estimates for all measures in the engineering sample in a slightly different manner.<sup>10</sup> Table 24 also compares the results for FY07 to the results for FY06 and FY05. The number of projects receiving adjustments increased from 15 percent in FY06 to 62 percent in FY07. The comparison is deceptive because FY06 was an exceptional year in terms of the number of measures that were adjusted, due in part to more complete program paperwork than had been provided in the past. Historically, the program has an average of 50 percent of measures with at least one discrepancy for at least one applicable energy unit and 63 percent with no discrepancy found for at least one applicable energy unit<sup>11</sup>.

**Table 24. Discrepancies between Verified and Tracking Savings**

Discrepancy	Measures					
	FY05		FY06		FY07	
	Number	Percent	Number	Percent	Number	Percent
Not installed in any quantity	2	1%	3	2%	0	0%
Verified gross savings matches documented gross savings, but doesn't match tracking gross savings	4	2%	1	1%	1	1%
Due to lack of documentation, verified gross savings calculated independently of tracking gross savings	24	14%	6	3%	2	3%
Verified gross savings doesn't match documented gross savings	84	48%	22	13%	46	58%
Verified gross savings is within 10% of tracking gross savings	3	2%	0	0%	0	0%
Verified gross savings is more than 10% larger than tracking gross savings	47	27%	3	2%	12	10%
Verified gross savings is more than 10% smaller than tracking gross savings	39	22%	20	11%	38	48%
At least one discrepancy found for at least one applicable energy unit <sup>a</sup>	89	51%	26	15%	49	62%
No discrepancy found for at least one applicable energy unit (verified gross savings matches tracking)	110	63%	165	94%	32	41%
<b>Total engineering sample<sup>b</sup></b>	<b>176</b>		<b>183</b>		<b>79</b>	

<sup>a</sup> As a measure may have more than one type of discrepancy, this does not equal the sum of the number of measures above.

<sup>b</sup> As a measure may have more than one applicable energy unit, this does not equal the sum of the number of measures with at least one discrepancy and no discrepancy immediately above

<sup>10</sup> Discrepancies shown in Table 24 reflect only the discrepancies for measures that were part of the engineering review and not measures that were part of the computer-aided telephone interview (CATI).

<sup>11</sup> These two groups are not mutually exclusive. "...one discrepancy for at least one applicable energy unit" means that for either the kW, kWh, or therms, the verified gross installed savings WERE NOT equal to the tracking savings. "...no discrepancy found for at least one applicable energy unit" means that for either the kW, kWh, or therms, the verified gross installed savings WERE equal to the tracking savings. This means that any given measure can be counted in both categories if, for at least one fuel, the verified gross savings did not match the tracking savings and, for another fuel, the verified gross savings did match the tracking savings.