

# State of Wisconsin Public Service Commission of Wisconsin

Focus on Energy Evaluation

*Semiannual Summary Report  
(Second Half of 2007)*

Final: March 17, 2008

Revised: June 15, 2008<sup>1</sup>

Revised: July 12, 2008<sup>2</sup>

Evaluation Contractor: PA Government Services Inc.

Prepared by the Focus evaluation team

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<sup>1</sup> This revision added electric bill and gas bill savings maps by utility territory.

<sup>2</sup> This revision clarified that the maps are about dollar savings, not energy savings, per se. No data changed.



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

*The power is within you.*

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

## What is Focus on Energy?

Focus on Energy (Focus) is a public–private partnership offering energy information and services to residential, business, agricultural, and industrial customers throughout Wisconsin. These services are delivered by a group of firms contracted by the Statewide Energy Efficiency and Renewable Administration (SEERA), which the energy utilities formed to fulfill their obligations under Act 141, and overseen by the Public Service Commission of Wisconsin. Focus is funded by the Utility Public Benefits fund created by the Wisconsin State Legislature in 1999 as part of the Reliability 2000 initiative.

## What are the goals of Focus?

The mission of Focus is to develop and operate a range of sustainable energy efficiency and renewable energy programs. In partnerships with consumers, utilities, businesses, nonprofit organizations, and government at all levels, these programs will:

- Reduce the amount of energy used per unit of production in Wisconsin while improving energy reliability.
- Enhance economic development and make Wisconsin firms more competitive.
- Reduce the environmental impacts of energy use.
- Expand the ability of markets to deliver energy efficient and renewable goods and services to consumers and businesses.
- Deliver quantified financial returns on public investments in energy improvements.

### ***Focus on Energy Vision***

That the people of Wisconsin will make sound energy efficiency and renewable energy investments that result in sustained economic growth and a healthy environment for current and future generations.

## What programs does Focus offer?

Since 2001, Focus has sponsored energy efficiency programs in four major areas:

***Business Programs***—administered by the Milwaukee School of Engineering (program start through June 30, 2004) and by the Wisconsin Energy Conservation Corporation (beginning July 1, 2004)—promote energy-efficient equipment and practices in new and existing buildings in the industrial, commercial, agricultural, and government sectors.

***Residential Programs***—administered by the Wisconsin Energy Conservation Corporation—promote the building of energy-efficient homes and apartment buildings, the installation of energy-efficient equipment in existing homes and apartment buildings, and the distribution of energy-efficient ENERGY STAR® products (e.g., compact fluorescent light bulbs, washing machines, dishwashers, and other appliances).

***Renewable Energy Program***—administered by the Wisconsin Energy Conservation Corporation—promotes the installation of renewable energy projects (e.g., photovoltaic cells [solar panels], solar water heating, wind machines, and biomass generation systems), educates the public, and works to develop Wisconsin’s renewable energy market place.

**Environmental Research Program**—administered by the Energy Center of Wisconsin—distributes grants for research on the environmental impacts of electric generation in Wisconsin. Because this is a research effort rather than the promotion of energy-efficient equipment, the measurable impacts will be different from those of other program areas. The semiannual report will include information on this program area as the findings become available.

## How will the success of the programs be measured?

PA Government Services Inc. of Madison, Wisconsin, is leading a team of evaluation experts to quantify the impacts of Focus on Wisconsin’s citizens and economy. The evaluators are charged with independently verifying administrators’ reports of program impacts. They do so by directly collecting data from program participants via telephone surveys, mail surveys, in-depth interviews, and on-site inspections. The analyses of these data are also informed by review of relevant documents on similar topics compiled by other professional evaluators.

The results of these extensive evaluation efforts have been presented in detail in prior evaluation reports. Many of the relevant reports are listed in *Appendix A* and are referenced in the sections of this report where appropriate.

## The Major Impacts of Focus

The Focus programs are designed to promote energy efficiency and the use of renewable resources in the state of Wisconsin. The evaluation is measuring the following primary impacts from energy efficiency improvements made through the programs. These evaluated impacts demonstrate achievement of the goals stated earlier:

- **Energy impacts**—energy and cost savings.
- **Economic benefits**—savings on energy bills, stimulation of economic development, and creation of jobs.
- **Environmental benefits**—primarily from displacement of power plant pollution emissions attributable to saved energy.
- **Other non-energy benefits**—the value of increased health, safety, and comfort.

### What Will This Report Tell Me?

The purpose of this document is to provide a concise yet comprehensive summary of the progress and performance of Focus. It will be updated semiannually to track the successes and challenges of Focus.

For detailed information, please see *Focus on Energy Evaluation: Semiannual Report (Second Half of 2007)* available online at:

[www.focusonenergy.com](http://www.focusonenergy.com)

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## Benefit-Cost Analysis

The *Benefit-Cost Analysis* section presents the results of analysis conducted to determine whether the benefits resulting from Focus outweigh the costs of running the program. Included in this section is an overview of what is involved in this analysis.

## ENERGY IMPACTS: What are they and how are they measured?

Energy savings result when consumers install new energy efficiency equipment, replace old equipment with energy-efficient units, or reduce energy usage through their actions. This can be as simple as turning off the lights when leaving the room or as complicated as implementing an energy management system in an industrial facility. In addition, energy can be said to be “saved”

when customers employ renewable energy technologies to produce heat or electricity on their own property.

Three types of energy savings are used in this report: **gross reported savings, verified gross savings, and verified net savings**. The energy is saved by program **participants**. Each of these terms is described in more detail below.

<b>Gross Reported Savings</b>	Energy savings as reported by the program administrator, unverified by an independent evaluation.
<b>Verified Gross Savings</b>	Energy savings verified by an independent evaluation based on reviews of the number and types of implemented improvements and the engineering calculations used to estimate the energy saved. Verified gross savings are used in reporting annual energy and dollars saved (Table 1) and reductions in emissions (Table 3).
<b>Verified Net Savings</b>	Energy savings that can confidently be attributed to Focus efforts. Evaluators make adjustments for participants who were not influenced by Focus. Verified net savings are used in reporting economic benefits (Table 2), non-energy benefits (Table 4), and benefit-cost ratios (Tables 5 and 6).
<b>Participant</b>	A person, household, firm, or organization that obtains products or services through a Focus program.

### How much energy has Focus on Energy saved?

Table 1 (on page 4) shows the total energy and dollars saved by Focus participants from the energy efficiency improvements installed during the most recent quarters (July 1–December 31, 2007). Energy savings are realized each year that the energy conservation measure remains in place, which typically ranges from 7 to 20 years.

<b>Average Energy Savings per Participating Household</b>	<b>\$62.60/ year</b>
<b>Average Energy Savings per Participating Business</b>	<b>\$2,007.72 year</b>

The annual verified gross savings of all the measures installed during the indicated time (taken from program administrators’ tracking records and verified by evaluators) have been summed (in Table 1) to determine the **Annual kWh and Therms Saved**. The **Annual Dollar Value** of the energy saved was calculated using average electric and natural gas retail rates paid in the state of Wisconsin as compiled by the Wisconsin Department of Administration, Division of Energy (also graphically presented in Figures 3 through 6). Figures 7 through 10 show the percent of energy saved to date by measure categories in the Business Program and the Residential Program.

The net present value of the energy that will be saved due to measures implemented by Focus on Energy is over \$766 million dollars. Business programs account for \$518 million of that, Residential programs over \$235 million, and Renewables accounts for over \$13 million.

The majority of savings for the program to date come from the Business and Residential Programs. The Renewable Energy Program has a significantly smaller budget than the Residential and Business Programs. It also promotes emerging technologies that are not as accepted by the residential and commercial markets as the efficiency technologies offered by the other programs.

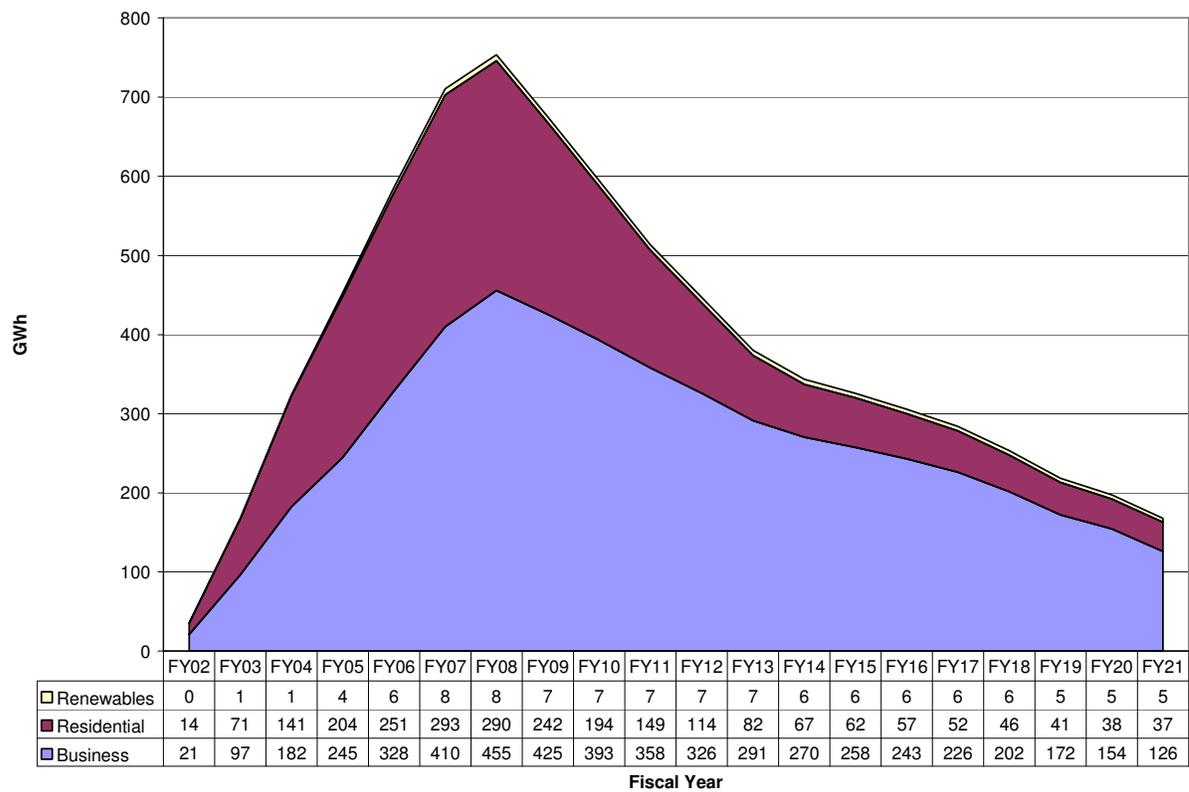
To date, Focus programs have also reduced peak electrical demand in Wisconsin by over 122 net megawatts (not shown in the table). Reducing peak energy demand contributes to the reliability of the energy grid and reduces stress on the transmission system.

**Table 1. Annual Verified Gross Energy Savings and Dollars Saved**

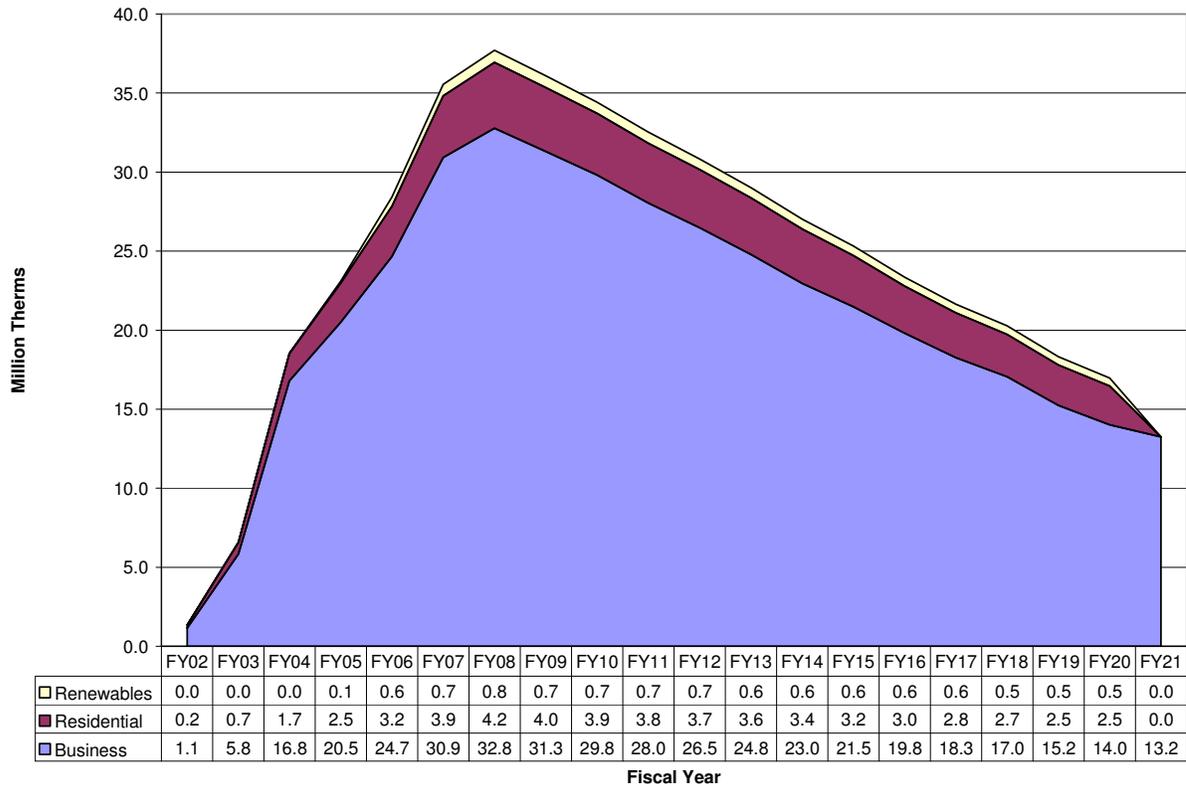
	Annual kWh Saved	Annual kW Saved	Annual Therms Saved	Annual Dollar Value of Energy Saved	Number of Participants
<b>Second Half of 2007 (July 1, 2007–December 31, 2007)</b>					
<b>Total Saved</b>	<b>134,456,104</b>	<b>24,477</b>	<b>5,732,558</b>	<b>\$16,697,668</b>	
Business	96,823,479	19,865	4,407,387	\$11,333,596	6,579
Residential	35,447,002	3,892	973,602	\$4,825,527	83,167
Renewables	2,185,622	721	351,569	\$538,544	106
<b>FY07 (July 1, 2006–June 30, 2007)</b>					
<b>Total Saved</b>	<b>238,215,129</b>	<b>41,000</b>	<b>13,610,670</b>	<b>\$33,809,745</b>	
Business	151,040,005	32,275	11,513,743	\$22,560,136	12,819
Residential	78,656,578	6,855	1,423,453	\$9,853,663	214,800
Renewables	8,518,546	1,871	673,475	\$1,395,946	117
<b>FY06 (July 1, 2005–June 30, 2006)</b>					
<b>Total Saved</b>	<b>218,773,020</b>	<b>41,438</b>	<b>13,058,131</b>	<b>\$32,153,016</b>	
Business	131,761,262	28,280	9,418,597	\$19,432,882	13,023
Residential	73,967,366	11,283	1,573,432	\$9,538,404	226,982
Renewables	13,044,392	1,874	2,066,101	\$3,181,730	92
<b>FY05 (July 1, 2004–June 30, 2005)</b>					
<b>Total Saved</b>	<b>214,916,929</b>	<b>35,903</b>	<b>9,175,257</b>	<b>\$27,775,738</b>	
Business	110,718,465	20,901	7,105,272	\$15,002,791	13,261
Residential	82,290,063	11,740	1,726,542	\$10,583,916	207,861
Renewables	21,908,401	3,262	343,443	\$2,189,031	65
<b>FY04 (July 1, 2003–June 30, 2004)</b>					
<b>Total Saved</b>	<b>228,345,200</b>	<b>37,688</b>	<b>14,469,634</b>	<b>\$33,860,837</b>	
Business	137,366,305	23,540	12,615,132	\$22,264,222	11,754
Residential	90,494,941	13,928	1,640,668	\$11,340,156	212,920
Renewables	483,954	220	213,833	\$256,459	52
<b>FY03 (July 1, 2002–June 30, 2003)</b>					
<b>Total Saved</b>	<b>221,782,713</b>	<b>35,851</b>	<b>8,142,803</b>	<b>\$27,103,787</b>	
Business	128,323,420	21,383	6,196,249	\$15,175,067	6,385
Residential	89,739,440	13,863	1,946,555	\$11,615,880	156,464
Renewables	3,719,852	604	0	\$312,840	31
<b>FY02 (July 1, 2001–June 30, 2002)</b>					
<b>Total Saved</b>	<b>56,501,440</b>	<b>11,717</b>	<b>2,659,333</b>	<b>\$7,661,131</b>	
Business	30,532,158	7,036	1,740,729	\$3,887,897	1,164
Residential	25,968,737	4,680	918,604	\$3,773,202	52,482
Renewables	545	0	0	\$32	1

Figures 1 and 2 below reflect the stream of energy savings over time from program inception to in fiscal year 2002 for twenty years, through fiscal year 2021. These graphs are based on the net savings shown in the table above. The savings implemented each fiscal year continues over the effective useful life of the measures installed to realize the savings. The charts show that the cumulative savings peaks at about 756 GWh and 38 million therms in the second half of 2007 (the current period) and then begins to decline, since it only reflects those measures that have been installed through December 2007. The electricity savings for the residential programs declines much more rapidly that the electricity savings for the business programs because CFLs make up a significant proportion of the residential programs electricity savings and CFLs have an expected measure life of six years, while the T8/T5 fluorescent lighting measures that account for approximately 26 percent of the business programs savings have an expected measure life of fifteen years. There are measures for both programs that have expected measure lives of more than fifteen years.

**Figure 1. Cumulative Electricity Savings (GWh)**



**Figure 2. Cumulative Gas Savings (Million Therms)**

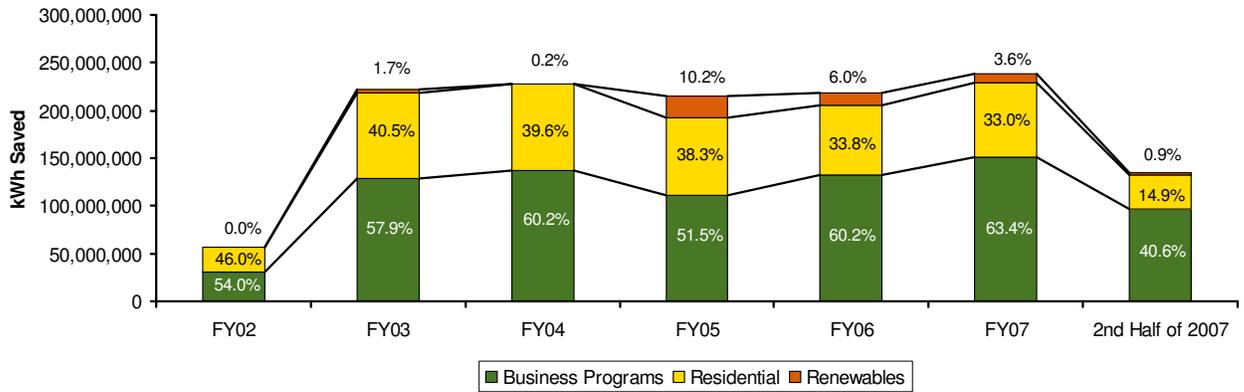


To put these savings into perspective, the total annual savings in this period of 759 GWh and 37 million therms is equivalent to:

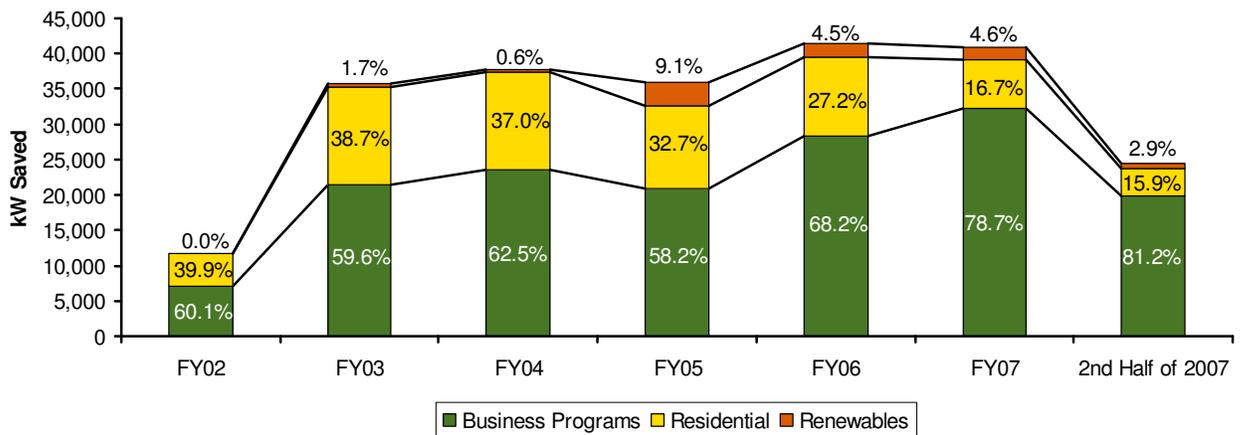
- The amount of energy produced by burning 3,767 rail car loads of coal.
- Enough electricity to power the town of Oconto Falls for over 75 years.
- The same energy value as 2,130,733 barrels of oil.
- The amount of electricity consumed annually by approximately 75,337 average homes in Wisconsin.

These numbers are now based on net cumulative net savings that accounts for equipment failure over time as compared to previous reports where it was a simple sum of first year savings.

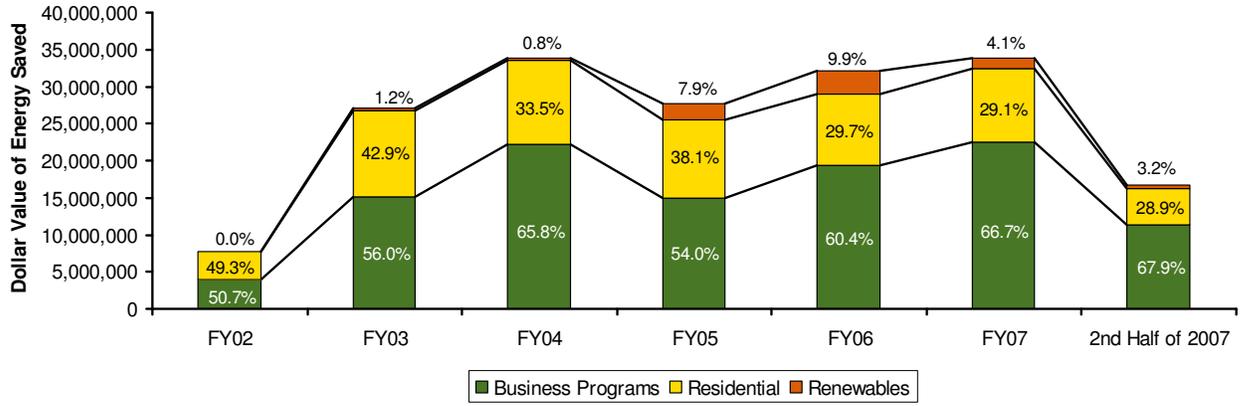
**Figure 3. Verified Gross kWh Saved per Program Year**



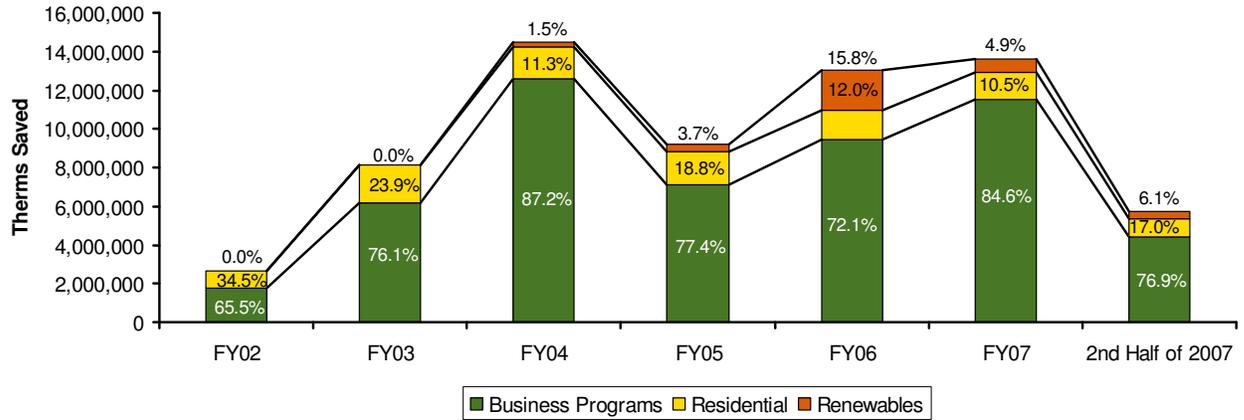
**Figure 4. Verified Gross kW Saved per Program Year**



**Figure 5. Dollar Value of Energy Saved per Program Year**

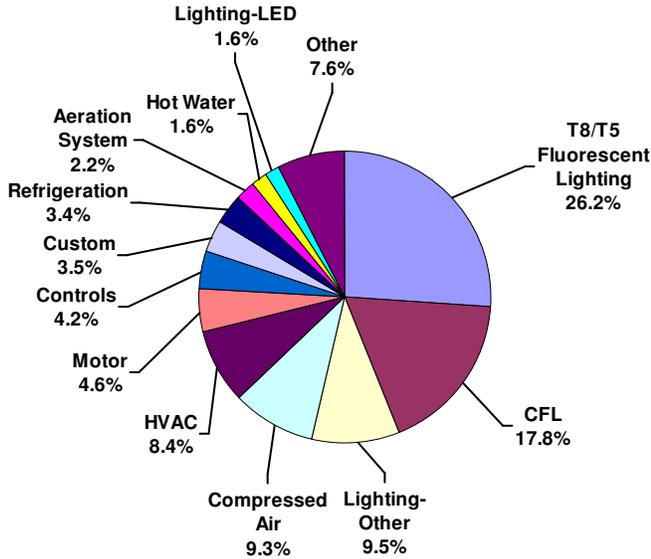


**Figure 6. Verified Gross Therms Saved per Program Year**

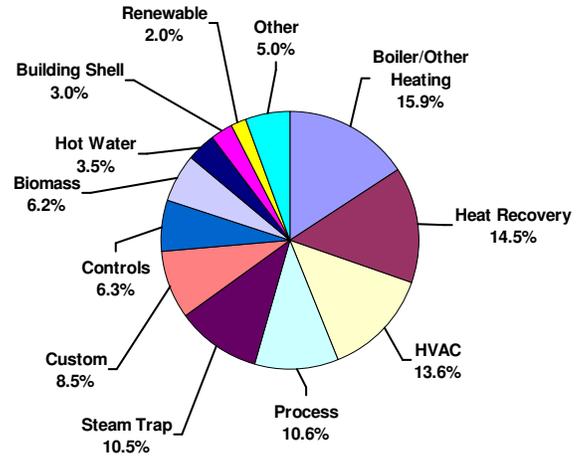


## Percent of Energy Saved to Date by Energy Efficiency Measure (Verified Gross Savings)

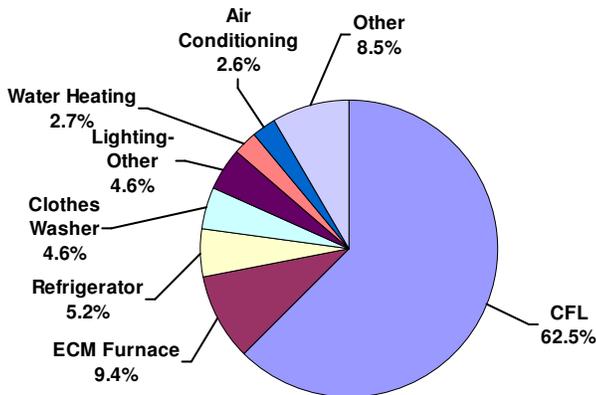
**Figure 7. Electric Energy Impacts by Measure Category Business Programs Program to Date (July 1, 2001–December 31, 2007)**



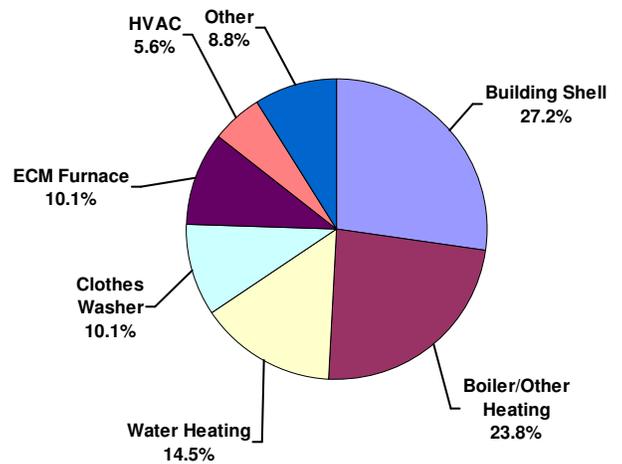
**Figure 8. Gas Energy Impacts by Measure Category Business Programs Program to Date (July 1, 2001–December 31, 2007)**



**Figure 9. Electric Energy Impacts by Measure Category Residential Programs Program to Date (July 1, 2001–December 31, 2007)**



**Figure 10. Gas Energy Impacts by Measure Category Residential Programs Program to Date (July 1, 2001–December 31, 2007)**



## Where in Wisconsin is energy being saved?

One of the goals of Focus is to expand the ability of markets to deliver energy efficiency and renewable energy goods and services to consumers and businesses. It is important for this goal to be achieved throughout the state.

Three maps—Residential, Commercial, and Industrial—have been created to illustrate Focus’s efforts to achieve energy savings and provide benefits in each Wisconsin county (Figures 11, 12, and 13). The maps show the “per capita” dollar value of energy savings for each county. Per capita is the dollar value of energy saved in a county relative to the number of households or businesses in that county eligible to participate in Focus. Using this unit of measurement, the reader can compare savings between two counties with different populations. For example, Jackson County, which has approximately 981 eligible households, has less overall potential for savings than Milwaukee County, which has 377,729 households. But, if you divide the annual energy saved by the participating households in the county by the number of households in that county, Jackson County has saved over \$73 annually per household, compared to around \$28 annually per household in Milwaukee County (see Figure 13).

The dollar value of the energy saved combines the savings realized from gas and electricity at the retail rate. Comparisons cannot be made between maps, because both the definition of per capita and energy savings scales vary by program.

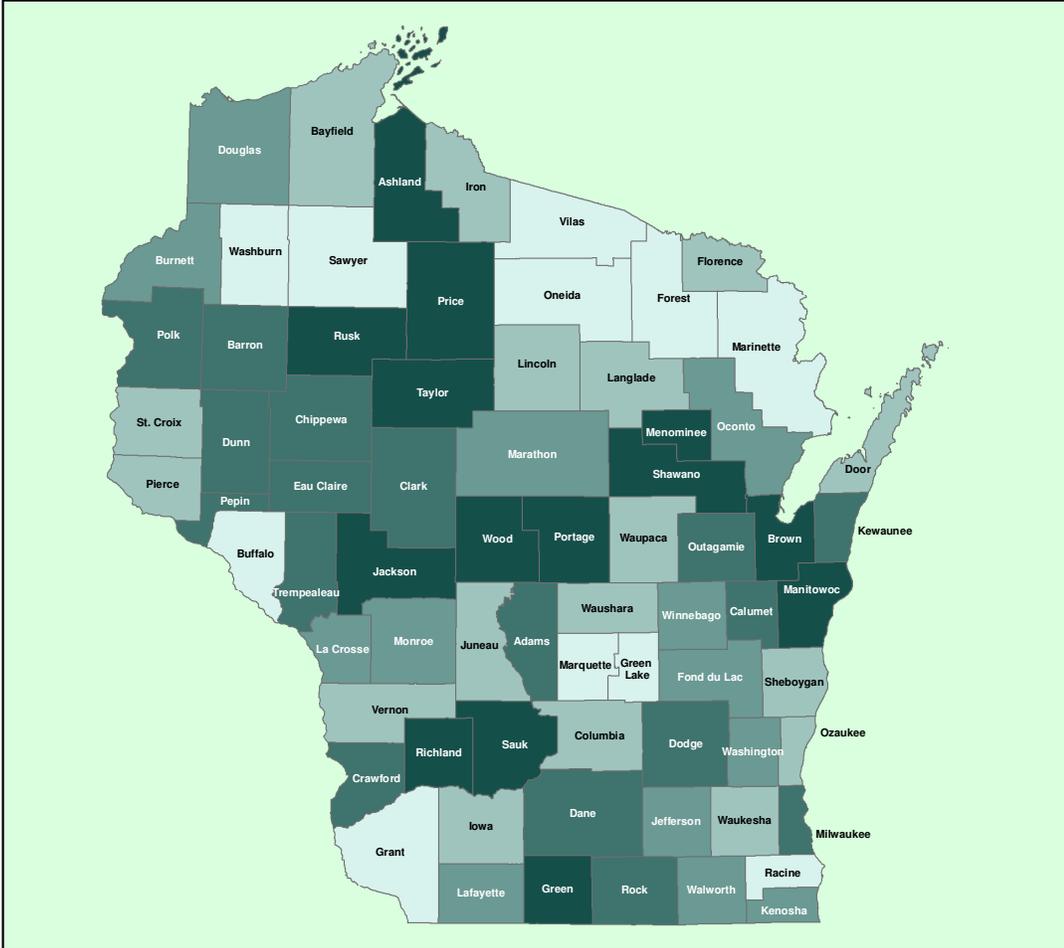
Figure 13 shows that savings by residential households are the most evenly distributed across the state, with some energy being saved in every county. Savings for commercial businesses are also fairly well distributed, also with some energy being saved in every county (see Figure 11). For industrial businesses, seven counties do not have any savings (see Figure 12). One reason for the difference in the number of counties that do not have energy bill savings is the number of participants in each program. There are over 982,904 residential households participating, compared to approximately 54,618 commercial and industrial businesses (including those purchasing compact fluorescent light bulbs). In addition, business projects take longer to implement, often several months to several years, while residential energy saving improvements take days or weeks with product purchases or months to a year for remodeling or construction projects.

## Locations of Renewable Energy Projects in Wisconsin

Projects sponsored by the Renewable Energy Program are widely distributed geographically in Wisconsin, and are mapped by renewable energy type (biogas, hydroelectric, wind machine, solar electric, solar water heating, thermal bioenergy, and other). Also, the county-specific annual value of the resulting energy impacts is detailed in the map (in five category ranges of value). (See Figure 14.)

**Figure 11.**  
**Wisconsin Focus on Energy Commercial Programs**  
**Per Capita Energy, Electric or Gas Bill Savings by County**  
**Net Cumulative Savings (July 1, 2001–December 31, 2007)**

**Wisconsin Focus on Energy Commercial Programs**  
**Per Capita\* Energy, Electric or Gas Bill Savings by County**



**Per Capita Annual Energy, Electric or Gas Bill Savings by County**

	\$0
	\$40.00 - \$100.00
	\$100.01 - \$150.00
	\$151.01 - \$200.00
	\$200.01 - \$250.00
	> \$250.01

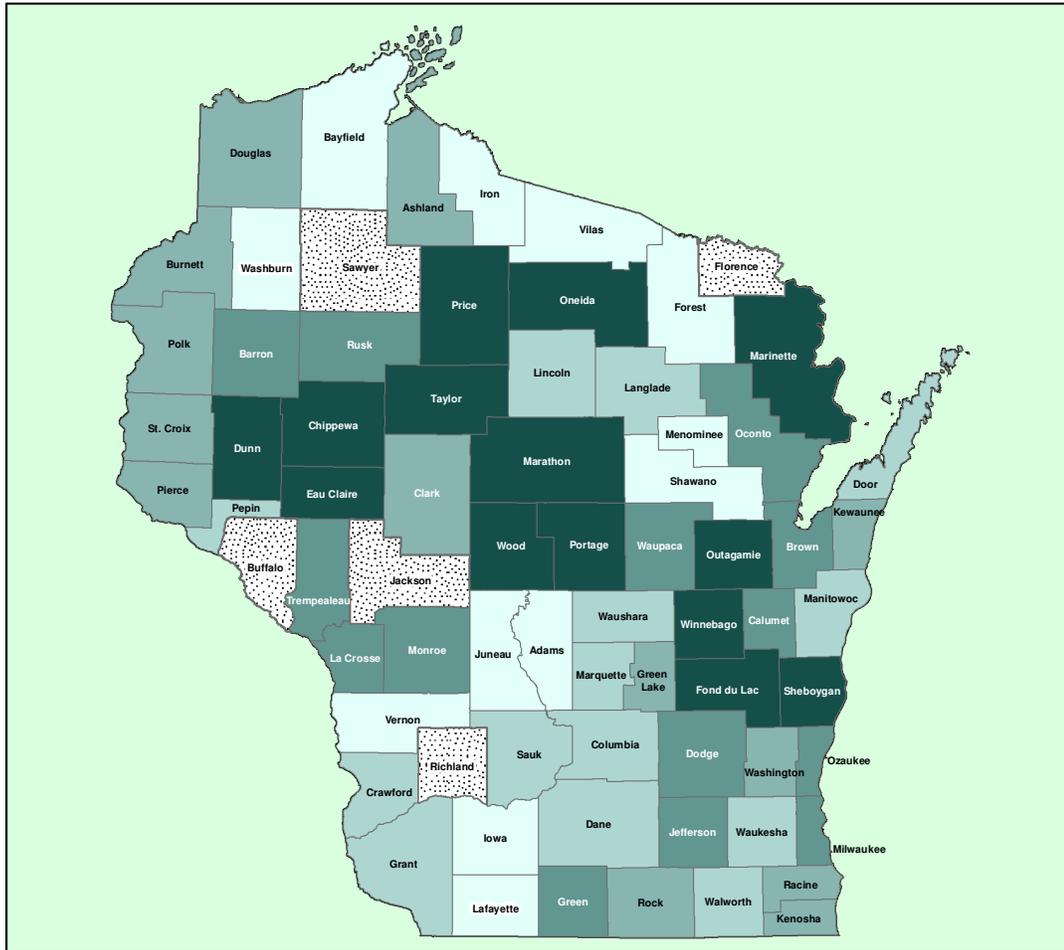
The map above portrays the annual energy, electric or gas bill savings realized by projects implemented through programs targeted at commercial sector businesses as of December 31, 2007. Electric and gas savings have been valued at the average cost of gas and electricity for commercial businesses in Wisconsin and summed for all projects within each county and divided by the number of eligible commercial businesses in that county.

\* The unit of population is commercial customers in industries targeted by the agricultural and commercial business programs in participating utility territories.

Map Produced by: PA Government Services and Patrick Engineering Inc. of The Focus on Energy Evaluation Team. March, 2008.

**Figure 12.**  
**Wisconsin Focus on Energy Industrial Programs**  
**Per Capita Energy, Electric or Gas Bill Savings by County**  
**Net Cumulative Savings (July 1, 2001–December 31, 2007)**

**Wisconsin Focus on Energy Industrial Programs**  
**Per Capita\* Energy, Electric or Gas Bill Savings by County**



**Per Capita Annual Energy, Electric or Gas Bill Savings by County**

	\$0
	\$7.00 - \$50.00
	\$50.01 - \$125.00
	\$125.01 - \$225.00
	\$225.01 - \$575.00
	> \$575.00

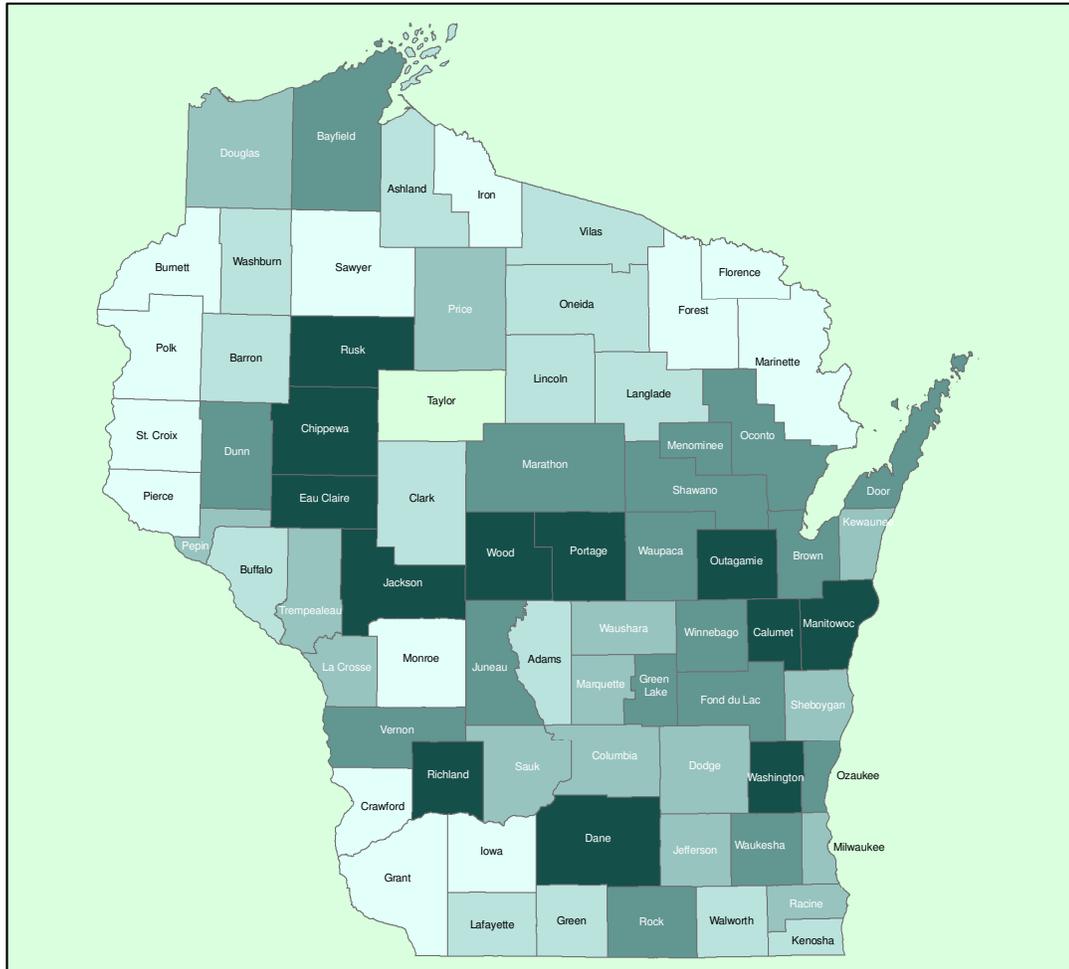
The map above portrays the annual energy, electric or gas bill savings realized by projects implemented through programs targeted at industrial sector businesses as of December 31, 2007. Electric and gas savings have been valued at the average cost of gas and electricity for industrial businesses in Wisconsin and summed for all projects within each county and divided by the number of eligible industrial businesses in that county.

\* The unit of population is industrial customers in industries targeted by the industrial programs in participating utility territories.

Map Produced by: PA Government Services and Patrick Engineering Inc. of The Focus on Energy Evaluation Team. March 2008.

**Figure 13.**  
**Wisconsin Focus on Energy Residential Programs**  
**Per Capita Energy, Electric or Gas Bill Savings by County**  
**Net Cumulative Savings (July 1, 2001–December 31, 2007)**

**Wisconsin Focus on Energy Residential Programs**  
**Per Capita\* Energy, Electric or Gas Bill Savings by County**



**Per Capita Annual Energy, Electric or Gas Bill Savings by County**

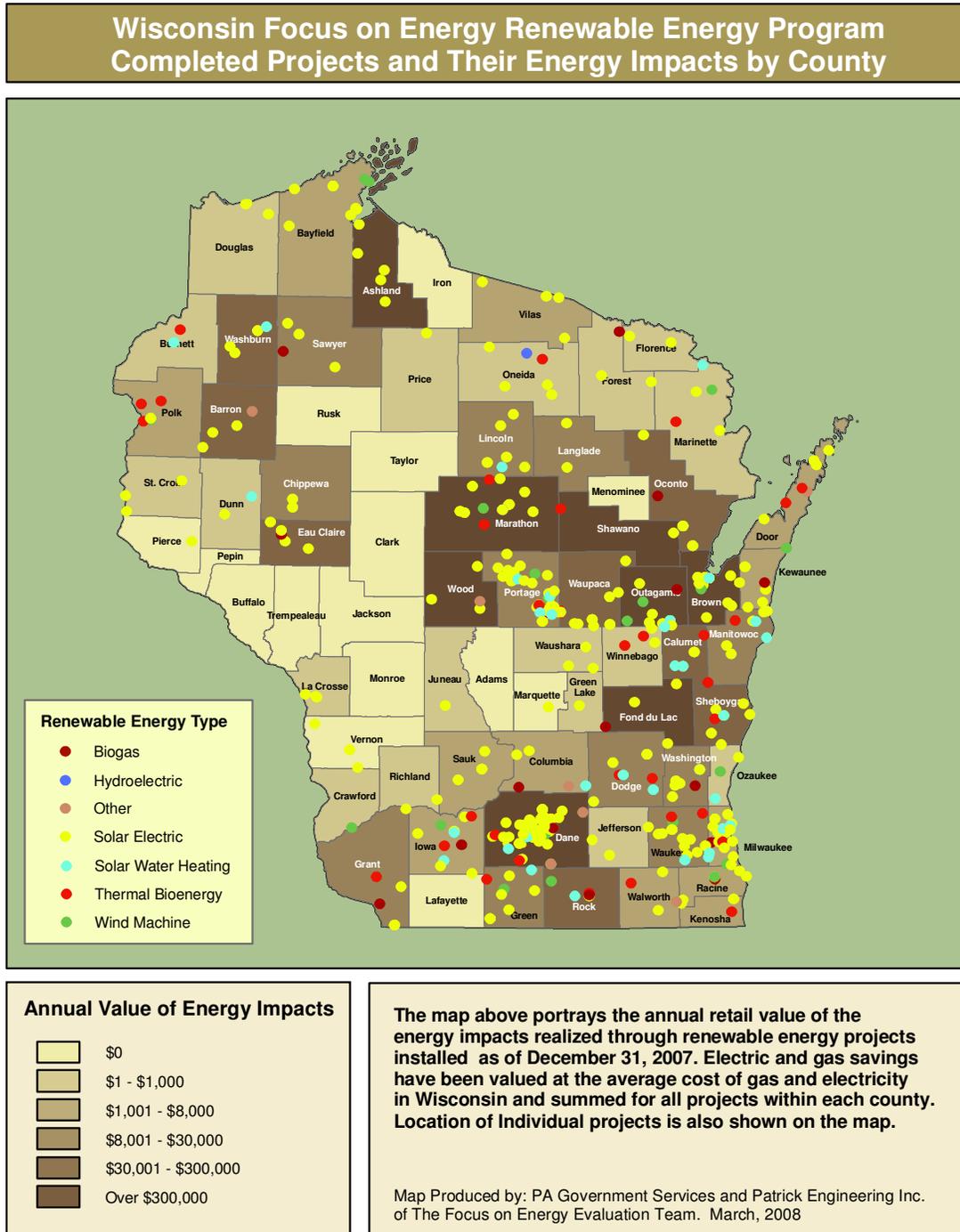
	\$0
	\$4.00 - \$21.00
	\$21.01 - \$25.00
	\$25.01 - \$32.00
	\$30.01 - \$40.00
	> \$40.01

The map above portrays the annual energy, electric or gas bill savings realized by projects implemented through programs targeted at households as of December 31, 2007. Electric and gas savings have been valued at the average cost of gas and electricity in Wisconsin and summed for all projects within each county and divided by the number of eligible households in that county.

\* The unit of population is residential customers in participating utility territories.

Map Produced by: PA Government Services and Patrick Engineering Inc. of The Focus on Energy Evaluation Team. March, 2008.

**Figure 14.**  
**Wisconsin Focus on Energy Renewables Programs**  
**Completed Projects and Their Energy Impacts by County**  
**Net Cumulative Savings (July 1, 2001–December 31, 2007)**



## ECONOMIC IMPACTS: What are they and how are they measured?<sup>ii</sup>

One of the goals of Wisconsin Focus on Energy programs is to support economic development. In general, economic development is a process of enhancing the state’s economy by supporting the growth, retention, and attraction of business activity in the state. By strengthening and diversifying the state’s economic base, Wisconsin residents can enjoy better job opportunities, higher incomes, and higher living standards. Economic prosperity can also increase revenue for state and local government. In an era of global economic change and uncertainty, it is particularly important to see that programs such as Focus are indeed addressing these economic development goals.

Focus directly affects participating business and residential customers’ energy costs. Decreasing energy costs through increased efficiency and conservation can make business operations more profitable and can also leave more money in families’ pockets (to spend on other desired purchases). By lowering costs of doing business, it also makes Wisconsin a more competitive location for additional business attraction, investment, and expansion.

Focus also creates other direct and indirect impacts throughout Wisconsin’s economy. Wisconsin businesses are major manufacturers of heating and air conditioning equipment, motors, and controls. Focus stimulates sales for these industries in Wisconsin as well as the development of solar, wind, and biomass energy production within the state. At the same time as it is increasing the flow of dollars staying within Wisconsin, it is also reducing the outflow of money from the state associated with importation of coal and natural gas.

Table 2 summarizes the economic analysis results for all Focus programs combined—including Residential, Renewables, and Business programs for low and high funding scenarios. The table shows the projected economic impacts for selected years and periods. It also shows how program impacts accumulate over a 25-year interval. These economic impacts are presented in terms of (1) the number of job years created for Wisconsin residents, (2) the sales generated for Wisconsin businesses, (3) the value added portion of those sales, and (4) disposable income generated for Wisconsin residents.

**Table 2. Economic Development Impacts for all Focus on Energy Programs, Low and High Funding Scenarios**

<b>Low Funding Scenario (mil. \$ 2006)</b>	<b>Year 1</b>	<b>Year 5</b>	<b>Year 10</b>	<b>Sum 10 Years</b>	<b>Sum 25 Years</b>
<b>Impact without Market Effects</b>					
Jobs (job year for Sums)	351	1,417	3,216	16,711	60,496
Sales generated	\$39	\$181	\$444	\$2,208	\$8,984
GRP (Value-added)	\$26	\$104	\$265	\$1,310	\$5,415
Disposable income generated	\$12	\$85	\$213	\$1,014	\$4,195
<b>Impact with Market Effects*</b>					
Jobs (job year for Sums)	351	1,418	3,218	16,716	62,296
Sales generated	\$39	\$181	\$444	\$2,209	\$9,261
GRP (Value-added)	\$26	\$104	\$266	\$1,310	\$5,575
Disposable income generated	\$12	\$85	\$213	\$1,014	\$4,366
*note: Renewable program has no built in market effect projections					

High Funding Scenario (mil. \$ 2006)	Year 1	Year 5	Year 10	Sum 10 Years	Sum 25 Years
Impact without Market Effects					
Jobs (job year for Sums)	351	1,417	3,934	18,229	73,233
Sales generated	\$39	\$181	\$549	\$2,438	\$10,863
GRP (Value-added)	\$26	\$104	\$316	\$1,411	\$6,637
Disposable income generated	\$12	\$85	\$257	\$1,097	\$5,095
Impact with Market Effects*					
Jobs (job year for Sums)	351	1,418	3,949	18,275	77,741
Sales generated	\$39	\$181	\$551	\$2,445	\$11,598
GRP (Value-added)	\$26	\$104	\$318	\$1,415	\$7,060
Disposable income generated	\$12	\$85	\$258	\$1,100	\$5,468
*note: Renewable program has no built in market effect projections					

## ENVIRONMENTAL BENEFITS: What are they and how are they measured?

The most significant environmental benefit of Focus is the displacement of emissions from burning coal and natural gas at power plants and the reduction of emissions from the burning of natural gas by utility customers. Sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), mercury (Hg), and carbon dioxide (CO<sub>2</sub>) are the emissions of greatest concern due to their negative impact on health, natural resources, and capital investments. Table 3 shows the pounds of these emissions that will be displaced annually due to the energy efficiency improvements installed by Focus participants.<sup>iii</sup> These displaced emissions are also graphically shown in Figures 15 through 17, expressed in tons.

**Table 3. Net Emissions Displaced Annually from Power Plants and Utility Customers  
(July 1, 2001–December 31, 2007)**

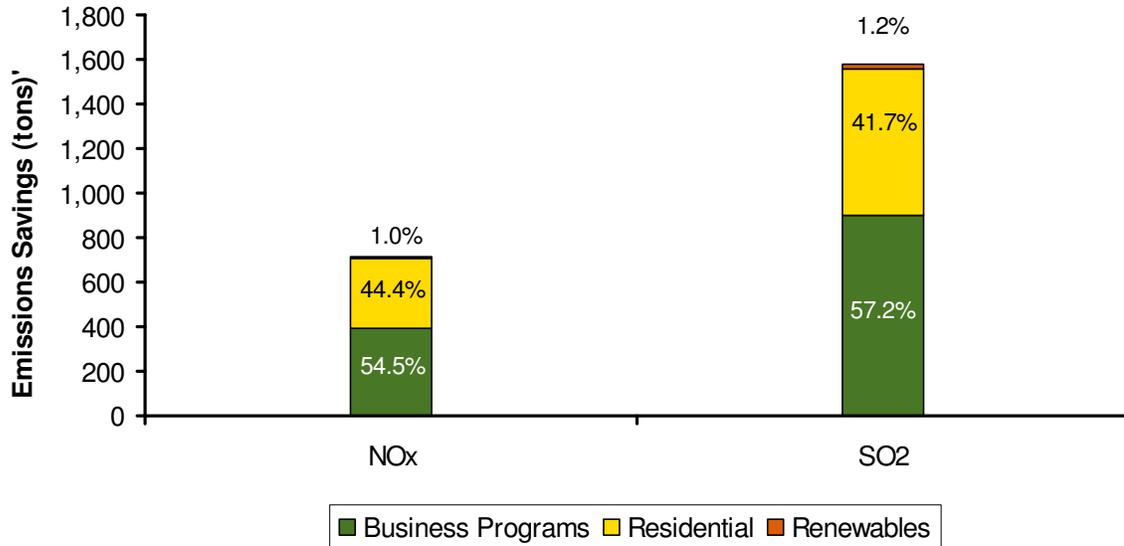
Program Area	Emissions Reductions (Pounds)			
	NO <sub>x</sub>	SO <sub>2</sub>	CO <sub>2</sub>	Mercury
<b>Total Reduction</b>	1,433,622	3,157,076	1,718,046,008	12.56
Business Programs	782,031	1,804,892	1,037,141,384	7.07
Residential Programs	636,543	1,315,520	658,611,289	5.36
Renewable Energy Program	15,048	36,664	22,293,334	0.14

Notes: Based on verified gross savings data

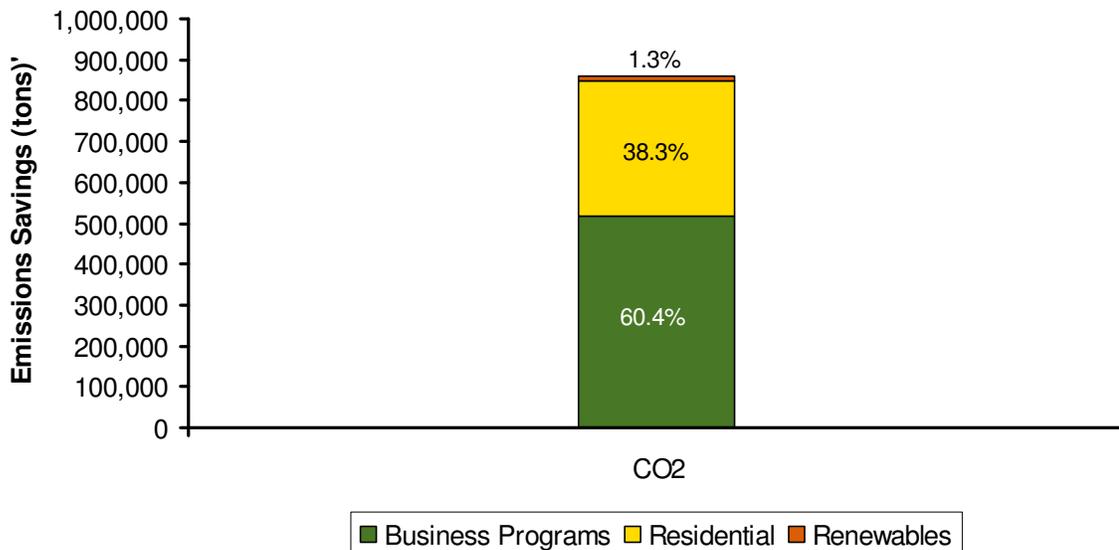
Wisconsin's investor-owned utilities are included in the federal SO<sub>2</sub> regulatory structure of the Clean Air Act (acid rain provisions). In this cap-and-trade system SO<sub>2</sub> emissions cannot be considered reduced or avoided unless EPA lowers the SO<sub>2</sub> cap.

The Department of Natural Resources (DNR) has developed an emissions registry to track emissions reductions in Wisconsin. The ongoing reporting of emissions reductions associated with Focus programs' energy impacts has been the basis for the Division of Energy's entries to DNR's *Voluntary Emissions Reduction Registry* (<http://www.dnr.state.wi.us/org/aw/air/registry/index.html>). For purposes of this Registry, the Focus evaluator serves as the independent third-party verification party for a residential program offered through Wisconsin's Focus on Energy. The program, ENERGY STAR® Products, promotes the installation of energy-efficient appliances, lighting, and windows. Drawing upon the evaluation activities conducted over the past four years, the emissions savings from the Energy Saver compact fluorescent lightbulb portion of the program were verified for the Registry. The calculations, assumptions, and research activity backup that supports the registered reductions in emissions associated with the evaluated energy impacts of the program are cited and available on the state's DNR website.

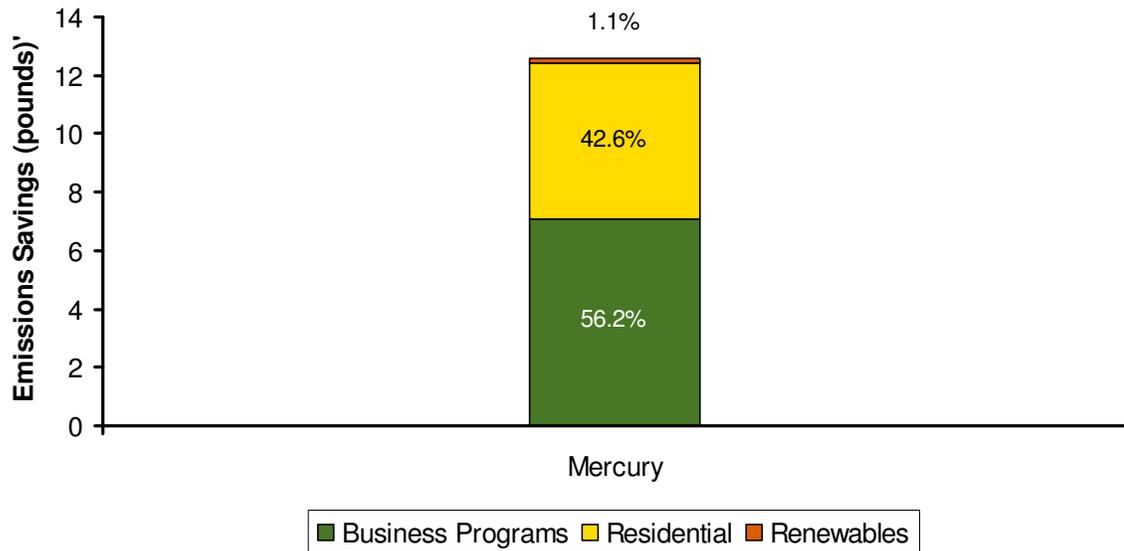
**Figure 15. NO<sub>x</sub> & SO<sub>2</sub> Emissions Displaced by Program Area Net Cumulative in This Year (July 1, 2001–December 31, 2007)**



**Figure 16. CO<sub>2</sub> Emissions Displaced by Program Area Net Cumulative in This Year (July 1, 2001–December 31, 2007)**



**Figure 17. Mercury Emissions Displaced by Program Area  
Net Cumulative in This Year (July 1, 2001–December 31, 2007)**



**NON-ENERGY BENEFITS: What are they and how are they measured?**

Non-energy benefits of the Focus program include benefits for participants—for example, increased health, safety, and comfort—and benefits for the utility companies serving the participants—for example, reduced cost of service. Currently, the identification and valuation of non-energy benefits has been completed for the Business and Residential Programs. A more qualitative analysis of the Renewable Energy NEBs has been completed and an approach to quantification of these NEBs is based on program energy savings.

Table 4 shows non-energy benefits for the Business, Residential, and Renewable program areas. The dollar values assigned to these benefits were determined from prior research and from an analysis of the non-energy benefits accruing from implemented energy efficiency improvements.

**Table 4. Annual Value of Non-energy Benefits  
(July 1, 2001–December 31, 2007)**

Program Area	Value of Non-energy Benefits	
	2007 Jul–Dec	Program to Date as of December 31, 2007
<b>Business Programs</b>	\$2.3 million	\$20.2 million
<i>Example Benefits from Business Programs:</i> <ul style="list-style-type: none"> <li>• Maintenance employee morale</li> <li>• Equipment life</li> <li>• Productivity</li> <li>• Waste generation</li> </ul>	<ul style="list-style-type: none"> <li>• Defects and errors</li> <li>• Sales</li> <li>• Non-energy costs</li> <li>• Personnel needs</li> <li>• Injuries and illnesses.</li> </ul>	
<b>Residential Programs</b>	\$2.4 million	\$25.1 million
<i>Example Benefits from Residential Programs:</i> <ul style="list-style-type: none"> <li>• Increased safety resulting from a reduction of gasses like carbon monoxide due to the installation of a new high-efficiency furnace</li> <li>• Fewer illnesses resulting from elimination of mold problems due to proper air sealing, insulating and ventilation of a home</li> <li>• Reduced repair and maintenance expense due to having newer, higher quality equipment</li> <li>• Increased property values resulting from installation of new equipment</li> <li>• Reduced water and sewer bill from installation of an ENERGY STAR qualified washing machine, which uses much less water than conventional washing machine.</li> </ul>		
<b>Renewable Energy Programs</b>	\$34,343	\$761,245
<i>Example Benefits from Renewable Energy Programs:</i> <ul style="list-style-type: none"> <li>• Greater diversity of primary in-state energy supplies</li> <li>• Use of wastes as a fuel instead of disposal</li> <li>• Increased ability to handle energy emergencies or generation short-falls</li> <li>• Increased sales of renewable energy by-products.</li> </ul>		

## BENEFIT-COST ANALYSIS<sup>iv</sup>

The first step in conducting a benefit-cost analysis of a program is to list the costs and benefits involved. Table 5 shows each element of the benefit-cost analysis for Focus and whether the element is added to or subtracted from the benefit or cost side.

The **benefits** of Focus consist of both pluses and minuses. The four major impacts discussed earlier—energy, economic, environmental, and other non-energy benefits—are all pluses. Market effects—the positive effect that Focus has on the market for energy efficiency goods and services—is also a plus (and is also included in the economic, environmental and non-energy benefits). Incentives paid to participants are a plus, but the portion the participant must pay to receive energy efficiency improvements through Focus is a minus on the benefits side of the equation.<sup>v</sup> The **costs** of Focus include total program spending and the cost of incentives paid to participants.

The analysis takes a societal perspective to counting Focus benefits and costs. The “simple” B/C test (results presented below in Table 5) is somewhat conservative. It counts as benefits only the avoided costs of well documented energy savings. These avoided costs include the value of

avoided emissions for which active offset markets currently exist. The simple test is comparable to Total Resource Cost or Societal tests typically done in other states.

The “expanded” test used is intended to be more realistic by including a broader range of effects (Table 6, below). However, including this broader set of effects requires using estimates that have somewhat less empirical certainty and that are not necessarily counted in other jurisdictions.

Costs in both tests are program spending, excluding incentive payments, and customer incremental costs for measures attributable to the programs.

The expanded B/C test expands upon the simple test in several ways.

- Market effects are counted that are considered reasonably likely, but have not been rigorously or precisely quantified in impact analysis to date.
- Non-energy benefits (and costs) are included for all programs.
- Avoided emissions externality costs for expected future emissions offset markets are counted as a benefit.
- Benefits are valued in terms of their net impact on the economy, as determined from the economic impact analysis. The net economic impacts take into account the economic ripple effects on the Wisconsin economy of energy savings and associated non-energy and emissions effects.

**Spending Scenarios.** For this long-term analysis, conducted in the middle of the life of the program, it is necessary to establish meaningful assumptions of the levels and duration of future program spending. Two spending scenarios are considered.

- The low-funding version of the analysis assumes that spending levels will be similar to those observed in the first five program years. This version indicates the cost-effectiveness of the program as it has existed to date, but assumes a longer total program life. The low-funding scenario provides a minimum realistic benefit-cost assessment.
- The high-funding version assumes that spending rises based on the currently legislated funding levels for the remaining years. Under this scenario, we also count additional market effects that are reasonably likely under increased funding but have not been documented for the programs so far. Thus, the high-funding scenario provides a measure of likely cost-effectiveness of the programs as they could proceed under current funding plans.

**Benefit-Cost Analysis Results.** In terms of benefit-cost ratios, the low- and high-funding scenarios gave very similar results for Focus as a whole, as well as for the Business and Residential program areas and individual programs. We present the high-funding results as representing a more likely future path for the programs. The consistency with the low-funding results reduces possible concern that the cost-effectiveness would be overstated if future funding turns out to be less than currently planned.

Focus as a whole is projected to have positive net benefits for the state for all forms of the benefit-cost comparison conducted. For the expanded test, high-funding assumption, the projected net present value of 10 years of program operations over a 25-year horizon is a net benefit of \$4.4 billion. The benefit-cost ratio for Focus as a whole is 5.3. Under the more conservative simple test, net benefits are \$1.4 billion, with a benefit-cost ratio of 2.4.

**Table 5: Benefits and Costs by Program Area  
25-Year Net Present Value (\$000,000), Simple B/C Test, High Funding**

<b>Program Area</b>	<b>Benefits</b>	<b>Costs</b>	<b>Net Benefits</b>	<b>B/C Ratio</b>
<b>Residential</b>	\$785	\$469	\$316	1.7
<b>Business</b>	\$1,499	\$483	\$1,016	3.1
<b>Renewables</b>	\$94	\$56	\$38	1.7
<b>Total</b>	\$2,377	\$1,008	\$1,369	2.4

**Table 6: Benefits and Costs by Program Area  
25-Year Net Present Value (\$000,000), Expanded B/C Test, High Funding**

<b>Program Area</b>	<b>Benefits</b>	<b>Costs</b>	<b>Net Benefits</b>	<b>B/C Ratio</b>
<b>Residential</b>	\$1,418	\$469	\$950	3.0
<b>Business</b>	\$3,577	\$483	\$3,094	7.4
<b>Renewables</b>	\$366	\$56	\$310	6.5
<b>Total</b>	\$5,361	\$1,008	\$4,353	5.3

The Residential Portfolio has projected benefits substantially above the program costs. The net benefit is estimated at \$0.3 billion using the simple test and \$1 billion with the expanded test. The benefit-cost ratio is 1.7 using the simple test and 3.0 using the expanded test. A large fraction of the program area achievement comes from compact fluorescent bulbs, both through direct savings tracked by the program and through market effects savings. The ENERGY STAR® Products (ESP) program, which is dominated by the CFL effort, has the highest simple B/C ratio of any of the Residential Programs.

The Business Program area has net benefits of \$1 billion and a benefit-cost ratio of 3.1 under the simple test and \$3.1 billion and 7.4 under the expanded test. These B/C ratios represent improvements compared to the findings from the Initial B/C report. Contributors to this improvement include increased attribution levels based on the most recent impact report, some projected added market effects savings, and, for the expanded B/C analysis, the inclusion of non-energy benefits. (The increased attribution stems largely from the change in attribution method for CFLs, applying the same analysis as has been used in the past for the Residential CFLs.)

For the Renewables program, the Low scenario appears to represent a more realistic estimate of the overall B/C ratio than does the High scenario. Under this scenario, the B/C ratio is 1.7 using the simple test, and 6.5 using the expanded test. Thus, even under the most conservative analysis, the program is cost-effective.

## Appendix A: Endnotes

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<sup>i</sup> Calculations by the state of Wisconsin, Department of Administration, Division of Energy.

<sup>ii</sup> Information for this section taken from *Economic Development Benefits: FY07 Economic Impacts Report*. Lisa Petraglia, Glen Weisbrod, Brian Baird. Final: February 23, 2007.

<sup>iii</sup> <sup>a</sup> *Estimating Seasonal and Peak Environmental Emissions Factors*. Jeff Erickson with Carmen Best, David Sumi, Bryan Ward, Bryan Zent, and Karl Hausker; PA Government Services Inc. Report for the Wisconsin Department of Administration, Division of Energy. Focus on Energy statewide evaluation. May 2004.

<sup>b</sup> EPA's *E-Grid 2000 database* with data for the MAIN and MAPP NERC regions from 1998.

<sup>iv</sup> *Interim Benefit-Cost Analysis: FY07 Evaluation Report*. Miriam L. Goldberg, Chris Clark, Sander Cohan. Final: February 26, 2007.

<sup>v</sup> Please note that this is a gross simplification of what is involved in a benefit-cost analysis. A more complete explanation is included in the report that serves as the source for this information (see *Initial Benefit-Cost Analysis*. PA Government Services Inc. Final Report: March 31, 2003).