

# State of Wisconsin Department of Administration Division of Energy

Focus on Energy Public Benefits Evaluation\*  
*Semiannual Summary Report (FY06, Year-end)*  
Final: September 29, 2006

Evaluation Contractor: PA Government Services Inc.

Prepared by the Focus evaluation team

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\* Includes Low-income Public Benefits Evaluation.



...ty of the state of Wisconsin, Wisconsin Department of Administration,  
... 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 Wisconsin Department of Administration's Division of Energy. 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. They also review relevant documents on similar topics compiled by other professional research organizations.

The results of these extensive evaluation efforts have been presented in detail in prior evaluation reports. Many of the relevant reports are included 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 reductions in power plant pollution emissions attributable to saved energy.
- **Other non-energy benefits**—the value of increased health, safety, and comfort.

**Benefit-Cost Analysis**

The *Benefit-Cost Analysis* section later in this report 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.

**Low-income Public Benefits Evaluation**

Included in Focus on Energy are two programs operated by the Wisconsin Department of Administration, Division of Energy. Both programs are designed to help households with incomes at or below 150% of poverty level. The programs differ in what they offer to low-income customers. The Wisconsin Home Energy Assistance Program (WHEAP) assists customers with payment of utility bills; and the Weatherization Assistance Program (WAP) implements energy efficiency

**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 Public Benefits Evaluation: Semiannual Summary Report (FY06, Year-end)* available at the Department of Administration, Division of Energy’s online Reference Center.

improvements to the homes of low-income households. The impacts of the low-income programs, energy and non-energy, are provided in the *Low-income Public Benefits Evaluation* section at the end of this report.

### 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 (January 1–June 30, 2006) and for the program to date (since July 1, 2001). 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>\$85.98/ year</b>
<b>Average Energy Savings per Participating Business</b>	<b>\$1,968.55/ 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 1 through 8). Figures 9 through 12 show the percent of energy saved to date by measure categories in the Business Program and the Residential Program.

The total annual dollar value of kWh and therms saved for the program to date was over \$79.8 million in electricity savings (kWh) and over \$49.3 million in gas savings (therms). The lifetime dollar value of kWh and therms saved (not shown in the table) is over \$666.9 million and over \$433.8 million, respectively. 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. Also, a great deal of Renewable Energy Program effort has been directed towards a number of large scale projects (of at least 100 kW capacity) that can take over 18 months to bring online once all of the funding issues have been finalized.

To date, Focus programs have also reduced peak electrical demand in Wisconsin by over 160.1 megawatts (not shown in the table). Reducing peak energy demand improves 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 Dollar Value of kWh Saved	Annual Therms Saved	Annual Dollar Value of Therms Saved	Number of Participants
<b>FY06 (July 1, 2005–June 30, 2006)</b>					
<b>Total Saved</b>	<b>198,228,057</b>	<b>\$17,198,064</b>	<b>12,847,200</b>	<b>\$13,301,758</b>	
Business	111,617,300	\$8,095,274	9,674,031	\$9,624,055	13,117
Residential	73,991,451	\$7,776,501	1,602,851	\$1,857,704	229,043
Renewable Energy	12,619,307	\$1,326,289	1,570,318	\$1,819,999	93
<b>Program to Date (June 1, 2001–June 30, 2006)</b>					
<b>Total Saved</b>	<b>931,660,730</b>	<b>\$79,883,666</b>	<b>47,882,278</b>	<b>\$49,297,610</b>	
Business	534,671,984	\$38,160,149	37,645,242	\$37,432,886	38,400
Residential	358,256,596	\$37,652,768	8,107,549	\$9,396,649	547,224
Renewable Energy	38,732,150	\$4,070,749	2,129,487	\$2,468,075	246
<b>FY05 (July 1, 2004–June 30, 2005)</b>					
<b>Total Saved</b>	<b>228,658,724</b>	<b>\$19,725,787</b>	<b>9,357,431</b>	<b>\$9,641,929</b>	
Business	124,511,649	\$8,779,929	7,294,858	\$7,251,406	11,284
Residential	82,237,365	\$8,643,147	1,718,951	\$1,992,265	208,894
Renewable Energy	21,909,710	\$2,302,711	343,622	\$398,258	69
<b>FY04 (July 1, 2003–June 30, 2004)</b>					
<b>Total Saved</b>	<b>229,804,131</b>	<b>\$19,326,839</b>	<b>14,750,286</b>	<b>\$14,941,434</b>	
Business	139,345,186	\$9,819,604	12,679,554	\$12,541,455	12,145
Residential	89,974,794	\$9,456,351	1,856,899	\$2,152,146	213,847
Renewable Energy	484,151	\$50,884	213,834	\$247,834	57
<b>FY03 (July 1, 2002–June 30, 2003)</b>					
<b>Total Saved</b>	<b>220,011,486</b>	<b>\$18,934,736</b>	<b>8,200,071</b>	<b>\$8,529,241</b>	
Business	128,661,286	\$9,333,830	6,204,370	\$6,216,224	7,448
Residential	87,631,763	\$9,210,098	1,993,987	\$2,311,031	156,526
Renewable Energy	3,718,437	\$390,808	1,713	\$1,985	26
<b>FY02 (July 1, 2001–June 30, 2002)</b>					
<b>Total Saved</b>	<b>54,958,331</b>	<b>\$4,698,240</b>	<b>2,727,289</b>	<b>\$2,883,249</b>	
Business	30,536,563	\$2,131,512	1,792,429	\$1,799,746	1,183

	Annual kWh Saved	Annual Dollar Value of kWh Saved	Annual Therms Saved	Annual Dollar Value of Therms Saved	Number of Participants
Residential	24,421,223	\$2,566,671	934,860	\$1,083,503	56,109
Renewable Energy	545	\$57	0	\$0	1

To put these savings into perspective, the total annual savings to date of 931,660,730 kWh and 47,882,278 therms is equivalent to:<sup>1</sup>

- The amount of energy produced by burning 4,658 rail car loads of coal.
- Enough electricity to power the town of Oconto Falls for over 93 years.
- The same energy value as 2,656,732 barrels of oil.
- The amount of electricity consumed annually by approximately 93,166 average homes in Wisconsin.

Figure 1. Verified Gross kWh Saved per Program Year)

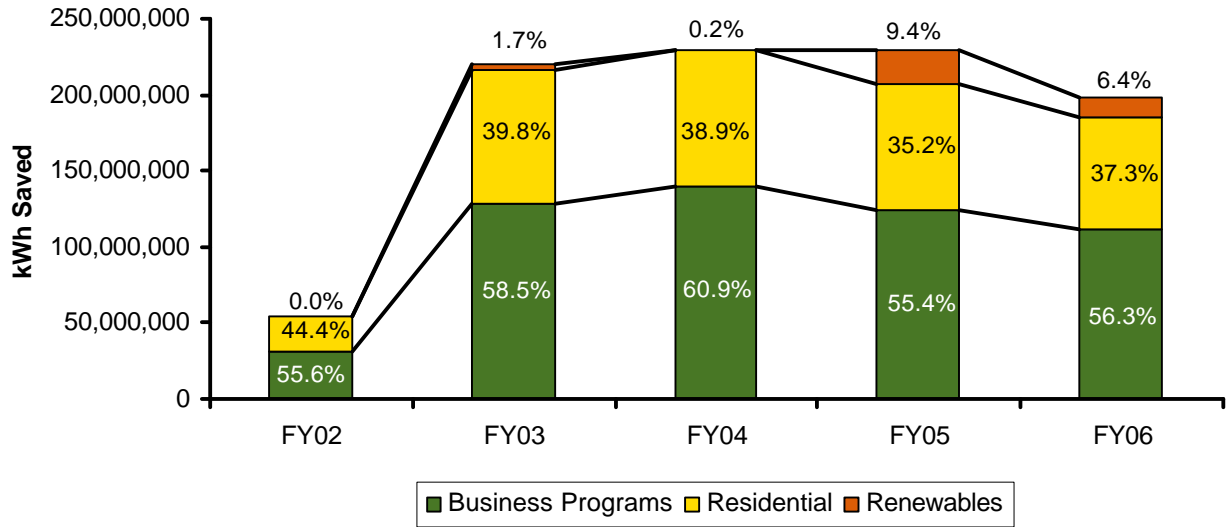


Figure 2. kWh Saved to Date

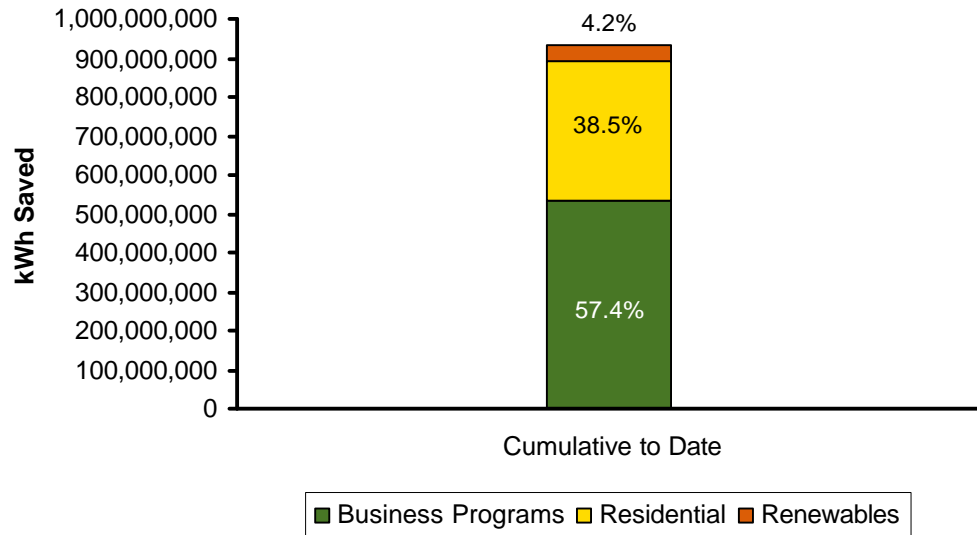


Figure 3. Dollar Value of kWh Saved per Program Year

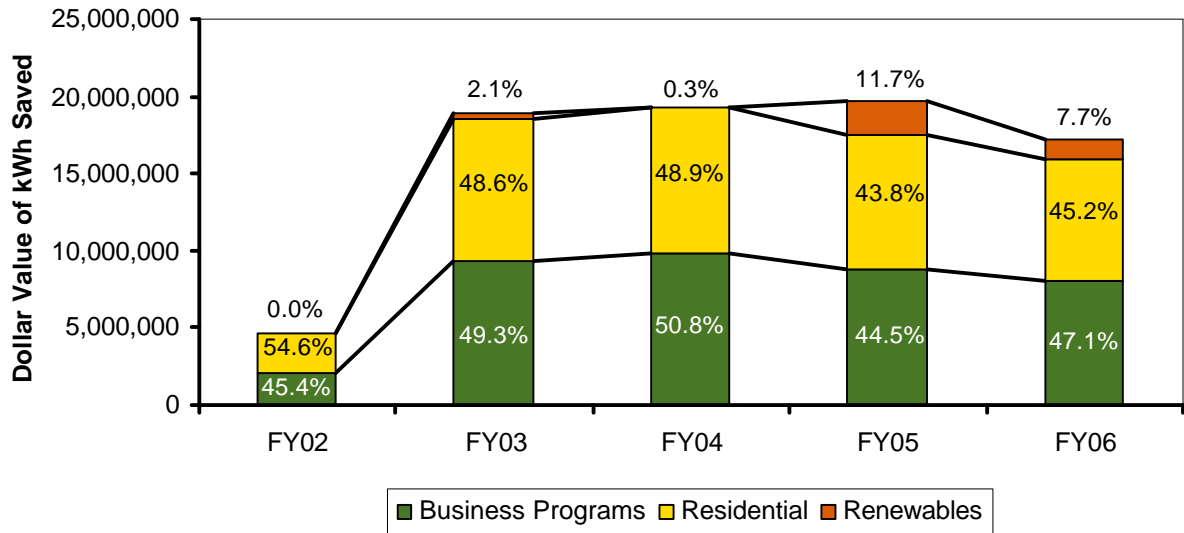


Figure 4. Dollar Value of kWh Saved for All Years Program to Date (July 1, 2001–June 30, 2006)

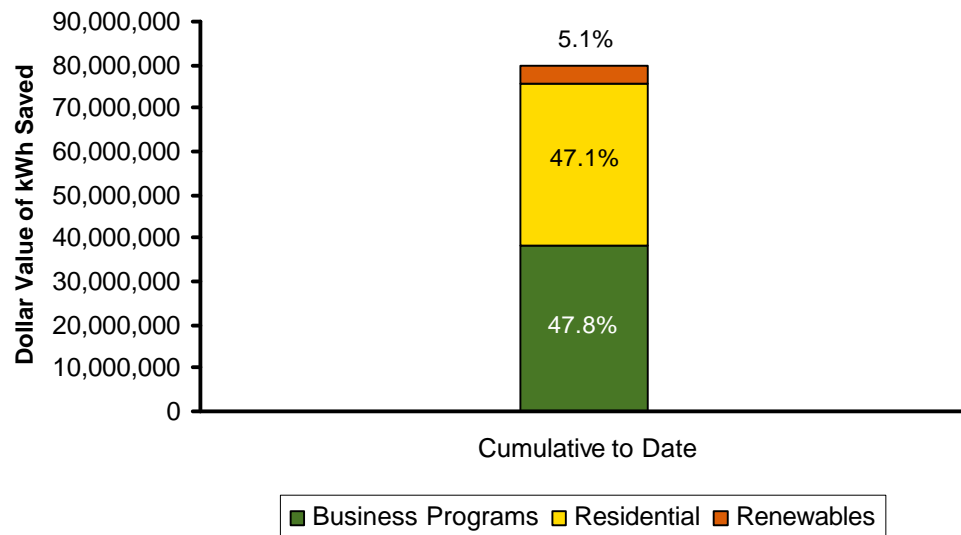


Figure 5. Verified Gross Therms Saved per Program Year

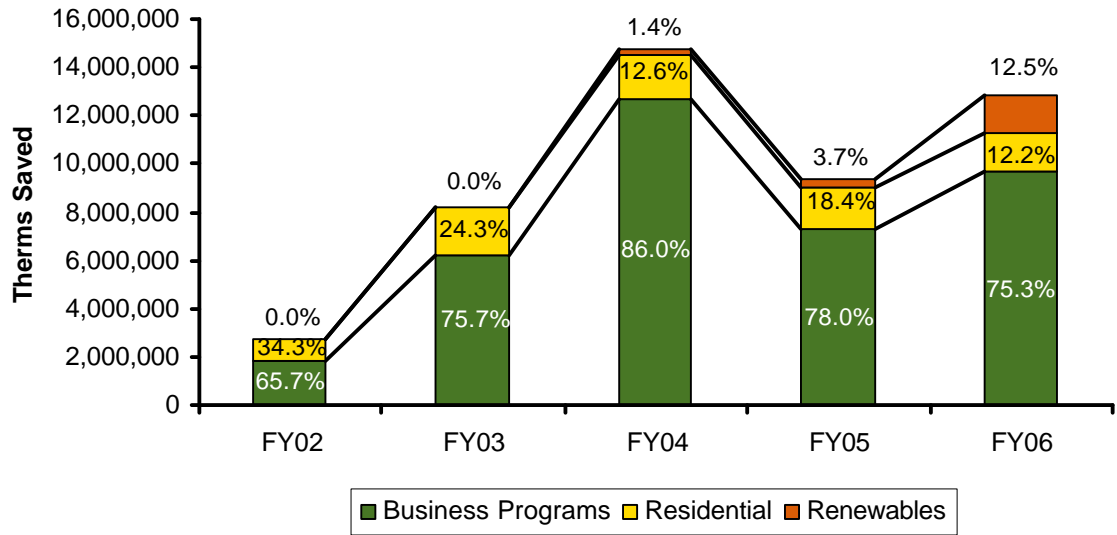


Figure 6. Therms Saved for All Years Program to Date (July 1, 2001–June 30, 2006)

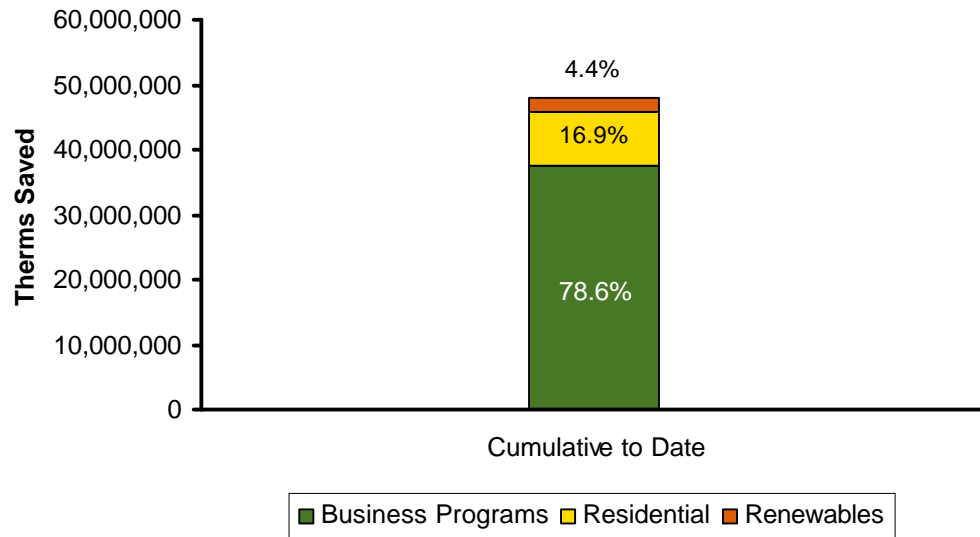


Figure 7. Dollar Value of Therms Saved per Program Year

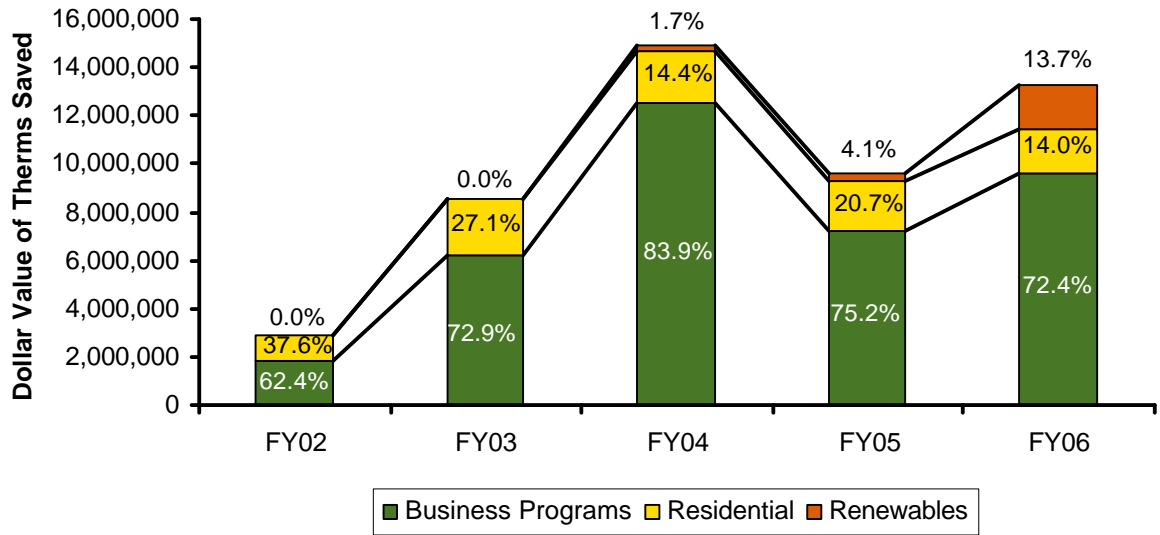
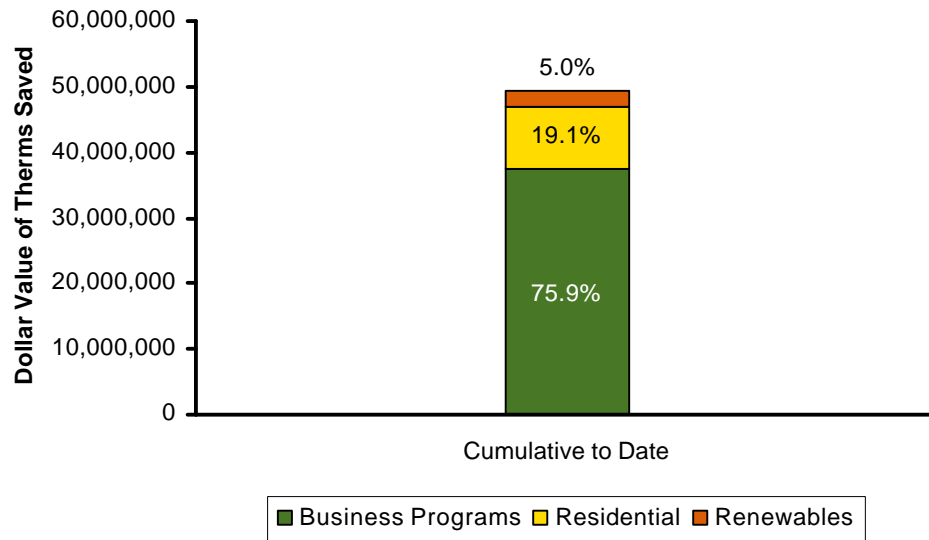
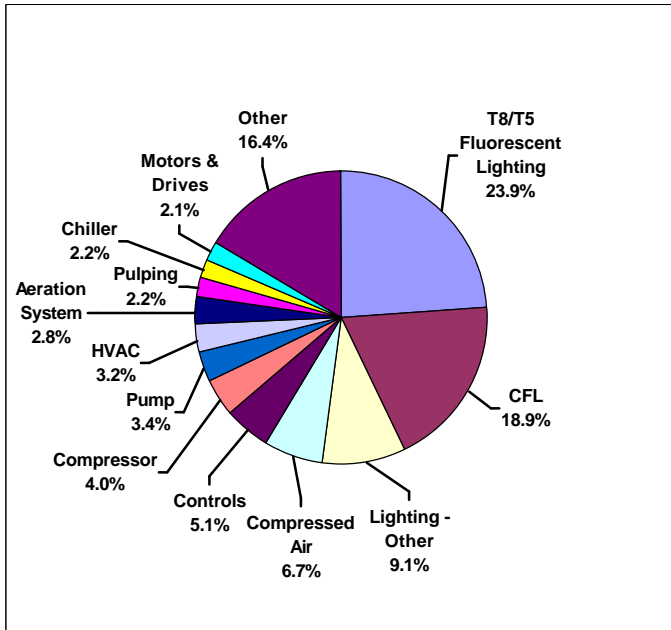


Figure 8. Dollar Value of Therms Saved for All Years Program to Date (July 1, 2001–June 30, 2006)

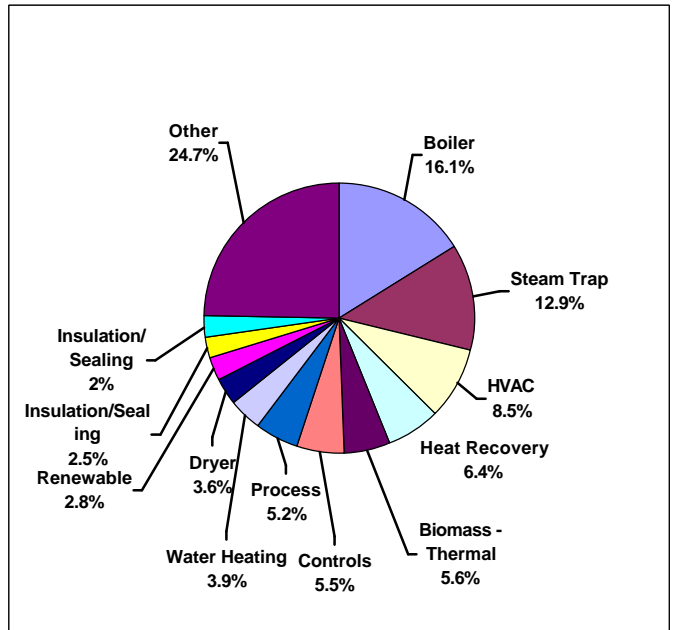


**Percent of Energy Saved to Date by Energy Efficiency Measure  
(Verified Gross Savings)**

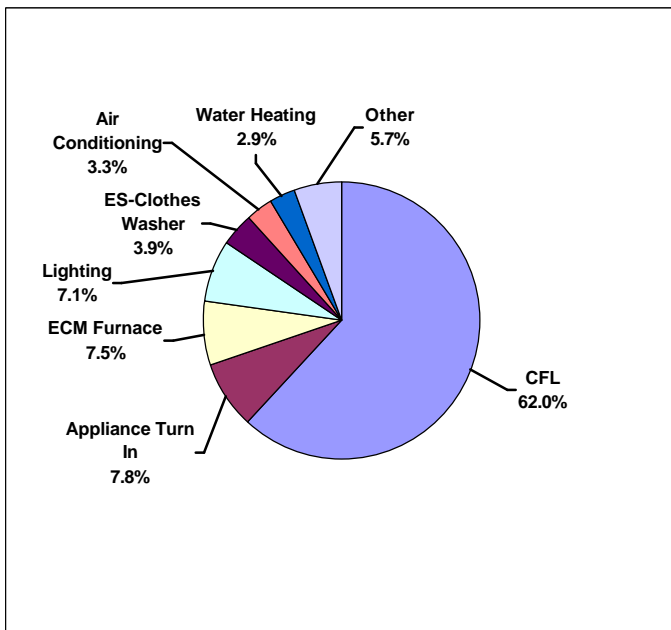
**Figure 9. Electric Energy Impacts by Measure Category  
Business Programs  
Program to Date (July 1, 2001–June 30, 2006)**



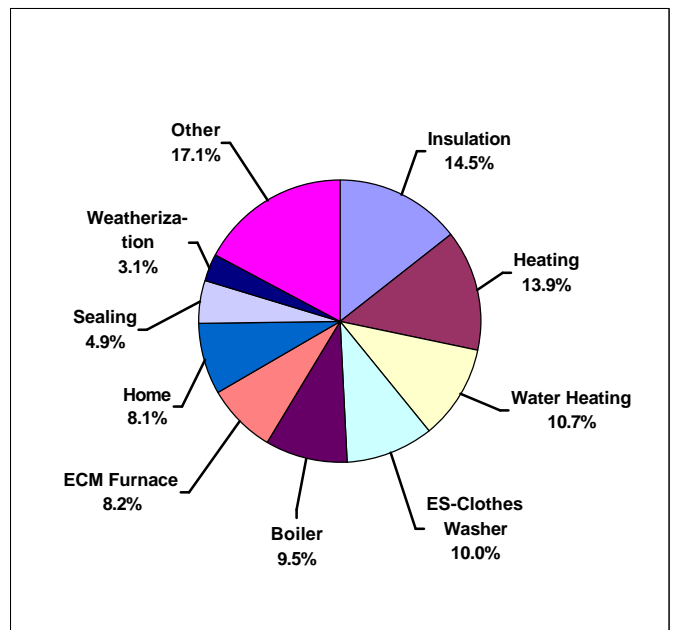
**Figure 10. Gas Energy Impacts by Measure Category  
Business Programs  
Program to Date (July 1, 2001–June 30, 2006)**



**Figure 11. Electric Energy Impacts by Measure Category  
Residential Programs  
Program to Date (July 1, 2001–June 30, 2006)**



**Figure 12. Gas Energy Impacts by Measure Category  
Residential Programs  
Program to Date (July 1, 2001–June 30, 2006)**



## 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 13, 14, and 15). 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 \$53.73 annually per household, compared to around \$21.88 annually per household in Milwaukee County (see Figure 15).

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.

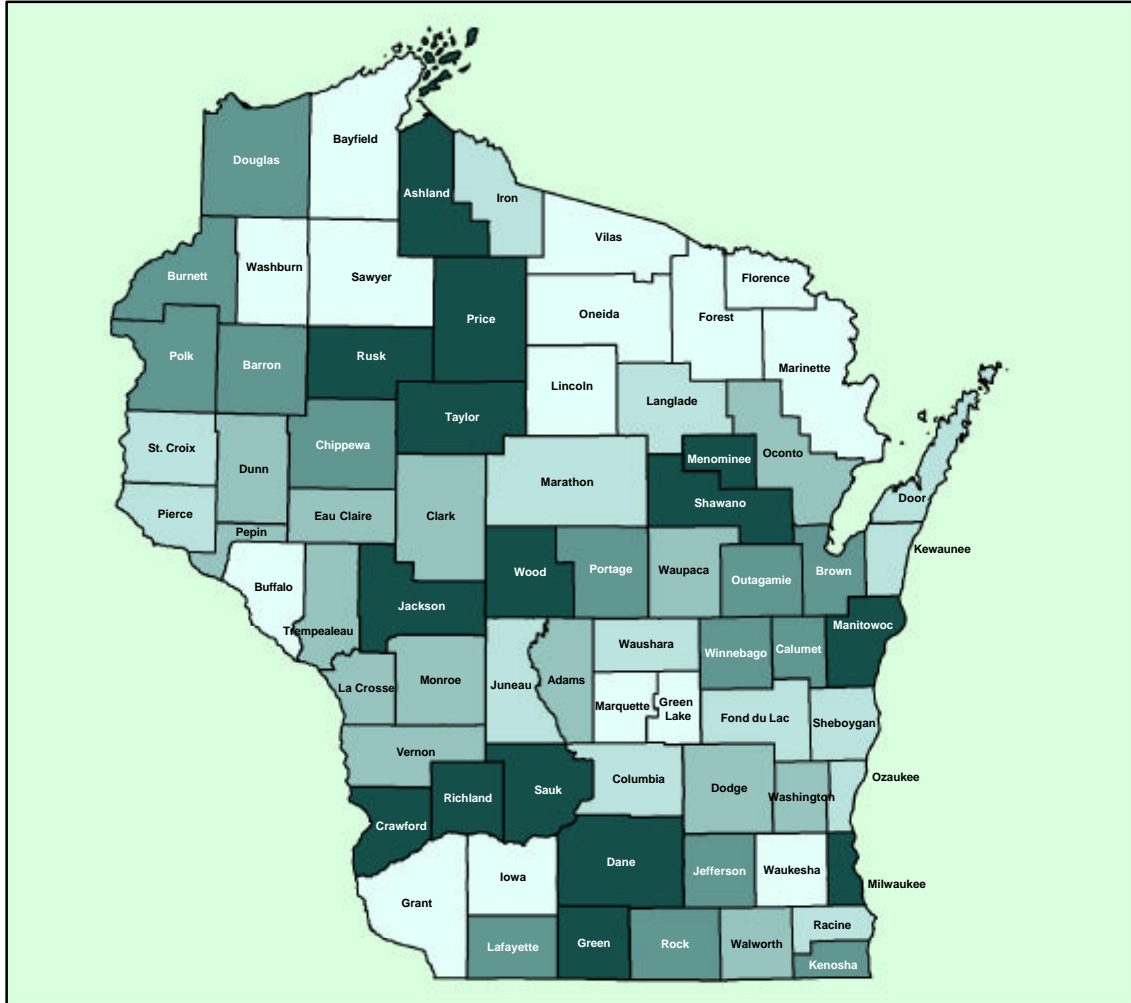
Figure 15 shows that savings by residential households are the most evenly distributed across the state, with some energy being saved in every county. Savings for commercial businesses are also fairly well distributed, also with some energy being saved in every county (see Figure 13). For industrial businesses, eight counties do not have any savings (see Figure 14). 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 540,000 residential households participating, compared to approximately 38,400 commercial and industrial businesses (including those purchasing compact fluorescent lightbulbs). 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 16)

**Figure 13.**  
**Wisconsin Focus on Energy Commercial Programs**  
**Per Capita Energy Bill Savings by County**

**Wisconsin Focus on Energy Commercial Programs**  
**Per Capita\* Energy Bill Savings by County**



**Per Capita Annual Energy Bill Savings by County**

	\$0
	\$1 - \$110.00
	\$110.01 - \$150.00
	\$150.01 - \$215.00
	\$215.01 - \$280.00
	> \$280.01

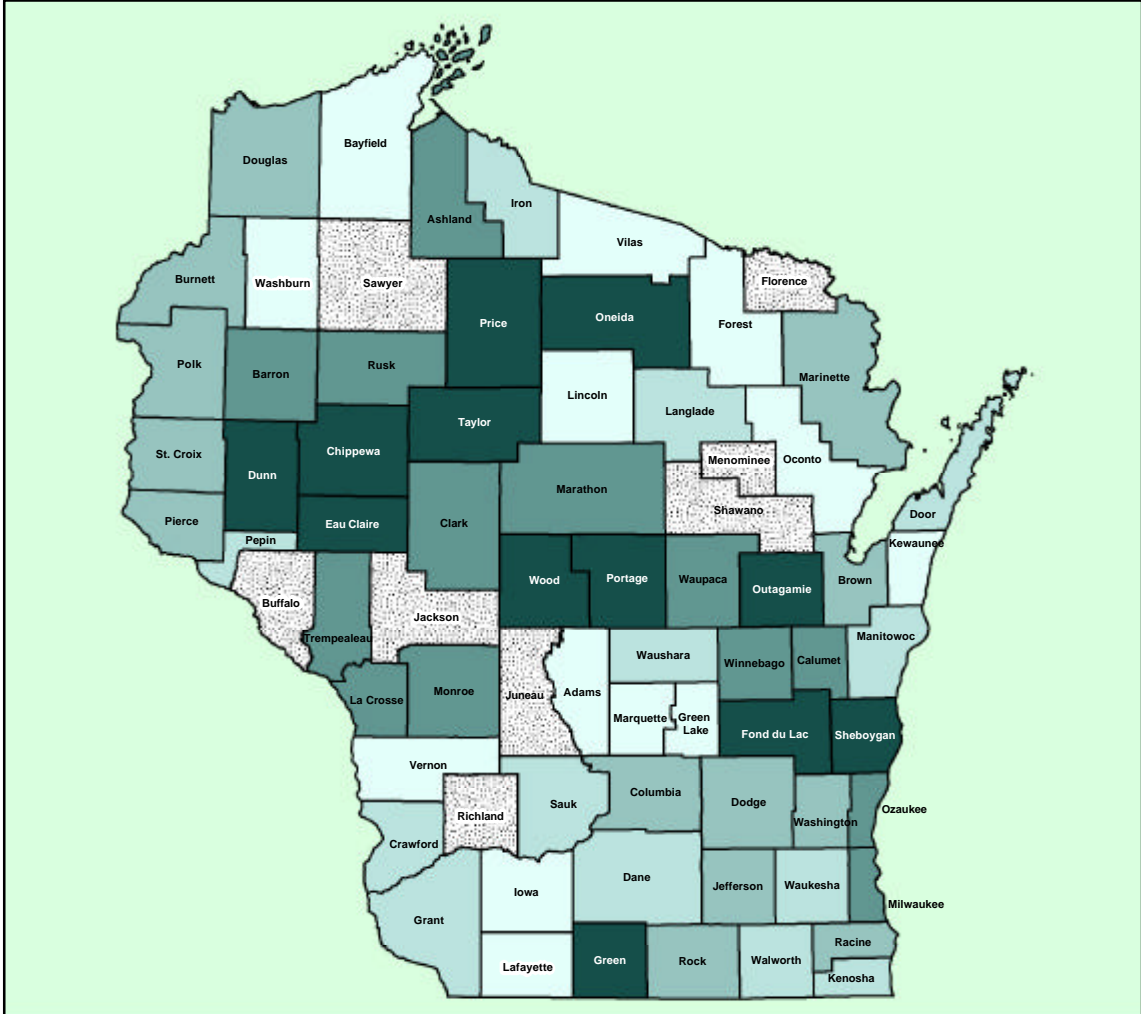
The map above portrays the annual energy savings realized by projects implemented through programs targeted at commercial sector businesses as of June 30, 2006. Electric and gas savings have been valued at the average cost of gas and electricity for commercial businesses in Wisconsin and summed for all 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. September, 2006.

**Figure 14.**  
**Wisconsin Focus on Energy Industrial Programs**  
**Per Capita Energy Bill Savings by County**

**Wisconsin Focus on Energy Industrial Programs**  
**Per Capita\* Energy Bill Savings by County**



**Per Capita Annual Energy Bill Savings by County**

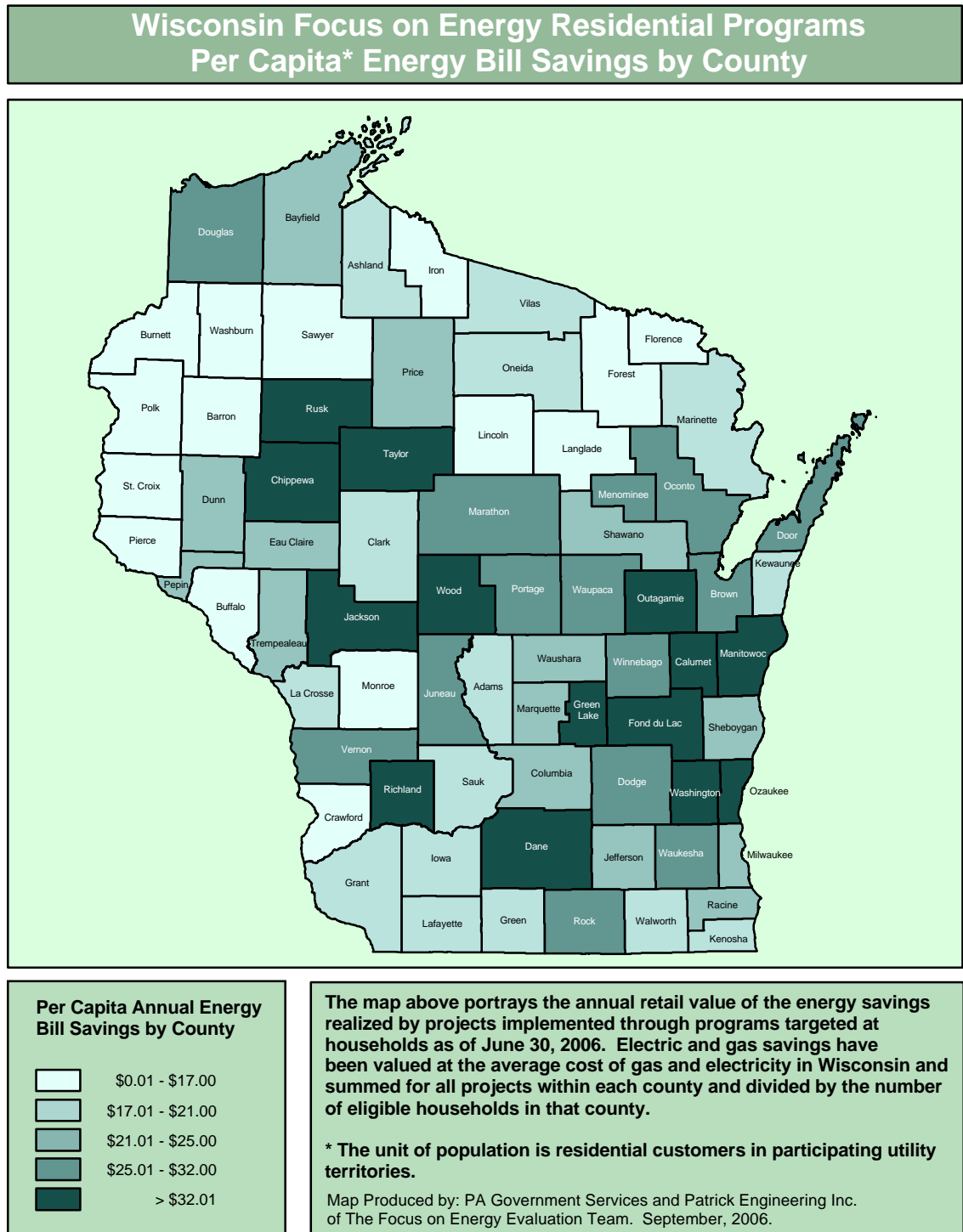
	\$0
	\$0.01 - \$75.00
	\$75.01 - \$160.00
	\$160.01 - \$310.00
	\$310.01 - \$550.00
	> \$550.00

The map above portrays the annual energy savings realized by projects implemented through programs targeted at industrial sector businesses as of June 30, 2006. 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.

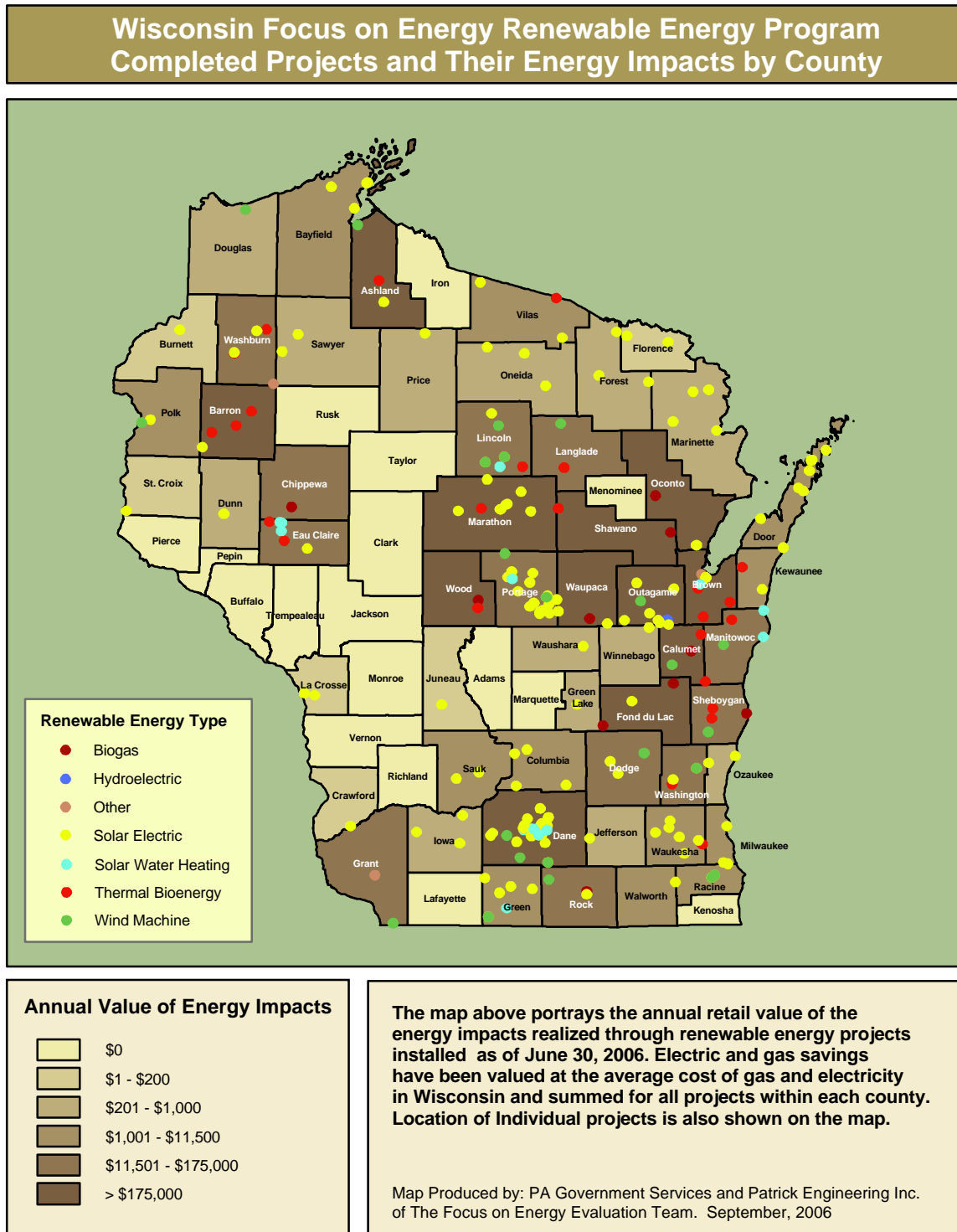
\* The unit of population is industrial customers in industries targeted by the industrial programs in participating utility territories.

Map Produced by: PA Government Services and Patrick Engineering Inc. of The Focus on Energy Evaluation Team. September, 2006.

**Figure 15.**  
**Wisconsin Focus on Energy Residential Programs**  
**Per Capita Energy Bill Savings by County**



**Figure 16.**  
**Wisconsin Focus on Energy Renewables Programs**  
**Completed Projects and Their Energy Impacts by County**



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

The Focus program spends money to promote energy efficiency improvements in the state of Wisconsin. This spending in turn results in a number of impacts on the economy: the creation of new jobs, increases in Wisconsin business sales, increases in Wisconsin's gross state product (GSP), and an increase in household income.

*Creation of New Jobs.* Focus directly affects the energy costs of participating businesses. Lower energy costs can make business operations more profitable. Reductions in energy bills may also allow businesses to spend dollars on ways to increase production. By lowering the costs of doing business, Focus also makes Wisconsin a more competitive location for attracting new business or increasing the investment and expansion of existing businesses.

*Increase in Sales.* Focus creates other direct and indirect economic impacts throughout Wisconsin. Wisconsin businesses include major manufacturers of heating and air conditioning equipment, motors, and controls. Focus stimulates sales for these industries, as well as the development of solar, wind and biomass energy production within the state.

*Increase in Wisconsin's Gross State Product.* At the same time Focus is increasing the flow of dollars within Wisconsin, it is also reducing the outflow of money from the state. Every kWh and therm saved means that less money leaves Wisconsin to buy coal and natural gas. Keeping money in Wisconsin saves jobs, increases personal income, and makes Wisconsin's economy more efficient and competitive overall.

*Increase in Personal Income.* If less money is spent on energy, the buying power of Wisconsin households is increased. Families with more money in their pockets have more to spend on other Wisconsin goods and products.

Table 2 below shows the number of jobs created (full-time equivalent job years), the sales generated, the value added to the gross state product, and the personal income generated. Economic impacts were projected for the first ten years, assuming the program would continue at similar budget levels. The benefits increased each year because energy efficiency improvements from earlier years are still creating benefits in future years (e.g., every time a new piece of energy-efficient equipment is installed, additional economic benefits occur over the operating life of the equipment). Therefore, benefits provided by Focus accumulate over time, as long as the energy-efficient equipment is working.

***Note: The economic benefits for Focus shown in Table 2 are based on analysis conducted in February and March of 2003, which at that time assumed stable funding levels over ten years of operation. However, the State biennial budget for 2003–2005 subsequently reduced the funding for Focus on Energy by approximately 40 percent. At this reduced level of funding, program impacts will not reach the levels projected and, thus, economic impacts will not reach the levels projected in the table, unless future funding is greater than was expected at the time, or there are significant increases in the ratio of energy saved per program dollar spent.***

**Table 2. Economic Benefits of the Focus on Energy**

	First Year	Fifth Year	Tenth Year	Sum of 10 years
Full-time equivalent job years	630	1,774	2,778	18,956
Sales generated ( <i>in millions</i> )	\$46	\$135	\$224	\$1,483
Gross state product (value-added) ( <i>in millions</i> )	\$26	\$85	\$146	\$934
Personal income generated ( <i>in millions</i> )	\$11	\$66	\$149	\$779

Note: Based on program operations data through December 31, 2002, including market effects and using verified net energy savings. All dollar amounts are in millions (MM) of Year 2001 constant dollars.

## 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 17 through 19, expressed in tons.

**Table 3. Annual Displaced Emissions from Power Plants and Utility Customers (July 1, 2001–June 30, 2006)**

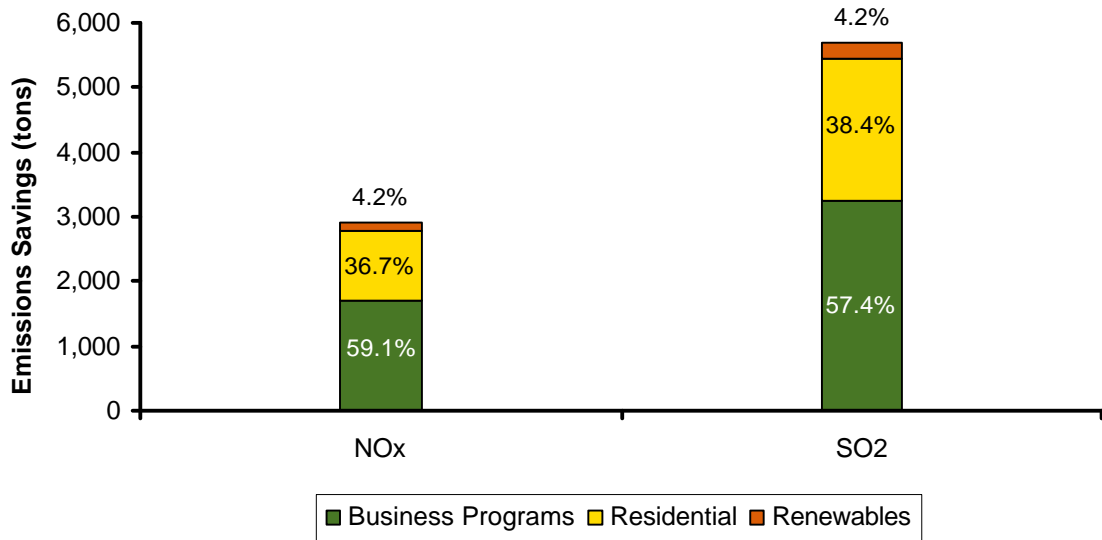
Program Area	Emissions Reductions (Pounds)			
	NO <sub>x</sub>	SO <sub>2</sub>	CO <sub>2</sub>	Mercury
<b>Total Reduction</b>	<b>5,789,291</b>	<b>11,369,137</b>	<b>2,625,166,506</b>	<b>45.558</b>
Business Programs	3,424,084	6,525,260	1,625,584,230	26.145
Residential Programs	2,123,138	4,371,217	888,819,797	17.519
Renewable Energy Program	242,068	472,660	110,762,478	1.894

Notes: Based on verified gross savings data

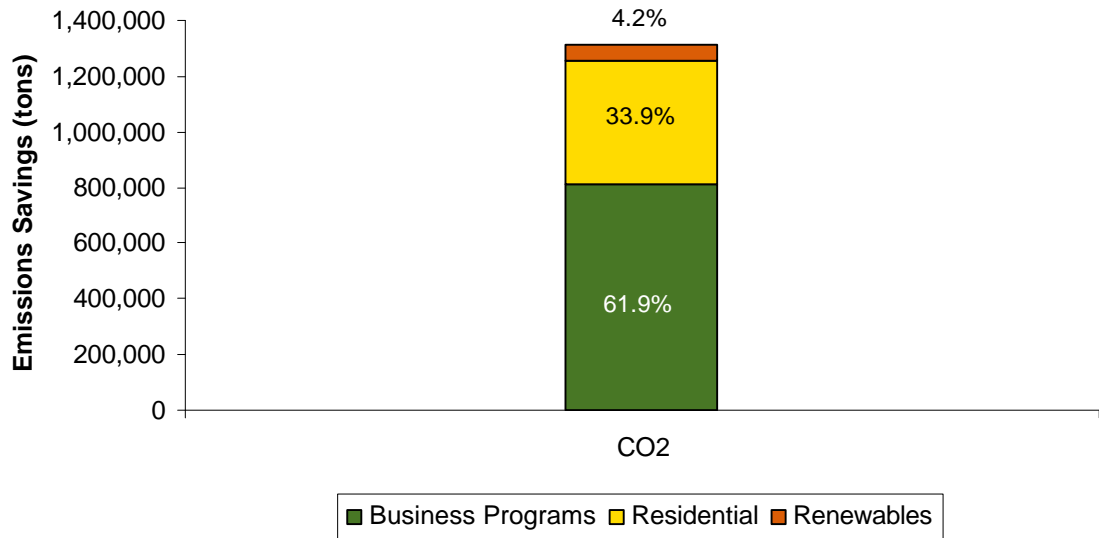
Wisconsin's investor-owned utilities are included in the federal SO<sub>2</sub> regulatory structure of the Clean Air Act (acid rain provisions). In this cap-and-trade system SO<sub>2</sub> emissions cannot be considered reduced or avoided unless EPA lowers the SO<sub>2</sub> cap.

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.

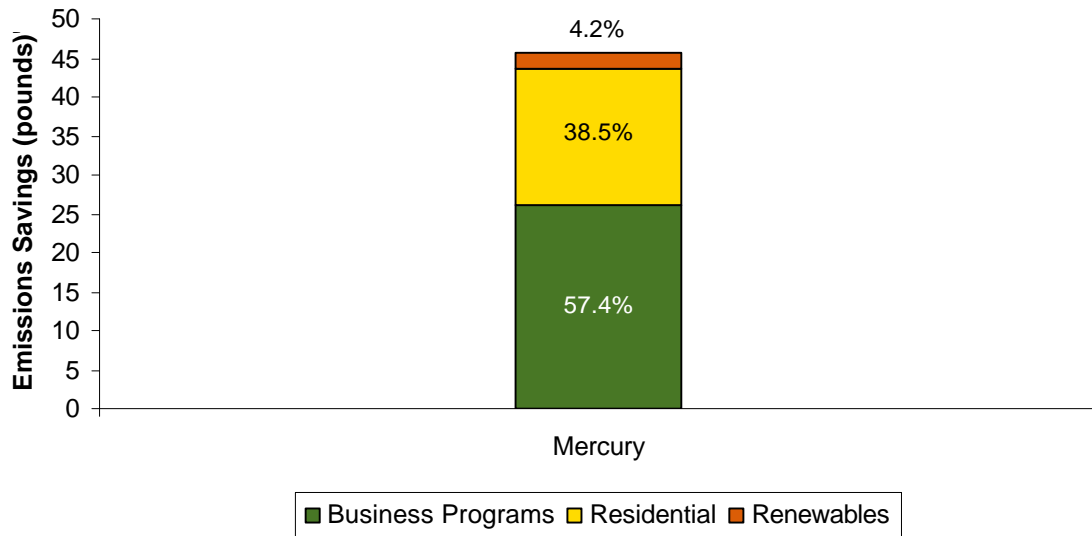
**Figure 16. NO<sub>x</sub> & SO<sub>2</sub> Emissions Displaced by Program Area  
Program to Date (July 1, 2001–June 30, 2006)**



**Figure 17. CO<sub>2</sub> Emissions Displaced by Program Area  
Program to Date (July 1, 2001–June 30, 2006)**



**Figure 18. Mercury Emissions Displaced by Program Area  
Program to Date (July 1, 2001–June 30, 2006)**



**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 qualitative analysis of the Renewable Energy NEBs has been completed, but there is not enough information to allow quantification of these NEBs.

Table 4 shows non-energy benefits for the Business and Residential 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–June 30, 2006)**

Program Area	Value of Non-energy Benefits	
	FY06 as of June 30, 2006	Program to Date as of June 30, 2006
<b>Business Programs</b>	\$13,560,988*	\$57,628,037*
<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>	\$1,783,556	\$9,840,480
<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 a horizontal-axis washing machine, which uses much less water than conventional washing machine</li> </ul>		
<b>Renewable Energy Programs</b>	N/A**	N/A**
<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>		

\* Method of applying value is under review.

\*\* A qualitative analysis of the Renewable Energy NEBs has been completed, but there is not enough information to allow quantification of these NEBs.

## BENEFIT-COST ANALYSIS

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>iv</sup> The **costs** of Focus include total program spending and the cost of incentives paid to participants.

**Table 5. Elements Included in a Benefit-Cost Analysis for Focus**

Element	“Benefit”	“Cost”
Economic Impacts	+/-	
Energy Impacts	+	
Environmental Benefits	+	
Market Effects	+	
Other Non-energy Benefits	+	
Participant Spending	-	
Program Incentives	+	+
Program Spending		+

The second step is to select a valuation method for the analysis. Table 6 shows three methods for estimating the benefit-cost ratios for Focus ranging from “conservative” to “most complete” depending on which elements are included or excluded. A ratio of greater than 1 in the table indicates that benefits exceeded the costs of the program.

Table 6 shows that using the most conservative estimate, which excludes economic impacts and non-energy elements, overall Focus benefits still outweighed the costs. This means that at the time of this analysis, Focus was creating greater value for the state of Wisconsin than it cost to run it.

A less conservative method that would include non-energy benefits was available only for the Residential Program. These benefits had not yet been quantified for the Business and Renewable Energy Programs at the time the benefit-cost analysis was completed. The most complete estimate available at that time included economic impacts for all programs and non-energy benefits for the Residential Program area only.

***Note: The benefit-cost analysis presented in Table 6, conducted in February and March of 2003, projected program impacts for the first ten years of operation assuming stable funding levels over that time period. However, the State biennial budget for 2003–2005 reduced funding for the Focus on Energy program by approximately 40 percent for 2003–2005. At this reduced level of funding, program impacts will not reach the levels projected, and thus assumptions about the elements in the benefit-cost ratios discussed in this section are also affected. The benefit-cost and economic impact analysis originally planned for FY04 to update these numbers was also cut as a result of budget reductions. An updated benefit-cost analysis is underway and results will be available in the spring of 2007.***

**Table 6. Benefit-Cost Ratios for Focus Overall and by Program Area**

Program Area	Conservative Estimate: (Economic Impacts and Non-energy Benefits Excluded)	Less Conservative Estimate: (All Elements Included)	Most Complete Current Estimate**
Focus overall	3.0	NA	5.7
Business	2.0	NA	3.0
Residential	4.3	9.0	9.0
Renewable Energy	(1.1)	NA	(0.8)

Notes: NA: Not available

Based on verified net savings data through March 2003.

“Most Complete Current Estimate” includes economic impacts for all program areas plus non-energy benefits for the Residential Program area only.

The Residential Programs have a very good benefit-cost ratio even by the conservative estimate. The majority of the benefits from this program area come from the CFL component of the ENERGY STAR Products program.

The Business Programs show moderately good performance, with a benefit-cost ratio above 2. The “Most Complete Current Estimate” for the Business Programs did not include non-energy benefits, which prohibits meaningful comparison between Business and Residential Programs. The Business Programs are planning some changes to improve operational efficiency, reduce program spending for energy efficiency measures that would be implemented even without program support, and develop more focused market transformation efforts. These changes should improve future cost effectiveness.<sup>1</sup>

The results for the Renewable Energy Program area are more preliminary and uncertain than those for the Residential and Business Program areas due to the late start of the Renewable program. A key contributor to this negative result is the high project implementation costs (participant spending plus program incentives) associated with the photovoltaic (solar panel) projects. With the project implementation costs and associated savings from these solar panel projects excluded, the benefit-cost ratio for Renewable Energy Program is greater than 1.

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<sup>1</sup> There are also significant differences in the market that could account for difference in the b-c ratio. BP programs have a much more diverse customer base with many more technologies to address. This, as well as performance, can make a difference in the resulting b-c ratio.

## LOW-INCOME PUBLIC BENEFITS EVALUATION

### What is the Low-income Public Benefits Program?

The Low-income Public Benefits program is composed of two programs that deliver benefits to households at 150% of the federal poverty level and below—the Wisconsin Home Energy Assistance Program (WHEAP) and the Weatherization Assistance Program (WAP). WHEAP and WAP are administered by the Wisconsin Department of Administration's Division of Energy.

### What are the goals of the Low-income Public Benefits Program?

Low-income evaluation results are presented separately from the other Public Benefits programs because the Low-income Programs' goals differ significantly from Focus on Energy program goals. The ultimate goal of the Low-income Programs is to deliver services in a manner that contributes to making households' energy self-sufficient within the constraints of state and federal limits for eligibility<sup>v</sup>, whereas the goals of Focus on Energy programs being evaluated revolve around market development of energy efficient products and services and energy savings.

### How much energy did Low-income Public Benefits Program save?

Table 7 shows the total energy and dollars saved by low-income participants from the energy efficiency improvements installed during the most recent quarters (January 1–June 30, 2006) and for the program to date (since July 1, 2001). 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 WAP Household</b>	<b>\$363.25/ year</b>
<b>Average Energy Savings per WHEAP furnace replacement</b>	<b>\$212.47/ 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 7) 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 Division of Energy in the State of Wisconsin Department of Administration.

The total annual dollar value of kWh and therms saved for the program to date was approximately \$3.8 million in electricity savings (kWh) and \$10.3 million in gas savings (therms).

The majority of savings for the Low-income Programs come from the Weatherization Assistance Program (WAP). This is to be expected as energy savings are a primary objective of WAP, but it is a secondary benefit of WHEAP resulting from emergency furnace replacements (less than five percent of the overall WHEAP budget is utilized for emergency furnace replacements).

To date, Low-income Programs have also reduced peak electrical demand in Wisconsin by 4,505 kilowatts (not shown in the table). Reducing peak energy demand improves the reliability of the energy grid and reduces stress on the transmission system.

**Table 7. Annual Verified Gross Energy and Dollars Saved for the Low-income Programs**

	Annual kWh Saved	Annual Dollar Value of kWh Saved	Annual Therms Saved*	Annual Dollar Value of Therms Saved	Number of Participants
<b>Year to Date (July 1, 2005–June 1, 2006)</b>					
<b>Total Saved</b>	<b>7,354,557</b>	<b>\$772,964</b>	<b>1,601,580</b>	<b>\$1,856,231</b>	
WAP	7,354,557	\$772,964	1,377,324	\$1,596,319	8,829
WHEAP	N/A	N/A	224,256	\$259,913	768
<b>Program to Date (July 1, 2001–June 30, 2006)</b>					
<b>Total Saved</b>	<b>36,776,420</b>	<b>\$3,865,202</b>	<b>8,930,717</b>	<b>\$10,350,701</b>	
WAP	36,776,420	\$3,865,202	8,090,341	\$9,376,705	36,454
WHEAP	N/A	N/A	840,376	\$973,996	4,584

NA: Not applicable.

To put these savings into perspective, the total savings to date of 36,776,420 kWh and 8,930,717 therms is equivalent to:<sup>vi</sup>

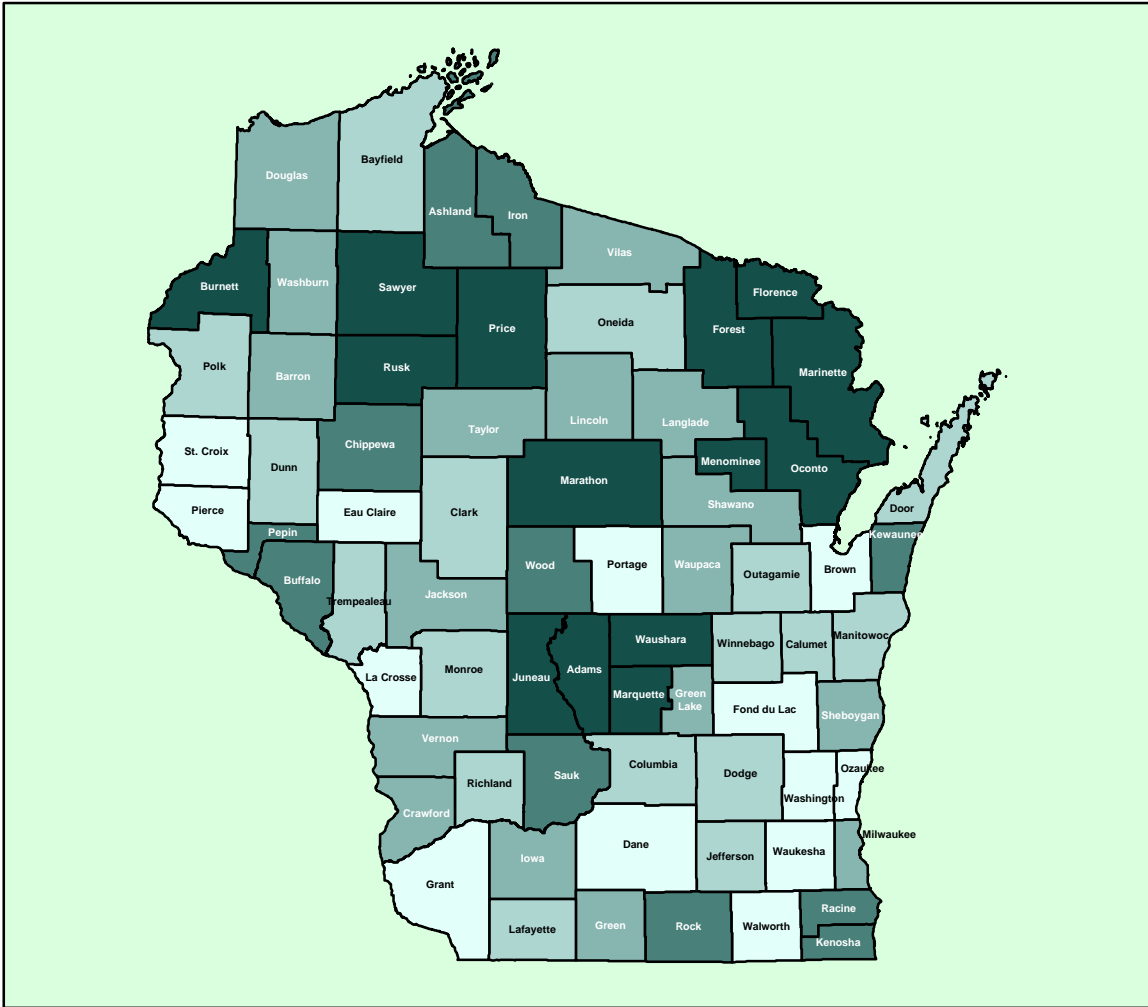
- The amount of energy produced by burning 184 rail cars of coal.
- Enough electricity to power the town of Oconto Falls over 3.6 years.
- The same energy value as 226,261 barrels of oil.
- The amount of electricity consumed annually by more than 3,678 average homes in Wisconsin.

**Where in Wisconsin are Low-income Public Benefits services being delivered?**

It is important for low-income households throughout the state to receive program benefits. Figure 25 below shows the percentage of eligible households receiving benefits through the Wisconsin Home Energy Assistance Program for each county. Figure 26 shows the monetary value of the energy saved by homes receiving services through the Weatherization Assistance Program.

**Figure 25.**  
**Wisconsin Home Energy Assistance Program**  
**Percent of Eligible Households Participating by County**  
**in Federal Fiscal Year 2006 to June 30, 2006**

**Wisconsin Home Energy Assistance Program**  
**Percent of Eligible Households Participating by**  
**County in Federal Fiscal Year 2006 through June 28, 2006**



**Percentage of Eligible Households at or below 150% of Federal Poverty Level Participating**

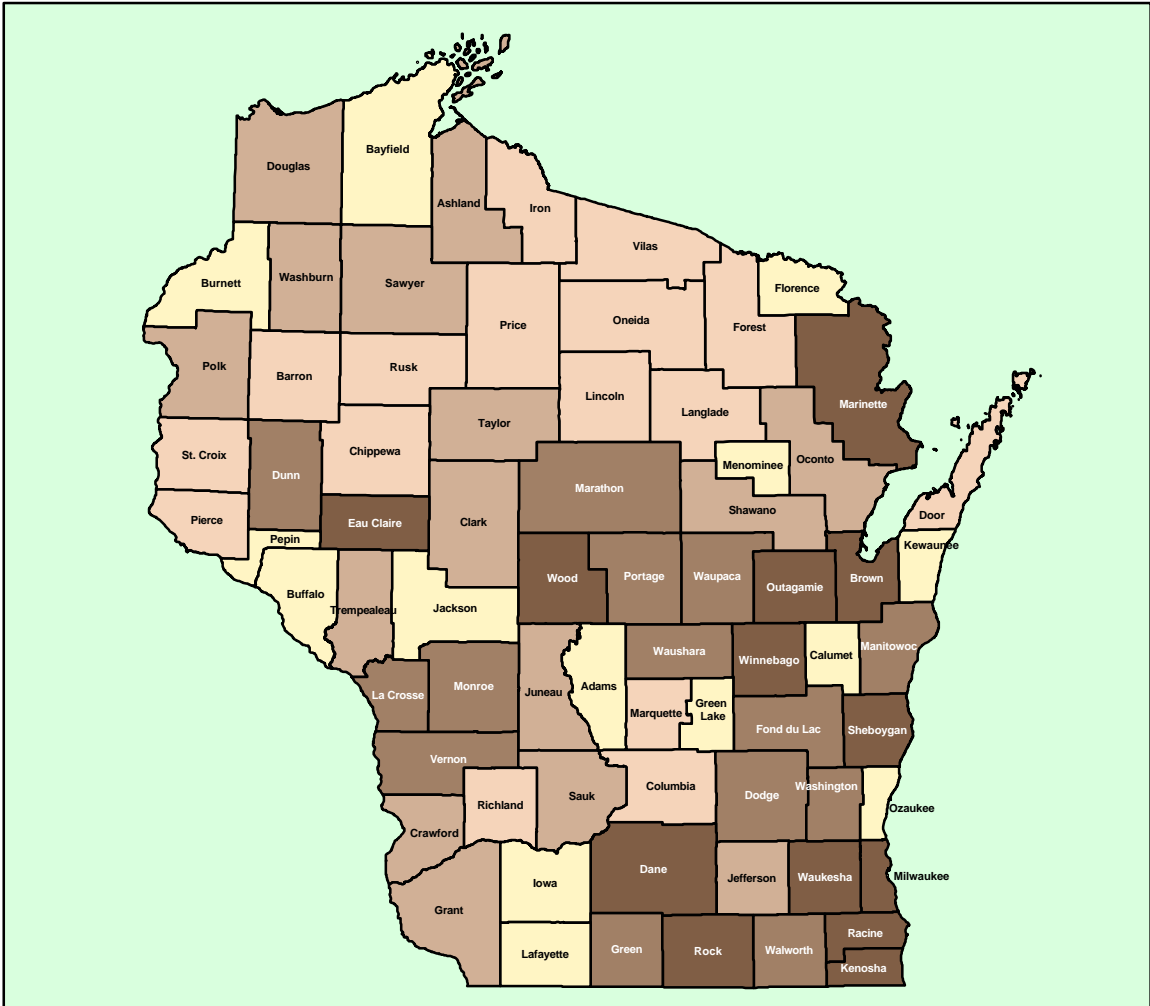
- Less than 40%
- 40% to 47%
- 48% - 55%
- 56% - 60%
- Greater than 60%

The map above portrays the proportion of eligible county residents in households that participated in the Wisconsin Home Energy Assistance Program in Federal Fiscal Year 2006 through 6/28/06 that are below 150% of the Federal poverty level. The numbers of eligible residents for each county was obtained from the U.S. Census Bureau, 2000 Census, Summary File 3, table P93.

Map Produced by: PA Government Services and Patrick Engineering Inc. of The Focus on Energy Evaluation Team. September 2006.

**Figure 26.**  
**Wisconsin Weatherization Assistance Program**  
**Monetary Value of Energy Savings**  
**for Households Weatherized**

**Wisconsin Weatherization Assistance Program**  
**Monetary Value of Energy Savings**  
**for Households Weatherized**



**Total Monetary Value of Energy Savings**

- Less than \$40,000
- \$40,000 to \$65,000
- \$65,000 to \$90,000
- \$90,000 to \$150,000
- Greater than \$150,000

The map above portrays the total monetary value of energy savings realized by county due to the Weatherization Assistance Program from Federal Contract Year 2002 through Federal Contract Year 2006, quarters 1 and 2. The monetary value of savings is based on energy savings in kWh and therms as a result of weatherization services.

Map Produced by: PA Government Services and Patrick Engineering Inc. of The Focus on Energy Evaluation Team. September, 2006

## ECONOMIC IMPACTS of the Low-income Programs<sup>vii</sup>

Public benefits spending on these low-income programs results in a number of impacts on the economy: the creation of new jobs, increases in Wisconsin business sales, increases in Wisconsin's gross state product (GSP), and an increase in household income.

**Table 8. Economic Benefits of the Low-income Programs**

	First Year	Fifth Year	Tenth Year	Sum of 10 Years
Full-time equivalent job years	2,101	2,094	2,233	21,302
Sales generated ( <i>in millions</i> )	\$164.40	\$157.50	\$176.50	\$1,630.00
Gross state product (value-added) ( <i>in millions</i> )	\$89.10	\$96.20	\$112.50	\$989.00
Personal income generated ( <i>in millions</i> )	\$108.10	\$129.60	\$154.20	\$1,317.50

Note: Based on program operations data for state fiscal year ending June 30, 2004, for WAP and federal fiscal year ending September 30, 2004, for WHEAP covering 10 years of program operations.

### Environmental Benefits

The most significant environmental benefit of Low-income Programs 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 oxides (SO<sub>x</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 9 shows the pounds of these emissions that will be displaced annually due to the energy efficiency improvements installed by low-income participants.<sup>iii</sup>

**Table 9 Annual Displaced Emissions from Power Plants and Utility Customers for the Low-income Programs (July 1, 2001–June 30, 2006)**

	Emissions Reduction (pounds)			
	Nitrogen Oxides (NO <sub>x</sub> )	Sulfur Oxides (SO <sub>x</sub> )	Carbon Dioxide (CO <sub>2</sub> )	Mercury (Hg)
<b>Total Reduction</b>	<b>290,529</b>	<b>449,158</b>	<b>186,521,779</b>	<b>1.798</b>
WAP	290,529	449,158	176,638,957	1.798
WHEAP	N/A	N/A	9,882,822	N/A

Note: Emission reductions are calculated using the marginal cost emission rates.

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.

### Non-energy Benefits

Non-energy benefits of the Low-income Programs 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. Table 10 shows non-energy benefits for the Low-income Programs. The dollar values assigned to these benefits were determined from prior research and from an analysis of the non-energy benefits accruing from energy efficiency improvements and bill payments conducted through the Low-income Programs.

**Table 10. Annual Value of Non-energy Benefits from the Low-income Programs**

Program Area	Approximate Value of Non-energy Benefits	
	FY06 July 1, 2005–June 30, 2006	Program to Date July 1, 2001–June 30, 2006
Low-income Programs	\$7,017,490	\$30,357,838
<i>Example Benefits from Low-income Programs:</i> <ul style="list-style-type: none"> <li>• Reduced arrearage carrying costs</li> <li>• Lower bad-debt write-offs</li> <li>• Increase property value (avoided capital expense)</li> <li>• Indoor air quality (CO related)</li> <li>• Fewer utility disconnects and reconnects.</li> </ul>		

**Benefit-Cost Analysis**

Table 11 shows each element of the benefit-cost analysis for the Low-income Programs and whether the element is added to or subtracted from the benefit or cost side. The **benefits** include the four major impacts discussed earlier—energy, economic, environmental, and other non-energy benefits. The economic impact counted in the analysis is the net change in real disposable income, after subtracting the opportunity cost of other ways the public funds could have been spent. This net economic impact can be positive or negative for any given program, but for these low-income programs, it is positive. An additional component counted in the benefits is the direct bill payment by WHEAP. This payment is counted also in the program costs. The **costs** of the programs are the total program spending, including project costs, bill payments, and administration.

**Table 11. Elements Included in a Benefit-Cost Analysis for Low-income Programs**

Element	“Benefit”	“Cost”
Bill Payments	+	+
Economic Impacts	+/-	
Environmental Benefits	+	
Net Energy Impacts	+	
Other Non-energy Benefits	+	
Program Spending		+

Table 12 shows the benefit-cost ratio for the low-income programs overall and by each program using the elements described above. A benefit-cost ratio of greater than 1 indicates that benefits exceed the costs of the program. Overall, the benefits of the Low-income Programs to Wisconsin outweigh the costs by about 30 percent. This means that the programs are creating greater value for the state of Wisconsin than they cost to run.

**Table 12. Benefit-Cost Ratios for Low-income Programs Overall and by Program Area\***

Program	Benefit/Cost Ratio
Low-income Programs Combined	1.3
Weatherization Assistance Program (WAP)	1.9
Wisconsin Home Energy Assistance Program (WHEAP)	1.0

\* Based on program operations data through October 2002 using verified net savings data.

The Weatherization Assistance Program has a benefit/cost ratio of 1.9. Thus, the program benefits to the state are nearly twice the program cost. About 60 percent of the total benefit goes to participants in the form of reduced energy costs and associated non-energy benefits. The remainder is a benefit to the state as a whole. Most of this societal benefit is from the additional economic development effects of the measure implementation. A small portion comes from lower

energy costs to ratepayers, resulting from reduced utility costs associated with arrearages. The remainder is the avoided externality cost of the saved energy.

The Wisconsin Home Energy Assistance Program has a benefit/cost ratio of 1.0. This result makes sense because the bulk of the program spending and the program benefit is the bill payment to participants. There are some additional costs for emergency furnace replacements and program administration. These are roughly balanced by the additional benefits in the form of participant non-energy benefits, avoided externalities related to the furnace replacements, ratepayer benefits via reduced utility costs, and additional economic development effects.

## 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: Interim Economic Impacts Report*. Mike Sherman, Lisa Petraglia, and Glen Weisbrod; Economic Development Research Group, Inc. PA Government Services Inc. March 31, 2003.

<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> 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).

<sup>v</sup> Tannenbaum, Bobbi. Wisconsin LIHEAP Performance Measures: Working Group Report. Energy Center of Wisconsin. 2000.

<sup>vi</sup> The state of Wisconsin, Department of Administration, Division of Energy.

<sup>vii</sup> *Low-income Public Benefits Evaluation Economic Development Benefits*. Mike Sherman, Lisa Petraglia, and Glen Weisbrod, Economic Development Research Group, Inc. PA Government Services Inc. Final Report: May 2, 2003.