An Approach to Quantifying Economic and Environmental Benefits for Wisconsin's Focus on Energy

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ABSTRACT

The structure and approach for evaluating the Wisconsin Focus on Energy (Focus) Program has provided an opportunity for taking a more holistic approach to energy efficiency evaluation than is commonly taken. This paper provides an overview the methodological approaches taken to quantify the environmental benefits, and the economic benefits of the Focus on Energy program, and also provides a brief overview of the benefit-cost analysis for which the values resulting from the environmental and economic impacts are important inputs.

The *economic* analysis examines the nature and magnitude of economic development impacts of Focus—tracing changes in the flow of income and spending caused by the program, and showing how the program causes both direct and indirect effects on the flow of money in the Wisconsin economy as well as effects on the state's economic development. Economic development (which is an explicit goal of the Focus on Energy program) is demonstrated through increased job opportunities, increased business sales and increased personal income that result from program activities.

The *environmental* analysis takes the Focus programs' energy impacts and estimates and monetizes the associated reductions in electricity power plant emissions. There is also a brief discussion addressing a more far-reaching question: What is the potential value of pollution credits that could be generated by public benefits programs? One answer is provided using prices from a "Multi-Pollutant Optimization Model," based on a scenario assuming enactment of the Bush Administration's "Clear Skies" proposal for SOx, NOx, and mercury reductions.

Introduction

This paper presents a summary of the interim evaluation results for the quantification of environmental and economic benefits in the Wisconsin Focus on Energy Statewide Program (Focus). Quantifying and specifying monetary values for these benefits responds to the State's energy policy requirements for this Public Benefits Program to identify and capture the full range of benefits. The paper presents the methodological approaches for quantifying and monetizing these benefits, and provides economic benefits resulting from the first ten years of program operations, based on data from the first one and one-half months of the program. In addition, since these economic and environmental benefits are key inputs to the interim benefit-cost analysis done by the evaluation team, this paper will also summarize those results.

The *economic* analysis examines the nature and magnitude of economic development impacts of Focus—tracing changes in the flow of income and spending caused by the program, and showing how the program causes both direct and indirect effects on the flow of money in the Wisconsin economy as well as effects on the state's economic development. Economic development (which is an explicit goal of the Focus on Energy program) is demonstrated through increased job opportunities, increased business sales and increased personal income that result from program activities.

The *environmental* analysis takes the Focus programs' energy impacts and estimates and monetizes the associated reductions in electricity power plant emissions. We also include a brief discussion addressing a more far-reaching question: What is the potential value of pollution credits that could be generated by public benefits programs? (Using prices from a "Multi-Pollutant Optimization Model," based on a scenario assuming enactment of the Bush Administration's "Clear Skies" proposal for SOx, NOx, and mercury reductions).

Program Background

Wisconsin Focus on Energy was initiated in April 2001 by the state's Department of Administration (Division of Energy) as a set of "Public Benefits" energy programs, designed to encourage residential and businesses customers, and local governments, to take advantage of available energy technologies and make more economically efficient (and environmentally-responsible) energy decisions. They are also designed to promote lasting changes in energy and equipment market supply/demand patterns by (a) reducing existing barriers to adoption of economically-efficient (and environmentally-responsible) energy products and services, and (b) encouraging the development of new market structures and entities to support those efforts. More information on the Focus on Energy can be found at the website <http://ww.focusonenergy.com>.

Focus is intended to produce both short-term and long-term economic benefits for Wisconsin residents. In the short term, it should result in the participating customers gaining the benefits of purchasing more energy-efficient equipment: reduced energy usage, reduced energy bills, and more income to spend on other needs. Installing more energy-efficient equipment of all kinds, from light bulbs to refrigerators to industrial motors, also reduces the demand for electricity generated in the state during the peak hours of the day and thus adds to the system's reliability (while also helping to avoid price spikes that have plagued Midwest utilities in recent years). In the long term, Focus is designed to help transform Wisconsin's energy efficiency and renewable energy markets so that all Wisconsin energy consumers will eventually realize benefits from a marketplace where the basic level of energy efficiency in all kinds of energy-using devices is greater than would otherwise be the case.

Types of Economic Development Impacts

Focus directly affects Wisconsin's economy, and thus the income and jobs of Wisconsin residents, in four primary ways:

(1) Enhanced Business Competitiveness. 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.

(2) Improved Cost of Living. Decreasing residential electric and gas customers' energy costs through increased efficiency and conservation can also leave more money in families' pockets (to spend on other desired purchases.) By lowering both the cost of living and cost of doing business, it also makes Wisconsin a more competitive location for additional business attraction, investment and expansion.

(3) "Import Substitution." Focus also encourages more spending dollars to stay within Wisconsin. 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. Each of these effects produces jobs, increases personal income, and overall makes the Wisconsin economy more efficient and competitive.

(4) Spin-off Spending Changes. There are also various indirect and induced impacts that cause both positive and negative changes in spending. Suppliers to the directly affected businesses can realize increased orders for their products and services. Additional jobs and worker income can mean more respending of that income on consumer purchases. On the other hand, reductions in the growth of demand for traditional energy sources can mean less growth (or actual reductions) in business sales and jobs associated with construction and operation of coal-fired power plants, and retail sales from those plants. The Public Benefits charge that funds Focus is a cost to customers, although not a new one, since customers have paid the cost of demand-side management programs through utility rates for years.

The analysis covers all aspects of changes in the economy, and describes the types of jobs and industries where jobs are gained as well as lost due to the Focus on Energy program. We refer to the sum of all of the above-cited effects as "economic development" impacts because they reflect changes in the growth and development of the State's economy (i.e., the flow of money into, out-of, and within the state, affecting jobs and income for Wisconsin residents). For a more complete discussion on the economic impact analysis see the report titled, *"Economic Development Benefits: Interim Economic Impacts Report, Final: March 31, 2003"* by Mike Sherman, Lisa Petraglia, and Glen Weisbrod.

Distinguishing Economic Development Benefits from Other Impact Measures

Some aspects of energy, environmental and other non-energy impacts can cause changes in the flow of dollars as measured in this paper. However, there are other aspects of those impacts that are *not* reflected in the analysis of economic development impacts in this paper. They include some aspects of safety, security, reliability, health and other aspects of quality of life—which either lack estimates of how they affect the economy, or have policy importance beyond their mere effect on the flow of dollars.

It is also important to distinguish the coverage of factors covered under economic development impact analysis from those covered in a traditional benefit-cost analysis. A benefit-cost study can include any type of benefit that can be put into dollar terms (based on either actual flows of money or willingness-to-pay studies), whereas economic development analysis considers only effects on the actual flow of dollars. On the other hand, a traditional benefit-cost study does not encompass localized (in this case, state-level) impacts on economic competitiveness, on economic diversification, or on shifts in activity between this state and other states. An economic development impact analysis can consider all of these other types of impacts. In a national view of societal impacts, many of these state-level impacts disappear. However, these factors are often of great importance for state legislatures that are validly concerned about focusing their spending in ways that also help strengthen their own state's economy.

Another important difference is that a benefit-cost study considers program spending as a cost that is subtracted from program benefit, while an economic development impact analysis traces how program spending can also be a source of additional business growth. These two perspectives are not at odds. There can be a very real public policy interest in how a program creates local jobs and income, which is different from the policy issue of whether the long-term benefits outweigh the required public outlay of funds. Both types of analysis have a place. As noted in the Introduction, while this paper primarily addresses the economic development impact analysis (including monetized environmental benefits), we also show how these analysis results provide data inputs to the benefit-cost analysis.

Point of Reference

When we look at the economic impacts of energy programs, we have to carefully distinguish three different perspectives concerning net impacts: (1) When measuring *net energy impacts*, we do attempt to measure the change in energy use that is beyond what would have otherwise happened if the program did not exist. However, we do not assume that without the program, there would be any alternative program or policy instituted to affect energy use. (2) When measuring *economic development impacts*, we measure the flows of dollars in the economy that are associated with the operation of the program and its net energy impacts. Since we are trying to understand the nature of the dollar flows in the economy that are associated with the program, we do not assume that there would be any alternative program or policy instituted to affect energy use. However… (3) When measuring *benefit-cost analysis* components, then we do net out the effects of spending on this program since similar effects could have occurred with any alternative disbursement of state program funds into the economy.

The above three perspectives have important value because each depends on correct measurement of preceding ones. First, it is important to be sure we are correctly measuring net energy impacts before even starting to measure dollar flows in the economy. Second, it is important to be sure that we are correctly tracking the full flow of dollars in the economy. Some recent economic impact studies have measured jobs created in the energy efficiency industry and dollars of cost savings for participants, but have not fully tracked how these programs can also affect economic diversification, and "import substitution" (local content of products purchased). Finally, it is important to be sure that we fully understand the impacts on the flow of dollars before comparing program benefits and costs. This is important because benefit-cost findings measure impacts relative to an alternative scenario for use of program funds, and the findings can thus vary depending on the nature of those assumptions. Without first looking at the nature of program direct impacts on the economy, we cannot know whether a small benefit-cost ratio means that: (a) the program has very little impact on the economy, or (b) the program has a large economic impact, but alternative uses of the funds could create similar effects.

The tracking of economic development impacts presented in this report is based on calculations of net energy impacts associated with Focus on Energy, but tracks the full economic effects of program spending without adjustment for how the money was being used prior to the creation of the Focus program. Funds for Focus were primarily re-directed from Wisconsin utilities to Focus on Energy in an effort to preserve energy efficiency efforts in the state. The utilities had been collecting funds for these energy efficiency programs since the mid-1980's, but the programs were perceived to be threatened by pending de-regulation of the utilities. Efforts to prepare an alternative economic scenario reflecting impacts of the myriad efficiency programs of the 31 participating utilities would be prohibitively expensive. We would expect to see net cost and effectiveness benefits associated with the new mix of program elements operating within Focus, as well as economies of operating scale (and opportunities like being able to conduct statewide promotions with chain stores) that are realized by having one energy efficiency effort targeted at the entire state instead of 31 different efforts run by each of the utilities. However, the analysis covered in this report is not intended to compare the current program against either past programs or hypothetical alternative spending programs. Rather, it is intended to illustrate how efforts are being made to become increasingly sophisticated and broad in measuring economic and environmental effects of energy programs.

Steps in the Economic Analysis Process

There are three steps in the process of analyzing the economic development impacts of the Focus on Energy program. These steps are briefly summarized below.

(1) Document Direct Effects. The first step is to track the net *direct effects* of the program. These are net changes in:

- Program operations spending – in this case "public benefit" dollars are spent in operating the program and paying incentives to business and household participants;
- Household and business savings – these are dollar savings to businesses and households (resulting from reductions in energy and electric demand), realized because of the existence of the program;
- Household and business cost – these are the additional household and business expenditures associated with the incremental cost of purchasing energy-efficient equipment (generally the total cost of new equipment minus incentives paid by the program, and net of what would otherwise have been spent anyway);
- Other spending shifts – shifts in patterns of spending and business sales among sectors of the state economy – affecting the flow of dollars into, out-of, and within the state. This includes changes in of goods and services purchased by businesses, households, and government (compared to having no program and retaining public funds in interest-bearing accounts).

We rely on other program evaluation efforts and program tracking data to obtain the basic information for these four types of direct economic impacts. A key element of this process is careful attention to establishing the net change in government, household, and business behavior compared to what would otherwise be expected to occur without the program. In addition, attention is given to estimating the lifetime and persistence of energy savings for program participants, and longer-term market effects on households and businesses that are not formally participants but who are also affected by the program.

(2) Apply the Economic Model. The second step is to apply the REMI economic model of the state of Wisconsin. The model is a tool used to trace how the direct effects lead to changes in household and business costs, spending and sales patterns throughout the state's economy. As illustrated in Figure 1, we apply the inputs from step 1 to the REMI economic model to track a series of shifts in the state economy, including:

- Lower Business Operating Costs (increased competitiveness for business attraction)
- Lower Household Living Costs (increased attraction as a place to live)
- Import-Substitution (Wisconsin-made products substitute for purchases of out-of-state equipment and fuels)
- Increased orders for firms supplying goods and services to equipment manufacturers and installers in Wisconsin (indirect effect)
- Re-spending of additional worker income within Wisconsin (induced effect).

The application of economic impact models to measure impacts of programs and policies is widely used and accepted around the nation. Nearly all, if not absolutely all, of the states use such models. The specific application of these models for energy efficiency, renewable energy, and energy pricing policies is also widely applied and proven.

The most basic type of economic model is known as an "input-output (I-O) model"—an accounting table that traces the pattern of how households and industries buy from and sell to each other.

This type of model is useful because it allows us to trace how changes in spending and business sales lead to indirect spin-off (or "multiplier") effects on other aspects of the economy. A statewide input-output model can also trace program impacts on the net flow of money going into and out of the state. A more advanced type of economic model is known as a policy analysis and forecasting simulation model, which combines an input-output mode with an additional ability to forecast shifts in prices, competitiveness factors and business attraction over time. The REMI model (developed by Regional Economic Models, Inc.) is the most well-known and widely used policy analysis and forecasting model in the United States. The results of the REMI model represent changes in the economy of the state, on a year-by-year basis. The key indicators of change in the state's economy are:

- Total Volume of Business Sales – by type of business
- Total Number of Jobs associated with the change in business sales – by type of business and occupation category
- Total Personal Income associated with the change in jobs and business sales – by type of business
- Total Gross Regional Product – the change in "value added" that is generated in Wisconsin, which is essentially the sum of personal income and corporate income (profit).

(3) Analyze Economic Development Implications. The third and final step in the analysis process is to apply results of the economic model (step 2) to assess how the forecasted program impacts translate into economic development changes. These include:

- Changes in the growth and mix of jobs for Wisconsin residents, in terms of industries and occupations. These can lead to increased diversification of the economy, increased opportunities for job skills and higher income levels for Wisconsin workers.
- Changes in the incidence of economic impacts, in terms of urban and rural locations.
- Shifts in the nature and size of impacts occurring over time.
- Shifts in the economic competitiveness and attractiveness of Wisconsin as a place to live and to locate a business.

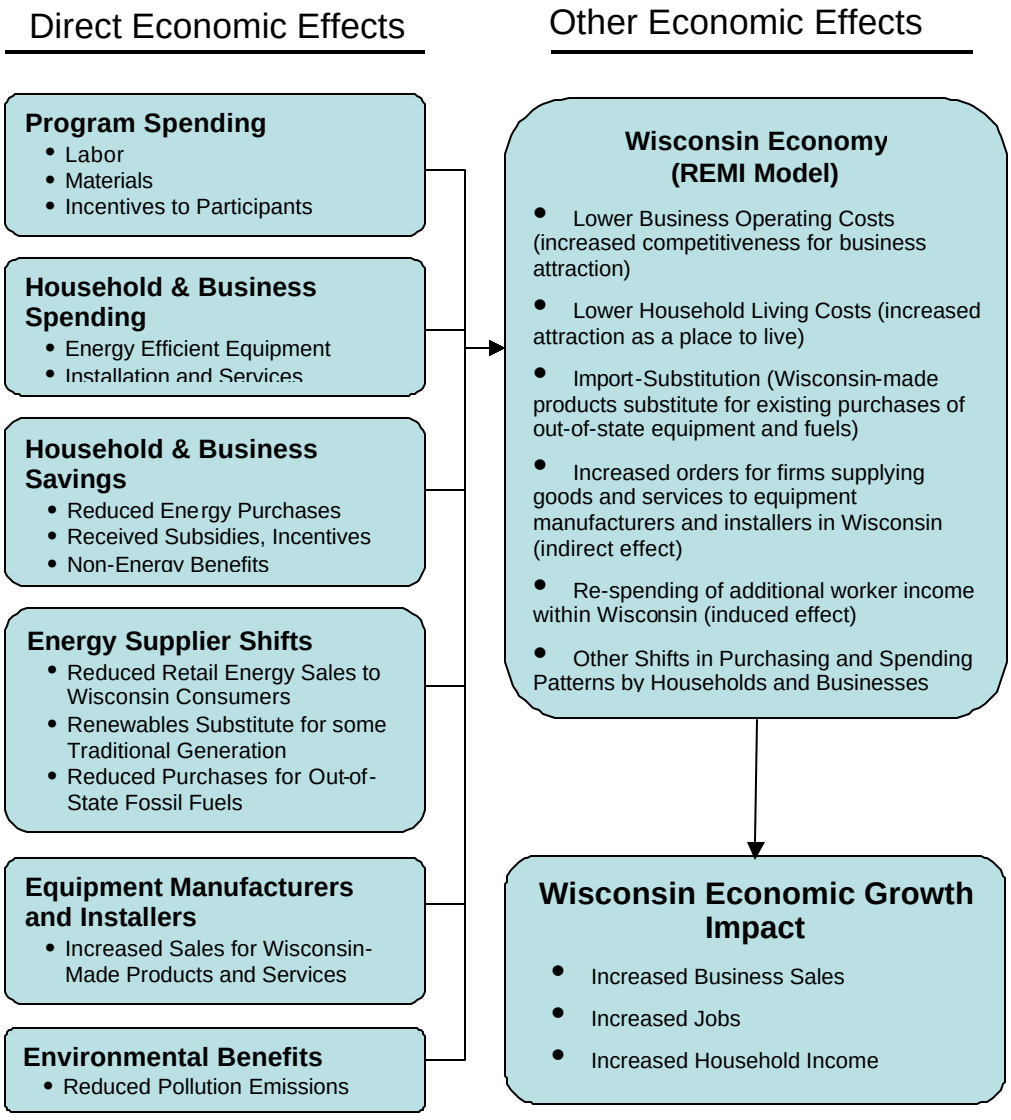
Roles of Different Program Types

It is important to recognize that programs that are part of the Focus on Energy portfolio may serve different roles, have different program objectives, and as such can impact the economy differently. Business Programs and Residential Programs are both designed to achieve energy efficiency through the purchase of more energy efficient equipment. As such, they encourage households and businesses to spend money on purchases of such equipment in cases where the households and businesses will subsequently receive even greater cost-savings benefits of reduced energy use over time. While the Renewable Energy Program is intended to stimulate the production of electricity in Wisconsin using non-fossil fuel sources, such as wind, solar energy and biomass energy. The Renewable Energy Program does not reduce energy used but instead substitutes new forms of in-state electricity generation. The in-state generation can reduce the outflow of money from the state that is now going for imports of traditional fuels (e.g., coal and natural gas), and potentially increase electric system reliability. Some forms of renewable generation (wind and solar) also add a benefit of decreased emissions. Biomass generation does produce emissions but has the added benefit of using in-state resources (farm waste, waste water products) that would otherwise produce no economic benefits to Wisconsin.

While the primary objectives of the programs may differ, they all have some effects on the economy, either by shifting purchasing patterns, saving energy and/or providing other non-energy benefits and the same economic analysis framework is applied for each program. However, it should be noted that the programs that are specifically designed to save money (by savings energy) emerge with

the greatest magnitude of economic benefits, while programs whose primary objectives are other than energy savings (e.g., promoting alternative energy generation) have a relatively smaller impact on the economy.

Figure 1. Key Elements of Economic Development Impact



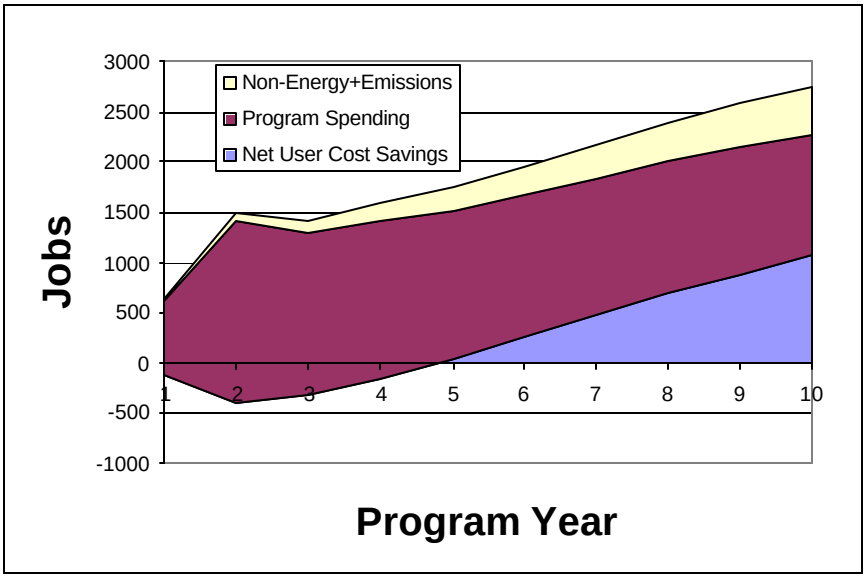
Findings for the Economic Analysis

Presented here is an overall summary of expected economic development impacts, based on analysis of operations over the first 1-½ years of Focus, and based on that analysis, projections of program activity over another 8.5 years. Through the analysis process that was previously described, the REMI economic model generated estimates of the current and projected future economic impacts of Focus. Since a key feature of Focus programs is energy cost savings for households and businesses, and since those savings continue over the lifetime of installed equipment, it is necessary to measure economic impacts over a period of time. Since Focus programs are also projected to expand in the second year (compared to the first year of operation) and continue at that higher level in subsequent

years, it is also necessary to measure economic impacts assuming continuation of the programs over a period of time.

Figure 2 illustrates the economic analysis results for all Focus programs combined (Business, Residential and Renewable Energy) It shows how overall program impacts increase as user cost savings benefits, non-energy and emission benefits, and non-program spending benefits all accumulate over time. On the other hand, the economic impact of government spending (on the program) alone leads to additional economic impacts that actually diminish over time.

Figure 2. Employment Impact over Time, by Cause (All Focus on Energy Programs)*



* Including market effects.

Table 1 shows the economic impacts the projected by the REMI model for selected years and periods, presented in terms of (1) the number of full-time equivalent job years created for Wisconsin residents, (2) the sales generated for Wisconsin businesses, (3) the value added portion of those sales, and (4) personal income generated for Wisconsin residents. The table also summarizes impacts with and without expected "market effects" for the Residential and Business programs—increases in households and businesses purchasing energy efficient products and adopting energy efficient practices without formal program participation. The model also provides information about the types of jobs created and the industries impacted, however, due to space constraints that detail is not provided here.

Market effects reflect the behavior of customers, retailers, wholesalers and manufacturers who are influenced by Focus programs to take additional actions on their own to increase the supply and use of energy-efficient equipment that they would not have done without the existence of the program. Since Focus programs specifically incorporate information dissemination, training and market intervention elements, which are intended to encourage such market effects, it is reasonable to expect that such effects would occur, although they are off in the future. The approach taken to projecting market effects varied with the program, according to the level of information available at this stage. In all cases, the projected effects are considered to be plausible, but more uncertain than the direct energy savings.

Table 1. Economic Development Impacts for All Focus on Energy Programs

Year	First Year	Fifth Year	Tenth Year	Sum of 10 years
Impact Without Market Effects				
Job Years	582	1,667	2,401	17,243
Sales generated *(In Millions)*	$43	$125	$190	$1,322
GRP (Value Added)* *(In Millions)*	$24	$78	$123	$824
Disposable income generated** *(In Millions)*	$11	$63	$127	$613
Impact With Market Effects				
Job Years	630	1,774	2,778	18,956
Sales generated *(In Millions)*	$46	$135	$224	$1,483
GRP (Value Added)* *(In Millions)*	$26	$85	$146	$934
Disposable income generated** *(In Millions)*	$11	$66	$149	$779

Note: All dollar amounts are in millions of year 2001 constant dollars.
* GRP = Gross Regional Product, reflecting both net personal incomes to households and net income to businesses.
** Disposable Income reflects both earned income and household savings in energy costs resulting from program participation.

Altogether, the analysis found that Focus leads to significant economic development benefits for Wisconsin's economy. Even without counting market effects, the first year of program operation causes a variety of household and business cost savings and spending changes that altogether support over 500 jobs in the state, and that impact grows to over 1,600 jobs by the fifth year of program operation. The personal income generated in Wisconsin from this additional business activity represents $11 million in the first year, and grows to over $60 million by the fifth year of program operation. The market effects grow over time, adding essentially no impact in the first year, adding roughly 4 - 6% to income and jobs by in the fifth year, and roughly 16% by the tenth year of program operation.

Environmental Benefits

For Focus, the evaluation team has used plant-specific emissions- and operations-related hourly data to estimate emissions factors for electric generation pollutant emissions (NO_x, SO_2 and mercury) and greenhouse gas emissions (CO_2). These factors have been applied to the net energy impacts from the Focus impact evaluation efforts based on results for all of the Focus programs.[1] For this analysis, we have described some of the effects on nitrogen and sulfur oxides (NO_x and SO_2) emissions based on Focus program impacts on utility generation costs for power generators within Wisconsin. The economic value of these effects statewide was found to be minimal in this context. However, this analysis did not look at the economic effects of other environmental impacts that affect individuals directly, such as effects on health. This is a separate issue that could be addressed by the evaluation team and the state in future studies (e.g., identification and application of an appropriate damage function that establishes dollar values for the externalities associated with the burning of fossil fuels for electricity generators supplying Wisconsin).

It is important to recognize that this economic analysis did not capture some types of program benefits at all and that some benefits have been captured incompletely. As suggested above, a good example of this is the calculation of economic benefits resulting from decreases in electric generation

[1] Impact evaluations are updated every six months for the Business Programs and are evaluated at the sector level (Commercial/Industrial), while impact evaluations for Residential Programs are conducted at the sub-program level. A quarterly report is produced which reports up-to-date gross, evaluated gross and net energy impacts based on all reviewed evaluation impact reports submitted prior to the quarterly report being submitted. The most recent at the time this paper was submitted is *Focus on Energy Public Benefits Evaluation Quarterly Report (Contract Year 2, Quarter 3) Final May 30, 2003.*

pollutant emissions (NO_x, SO_2 and mercury) and greenhouse gas emissions (CO_2). While it is recognized that decreased emissions of pollutants and greenhouse gases have beneficial impacts on health and other quality of life concerns, it is currently difficult or impossible to quantify those impacts from the perspective of individuals living in the state. It is possible to quantify the value of some avoided emissions by looking at their value in pollution trading credit markets. However, the pollution credit trading markets primarily involve and affect utility companies.

In this economic analysis, the scale of utility operations statewide is so large that the economic benefits derived from reducing emissions, though significant in themselves, barely register in the model. This is the case for the NO_x and SO_2 pollutants, which have U.S. markets where credit trading clearing prices have been applied. However, with no U.S. carbon credit market, it is more speculative to assign a monetary value; this is unfortunate because the scale of avoided CO_2 currently estimated to be attributable to Focus is significant (see additional discussion below on this topic).

What is the potential value of pollution credits that could be generated by Public Benefits programs?

Assuming that stricter air pollution controls are desirable and will come into being, and that the form of controls will be cap-and-trade systems, the State of Wisconsin may be able to generate a valuable asset by creating pollution credits from energy efficiency gains from its Focus program. In its first year of operation, the program has documented significant energy savings. The most recent figures as reported in the *Focus on Energy Public Benefits Evaluation Quarterly Report (Contract Year 2, Quarter 3) Final May 30, 2003* indicate that in the Focus program is responsible for over 161 million kilowatt hours of annual electricity savings and over 4.4 million therms of annual natural gas savings, resulting in millions of dollars in savings on consumers' utility bills. The potential value of related pollution reductions should be viewed as a multi-year stream of savings. As the program continues, and ramps up to full funding and increased effectiveness, this savings stream will grow in size.

Table 2 below provides estimates of the potential value of pollution credits that could be generated by Focus. The first column provides the type of emission reduction associated with the energy savings, and the second column presents the quantity of emission reduction. These quantities can be multiplied by a price for a pollution credit to produce an "Annual Value" for the credits. For 2003, the table uses current spot market prices for sulfur oxides (SO_x) and green house gasses, primarily CO_2, (GHG). For the 2012 projection, projected prices from PA Consulting Group's "Multi-Pollutant Optimization Model" are used, based on a scenario assuming enactment of the Bush Administration's "Clear Skies" proposal for SO_x, nitrous oxides (NO_x), and mercury reductions. For a lower bound on mercury prices, the projections assume EPA's estimated price of $16,000/ton. The table also assumes a market for GHG credits with a price of $5 - $10/ton, up from today's $1 - $2/ton.

Table 2. Estimates of the Potential Value of Pollution Credits for Focus

Type of Emission	Annual Emission Reduction	Spot Market Price (2003)	Annual Value at Current Spot	Projected Price (2012)	Annual Projected Value (2012)
SO_x (tons)	445	$130/ton	$58,000	$332 - $392/ton	$148,000 - $175,000
NO_x (tons)	264	N/A	N/A	$1,767 - $1,847/ton	$467,000 - $488,000
GHG (tons CO^2e)	110,045	$1 - $2/ton	$110,000 - $220,000	$5 -$10/ton	$550,000 -$1,100,000
Mercury (pounds)	3.1	N/A	N/A	$16,000 -$120,653/lb	$49,000 - $371,000
Total			**$168,000 - $278,000**		**$1,200,000 - $2,100,000**

The estimate of the potential value of credits for the four pollutants in 2003 is between $168,000 and $278,000. For 2012, when markets for all four pollutants are expected to exist and prices are higher than today, the potential value is $1.2 - $2.1 million. Over the 10-year period 2003-2012, the potential value of credits is estimated at $6 - $10 million. All such projections are inherently uncertain but those presented here represent a very plausible set of assumptions about how future emission markets will unfold. Other scenarios are possible and could be explored.

A Summary of the Interim Benefit-Cost Analysis

The first comprehensive comparison of benefits and costs for the Focus program were presented in the evaluations report *Initial Benefit-Cost Analysis Final Report: March 31, 2003* prepared by Miriam Goldberg, Valy Goepfrich, Lori Boeckeler, and Kennedy Agnew. The summary provided below has been adapted from that report and has was presented in *Focus on Energy Public Benefits Evaluation Quarterly Summary Report: Contract Year 2, Third Quarter Final: May 30, 2003* which is an effort to summarize evaluation efforts over the previous quarter in a report that is accessible by someone that is not familiar with the jargon commonly used by those in the energy efficiency industry.

The first step in conducting a benefit-cost analysis is to list the costs and benefits that are involved. Table 3 shows each element of the benefit-cost analysis and whether the element is added to or subtracted from the benefit or cost side. A review of that table shows that the environmental impacts and the economic benefits are two of nine elements accounted for in the benefit-costs analysis (It should be noted that for the most part these same elements are also inputs into the economic model). Eight of the nine categories are considered on the "benefit" side of the equation, with participant spending having a negative impact on benefits while it is possible for economic impacts to have a positive or a negative impact on the "benefit" side of the equation. Only two elements are counted on the "cost" side of the equation; "program spending" and "program incentives." Some tests do not count incentive payments as either costs or benefits, because they contribute a net difference of zero between the two (positive benefit to participants, but a cost to the program). This approach recognizes this net difference of zero, but explicitly accounts for incentives on both sides of the benefit-cost comparison.

Table 3. Elements Included in a Benefit-Cost Analysis for Focus

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

The second step in conducting a benefit-cost analysis is to select a valuation method. Regardless of which benefit-cost valuation method the researcher uses, if the value of the benefits do not outweigh the costs of achieving those benefits, continued spending should be questioned. A ratio greater than 1 indicates that program benefits exceed the costs of the program.

Table 4 below provides three benefit-cost ratios for each program area, one that excludes economic and non-energy benefits and one that adds in the non-energy benefits for the Residential program and one that includes all the benefits that have been valued (which only adds economic benefits for the Business and Renewable Energy programs since the non-energy benefits for those programs have not yet been quantified). The Business and Residential programs have benefit/cost ratios that are greater than 1, indicating that the programs are creating greater value for the state of Wisconsin than it costs to run them. For the Renewable Energy Programs, the total projected benefit is less than the program spending. That is, the net benefit is negative, and the benefit-cost ratio is also negative. This is driven by significant participant spending for photovoltaic systems, an important technology in the Renewable Energy portfolio, which are not offset by the projected energy savings provided. It is also important to note that the program did not become operational until almost a year after the other programs, so the demonstrated impact per program dollar is currently low, the non-energy benefits have not yet been quantified, which is even more important for the Renewable Energy program than the Business programs due to differences in their policy objectives.

Table 4. Benefit-Cost Ratios for Focus Program Areas and Focus Overall

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	N/A	5.7
Business	2.0	N/A	3.0
Residential	4.3	9.0	9.0
Renewable Energy	-1.1	N/A	-0.8

* Includes economic impacts for all program areas and non-energy benefits for the Residential program area. The valuation of non-energy benefits for the Business and Renewable Energy programs areas has not yet been completed. At the time this paper was submitted a report quantifying non-energy benefits for Business Programs was under internal review, quantification on non-energy benefits for Renewable Energy is planned, but is on hold until a critical mass of projects has been completed for a sufficient period of time for participants to be able to report impacts the projects have had on their operations. It is expected that for the next benefit cost analysis that is conducted in early 2004, the quantification of non-energy benefits for both Business and Renewable Energy Programs will be completed and will be included in that analysis.