State of Wisconsin
Department of Administration
Division of Energy

Focus on Energy Pilot Study:

Demonstration of Economic Impact Analysis for Commercial & Industrial Programs

September 30, 2001

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1. INTRODUCTION

1.1 OBJECTIVE OF THIS REPORT

There is a clear interest in assessing the economic impact of the Wisconsin Focus on Energy (FOE) program – both the initial pilot as implemented in one corner of the state, and the larger program rolled out at a statewide level. It became clear during the course of the initial pilot evaluation effort that while the measurable, immediate impacts of the pilot program were modest, the longer-term economic impact of a sustained statewide program could be much more substantial. Accordingly, this report covers two related topics: (1) it examines the magnitude of initial impacts for selected elements of the pilot program as a means of testing the methodology and highlighting its key data needs, and (2) it illustrates the application of a broadened approach for assessing longer-term impacts of the full statewide program. The latter topic is particularly important because a significant part of the FOE program is intended to increase both demand and market capacity for future change in equipment and technology investments, and much of the payback from those kinds of investments can continue for many subsequent years. This report illustrates how we can potentially address that issue by extrapolating from initial program experience to assess potential longer-term impacts expected from a statewide program.

1.2 BACKGROUND

Goals of the "Focus on Energy" (FOE) Pilot Program. The Wisconsin Focus on Energy (FOE) programs are "public benefits" energy programs, designed to encourage businesses and local government to take advantage of available energy technologies and make more economically-efficiency (and environmentally-responsible) energy decisions. They are also "market preparation" programs, intended to initiate 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 (b) encouraging the development of new market structures and entities to support those efforts.

The FOE programs have explicit goals of helping to:

1. increase understanding of energy efficiency and renewable energy issues
2. conserve non-renewable energy resources
3. boost the economy, creating jobs and income
4. protect the natural environment.

Topics #1 and #2 are energy-related impacts and were examined by the evaluation in a separate series of program impact reports. Topic #3 is the focus of this report, while topic #4 is the focus of a separate environmental impact report.

Definition of Economic Impact. In general, the term "economic impact" refers to program effects on the level of business activity within the state, which in turn also affect jobs and wages. Economic impacts can be defined as effects that create additional real income for people in Wisconsin through the expansion of salaries and profits. These benefits represent real money, which can be spent and recirculated in the state economy. While we can also set monetary values for environmental and other quality of life impacts, the values of these benefits do not necessarily translate directly into money residing in people's pockets and recirculating in the economy. Thus, this report makes an important distinction between the value of overall benefits and impacts on the state economy.

The FOE programs can cause economic impacts in a variety of ways which are described further in Chapter 2. Basically, these programs help to increase local business sales and reduce the cost of doing business for some segments of Wisconsin businesses. For example, participating customers who undertake recommended measures increase local spending on purchases and installation of energy savings equipment and materials, which generates short term income for suppliers and contractors. The long term realization of energy savings may also translate into a reduction in the level of local purchases of energy, and hence reduce the flow of dollars out of the state to purchase power plant fuels such as coal and natural gas. Together, these effects can serve to increase growth of the Wisconsin economy, as measured in terms of business sales, jobs or aggregate personal income.

Challenges for this Economic Evaluation. Assessing the economic impacts of the FOE programs is a challenge, because these program are *not* traditional "resource acquisition" program which obtains energy savings through rebates, subsidies, giveaways or free installations to encourage installation of more energy efficient equipment. Rather, many elements of the FOE programs seek to provide information, training, and technical support to help increase market demand and market supply for energy efficient products and services. They can and does lead to some immediate energy savings, but they are also intended to encourage longer term growth of energy efficiency by preparing markets to move towards eventual "market transformation."

Due to the nature of the FOE programs, their ultimate impacts on private investment in energy efficiency and the realization of energy savings may unfold over time. We can classify these impacts into four categories:

1. energy savings from *immediate installation* or implementation of energy efficiency products and services as a result of the program's direct or indirect outreach to businesses and households (typically within one year)

2. energy savings from *later installation* or implementation of energy efficiency products and services, by customers planning to upgrade equipment when replacement is needed or when budgets will become available (e.g., within two to three years)

3. additional energy savings (of types #1 or #2) which occur as *sustained outreach* by the program reaches additional businesses and households in later years. This can go on until the program reaches effective saturation of the market (e.g., out for another ten to fifteen years).

4. additional energy savings in later years as cumulative effects of the continued program leads to *lasting changes (transformation)* in market supply (offerings), market demand (attitudes and interest) and market prices for energy efficiency products and services.

Analysis of the pilot program to date can only confirm category #1 impacts and indicate the likelihood of category #2 impacts (based on surveys of reported intentions). Further impacts of #3 can only be estimated based on extrapolation of the earlier program impacts. The nature of category #4 impacts is necessarily speculative, though existing assessments have examined the extent of movement towards market preparation, and they can form a basis for alternative high and low scenarios. Overall, the limited scope of the pilot program makes it difficult to fully document its economic impacts, so it is appropriate that readers view this economic impact report as primarily a demonstration of methods to be applied more fully in a later statewide analysis.

Selection of Programs to be Analyzed. To measure economic impacts it was necessary to have estimates of energy savings associated with a program and also to have data on costs and expenditures for both the program and participating customers. Since many elements of FOE pilots have been in the form of information, training and technical support, not all of them can directly lead to measurable changes in customer investment and energy savings within one year. For that reason, a decision was made, early in the pilot evaluation effort, to focus the tracking of program expenditures and energy impacts on two programs expected to provide significant and documentable short-term energy savings results that could meaningfully be extrapolated. These were the programs focusing on major commercial and industrial business customers, referred to during the pilot period as the Commercial and Industrial (C&I) program and the Energy Efficiency Performance (EEP) program.

Since the selection of programs for this analysis was made early in the analysis process, that selection should not be interpreted as making any statement about the actual effectiveness of the programs involved (either in absolute terms or relative to other FOE pilot programs) in generating near-term savings or providing potential to generate long-term market transformation effects. As noted in other reports in the pilot evaluation series, some other FOE pilot programs have also ended up generating near-term energy savings. The evaluation reports further raised serious questions concerning the likelihood of significant long-term market transformation effects from several of the programs in their pilot configurations. As a result, the new statewide FOE effort incorporates a “Major Markets Program” that continues the evolving C&I pilot program design, while the EEP pilot program design was not continued into the statewide effort. Given all of these changes, the focus of this report is primarily on the development and testing of economic impact assessment methods to be applied to the FOE statewide effort, rather than on just measuring economic impacts of the pilot.

Time Period of Impacts. The economic impact analysis in this report examines the effects of the commercial and industrial sector pilot programs in the year 2000, and then forecasts potential future economic impacts of extending the commercial and industrial program at a broader statewide level in subsequent years. The forecasts of future impacts are based on alternative scenarios regarding program continuation and eventual phase-out, and longer-term (35-year) market effects on sales of energy efficient products and services. `      `

Overview of the Rest of This Report. Section 2 of this report provides definitions and a description of the overall methods used to assess economic impacts. Sections 3 and 4 respectively assess the pilot program (short-term) impacts on energy use and spending patterns, which are the starting bases for the economic modeling. Section 5 provides scenarios for longer-term program impacts on technology diffusion and market transformation, which must also be assumed to forecast long-term program impacts on the economy. Section 6 then provides the long-term statewide economic model results, and Section 7 contains conclusions from them.

2. DEFINITIONS AND METHODOLOGY

This chapter provides a background discussion of three fundamental issues:

(A) What are the different economic measures of program impact, and how do they relate to effects on the state economy?

(B) What mechanisms (drivers and intermediate effects) cause impacts on the state economy to occur?

(C) How are these economic mechanisms modeled and their impacts calculated?

2.1 TYPES OF IMPACTS AND BENEFIT MEASURES

In recent years, there has been increasing acknowledgement that the full impact of energy programs is more than just reductions in kWh or therms. Programs such as Wisconsin's Focus on Energy can directly affect the state's economy (affecting jobs and income for Wisconsin residents), as well as the environment and quality of life (both of which may also lead to impacts on jobs and income). Therefore, a full benefit/cost analysis of the Focus on Energy program should examine not only impacts on energy use by program participants, but also the complete range of economic and social benefits, costs and distributional impacts for Wisconsin residents.

It is important at the outset to distinguish between three types of program impacts, based on how they translate into dollars:

- ***Economic Impacts*** are measurable changes in the net inflow of dollars coming to households and businesses (as revenue or income) and/or measurable changes in the net outflow of dollars from households and businesses (due to shifts in the local "cost of living" or "cost of doing business"). At the statewide level, economic impacts represent results of both increased economic productivity and greater business attraction. At the national level, inter-state shifts due to changing business attraction patterns are essentially cancelled out, while the productivity impacts remain.

- ***Monetized Social Impacts*** are values that people place on their quality of life, which are over-and-above the flows of money (income). While they do not create money flows, people can still value those impacts in terms of a monetary (dollar-equivalent) *"willingness to pay"* to receive the positive impacts and avoid the negative ones. This can include some types of impacts related to air quality, comfort and other aspects of the quality of life.

- ***Non-Monetized Social Impacts*** are additional positive or negative impacts which do not lead to changes in the flow of dollars and for which there is no consensus on how to value them in dollar terms. This can include some environmental impacts associated with long-term depletion of natural resources.

The distinction between these three types of impacts is not always clear. In economic theory, all social impacts (e.g., environmental and quality of life effects) should ultimately be "capitalized" in the form of in the form of shifts in property values, housing prices and business productivity – all of which ultimately affect income levels. In practice, changes in property values and population movements are both subject to a wide variety of supply and demand factors, and market imperfections, so there is no guarantee that those economic (income) benefits will actually occur and be measurable, or that they will match the "monetized" (willingness to pay) value that people report placing on "quality of life" or environmental improvements.

In theory, there is also no type of social impact that cannot be turned into dollar equivalents, and thus put into a benefit-cost analysis. In practice, some types of social impacts (e.g., natural resource preservation or depletion impacts) tend to have a very wide range of estimated monetary values found in the research literature, and the selection of specific values within that range is often seen as reflecting the political viewpoint of the analyst. To apply those factors in a benefit-cost analysis, it is necessary to either (a) select a wide range of possible values for those benefits, which can make it difficult to discern whether the impacts do or do not pass any benefit-cost tests, or (b) select one value for those benefits, knowing that the resulting benefit-cost numbers are likely to be attacked by those who do not agree with the selected choices.

For these reasons, it is useful to keep the concept of three types of impact measures. Now once we have three different types of impact measures, then we also end up with three different ways to compare program benefits and costs:

- *<u>Economic Benefit/Cost</u>.* In this context, the economic impact refers to effects on the economy – leading to changes in business sales, income and jobs. There is a broad interest among Wisconsin residents in seeing the creation, preservation and improvement in jobs available in the state and associated increases in personal income. Since the operation of energy programs also have economic impacts on jobs and business activity, it is quite possible to calculate the overall impact on the Wisconsin economy and *economic benefit/cost ratio* for these programs. This measure can be thought of as a comparison between the in-flow of money to residents of Wisconsin (benefit) and the out-flow of money from the pockets of Wisconsin residents (cost).

- *<u>Social Benefit/Cost</u>.* A more complete measure of the total social (or societal) impact is the sum of all (1) economic impacts and (2) monetized social impacts, with adjustment for any double-counting. That adds together the dollar value of those impacts that affect the flow of dollars, and the "dollar-equivalent" value of those impacts that do not affect the flow of money. This is justified insofar as "willingness to pay" indicates (in theory) a willingness to be left with a lesser disposable income in order to achieve desired outcomes. This measure is equivalent (when defined at the statewide level which excludes inter-state transfers) to what is referred to in the California energy program evaluation standards as the "Societal Cost Test" (or when expended to include long-run market changes, the "Public Policy Test").

- *<u>Cost-Effectiveness</u>.* In broad general terms, it is possible to assess the effectiveness of spending money on programs in terms of the amount of benefit achieved (either in dollar or non-dollar terms) per dollar of program spending. While the broad category of cost-effectiveness measures can encompass both economic benefit/cost and social benefit/cost comparisons, they are not bound by any requirement that benefits be represented in terms of dollars (or dollar-equivalents). Thus, cost-effectiveness measures can also be used for assessing the effectiveness of program spending on "non-monetized" social impacts (e.g., amount of resources saved per dollar of program spending).

It is important to note that all of the above three forms of benefit and cost comparison focus on the "efficiency" of program spending, in terms of the magnitude of aggregate benefit achieved. There are additional public policy objectives beyond the goal of increasing aggregate public benefit. They include:

- *distributional equity* – assuring that the incidence of program benefits and the incidence of program costs do not unfairly transfer money or well-being between sectors of the state's population, between sectors of the state's economy, or between regions of the state.

- *targeting segments* – assuring that the program is helping to reach certain sectors of the population and the state that are target priorities for government policy – such as low income populations and rural areas.

- *economic growth goals* – beyond providing income and other benefits to Wisconsin residents, there is a state policy goal to improve the competitiveness of the state's economy, thus increasing the flow of private investment and business activity coming into the state and hence growing the size of the state's total economy.

2.2 MECHANISMS LEADING TO IMPACTS ON THE ECONOMY

The Focus on Energy program leads directly or indirectly to economic effects on households, businesses, utilities, and government. They occur though five primary mechanisms:

1. *Reduction in Energy Use* – The program audits and information dissemination can directly cause participants to implement measures that reduce energy consumption, or it can indirectly cause both participants and non-participants to reduce energy consumption as a result of "market preparation" or "market transformation" activities.

   In economic terms, the reduction in energy consumption can represent a reduction in the cost of living for households, and a reduction in the cost of operations for businesses. (For energy utilities, this can mean a loss of revenue, though that could also be offset by reductions in excess utility costs associated with serving peak load and incremental load growth, as well as arrearages and subsidies for low income population segments.) The aggregate cost savings from reduced energy use can translate into an increase in net disposable income for households and an increase in net income for businesses. They can also make the state a more attractive place for people to live, and a more competitive place for businesses to grow and locate – thus causing further long-term growth in business sales, jobs and income.

2. *Improvement in Safety and Reliability*- Depending on the types of energy-saving measures being installed, the program could also cause users to substitute newer, more reliable and more effective equipment for home or business operation. Insofar as that occurs, it can directly cause participants to experience fewer equipment failures and fewer situations of damage to facilities.

   In economic terms, the reduction in equipment failures and/or property damage can represent a reduction in property or business losses, which again translate into an increase in net disposable income for households and an increase in net income for businesses. (For energy utilities and local government, they can also represent a reduction in unreimbursed costs for emergency calls.) Any such increases in household and business income can also help make the state a more attractive place for people to live, and a more competitive place for businesses to grow and locate – thus causing further long-term growth in business sales, jobs and income.

3. *Improvement in Comfort and Quality of Environment* - Insofar as the program causes users to install physical improvements to their buildings or facilities, it can also provide them with greater comfort, health, personal productivity and/or quality of life. If the program improves air quality or water quality due to equipment improvements or reductions in local power plant operations, then that too can represent increases in comfort, health or quality of life.

   In economic terms, the improved comfort and quality of life can lead to increases in property values. The improved health and productivity of workers can also translate into an increases in income for employees and employers. It is also possible that reductions in air pollution (from reduced power plant production) can also lead to savings in business costs associated with building maintenance. Any such increases in household income (and spending), worker productivity or reductions in business operating costs can help make the state a more attractive place for people to live, and a more competitive place for businesses to grow and locate – thus causing further long-term growth in business sales, jobs and income.

4. Substitution of Spending - The program can encourage households and businesses to install certain types of measures that have a disproportionately high degree of reliance on Wisconsin-made products (e.g., controls and motors) or Wisconsin-based labor (e.g., installation of weatherization measures). By decreasing total energy use, it can also reduce reliance on out-of-state power plants, or at least reduce local demand for coal or gas, neither of which is extracted or refined in Wisconsin. By encouraging trade allies to offer more extensive energy-saving products and services (as a result of market preparation or market transformation processes), the program can further promote the growth of locally-based product and service providers.

   In economic terms, the increase in demand for Wisconsin-based products and services (and the decrease in demand for out-of-state produced products) represents a form of "import substitution" – meaning that there are more jobs and worker income occurring in Wisconsin instead of going to out-of-state workers and businesses (whose products are "imported" into Wisconsin). In the long term, that can help grow the state economy, providing more jobs and income within the state.

5. Shift in Program Funding and Use of Funds– Energy programs are generally financed by a charge added onto electric bills. That diverts some consumer and business spending from other types of purchases to the programs. However, the design of the Wisconsin Focus on Energy, as a market preparation program (leading to future market transformation), has some additional economic shifts. First of all, it moves energy program operations spending away from utilities to dispersed private sector organizations, where the funding is designed to leverage greater initiatives by trade allies to offer new products and services, and for energy users to desire them. By promoting private sector initiatives, the program is also designed to ultimately reduce government costs of program administration and operation.

   In economic terms, the public benefits charge represents a redirection of funds from households and businesses toward private sector implementation organizations (instead of being spent on government, or normal spending patterns by households and businesses).

These five types of impact mechanisms ultimately affect businesses and households throughout the state by:

- shifting the competitive position of Wisconsin in industries relative to competition outside the state, thus affecting business investment in retention or expansion of existing businesses and attraction of new businesses

- influencing the cost of living for Wisconsin residents over time. This changes disposable (spending) income as well as population movements.

Among these five types of impact mechanisms, the Wisconsin Focus on Energy pilot program affects some more directly than others. Impact evaluations of the pilot programs indicate some initial energy impacts (impact category #1) primarily from installation of higher efficiency equipment in the commercial and industrial sectors. Those equipment purchases also led to changes in business spending patterns (impact category #4) and energy program resources (impact category #5). The program's energy savings also may have led to air quality impacts (impact category #3), though that analysis is not yet completed and it is also doubtful that the initial impacts on air quality were large enough to trigger perceptible savings in business operating costs. The economic analysis is also designed to assess effects of additional impacts on the cost of living and the cost of doing business, which may be associated with changes in safety, reliability or comfort (impact categories #3 and 4). However the program evaluations to date have shown little evidence of these additional benefits, largely due to the nature of the pilot program – which did not particularly focus on low income population segments or economically-depressed groups of businesses (where there is most opportunity for safety and reliability improvements).

2.3 MODELING ECONOMIC IMPACTS

Types of Economic Impact Models. The economic impacts of energy programs can be complex, but models have been developed that can systematically trace through the direct and indirect effects and account for their resulting impacts on the economy. The modeling of energy program impacts can be viewed in terms of three "generations" of sophistication.

<u>The "first generation" are *Input-Output (I-O) Models*</u>. In general, I-O models are accounting systems that identify typical inter-industry linkages – i.e., showing how sales of goods and services in one industry lead to purchases of supplier goods and services in other industries. The *direct* impacts of energy-related expenditures are increases purchases made to buy goods or services from specific industries. These, in turn, lead to *indirect* impacts on spending for "factor inputs" (other goods and services) in supplier industries. Respending of the additional workers income (created by the direct and indirect impacts) lead to *induced impacts* in the form of additional purchases of consumer goods and services. The extent of spending going to firms and individuals outside of the state is known as leakage. Overall employment and income multiplier effects are calculated on the basis of the inter-industry linkages and leakage rates for the affected industries.

I-O models were designed primarily to calculate the overall impacts of increases or decreases in income and spending caused by the expansion or contraction of programs, projects, population or businesses. They were never designed to assess how changes in *costs* can affect the competitiveness of an area for business attraction and investment. Since energy efficiency can affect business operating costs, most applications of relying on I-O models have simply assumed that cost savings are turned into corresponding increases in business sales. Early examples are studies completed for California (Cal. Energy Commission, 1979), Long Island (Buschsbaum et al., 1979), Pacific Northwest (Charles River Associates, 1984), the Midwest (Nebraska Energy

Commission, 1984). More recent studies also assessed hypothetical scenarios in which spending is made in the development of local electric efficiency programs instead of traditional energy supply sources (which come primarily from out-of-state). These include Florida (Krier et al., 1993), Minnesota (Economic Research Associates, 1993), British Columbia (Jaccard & Sims, 1991), Ohio (Laitner et al., 1994) and New York (NYS Energy Planning Board, 1994).

The "second generation" are *Dynamic Simulation Models*. They combine I-O accounting tables with forecasting simulations which respond to dynamic factors that change over time. This includes changes in the pattern of in-flow and out-flow of capital investment, business location and expansion, and population over time. Key driver of these changes are *price effects* -- the fact that energy efficiency programs can positively or negatively affect the cost of living, costs of doing business and productivity. Those changes, in turn, can ultimately affect the cost competitiveness of local industry and lead to changes in the attraction of investment, growth of business activity and movement of population over time. The dominant regional economic simulation and forecasting tool that is used around the US to assess energy policies is the REMI (Regional Economic Models, Inc.) policy forecasting model.

The REMI model has been applied for forecasting the competitive economic development impacts of changes in energy prices and policies on counties and states. The California P.U.C. Study: "Impacts of the Proposed SCE/SDG&E Merger" (Weisbrod and Moses, 1984), provided a first application of the REMI model to assess energy rate impacts. Subsequently, the model was also applied to assess economic impacts of energy efficiency programs in Missouri (Department of Natural Resources, Dec., 1993) and Wisconsin (the Wisconsin Energy Bureau, with Cambridge Systematics, 1994). A more detailed analytical model was subsequently developed by Weisbrod for the Iowa Dept. of Natural Resources in 1996. That model, summarized in Energy Services Journal (Weisbrod and Friedman, Energy Services Journal, v.2, n.3, pp. 133-146, 1996), addressed economic impacts associated with different types of energy efficiency measures, targeting to different sectors of the customer base, as well as alternative types of power generation, and alternative pricing levels. Similar applications of REMI have subsequently been conducted for New Jersey (Treyz and Petraglia, Journal of Business Forecasting, 5-7, Summer 1997) and Wyoming (Black and Veatch, 1997).

The "third generation" combine dynamic simulations with technology diffusion forecasts. The used in this report to assess long-term statewide economic impacts incorporates a two-stage process. The first stage is a spreadsheet-based model which forecasts alternative scenarios for the future market transformation of energy efficient technologies. Those results are then fed into the second stage – the REMI economic simulation model, to assess overall long-term economic impacts. The spreadsheet model extrapolates from early survey results of the Focus on Energy program to forecast:

(a) longer term rates of technology implementation among businesses (and households) that did not immediately implement all recommended measures;

(b) a sustained program that eventually phases down as program outreach approaches effective market saturation;

(c) shift of publicly-supported programs to private sector initiatives as the program matures.

Factors Affecting Economic Model Results. As a "third generation" form of economic impact analysis, this study examines three types of factors which directly affect the economic results. They are listed below and directly addressed in Chapters 4, 5 and 6.

<u>Factors Affecting Short-Term Energy Cost Savings</u> (covered in Chapter 3)

- *Gross energy savings* associated with the first full year of the pilot program
- Projected *short-term realization rates* for net energy savings in the subsequent two years, based on participant survey data.
- *Incremental short-term energy savings*, adjusted for actions that would have occurred even without the program.
- Average *cost of energy* (kWh and therms) to commercial and industrial customers in Wisconsin (to convert energy savings to customer cost savings).

<u>Factors Affecting Expenditure Patterns</u> (covered in Chapter 4)

- *Capital investment* required of participating customers to implement recommended actions.
- Pilot *program spending pattern* including marketing, administration, fieldwork, travel and equipment
- Extent of *Wisconsin-based businesses* capturing the program-induced spending on products and services.
- Portion of energy *fuel and power production* activities occurring within Wisconsin.

<u>Factors Affecting Long-Term Technology Diffusion and Energy Savings</u> (covered in Chapter 5)

- Projected *long-term adoption rates for energy-saving equipment* attributable to sustained pilot program efforts, as it saturates the market
- Projected *program cost* required over time, as markets start to be transformed
- Average *persistence* of savings from installed energy efficient equipment
- Average *useful life* of installed energy efficient equipment

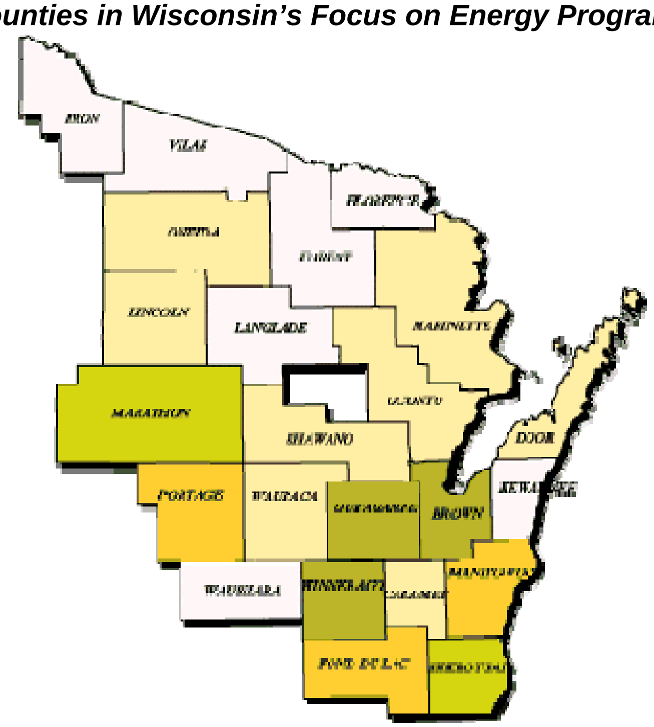
3. PILOT PROGRAM ENERGY USE AND COST

3.1 Study Focus on Specific Programs and Energy Impacts

The economic impact analysis that is described in Chapters 3 – 4 is based on first-year evaluation data for pilot programs aimed at commercial and industrial customers. The objective of the analysis is to demonstrate the basic economic impact methodology, by illustrating how these energy savings and related investments affect the economy. A similar approach could be used at a later date to more completely estimate impacts of a full set of statewide programs.

The pilot program itself covers 23 counties, representing roughly one-quarter of the land area of the State of Wisconsin, and approximately 18% of the state's economy (employment and business sales). Much of this area is comprised of small towns and semi-rural areas, which is why the economic activity is proportionately somewhat lower than for the overall state. The analysis in this chapter describes the estimates of first-year costs, savings and impacts for the commercial and industrial sector pilot programs. These estimates are used as a starting basis for assessing long-term statewide economic impacts in Chapters 5 - 6.

The 23 Counties in Wisconsin's Focus on Energy Program



As a prelude to the statewide economic impact modeling, this chapter presents measures of first-year program impacts on energy use within the pilot area. (Subsequent chapters also examine investment and spending effects and extend these savings and spending patterns to represent longer-term and broader statewide impacts.) These energy savings fall into the following categories:

- *Gross short-term energy savings* associated with completed cases in the first full year of the pilot program.
- *Incremental short-term energy savings* is the part of the gross energy savings that would have occurred even without the program.
- *Dollar value of energy savings*, based on typical costs of energy (per kWh and therms) to commercial and industrial customers in Wisconsin.

3.2 Measures of Year One Gross Energy Savings

Initial Documentation of Benefits. The first step in the economic analysis is to measure the change in total energy use (kWh of electricity and therms of natural gas) which is associated with the installation of energy efficiency equipment under the pilot programs. This is based primarily on participant survey data concerning actual installation of equipment within the first year, plus further intentions of some C&I program participants to install equipment later in the year. (The stated intentions were discounted based on the what was deemed the "most likely" realization rate, as discussed in the C&I program evaluation report.) We refer to these initial estimates as "gross" energy savings because they have not yet been adjusted for the fact that some of the equipment changes may have occurred even in the absence of the program.

For purposes of this report, the total gross energy savings is that associated with: (1) already-installed equipment among the 118 substantially completed participants in the two commercial and industrial sector pilot programs, (2) the most likely magnitude of additional equipment "expected to be installed later in the year" among completed participants in the C&I Program, and (3) extrapolated savings associated with the 114 additional C&I Program participants who were signed up sometime during the first year but whose program involvement was not completed by the end of the year. The gross energy savings associated with the first two categories was calculated to be 13,139,768kWh/year and 3,070,546 therms/year. Adding in the third category raises the estimate of overall total gross energy savings to 18,828,289 kWh/year and 5,701,871 therms/year.

To accurately measure how these energy savings flow through the economy it is necessary to develop detailed breakdowns on the incidence of energy savings by type of customer (standard industrial classification) and by type of equipment (or system) installed. In this case, there was relatively detailed data available for the C&I pilot program. Table 3-1a shows the estimated breakdown of first year gross energy savings by type of equipment. It shows that industrial process equipment, compressed air, lighting and heat generation were responsible for the largest shares of total energy savings. Table 3-1b breaks down those same energy savings by economic sector. It shows that industrial customers were responsible for a disproportionately large share of the total energy savings.

Table 3-1 Gross Energy Savings in Year 1, by Equipment and Business Type

Type of Equipment	Percentage of Total		Total Gross Impact	
	KWH	Therms	KWH	Therms
(a) by Type of Equipment				
Lighting	32%	3%	6,045,885	151,128
HVAC	7%	3%	1,271,881	187,328
Controls	6%	3%	1,099,344	169,324
Motors/VSD	4%	0%	793,630	12,986
Compressed Air	17%	4%	3,118,556	240,486
Heat Gen./Distr.	0%	36%	11,990	2,038,642
Bldg. Envelope	0%	28%	49,976	1,617,475
Industrial Process	32%	10%	6,073,196	567,716
Comm. Process	1%	2%	271,874	88,300
Hot Water	0%	11%	91,957	628,485
Total	**100%**	**100%**	**18,828,288**	**5,701,870**
(b) by Economic Sector				
Commercial	23%	91%	4,401,930	5,160,570
Industrial	71%	9%	13,264,708	520,295
Governmental	6%	0%	1,125,552	21,006
Other	0%	0%	36,100	0
Total	**100%**	**100%**	**18,828,289**	**5,701,871**

Source: based on data in Evaluation of the Commercial and Industrial Program, July 2001 (expanded from 98 "substantially complete" to 208 total C&I participants in the first year) and Third Interim Evaluation Report for the EEP Program (representing 24 participants)

For the C&I program, data was also available to show how the mix of business types differed by type of equipment being promoted and installed (as shown in Tables 3-2a and 3-2b). This data represented only the first year of the program, and it is likely that the pattern will vary as the program reaches a broader set of participants in future years. Future follow-up studies may thus provide more reliable and robust profiles of energy savings by industry. Nevertheless, Table 3-2 is useful as it confirms the logical relationships between industries and equipment types. By comparing the last column (which shows the industry mix of overall energy savings) against other columns (which show the industry mix for specific types of equipment), we can see that:

- Lighting improvements were most common for commercial activities such as printing (#27) and hotel (#70) industries.
- Motors and compressed air improvements were most common for manufacturing activities such as the machinery (#35) industry.
- Control system improvements were most common for manufacturing activities such as textile industries (#22).
- Industrial process improvements were most common manufacturing activities such as food products manufacturing (#20) and primary metal manufacturing (#33) industries.
- Building envelope (insulation) and commercial process improvements were most common for stand-alone buildings holding health care (#80) and related service facilities.
- HVAC improvements were most common for retail (#53), health services (#80) and government (#91) activities.

Table 3-2a
Detailed Breakdown of <u>Electricity Savings by Business Type</u>,
Gross kWh Savings in Year 1 *(percentages of total in each economic sector)*

Participant Economic Sector	Lighting	HVAC	Motor/ VSD	Compressed Air	Envelope	Control Systems	Industrial Process	Comm. Process	Dom. Hot Water	Total : All Equipment Types
15 Construction	0.00%	0.00%	0.00%	0.00%	0.00%	0.40%	0.00%	0.00%	0.00%	**0.02%**
20 Food & kindred	1.60%	5.30%	0.70%	1.10%	0.00%	0.10%	24.40%	0.00%	0.00%	**8.97%**
22 Textile mill prod	9.10%	0.00%	1.10%	9.80%	0.00%	37.00%	0.00%	0.00%	0.00%	**6.76%**
24 Lumber products	0.00%	0.00%	7.60%	7.20%	0.00%	6.60%	1.80%	0.00%	0.00%	**2.48%**
27 Printing & publish	30.30%	8.70%	9.60%	6.70%	0.00%	7.80%	0.00%	0.00%	0.00%	**12.29%**
28 Chemical	0.00%	1.80%	0.60%	1.60%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.41%**
33 Primary metal	0.90%	0.50%	8.70%	5.90%	0.00%	0.30%	69.40%	0.00%	0.00%	**24.09%**
34 Fabricated metal	2.80%	0.00%	0.20%	2.10%	0.00%	0.10%	0.00%	0.00%	0.00%	**1.26%**
35 Machinery	20.90%	0.60%	56.40%	50.80%	1.70%	22.60%	0.10%	0.00%	0.00%	**18.91%**
37 Transportation	4.90%	0.40%	1.30%	4.10%	0.00%	0.20%	4.40%	0.00%	0.00%	**3.77%**
39 Misc mfg	0.00%	8.20%	2.40%	4.80%	0.00%	0.00%	0.00%	0.00%	0.00%	**1.45%**
49 Utilities	0.00%	0.00%	0.00%	0.00%	0.00%	4.30%	0.00%	0.00%	0.00%	**0.25%**
51 Wholesale trade	0.10%	0.00%	0.40%	0.30%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.10%**
53 Retail non-food	3.40%	27.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**2.96%**
55 Auto dealers	1.40%	0.10%	0.00%	0.90%	0.00%	0.20%	0.00%	0.00%	0.00%	**0.62%**
56 Apparel stores	0.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.06%**
58 Eating & drinking	0.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.06%**
70 Hotel & lodging	7.90%	0.00%	0.00%	0.00%	0.00%	4.80%	0.00%	0.00%	0.00%	**2.82%**
72 Personal repair	0.80%	0.00%	0.20%	0.30%	0.00%	0.00%	0.00%	2.00%	0.00%	**0.34%**
75 Auto repair	0.30%	1.00%	0.10%	1.70%	0.00%	0.40%	0.00%	0.50%	0.00%	**0.48%**
80 Health services	10.00%	23.30%	8.10%	0.00%	89.70%	14.20%	0.00%	96.70%	9.80%	**7.64%**
83 Social services	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	0.00%	0.80%	0.00%	**0.02%**
86 Membership orgs	1.20%	0.00%	0.10%	0.00%	8.70%	0.10%	0.00%	0.00%	0.00%	**0.42%**
87 Engineering serv	0.40%	0.00%	1.40%	2.60%	0.00%	0.40%	0.00%	0.00%	0.00%	**0.64%**
89 Accounting serv	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	90.20%	**0.44%**
91 Executive govt	3.10%	22.50%	1.00%	0.00%	0.00%	0.40%	0.00%	0.00%	0.00%	**2.58%**
93 Finance, taxation	0.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.19%**
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.05%**

Source: Evaluation of the Commercial and Industrial Program (July 26, 2001) and program tracking records.

Table 3-2b
Detailed Breakdown of Natural Gas Savings by Business Type,
Gross Therm Savings in *(percentages of total in each economic sector)*

Participant Economic Sector	Lighting	HVAC	Motor/ VSD	Compressed Air	Heat Gen/Dist.	Envelope	Control Systems	Industrial Process	Comm. Process	Dom. Hot Water	Total : All Equipment Types
15 Construction	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
20 Food prod	0.00%	0.00%	0.00%	0.00%	74.10%	94.70%	0.00%	0.00%	0.00%	0.00%	**53.36%**
22 Textile mill prod	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	29.10%	0.00%	0.00%	0.00%	**0.86%**
24 Lumber prod	0.00%	33.90%	0.00%	0.00%	0.00%	0.30%	27.70%	0.00%	0.00%	0.00%	**2.02%**
27 Printing & pub	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	3.10%	0.00%	0.00%	0.00%	**0.32%**
28 Chemical	0.00%	0.00%	0.00%	0.00%	3.70%	0.00%	0.00%	0.00%	0.00%	0.00%	**1.32%**
33 Primary metal	0.00%	8.20%	0.00%	5.30%	0.20%	0.00%	0.00%	100.00%	0.00%	0.00%	**10.52%**
34 Fab metal	0.00%	0.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.01%**
35 Machinery	100.00%	0.00%	0.00%	32.20%	0.00%	0.30%	1.10%	0.00%	0.00%	0.00%	**4.13%**
37 Transportation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
39 Misc mfg	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
49 Utilities	0.00%	0.00%	0.00%	0.00%	0.00%	1.40%	0.00%	0.00%	0.00%	0.00%	**0.40%**
51 Wholesale	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
53 Retail non-food	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
55 Auto dealers	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.30%	0.00%	0.00%	0.00%	**0.16%**
56 Apparel stores	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
58 Eating, drinking	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.40%	0.00%	0.00%	0.00%	**0.01%**
70 Hotel & lodging	0.00%	34.10%	0.00%	0.00%	0.00%	0.00%	3.70%	0.00%	0.00%	0.00%	**1.23%**
72 Personal repair	0.00%	0.00%	0.00%	15.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.64%**
75 Auto repair	0.00%	2.70%	0.00%	0.00%	0.70%	0.50%	0.00%	0.00%	0.00%	56.40%	**6.70%**
80 Health services	0.00%	16.00%	0.00%	25.30%	15.60%	1.40%	21.20%	0.00%	95.80%	43.20%	**14.44%**
83 Social services	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.10%	0.00%	0.00%	0.00%	**0.12%**
86 Member orgs	0.00%	4.70%	0.00%	0.00%	0.10%	0.00%	0.20%	0.00%	0.00%	0.00%	**0.20%**
87 Engineering	0.00%	0.00%	0.00%	22.00%	0.00%	0.00%	0.50%	0.00%	0.00%	0.00%	**0.94%**
89 Accounting	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
91 Executive govt	0.00%	0.00%	0.00%	0.00%	5.60%	1.40%	3.60%	0.00%	4.20%	0.40%	**2.62%**
93 Finance & tax	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Source: Evaluation of the Commercial and Industrial Program (July 26, 2001) and program tracking records.

3.3 Calculation of Incremental Energy Savings

Additional adjustments were made to estimate the “incremental” energy savings that only occurred because of these pilot programs. This adjustment was made by subtracting the portion of total gross energy savings that would have occurred even in the absence of the program.

What we are here calling the “incremental energy savings attributable to the program” is often referred to in energy program impact studies as the “net” energy savings. This report avoids that term to prevent confusion with the very different concept of a “net” economic savings (which is the amount of money saved over a period of time from reduced energy usage, after subtracting the additional cost of installing the new equipment.)

The portion was determined from survey questions which inquired as to whether participants had previously intended to undertake some or all of the recommended energy efficiency improvements anyway. This is based on participant survey data, asking participants whether there was a prior intention to undertake this energy efficiency improvement before joining the program. The portion of the energy savings that presumably would have occurred even without ranged by program from 17.5% to 36%. The overall average for commercial and industrial businesses in the pilot was 19%. (That portion is often referred to in energy program impact studies as the “free ridership” rate. This report avoids that term because the C&I pilot program was an information and training-based “market preparation” program that specifically sought to change attitudes and intentions without financial rewards. In that case, those who already intended to install energy-efficient equipment were not actually getting a “free ride” on any financial rewards.) The total incremental energy savings was thus calculated to be 14,340,693 kWh/year and 4,704,196 therms/year.

3.4 Dollar Value of Incremental Energy Savings for the Full Pilot

To perform the economic impact analysis, we needed to translate the incremental energy savings into financial savings in operating costs for all participants. This was done based on average energy prices for medium-size commercial and industrial customers during the year 2000. These were $.0658/kWh of electricity and $0.664/therm of natural gas. The result was an estimated gross savings for first-year participants totaling $5,024,944, with an estimated incremental savings portion totaling $4,067,234. (These numbers include the value of energy savings from customers who signed up during year one but whose program participation process was not yet complete by the end of the year. If that group was excluded, then the gross savings would be $2,903,307 with an incremental value of $2,315,479.)

In the economic modeling process, the higher value for incremental cost savings was input into the model as a reduction in the relative “cost of doing business” in Wisconsin. This reduction in cost was allocated to various industries based on the pattern of savings by type of equipment as previously shown in Table 3.1, and the match of equipment to industries as previously shown in Table 3.2.

4. Pilot Program Impact on Spending & Economy

Whereas the preceding chapter provided measures of direct program impacts on energy savings for participants, this chapter examines program impacts on spending by participants, for program operation and for energy fuel and supply purchases. These direct spending and cost effects offset and change the nature of impacts on the economy. They fall into the following categories:

- *Capital investment* (private upfront cost) by participating customers to implement recommended energy efficiency measures and achieve the energy savings (by type of energy efficiency measure installed);

- Pilot *program operating expenditures* (annualized cost), by type of activity including labor, materials and travel;

- Extent of *Wisconsin-based producers* for alternative types of energy efficiency products and services, based on industrial classification. This indicates the portion of net capital investment flowing to Wisconsin-based businesses.

- Portion of *energy fuel and power production activities* occurring within Wisconsin.

4.1 Capital Investment Expenditures by Participants

While energy savings for businesses represent a reduction in the cost of doing business in Wisconsin (and energy savings for households represents a reduction in the cost of living in Wisconsin), those annual cost savings are partially offset by the up-front cost to participants associated with purchasing and installing the energy efficient measures. These one-time, up-front expenditures on upgrading equipment and facilities are referred to as “capital investments” made by the participants. Available survey data from substantially-complete C&I participants provided a basis for calculating rates of reported capital investment (per unit of energy savings). They are shown in Table 4-1.

These capital investments are one-time expenditures which continue to provide annual savings over the lifetime of the installed equipment. Overall, the ratios indicate that the average investment expenditure (per annual kWh or therm saved) for most types of equipment is around 1 ½ to 2 ½ times the cost of electricity (kWh) or gas (therms). That means that most of the installed equipment has an energy saving payback of around 1 ½ to 2 ½ years, and continually returns cost savings thereafter. (The exceptions are compressed air, control and building envelope measures, which in some cases provide payback within the first year.) It is important to note that the ratios in this table are based solely on the 94 C&I pilot participants who were substantially complete and for whom information on actual dollars spent on individual equipment were available. Since this is a relatively small sample, the values shown here should be interpreted as illustrative, but they should not be used as “rules of thumb” to be applied elsewhere. Future studies may be able to provide better values for these ratios.

Table 4-1.
Reported Rate of Capital Investment in New Equipment

Measure	Typical Measure Life	Electricity	Natural Gas
		Equipment Investment per Annual KWH saved	Equipment Investment per annual Therms saved
Lighting	7	$0.11	--
HVAC	15	$0.08	--
Controls	15	$0.16	--
Miscellaneous	20	$0.03	--
Motors/VSD	15	--	$1.03
Compressed Air	20	$0.06	$1.64
Heat Gen./Distr.	25	$0.04	--
Bldg. Envelope	15	$0.13	--
Industrial Process	15	$0.14	--
Comm. Process	15	$0.16	--
Hot Water	15	NA	--

Sources: Information on dollars spent on equipment to achieve energy savings are from survey of participants in the C&I Program. Not all customers were unable to provide this information, so the sample sizes were small and the estimates may not reliably represent what could be expected in a larger program. This table is shown for illustrative purposes to demonstrate our modeling approach, and should not be considered authoritative. Estimates of measure life were drawn from studies by the New York State Energy Research & Development Authority (NYSERDA) and studies by ACEEE ("Selecting Targets for Market Transformation Programs: A National Analysis," , August 1998).

Just as the analysis of energy savings distinguished between the gross impacts (associated with installation of equipment under these programs) and the incremental impacts (that would not have otherwise occurred), the same distinction can be made for the capital investments in new equipment. The next step was to multiply the per unit rates of spending on equipment purchases (from Table 4-1) by the estimates of total gross and incremental energy savings for the full pilot programs (from Table 3-5). The end result, shown in Table 4-2, is the estimated total amount of capital investment by participants in the full pilot programs.

Table 4-2
Estimated Capital Investment in New Equipment Purchases by All 1st Year Participants

Type of Equipment	Total Program-Related Investment	Incremental Investment Due to Program
Lighting	$912,897	$673,094
HVAC	$408,968	$323,599
Controls	$321,665	$258,266
Motors/VSD	$148,278	$119,401
Compressed Air	$487,953	$400,655
Heat Gen./Distr.	$2,101,600	$1,735,170
Bldg. Envelope	$2,655,658	$2,192,606
Industrial Process	$1,720,570	$1,401,795
Comm. Process	$182,874	$150,085
Hot Water	$1,045,429	$862,821
Total	**$9,985,892**	**$8,117,492**

Source: calculated from savings distribution in Table 3-1, incremental impact (gross - net) deduction of 19% and per unit investment rates in Table 4-1.

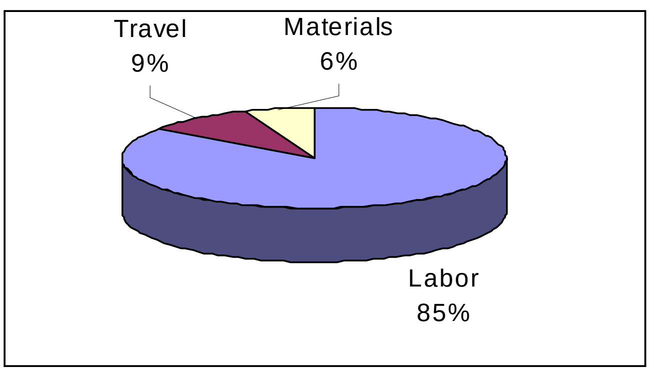
They indicate that the pilot program caused first-year participating firms to make an additional $11 million of capital investment in the first year (from Table 4-2), to save approximately $4-5 million/year over the lifetime of the equipment (from Table 3-5 and preceding text). That is consistent with the 1 ½ to 2 ½ year payback period previously noted. Surveys for the C&I Program indicated that some first year participants also intended to install additional equipment in the subsequent two years, so it was likely that the total annual cost savings from equipment installed by the end of the third year could be 33% higher than the first year savings alone.

4.2 Pilot Program Operating Expenditures

Focus on Energy program operating expenditures are paid by a customer "wires charge" that is applied to all electric bills. The charge could be viewed as a factor raising customer energy bills, though in this case the charge is actually a replacement for the funding of more traditional energy efficiency programs that similarly affected customer electric bills. The program expenditures do affect the Wisconsin economy to the extent that they directly provide jobs and income for program workers, and indirectly provide jobs and income at businesses selling products or services. The nature of that effect depends on the extent to which the expenditures are going for labor, purchases of equipment and materials, and purchases of travel and other services. The first full year of operations of the pilot programs for commercial and industrial customers totaled $4.5 million of spending.

A breakdown of spending was available only for the C&I Program, and that was split between labor, materials and travel as shown in Figure 4-1. Analysis of future statewide programs may make it possible to better refine these breakdowns among more detailed categories of administration, marketing, training, technical assistance and fieldwork aspects of the programs.

Figure 4-1
Mix of Program Operating Costs



It is important to note that while the program expenditures will have effects on purchases and sales patterns within the Wisconsin economy, Wisconsin business sales caused by this program spending alone would not normally be included in a benefit-cost analysis, since alternative uses of the funds could also create roughly similar spending effects. However, the program spending can lead to net additional economic growth in Wisconsin if it takes the place of spending that would otherwise go to fund purchases of out-of-state fuels for power plants. (That effect, known as “import substitution,” is discussed next.)

4.3 Wisconsin-Based Producers.

For any kind of purchases made in Wisconsin, some portion of the dollars flow to business establishments located within Wisconsin and some portion flow to businesses located outside of Wisconsin. The distinction is important because the first portion generally creates jobs and income for Wisconsin residents, while the second portion does not. Economists often refer to the proportion of spending going to in-state businesses as the "regional purchase coefficient." For Wisconsin, that coefficient differs by type of product or service -- from under 30% in the case of lighting, compressed air, commercial & industrial process equipment, heat generation and hot water heating, to over 70% in the case of HVAC, motors and controls. Money spent on installation of building envelope (insulation) measures also tend to flow locally, due to the large local labor components involved in installation of building insulation.

These regional purchase coefficients were determined based on an analysis of the extent to which Wisconsin has a disproportionately large or small base of manufacturers providing the relevant types of energy-saving equipment. Table 4-3 lists the affected technologies and the associated North American Industrial Classification System (NAICS) categories. (Note that NAICS is a replacement for the SIC -- Standard Industrial Classification System.)

Table 4-3. Key Industries Providing Energy-Saving Equipment for Pilot Participants
Industry Name and North American Industrial Classification System (NAICS) Number

High Representation of Production in Wis.	**Average Representation of Production in Wis.**
HVAC Equipment & Controls	*Lighting Equipment*
333-4 Heating, Ventilation and AC mfg.	335-1 Lighting Equipment Manufacturing
Motors & Drives	*Commercial & Industrial Process*
333-6 Engine, Power transmsn equip mfg	333-2 Industrial machinery mfg
	333-3 Commercial & Service machinery
Control Systems	*Heat Generation*
334-512 Environmental Controls	332-41 Power Boiler & Heat Exchanger mfg
334-513 Industrial Process Controls	332-811 Metal Heat Treating
Building Envelope Insulation	*Hot Water and Heat Generation Systems*
327-993 Mineral Wool / Fiberglass Insulation	335-228 Hot Water Heaters Manufacturing
	333-4 Heating Equip. excl. warm air furnaces

source: US Dept. of Commerce, County Business Patterns, 1999.

There are three industry categories in which Wisconsin manufacturers are national leaders:

- *Manufacturing of heating, ventilation, air conditioning & cooling equipment (NAICS 333-4)* – Wisconsin's share is 70% higher than the national average for employment in this industry. With major US firms such as Trane headquartered in Lacrosse, the state is a national leader in production of energy efficient HVAC systems.

- *Manufacturing of environmental controls (NAICS 334-512)* – Wisconsin's share is double the national average for employment in this industry. With major US firms such as Johnson

Controls headquartered in Milwaukee, the state is a national leader in production of energy efficient control equipment.

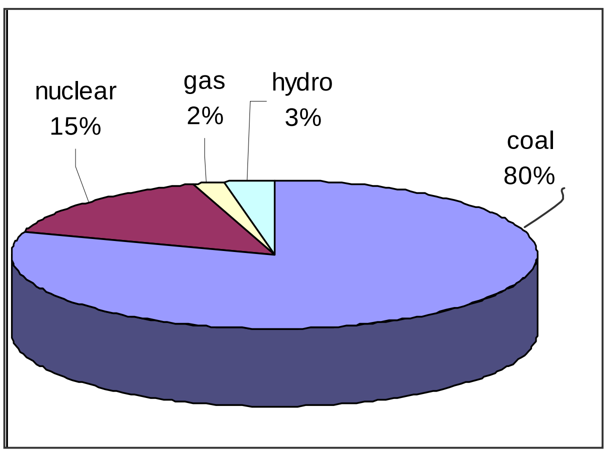
- *Manufacturing of electric motors (NAICS 333-6)* -- Wisconsin's share is seven times the national average for employment in this industry. With major US firms such as Marathon Electric in Wausau and Leeson Electric headquartered in Grafton, the state is a national leader in the production of energy efficient motors.

Table 4-4 (a – c) on the next page lists the largest employers (those with over 100 employees at the site) producing these types of products within Wisconsin.

4.4 Fuel and Power Expenditures.

Current data indicate that 20 percent of the money spent on retail purchases of electricity in Wisconsin are attributable to the cost of fuel for power plants – primarily coal and nuclear fuel. While the power plants are in Wisconsin, essentially all of their fuel comes from out-of-state sources. For the major power plants serving Wisconsin, the fuel mix is roughly 80% coal and 20% other. (See Figure 4-2.) Together, these facts mean that every hundred dollar of electricity cost savings brings 20 dollars of reduced purchases of out-of-state coal and other fuels.

Figure 4-2. Fuel Mix of Wisconsin Utility Electric Power Generating Plants



Source: The fuel portion of total electric cost is based on input-output technological matrices, which reflect inter-industry patterns of sales and purchases, together with estimates by Jim Mapp of the Wisconsin Energy Bureau. The coal portion of the fuel mix is based on 1998 data from the Energy Information Administration of the US Dept, of Energy, which indicated a 76% share for coal as the fuel for utility power plants located in Wisconsin, this figure was updated by estimates from Jim Mapp which indicated a slightly higher share for coal in 2000.

Table 4-4 Major Wisconsin Manufacturers of HVAC, Motors and Controls

Table 4-4(a) Wisconsin Manufacturers of Heating, Air Conditioning & Refrigeration
(*establishments with 100 to 3,200 employees, sorted by size)*

The Trane Co. (Headquarters)	La Crosse, WI
Manitowoc Ice, Inc.	Manitowoc, WI
Sub Zero Freezer Co.	Madison, WI
APV Americas-Lake Mills	Lake Mills, WI
Vilter Manufacturing Corp.	Cudahy, WI
Bassett, Inc.	Kaukauna, WI
Kolpak Walk-Ins	River Falls, WI
Leer LP	New Lisbon, WI
Parker Hannifin Corp., Refrig. Div.	Mauston, WI
Sterling Inc.	Milwaukee, WI

Table 4-4(b) Wisconsin Manufacturers of Electric Motors
(establishments with 100 to 1,000 employees, sorted by size)

Marathon Electric Mfg Corp	Wausau, WI
Leeson Electric Corporation	Grafton, WI
McMillan Electric Company	Woodville, WI
E C M Motor Co	Elkhorn, WI
Ametek Inc	Racine, WI
Emerson Electric Co	Sturgeon Bay, WI
General Signal Corporation	Hudson, WI
Mamco Corporation	Franksville, WI
Dumore Corporation	Mauston, WI

Table 4-4(c) Wisconsin Manufacturers of Electronic Controls & Parts
(establishments with 100 to 1,500 employees, sorted by size)

Johnson Controls	Milwaukee, WI
Electronic Assembly Corp.	Neenah, WI
Honeywell Advanced Circuits	Chippewa Falls, WI
Sanmina Corp.	Pleasant Prairie, WI
Quad/Tech, Inc. (QTI)	Sussex, WI
Microelectronic Modules Corp.	New Berlin, WI
W. L. Gore & Associates, Inc.	Eau Claire, WI
Rexnord Corp., Stearns Division	Milwaukee, WI
MTI Electronics, Inc.	Menomonee Falls, WI
Montello Products Co.	Montello, WI
Allen-Bradley Co.	Eau Claire, WI
Camdec Corp.	Germantown, WI
Milwaukee Electronics Corp.	Milwaukee, WI
Pho-Tronics, Inc.	Milwaukee, WI
Precision Devices Inc.	Middleton, WI
U. S. Controls., Div. of Ark-Les	New Berlin, WI
Universal Electronics Inc.	Menomonee Falls, WI

Source: Dun & Bradstreet, and the Wisconsin Manufacturers Directory (Manufacturers News, Inc.)

4.5 Short-term Economic Impact

Chapters 3 and 4 show that the first-year impacts of the commercial and industrial sector pilot programs were modest, totaling approximately $4.1 million of incremental energy savings/year, and spurring approximately $8.1 million of incremental investment in new equipment (a portion of which turned into sales for Wisconsin manufacturers). However, given the short time frame and limited geographic coverage of the pilot, as well as the limited time period of the analysis to date, it remains possible that a sustained statewide program (which reflects the best features from the pilot effort) could have much more substantial longer-term impacts. Accordingly, this report provides a methodology for addressing longer-term economic impacts and illustrates its use in the subsequent two chapters. Full descriptions of the economic analysis process and the REMI economic simulation model are provided in Chapter 6.

In accordance with that same analysis process, the findings on one-year economic impacts from the commercial and industrial sector pilot programs are summarized in Table 4-5. Overall, the table indicates that these pilot programs supported 220 jobs and $7.7 million of income for Wisconsin residents. It is important to note that approximately 60% of these impacts were due to program spending, and would not be included in a benefit-cost analysis since spending the money on alternative uses would also yield roughly similar impacts on jobs and income. It is also important to note that the remaining impacts due to program benefits include impacts associated with customers who completed participation during the first year and also customers who signed up but had not yet completed the participation process by the end of the year. Excluding the latter group would reduce the program benefit element of impacts by 43%.)

While the numbers for first-year pilot impacts are modest, the more interesting result is the potentially larger long-term economic benefit of further reducing energy costs and transforming energy markets under a sustained statewide program, and that issue is examined in the next two chapters.

Table 4-5. Economic Impacts of Year One Commercial and Industrial Sector Pilots

Element of Impact	Jobs*	Personal Income*	Business Output*
(1) Program Operations Spending	131	$4.4 m	$8.0 m
2) Program Benefit: Increased Customer Spending on Locally-Made Energy-Saving Equipment, Offset by Decreased Utility Sales and Spending on Fuel Imports	74	$2.8 m	$14.2 m
(3) Program Benefit: Increased Business Competitiveness Due to Energy Cost Savings, Offset by Additional Customer Cost of New Equipment	15	$0.5 m	$1.7 m
TOTAL IMPACT	**220**	**$7.7 m**	**$12.7 m**

** Source: analysis by Economic Development Research Group, using the REMI economic model for State of Wisconsin. While the pilot program in the year 2000 was operated in just one quarter of the state, these economic model results include indirect impacts on suppliers and induced effects of income respending throughout the entire state. Note that income and business output impacts include changes in profitability and wage rates for pre-existing as well as expanded and new activities.*

5. SCENARIOS FOR LONG-TERM STATEWIDE CHANGE

Since the Focus on Energy Pilot was intended to lay the groundwork for a statewide program, it is appropriate to examine the implication of its economic impact findings for a state-level program. Given that one of the primary policy objectives of a statewide FOE is to support long-term changes in market demand and supply for energy-efficient technologies, it is also useful to assess the nature of potential economic impacts from long-term changes in those markets.

At this time, it is premature to actually measure the long-term economic impacts of the actual statewide program. It is also difficult to directly extrapolate such findings merely from the pilot program evaluations covering one full operating year -- given that those evaluations showed little evidence that the programs had yet achieved substantial behavioral changes among the trades or other market actors beyond participating customers. However, it is possible to assess the potential range of long-term economic impacts through use of alternative scenarios. This chapter illustrates how we can potentially develop alternative scenarios building upon initial pilot program experience, and the subsequent chapter applies economic models to show how we can assess their long-term economic implications. These illustrative examples are shown for the commercial and industrial sector programs, though the same basic approaches can also apply for programs aimed at residential, government/institutional and agricultural sectors.

5.1 Expanding Analysis to Represent Long-Term, Statewide Effects

The extrapolation of program impacts over a long period of time is necessary for two reasons. One reason is that even in a one-year program, residents incur program funding charges on their energy bill and participants incur additional capital investment costs – both of which are justified by recurring energy savings that may last for the life of the installed equipment (up to 25 years) and beyond (if the installed energy-saving equipment is then replaced with new energy-saving equipment). The continuing energy savings can thus reduce costs of living and increase business competitiveness for decades. The other reason is that a successful statewide program can be expected to eventually transform long-term market supply and demand for energy-saving equipment, and thus either phase out or be reduced to a maintenance level of activity while energy savings continue to occur.

All of the scenarios developed in this report assume that the pilot C&I Program is extended over a period of time and applied at a statewide level. The statewide extrapolation of the program is basically accomplished by multiplying all program spending and benefit values by a factor of five. The long-term program impacts are determined by five additional factors, listed below. The first two are basic assumptions, while the latter three can be represented as alternative scenarios:

- Average *useful life* of energy-saving equipment, by type of equipment.
- Average *persistence* of savings from installed equipment, adjusting for losses of savings due removal, equipment failure, businesses closing, or remodeling of the premises.
- Projected *long-term adoption rates of energy-saving equipment* attributable to sustained program efforts.
- Future *program marketing saturation* point, when program marketing and outreach efforts have effectively reached as much of the eligible population (of businesses) as is practical.
- Average *program cost* required to continue the program over time.

5.2 Alternative Scenarios

We define three illustrative scenarios for statewide impact:

(a) low scenario, in which the program continues with a constant level of incremental annual cost and benefit until it its outreach saturates the market, at which time it is terminated.

(b) medium scenario, in which the program continues with a constant level of incremental annual benefit, but with cost falling over time as private (trade ally) initiatives help maintain a higher level of energy efficiency.

(c) high scenario, in which markets are transformed so that incremental program benefits continue to grow although the program itself is phased out.

All of the scenarios share two common assumptions about the long-term aspects of energy savings from installed measures:

- *Persistence Loss.* Assume that there is an annual “persistence loss” of (non-realized) energy savings attributable to businesses failing or moving, and buildings being vacated or remodeled over time. Assume that this persistence loss is 2%/year in the second year after equipment installation and an additional 5%/year in all subsequent years.

- *Cost Amortization Over Useful Life of Equipment.* Assume that installed energy saving measures (equipment and improvements to facilities) have a limited useful life, as previously shown in Table 4-1. Assume that any energy savings not already eliminated by persistence loss and remaining at the end of the equipment’s useful life will be renewed with another capital investment in replacement equipment.

Low Scenario. This scenario assumes that future program benefits and costs will continue to occur in proportion to those observed for the pilot, until the program ends. This reflects an assumption of no real program impact on inducing private sector initiative or measure adoption outside of the program. Specific parameters are as follows:

- Energy-Saving Equipment Adoption Rates. Assume the program continues to enroll additional participants with additional energy cost savings until it reaches a saturation point. Assume a uniform annual rate of adoption of program equipment and facility upgrade measures (at the rate as demonstrated in the pilot program), until that saturation point is reached. Use projections from the pilot program, factored up to represent the state level (a factor of 5), as an indication of the incremental annual energy savings to be realized in each subsequent year from until the market saturation point is reached. Assume that the program ends at that point, with energy savings subsequently declining due to persistence loss over time. See Table 5-1 and Figure 5.1.

- Market Saturation. Assume that the program ends when it has saturated its market. For purposes of illustrating economic impacts, assume that this saturation rate occurs when the program has reached 50% of all firms with more than 20 employees. This occurs in the tenth year.

- Program Costs. Assume that the full costs of the pilot program, scaled up by a factor of five, will apply for the statewide program. Those costs will continue until the program ends. See Figure 5-2.

Medium Scenario. This scenario assumes that the program is continued indefinitely, but with a lower level of cost. Specific parameters are as follows:

- Energy-Saving Equipment Adoption Rates. Same as for the low scenario, except that the program will continue to operate at a reduced level (rather than end) after the market saturation point has been reached, so adoption of energy measures and incremental annual energy savings will continue to occur after 2009, with energy savings in all subsequent years remaining constant at the level achieved in year ten. See Table 5-1 and Figure 5.1.

- Market Saturation. As with the low scenario, market saturation is assumed to occur at approximately ten years out, when the program has reached 50% of all firms with more than 20 employees. However, the program will not end then, but will continue at a low level as necessary to maintain the same level of energy savings as the saturation peak.

- Program Costs. Assume that the statewide program can be provided at half the proportional level of resources as the pilot –i.e., 2.5 times the pilot cost (rather than five times the cost as was assumed under the low scenario). See Figure 5-2.

High Scenario. This scenario assumes that the program does have some market transformation impact, by inducing private sector initiatives and measure adoption to occur outside of the program. As a result, energy savings grow over time, and program costs drop over time. Specific parameters are as follows:

- Energy-Saving Equipment Adoption Rates. Assume that each year's incremental energy savings will be 1% larger than the prior year, and that will continue until a higher market saturation rate is reached (as defined in the next bullet), after which it will continue at a constant level. See Table 5-1 and Figure 5.1.

- Market Saturation. Assume that the program's potential market saturation point is higher -- when it has reached 75% of all firms with more than 20 employees (rather than the 50%, as assumed under other scenarios). This occurs at approximately 15 years out.

- Program Costs. As with the medium scenario, assume that a statewide program requires half the proportional level of resources as the pilot (i.e., 2.5 times the pilot cost rather than five times that cost). Further assume that this cost, expressed in inflation-adjusted dollars, will drop 2% each year as trade allies take on a larger role in marketing and providing energy-saving equipment and supporting services. See Figure 5-2.

Expectations. Available evidence from the pilot evaluations indicate that the energy savings benefits indicated in the low scenario are occurring. However, it is premature at this time to determine whether or not the long-term changes posited in the medium and high scenarios would eventually occur if the program is sustained as a statewide program.

Table 5-1 Energy Cost Savings Associated with Each Scenario (Statewide)

Cost Savings millions of yr 2000 dollars	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 10**	**Year 20**
Low Scenario	$20.3	$53.0	$97.4	$141.2	$184.0	$226.0	$351.9	$290.6
Medium Scenario	$20.3	$53.0	$97.4	$141.2	$184.0	$226.0	$351.9	$351.9
High Scenario	$20.3	$53.5	$98.4	$142.6	$185.9	$228.3	$397.8	$596.7

Figure 5-1 Energy Cost Savings Associated with Each Scenario *(statewide, yr. 2000 dollars)*

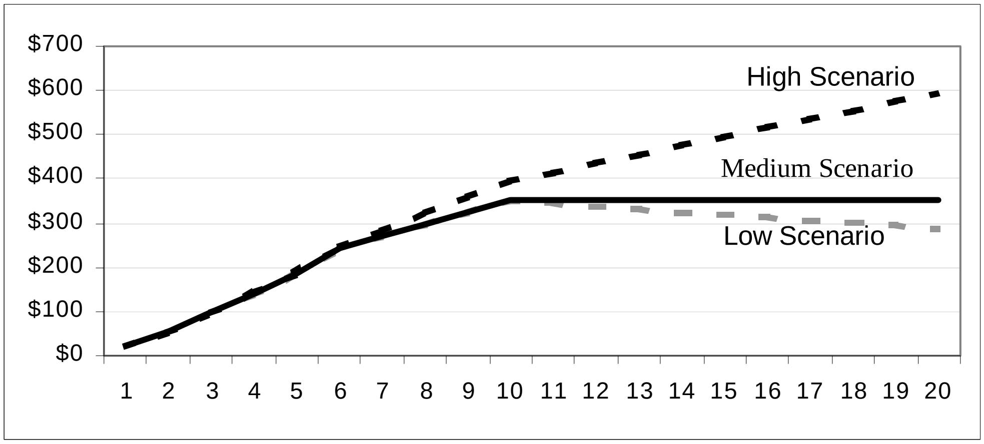
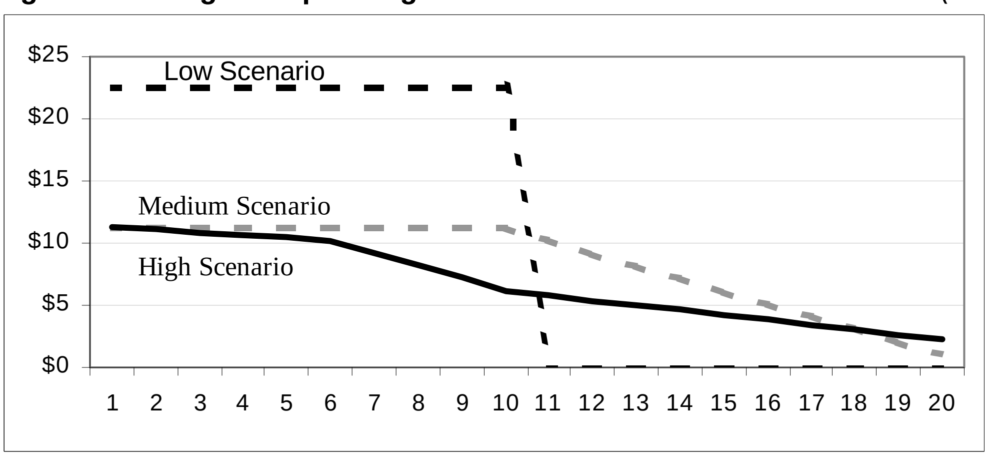


Table 5-2 Program Operating Cost Associated with Each Scenario (Statewide)

Cost Savings millions of yr 2000 dollars	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 10**	**Year 20**
Low Scenario	$22.6	$22.6	$22.6	$22.6	$22.6	$22.6	$22.6	$0.0
Medium Scenario	$11.3	$11.3	$11.3	$11.3	$11.3	$11.3	$11.3	$1.1
High Scenario	$11.3	$11.1	$10.8	$10.6	$10.4	$ 9.4	$6.2	$2.2

Figure 5-2 Program Operating Cost Associated with Each Scenario *(statewide, yr. 2000 dollars)*



6. STATEWIDE ECONOMIC IMPACTS

This section summarizes the economic model inputs and results for illustrative statewide long-term program impacts. The inputs were based on patterns of capital investment and spending as shown in Chapters 3-4, with extrapolated scenarios for long-term program costs and savings as described in Chapter 5.

6.1 REMI Economic Model

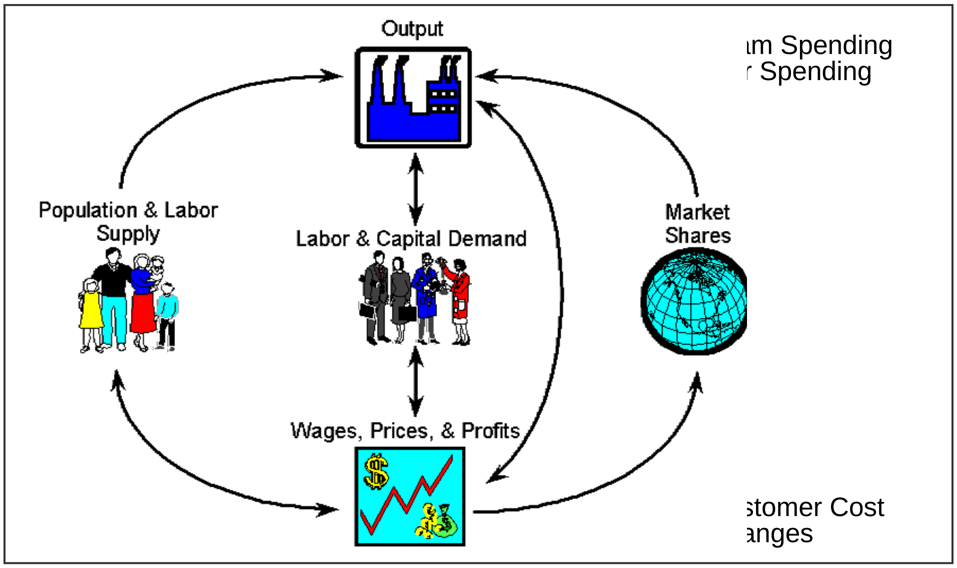
The REMI Policy Insight Model for Wisconsin, provided by Regional Economic Models, Inc. (REMI), combines four model features, which interact to form an integrated modeling system:

- a forecasting element, which tracks historical changes in population, employment, business sales, and profits over the 1969-2000 period, and then projects future changes for the 2000-2035 time period.
- an input-output element, which accounts for the inter-industry flows of dollars, and the associated indirect economic effects on suppliers and induced economic effects on consumer spending.
- a policy impact element, which estimates how policies and projects lead to changes in business revenues and operating costs in each industry in the region, causing dynamic economic effects on the region's competitive position and share of national growth;
- a population element, which estimates changes in population migration in response to changes in demand for labor, wage levels and living costs.

For this study, the input-output element of the REMI model allows it to capture the extent to which spending by each specific industry sector leads to sales of materials and services by businesses from within the region. The indirect effect of purchases from business suppliers and the induced effects of additional income and consumer re-spending are then estimated by the model. The forecasting and policy elements of the REMI model also indicate additional changes in the regional economy associated with of a large number of dynamic economic interrelationships. These include changes in the share of local and export markets in response to changes in regional profitability and production costs.

The structural components the REMI model and their interactions are illustrated in the schematic in Figure 6-1. In that context, the inputs to the REMI model are either changes in spending flows (part of the model's output block) or changes in costs of doing business (affecting the model's wage/price/profit block).

Figure 6-1 Modules in the REMI Economic Model



6.2 Model Inputs

There are four main groups of economic model inputs:

1. *Program operations spending* – Values for the program budget and total program spending are indicated in the scenarios (in chapter 5). Assume that they have a constant mix of labor, travel expenses and materials, as indicated in Figure 4-1. This spending serves as a generator of jobs and business sales in Wisconsin -- a positive effect on the economy. (Refer to back to Table 5-2 for actual values.)

2. *Customer spending* -- Firms are assumed to amortize the additional cost of purchasing and installing energy-saving equipment over the useful life of the equipment, as defined in Table 4-1. This spending generates business sales for various types of electrical equipment, machines & computers, instruments and building materials, as well as construction and professional engineering services provided by Wisconsin businesses -- a positive effect on the economy. (Refer to Table 6-1 for first year values.) The overall growth in Wisconsin-based business sales is diminished slightly by a reduction in spending on power purchases, which leads to smaller business sales for Wisconsin utilities (and less purchases of out-of-state coal). The net effect is an “import substitution” – in which the money flowing to Wisconsin-based equipment manufacturers and dealers substitutes for money that previously flowed out-of-state for fuel purchases.

3. *Customer cost savings*. Values for the program-induced incremental cost savings are indicated in the scenarios (chapter 5), Assume that these savings accrue cumulatively (after persistence loss) to participating business and institutional establishments as a reduction in the relative cost of doing business in Wisconsin -- a positive effect on the economy. For participating state/local government offices, energy savings are assumed to free up dollars for more public spending. (Refer to Table 5-1 for actual values).

4. *Customer cost of equipment.* The additional cost of investment in new energy-saving equipment (as defined in item "B" above) is also a cost to users of the equipment, which reduces their net money savings from energy efficiency, and hence it also reduces the benefit of lower business operating costs in Wisconsin -- a negative effect on the economy.

For all scenarios, it is necessary to allocate the equipment spending and energy cost savings (elements *b* – *c* – *d* above) among different types of participating businesses. Assume that the mix of industry participation for years 1-3 reflects the first year of the pilot program (as reflected in Table 6-2,column A), but that it broadens after year 3 to other types of business not involved in the first year of the pilot program (Table 6-2, column B). The future participation of other types of businesses will be based on their relative level of natural gas and electricity reliance. However, we cap the apportioned annual cumulative savings for any specific type of business to not exceed 20 percent of total annual energy expenditures by that group. As shown in Table 6-2, the long-term effect is to allocate a smaller share to those types of business that were over-represented in the first year pilot (e.g., food products, health care and auto repair), and a larger share to those types that were under-represented in the pilot (e.g., manufacturing of metal, machinery, paper and plastic products).

Table 6-1 Statewide Impact on Investment in New Equipment, and Business Sales, Year 3

Type of Equipment Purchased	Gross (Program Related)		Incremental Effect of Program	
	Purchases Made by Participants	Wisconsin Business Sales	Purchases Made by Participants	Wisconsin Business Sales
Lighting	$6,070,764	$1,311,285	$4,476,073	$966,832
HVAC	$2,719,636	$2,175,709	$2,151,936	$1,721,549
Controls	$2,139,070	$1,711,256	$1,717,467	$1,373,974
Motors/VSD	$986,046	$788,837	$794,017	$635,214
Compressed Air	$3,244,890	$700,896	$2,664,358	$575,501
Heat Gen./Distr.	$13,975,641	$3,018,738	$11,538,879	$2,492,398
Bldg. Envelope	$17,660,124	$14,128,099	$14,580,828	$11,664,663
Industrial Process	$11,441,790	$2,471,427	$9,321,937	$2,013,538
Comm. Process	$1,216,114	$262,681	$998,068	$215,583
Hot Water	$6,952,104	$1,501,654	$5,737,761	$1,239,356
Total Spending	**$66,406,179**		**$53,981,324**	
Total Wis. Equipment Sales		**$28,070,582**		**$22,898,607**
Additional Contractor Labor		**$13,281,236**		**$10,796,265**

source: Total purchases from Table 4-2, factored up to statewide level by a factor of 5. Wisconsin business sales estimated based on regional purchase coefficients, discussed in Ch.4, and assumption that 20% of spending is allocated to engineering and installation labor.

Table 6-2 Mix of Program Savings, Initial Year and After Market Saturation

Industry Group	Percent of Total Savings	
	Initial (yr 1)	*Saturation (yr 10)*
Retail Trade	0.2%	1.0%
Hotels	1.5%	1.6%
Auto Repair & Srvcs	5.6%	1.4%
Health Srvcs	13.9%	8.1%
Prof. Srvcs	2.5%	1.1%
Food Mfg.	45.3%	14.9%
Textile Mill Products	1.9%	0.6%
Lumber & Wood Products	2.5%	2.4%
Printing & Publishing	2.5%	1.3%
Prim. Metal Mfg.	2.5%	9.9%
Mach. & Computer Mfg.	6.9%	18.0%
Transport. Equip. Mfg.	0.7%	1.3%
Paper Mfg.	0.0%	13.1%
Rubber & Plastic Mfg.	0.0%	5.3%
Local Government	2.5%	2.9%
Miscellaneous / Other	11.7%	17.4%
Total	100.0%	100.0%

6.3 Model Results – Overall Statewide Extrapolation

Total Impact. Impacts of the three scenarios on total personal income to Wisconsin residents are shown graphically in Figure 6–2. Model projections indicate that an extrapolated statewide program for the commercial and industrial sectors would lead to a level of total personal income in the state which is $27-38 million higher (depending on the scenario) than would otherwise occur in the first year. This value rises to $160 - $172 million more in the tenth year, and up to $250 million in the twentieth year under the high scenario. (All dollar figures are inflation-adjusted and expressed in constant year 2000 dollars).

Job (employment) impacts reflect the same patterns (as shown later in Table 6-3a-c). The projected job impact is a level of employment 772 – 1,100 higher (depending on the scenario) than would otherwise occur in the first year. This projected impact rises to 3,266 – 3,618 more jobs in the tenth year, and up to 5,272 more jobs in the twentieth year under the high scenario.

Trend Pattern. Examining the trend patterns in Figure 6-2, it is evident that the economic impacts of all three scenarios are roughly similar during the first ten years. They are similar because it is assumed that comparable rates of equipment investment and energy savings are occurring over this period in all cases. The trend of growing economic impact is driven largely by the energy cost savings, which the REMI model interprets as lowering the cost of operating businesses in Wisconsin and hence increasing both business productivity and the competitiveness of the state for business attraction. It is important to note that while program spending and customer spending both continue at flat rates over the first ten years under all scenarios, the associated cost savings continue to grow larger each year because they also reflect the cumulative benefits of earlier-year investments.

The high scenario actually shows a slightly lower economic stimulus impact during the first ten years, due to the assumption that less public spending is necessary to achieve the same level of energy impact.   The low and medium scenarios both assume market saturation by year 10, after which the economic impact remains either stable (through continuing trade ally support in the medium scenario) or degrades (after the program is terminated in the low scenario). The high scenario assumes that a higher level of market saturation is possible, and that does not occur until year 15. As a result, it shows economic impacts continuing to grow until that later year, after which the economic impacts remain stable (due to continuing trade ally support).

Figure 6-2 Summary of the Statewide Income Impact of Alternative Scenarios

Components of Economic Impact. To further understand the causes of these economic impacts, we ran each the REMI model five times for each scenario, to assess: (1) effects of program operations spending, (2) effects of customer spending, (3) effects of customer cost savings on economic competitiveness, (4) effects of additional customer costs of equipment, as well as (5) combined effects of all four of the previously-noted components.

Figure 6-3 shows that in the first year, the program spending effect (#1) and the customer spending effect (#2) have the largest proportional effects on total change in personal income. However, by year ten and thereafter, it is the cost competitiveness effect of energy cost savings (#3) that is the dominant cause of economic growth. The reasons for these patterns of change, and details of the economic impacts of each component, are discussed further below.

Figure 6-3
Contribution of Each Component Effect to the Overall Impact of the Medium Scenario

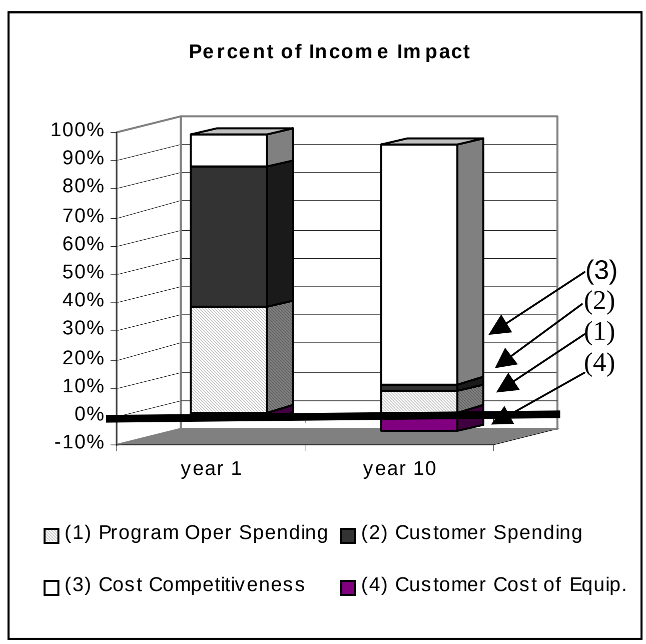


Table 6-3 (a-c) shows details of the REMI model projections of economic impact for an extrapolated statewide program under each of the three scenarios. These results are shown in terms of each of the four component effects and the grand total effect. They are summarized below in terms of their job impacts, although similar patterns emerge if presented in terms of personal income or business sales impacts.

1. *Program operations spending* in the first year supports an additional 327-328 jobs in the medium and high scenarios, and 655 jobs in the low scenario (due to the assumption of higher spending levels). This level falls by the tenth year to be 101 –184 jobs in the medium and high scenarios, and 368 jobs in the low scenario. After the tenth year, the program is either ended (supporting 0 jobs) in the low scenario, or phased down (supporting under 50 jobs in the last two decades) in the medium and high scenarios. In all of these cases, less than half of these jobs are directly associated with the program; the rest are indirect effects (effects on suppliers and producers) or induced effects (consumer re-spending of added income).

2. *Customer spending* changes in the first year support an additional 373 jobs, falling over the next decades to 92-93 jobs for all the scenarios. In the low scenario, this effect falls steadily over the subsequent two decades to just 50 jobs. In the medium scenario, it remains roughly stable in the 81-105 range over those next twenty years. In the high scenario, this effect rises to the range of 136-177 over that period. These differences are due to assumptions about whether investment in new equipment falls or rises as the program winds down; they are thus dependent about expectations concerning future market transformation. In all cases, though, the customer spending effect is strongly positive, indicating that the investment in customer equipment is supporting more Wisconsin jobs than the prior spending on purchases of coal and other power production fuels (which came primarily from out of state).

3. *Customer cost savings* affects the economy by increasing productivity of Wisconsin businesses and the state's competitiveness for business growth and attraction. The model results reflect that fact that aggregate statewide cost savings accumulate over time. Thus, the first year effect is relatively small – attracting an additional 94 jobs in the first year. However, it rises steadily as more jobs are attracted each subsequent year. The result is that the state is projected to have in the range of 3,255 – 3,678 more jobs by the tenth year than would otherwise be expected to occur. After that year, the effect depends on the scenario. In the low scenario, the impact falls as the state loses 1/3 of its gain and ends up by the end of year 30 with 2,024 more jobs than would otherwise be expected. In the medium scenario, nearly all of the gains are retained, and the state ends year 30 with 2,955 more jobs than would otherwise be expected. In the high scenario, job gains keep growing, so that the cumulative effect by the end of year 30 is 5,517 more jobs than would otherwise be expected. Of course, all of these numbers reflect the energy savings effect without considering any offsetting additional costs incurred by customers, which are discussed in the next item.

4. *Customer cost of equipment* is a negative effect that reduces the net cost savings to businesses in the state. Since we assume that these costs to business customers are amortized over the life of the equipment, the aggregate amount of additional cost rises over time as additional businesses participate in the program. The economic impact is a loss of 22 jobs in the first year, rising to a loss of 265 jobs in year 10. The effect continues over the subsequent two decades, although exact values depend on the scenarios. By year 30, the economic impact is a loss of 323 – 398 jobs. In real life, there are no actual losses, as these values are merely reductions in the estimates of cost savings gains in item "3" above.

Table 6-3 (a) Statewide Economic Impacts of the Low Scenario:
Overall Employment, Income and Output Impacts of each Program Component, by Year
(all personal income and business output amounts in constant year 2000 dollars)

Component	Economic Impact	Year 1	Year 10	Year 20	Year 30
(1) Program Operations Spending	Total Employment Change	655	368	0	0
	Total Pers. Inc. Change	$21,500,000	$26,062,400	$0	$0
	Total Output Change	$40,331,200	$8,887,200	$0	$0
(2) Customer Spending on Energy-Saving Equipment & Reduction in Fuel Imports	Total Employment Change	373	92	87	50
	Total Pers. Inc. Change	$14,443,200	$4,848,039	$4,506,304	$2,927,994
	Total Output Change	$71,083,200	$25,384,986	$27,817,108	$18,609,709
(3) Competitiveness Due to Energy Cost Savings	Total Employment Change	94	3,255	2,517	2,024
	Total Pers. Inc. Change	$3,292,643	$151,396,424	$128,636,125	$113,280,550
	Total Output Change	$10,395,210	$556,868,550	$491,052,870	$412,772,540
(4) Customer Cost of Equipment	Total Employment Change	-22	-265	-308	-323
	Total Pers. Inc. Change	($756,380)	($11,593,944)	($14,585,060)	($17,351,226)
	Total Output Change	($2,074,440)	($33,276,000)	($44,377,440)	($50,253,840)
TOTAL IMPACT	**Total Employment Change**	**1,100**	**3,450**	**2,296**	**1,751**
	Total Pers. Inc. Change	**38,479,463**	**170,712,919**	**118,557,369**	**98,857,318**
	Total Output Change	**119,735,170**	**557,864,736**	**474,492,538**	**381,128,409**

Table 6-3 (b) Statewide Economic Impacts of the Medium Scenario:
Overall Employment, Income and Output Impacts of each Program Component, by Year
(all personal income and business output amounts in constant year 2000 dollars)

Component	Economic Impact	Year 1	Year 10	Year 20	Year 30
(1) Program Operations Spending	Total Employment Change	328	184	16	48
	Total Pers. Inc. Change	$10,750,000	$13,031,200	$769,160	$6,322,400
	Total Output Change	$20,165,600	$4,443,600	($854,560)	$4,272,800
(2) Customer Spending on Energy-Saving Equipment & Reduction in Fuel Imports	Total Employment Change	373	92	105	81
	Total Pers. Inc. Change	$14,452,227	$4,848,039	$5,445,719	$4,777,687
	Total Output Change	$71,104,794	$25,384,986	$33,662,710	$30,507,720
(3) Competitiveness Due to Energy Cost Savings	Total Employment Change	94	3,255	3,051	2,955
	Total Pers. Inc. Change	$3,292,643	$151,396,424	$155,922,576	$165,373,065
	Total Output Change	$10,395,210	$556,868,550	$595,215,600	$602,587,650
(4) Customer Cost of Equipment	Total Employment Change	-22	-265	-308	-323
	Total Pers. Inc. Change	($756,380)	($11,593,944)	($14,585,060)	($17,351,226)
	Total Output Change	($2,074,440)	($33,276,000)	($44,377,440)	($50,253,840)
TOTAL IMPACT	**Total Employment Change**	**773**	**3,266**	**2,864**	**2,761**
	Total Pers. Inc. Change	**27,738,490**	**157,681,719**	**147,552,395**	**159,121,926**
	Total Output Change	**99,591,164**	**553,421,136**	**583,646,310**	**587,114,330**

Table 6-3 (c) Statewide Economic Impacts of the High Scenario:
Overall Employment, Income and Output Impacts of each Program Component, by Year
(all personal income and business output amounts in constant year 2000 dollars)

Component	Economic Impact	Year 1	Year 10	Year 20	Year 30
(1) Program Operations Spending	Total Employment Change	327	101	33	16
	Total Pers. Inc. Change	$10,750,000	$7,167,160	$1,538,320	$2,086,392
	Total Output Change	$20,165,600	$2,443,980	$1,709,120	$1,410,024
(2) Customer Spending on Energy-Saving Equipment & Reduction in Fuel Imports	Total Employment Change	373	103	177	136
	Total Pers. Inc. Change	$14,452,227	$5,453,345	$9,149,699	$8,050,220
	Total Output Change	$71,104,794	$28,606,386	$56,711,084	$51,558,047
(3) Competitiveness Due to Energy Cost Savings	Total Employment Change	94	3,678	5,517	5,517
	Total Pers. Inc. Change	$3,292,643	$171,077,959	$256,616,939	256,616,939
	Total Output Change	$10,395,210	$629,261,462	$892,823,400	892,823,400
(4) Customer Cost of Equipment	Total Employment Change	-22	-265	-398	-398
	Total Pers. Inc. Change	($756,380)	($11,593,944)	($17,390,916)	($17,390,916)
	Total Output Change	($2,074,440)	($33,276,000)	($49,914,000)	($50,253,840)
TOTAL IMPACT	**Total Employment Change**	**772**	**3,618**	**5,329**	**5,272**
	Total Pers. Inc. Change	**27,738,490**	**172,104,521**	**249,914,042**	**249,362,635**
	Total Output Change	**99,591,164**	**627,035,828**	**901,329,604**	**895,537,631**

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions: Interpretation of Pilot Impacts and Benefits

While the analysis of long-term statewide impacts at this point in time must necessarily be based on illustrative scenarios, it does demonstrate the magnitude and range of potential economic impacts associated with commercial and industrial sector programs. Additional economic impacts associated with residential, government/institutional and agricultural programs can also be modeled in parallel fashion.

Another important use of the model results is in a form of benefit-cost analysis based on flows of income to Wisconsin residents and businesses compared to the cost incurred by them. However, when comparing the income generated by the program with the costs, it is necessary to make additional corrections. Most fundamentally, it is necessary to distinguish the marginal impact over and above the alternative option that best represents what would occur if there is not a Focus on Energy program. Specifically:

- If the alternative to the pilot would be continuation of a traditional energy efficiency program, then we should not count the economic effect of program spending (category #1 in Table 6-3) as a positive benefit, since a traditional program might spend a similar amount of money with similar spending effects. In this case, the first-year total economic effect would drop by 1/3.
- If the alternative to the pilot would be a reduction in the “wires charge” on customer electric bills, then we should also assess the negative economic impact of imposing that additional charge on customers (not done in the current economic modeling), by adding that figure in the analysis of customer costs (category #4 in Table 6-3). In this case, the negative effect on customer cost would double in the first year. This differential (in absolute terms) would remain the same in subsequent years since the energy charge to customers is essentially fixed regardless of the cumulative number of program participants. The total net economic effect would still remain positive.

It is premature at this point to further calculate firm benefit-cost figures, as the base case alternative has not yet been defined. Further studies can refine these issues and provide a more solid basis for computing benefit/cost ratios.

7.2 Recommendations

The analysis to date has covered only selected commercial and industrial programs within the Focus on Energy pilot. Based on this illustrative example, it is recommended that the analytic framework be carried forward to assess the economic impacts of the full set of program elements within the statewide Focus on Energy program.

If there is to be further benefit-cost analysis which considers economic growth effects of the Focus on Energy program, then additional work is also necessary to define a base case alternative. Further work is also warranted to collect more complete data on characteristics of program spending, customer purchases, customer financing and private sector (trade ally) participation in promoting and offering energy efficient products and services.