FOCUS ON ENERGY
CALENDAR YEAR 2012
ECONOMIC IMPACTS REPORT

November 2013

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Introduction

Under the existing contract with the Public Service Commission of Wisconsin to evaluate the Focus on Energy programs for the calendar year (CY) 2012, the Evaluation Team[1] performed a macroeconomic analysis of programs in the residential and nonresidential sectors. This analysis entailed reviewing the results of the impact evaluation conducted on each program for CY 2012 and then projecting those impacts for Focus on Energy's portfolio of programs from 2012 to 2036 (the study period).

This report presents the Evaluation Team's findings for the following:

- Portfolio-level impacts (for both residential and nonresidential sectors)
- Impacts of residential sector programs only
- Impacts of nonresidential sector programs only
- Impacts of energy-efficiency measures only
- Impacts of renewable-energy measures only

The Evaluation Team analyzed the impacts of 17 residential programs in the mass market sector and eight nonresidential programs in the targeted market sector. Table 1 lists the programs in the macroeconomic analysis for CY 2012.[2]

[1] The Evaluation Team is made up of Cadmus, Nexant, St. Norbert College Strategic Research Institute, and TecMarket Works.

[2] Some of the programs included in the analysis are no longer offered by Focus on Energy, but are part of this analysis due to carry-over effects from CY 2011 (see Table 1).

Table 1. Economic Impact Analysis of CY 2012 Programs

Programs in Mass Market Sector	Programs in Targeted Market Sector
Appliance Recycling	Business Incentives
Assisted Home Performance with ENERGY STAR®	Chains and Franchises
Express Energy Efficiency	Design Assistance*
Home Heating Assistance	Emerging Technologies*
Home Performance with ENERGY STAR	Large Energy Customers
Multifamily - Direct Install	New Construction*
Multifamily - Energy Savings	Renewable Energy Competitive Incentive*
New Homes	Retrocommissioning*
Residential Lighting and Appliance	Small Business
Residential Rewards	Agricultural Custom Energy**
Appliance Plug Load**	Commercial Custom Energy**
Efficient Heating and Cooling**	Industrial Custom Energy**
ENERGY STAR Lighting**	Schools and Government**
Multifamily - New Construction**	
Multifamily - Whole Building**	
Residential Renewables**	
Targeted Home Performance**	

*These programs had expenditures in CY 2012 but did not claim savings.

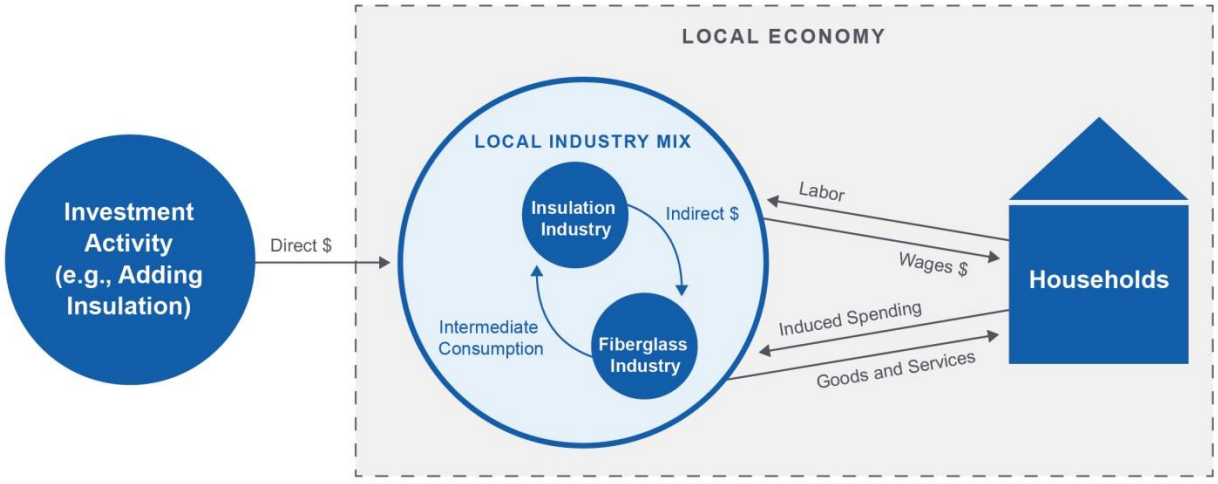
**Legacy programs not offered in CY 2012.

Background of the Report

Introduction to Investment and Energy Savings Impacts

Programs offered by Focus on Energy affect the flow of money through the regional economy in multiple ways. For instance, economic impacts arise from direct short-term investment activities (such as building retrofits), which lead to a series of economic exchanges among all related industries and households. Figure 1 shows an example of how program-specific investments circulate through Wisconsin's economy.

Figure 1. Example of How an Investment Flows Through the Local Economy



The direct spending on program goods and services leads to a high positive economic impact for the first year of the programs. Although total spending is the same with or without the programs (i.e., the model assumes households and businesses would have spent the funds they otherwise have paid for the programs), the economic effects are positive because the nature of the spending within the economy differs. In the example shown in Figure 1, investment activity derived from the 2.3 million ratepayers in Wisconsin is directed into the insulation industry and increases demand for those goods and services, which generates an effect that is amplified through the local economy. This effect results in positive economic impacts because funds that were directed into the insulation industry in Wisconsin would have otherwise been spent on electricity and fuel, much of which is imported into Wisconsin.

In addition to these first-year impacts, the investments made by Focus on Energy and program participants continue to affect the Wisconsin economy over time. Persistent energy savings resulting from the use of energy-efficient and renewable-energy measures allow residential and nonresidential participants to spend less money on energy and more on other products and services. Local utilities can reduce the amount of fuel imported into the region and regional supply for energy-efficient and renewable-energy measures increases to meet demand within Wisconsin.

Participating utilities benefit from reducing their fuel purchases; transmission and distribution costs; emission allowance costs; and need to increase capacity. However, since participants purchase less energy after participating in Focus on Energy programs, participating utilities also experience a reduction in energy sales. The dollar value of these sales reductions represents an offset to the positive overall gross economic benefits noted above.

This report is organized into two main chapters:

- **Methodology:** Includes a description of the modeling software and an overview of the methodology and inputs.
- **Impacts:** Presents the Evaluation Team's findings for the Focus on Energy portfolio.

Methodology

Under the existing Focus on Energy evaluation contract, the Public Service Commission of Wisconsin apportions macroeconomic impact analyses, with the most recent study completed in 2009.[3] The 2009 study modeled two scenarios based on historical data (2002-2026) and forecasted data (2012-2036). For the historical data scenario, evaluators modeled annual Focus on Energy spending for the 10-year period between 2002 and 2011, and modeled the effects over an additional 15-year period without additional spending, from 2012 through 2026, to capture remaining persistent energy savings. For the forecasted data scenario, the 10-year period of Focus on Energy spending was modeled between 2012 and 2021 and the additional 15-year period without additional spending was modeled from 2022 through 2036. To align the evaluation methodologies and allow for meaningful comparison of impacts over time, the Evaluation Team consulted with the authors of the 2009 study.

The following caveats are important to note when comparing impacts from the 2009 study and the current study:

- The 2009 study modeled the economic impacts from a 10-year period of Focus on Energy spending, whereas the current study only models the impacts from one year (2012) of Focus on Energy spending.
- The 2009 study did not include ratepayer (participants and nonparticipants) program payments from which Focus on Energy funding is derived in its model. These program payments are included in the current study's model.

The Evaluation Team conducted macroeconomic impact and cost-effectiveness analyses on the same base data, consisting of evaluated program-specific results and portfolio cost data provided by Focus on Energy. The Evaluation Team modeled employment impacts across 70 industry sectors within Wisconsin using Regional Economic Models, Inc.'s (REMI's) economic forecasting model called Policy Insight^{+}[4].

The following section of this chapter describes the modeling software, the approach used to evaluate net economic impacts, and the model inputs used within REMI.

Description of Software and Modeling Approach

About the REMI Model

A dynamic economic forecasting model, REMI incorporates components from: an input-output (I/O) matrix, general equilibrium, econometrics, and economic geography.

- **I/O matrix** is at the core of how the REMI model captures industry-to-industry interactions within a particular region. Within the REMI model, the application of this component is illustrated with the following example: Buying an energy-efficient air conditioning unit

[3] PA Consulting and Economic Development Research Group. *Focus on Energy Evaluation Economic Development Benefits: CY09 Economic Impacts*. Wisconsin Public Services Commission. 2010. Available online: http://www.focusonenergy.com/sites/default/files/cy09economicimpactsreport_evaluationreport.pdf

[4] Developed by Regional Economic Models, Inc., the Policy Insight^{+} model is commonly known as the REMI model and is referred to as such in this report.

apportions funds to the energy-efficient equipment manufacturing industry, which is assigned a specific spending multiplier value determined by the interactions of energy-efficient equipment manufacturing industry with other industries, e.g. the metal manufacturing industry for metal required to construct fridge doors, the motor manufacturing industry to install a motor for the fridge's cooling system, etc.

- **General equilibrium** captures the long-term stabilization of the economic system as supply and demand become balanced. Within the REMI model, the application of this component is illustrated with the following example: As investments in energy-efficient equipment in Wisconsin subside, general equilibrium is established as energy-efficient equipment installation contractors hire more employees to maintain the new energy-efficient equipment in the region.
- **Econometrics** estimates responses to economic changes and the speed at which they happen. Within the REMI model, the application of this component is illustrated with the following example: As Focus on Energy program participants spend less on electricity due to using energy-efficient equipment, econometrics account for the elasticity of electricity in calculating the effect of reduced electricity demand on electric utilities.
- **Economic geography** represents spatial characteristics of the economy, such as productivity and competitiveness, arising from industry clustering and labor market access. Within the REMI model, the application of this component is illustrated with the following example: As investments into energy-efficient equipment increase, energy-efficient equipment manufacturers in Wisconsin increase production and hire more employees, some of whom may be out-of-state migrants.

Unlike typical I/O models, REMI models annual economic changes over the study period. The data underlying the model are based on historical economic information that relates subsectors to each other and creates forecasts of likely economic conditions. Because of this, the model will capture both the effects of recent conditions during the investment period and the long-term effects of the energy savings.

Modeling Approach

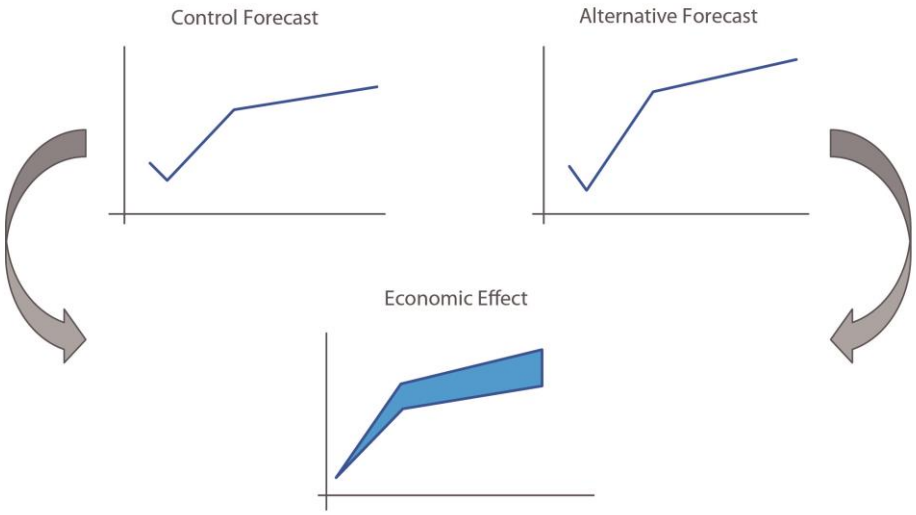
The Evaluation Team's analysis used REMI to estimate the net economic impacts stemming from program-related investments in energy efficiency and renewable energy. The term "net economic impacts" means that there is no net spending change within the State as a result of the programs. For example, the increase in consumer spending on energy efficient appliances was balanced by decreases in spending on other goods and services, such that total spending remains constant.

The Evaluation Team used the standard regional control (built into REMI) to determine net changes in employment and other economic variables resulting from Focus on Energy's investments. For the purposes of this study, REMI's standard regional control details the impact of the economic activity that would have occurred had Focus on Energy programs not been offered. This economic activity primarily consists of the fuel and electricity purchases that program participants would have incurred had they not been incented to invest in the energy-efficient technology as a result of the Focus on Energy programs in 2012.

REMI's standard regional control leverages various sources of economic data collected by the federal government. Employment and wage multipliers are derived primarily from Bureau of Economic Analysis data and also from Bureau of Labor Statistics and County Business Patterns data. Data from the Energy Information Administration (EIA) provides information on fuel costs and penetrations used to estimate multipliers for industry production. Finally, the Census Bureau data provides the basis for population growth and flow multipliers within and between regions.[5]

Figure 2 shows how REMI compares the model inputs to a control (baseline) scenario, translating the inputs into net economic impacts.

Figure 2. Net Economic Impacts with REMI



The shaded blue region in Figure 2, called "economic effect," highlights the net economic impacts. This was derived by calculating the change from the control forecast to the alternative or counterfactual forecast. More specifically, this "economic effect" is the difference between the economic activity of Focus on Energy spending in 2012 (alternative forecast) and the economic activity had the same funds for Focus on Energy programs been spent on fuel and electricity purchases by program participants as described above (control forecast; Focus on Energy programs did not occur).

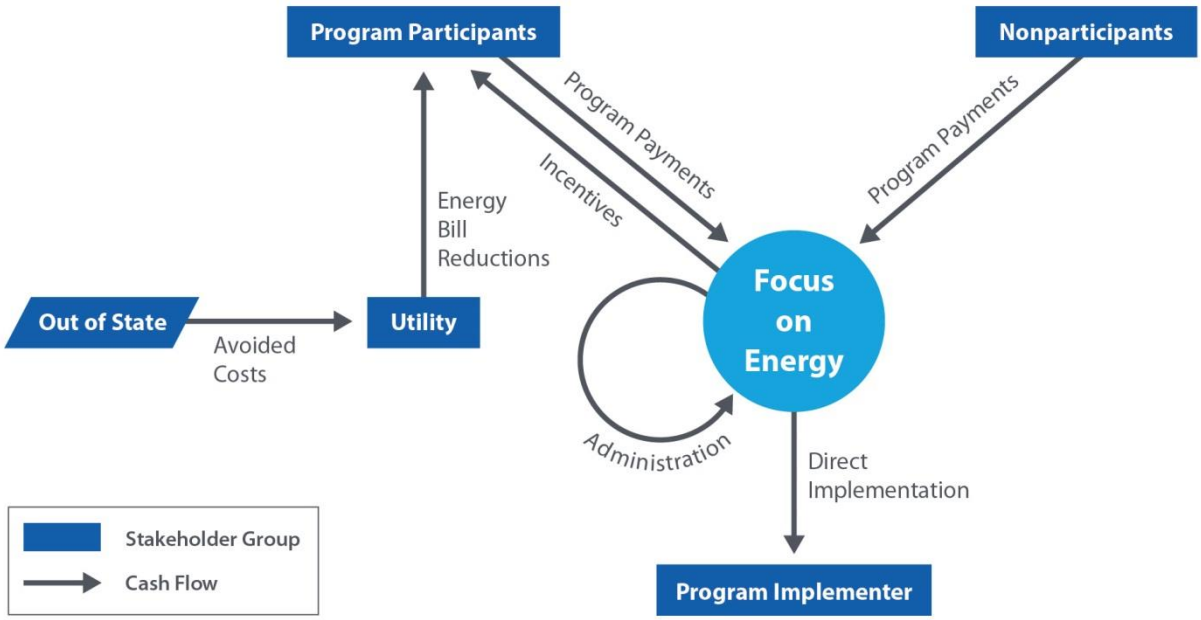
The Evaluation Team customized REMI so that the alternative forecast modeled the flow of program-related funds among stakeholders. Figure 3 depicts these cash flows for a typical program.[6] It is important to highlight the fact that utilities collect program funding from customers in the form of a

[5] For a more detailed breakdown of the data sources and estimation procedures used to derive REMI's control forecast, please reference REMI's user documentation: http://www.remi.com/download/documentation/pi+/pi+_version_1.4/Data_Sources_and_Estimation_Procedures.pdf

[6] Figure 3 highlights the flow of Focus on Energy spending and does not show participant-measure spending to specific industries. Also, some programs offer incentives to trade allies and not households/business entities, as indicated in the diagram.

charge embedded within energy rates.[7] For simplicity, this charge is indicated by "Program Payments" on the figure. The 2009 analysis did not model this cash flow.

Figure 3. Generic Program Stakeholder Cash Flow



The direction of each arrow in the diagram represents whether the impact to a particular stakeholder group is positive or negative; an incoming arrow represents a positive impact. The administration funding is shown as a circular flow to indicate that Focus on Energy is the Program Administrator.

Table 2 shows the relationship between each positive and negative input.

[7] In reality, participating utilities collect the embedded charge and then pass it on to Focus on Energy with levels set at 1.2% of utility operating costs. For purposes of simplicity, the charge depicted in Figure 3 flows directly from the ratepayers to Focus on Energy.

Table 2. Summary of Inputs Modeled

Positive Inputs	Negative Inputs
Program spending	Ratepayer program payments
Participant measure spending*	Reduced participant consumption of other goods
Participant energy bill savings	Reduced energy sales for utilities
Avoided utility costs**	There are no offsetting negative effects for the avoided utility costs.[8]

*For this analysis, participant measure spending refers only to the portion of the incremental cost[9] covered by participants' out-of-pocket spending; it is not the total measure cost.

**Avoided utility costs include avoided capacity, generation, transmission & distribution, and emissions costs.

The following list provides a brief overview of the specific modeling assumptions for each of the inputs the Evaluation Team used in the REMI model.

- **Program-Related Spending:** This refers to the spending by Focus on Energy on all aspects of program operation—administration, implementation, and incentives paid to participants and contractors—as well as participant spending on program goods and services.

  Spending by Focus on Energy on administration and implementation provides a positive effect on the Wisconsin economy and is modeled as either wage increases or direct spending to specific industry sectors.[10] Also, because program incentives offset a portion of the incremental cost of the higher-efficiency measures, the Evaluation Team generally modeled incentives as direct spending to the affected industry.[11]

  The Evaluation Team modeled participant-measure spending as positive direct spending to the industry supplying a program's goods and services. The amount spent by participants was offset with a negative consumption reallocation, to reflect the forgone consumption of other goods and services resulting from participation.

- **Ratepayer program payments:** The ratepayer (participants and nonparticipants) program payments were equal to Focus on Energy's portion of the program-related spending.

  As previously described, Focus on Energy obtained funds for the programs through a charge embedded within energy rates for residential and nonresidential ratepayers. The Evaluation Team modeled these costs for residential participants as an increase in electricity prices and for nonresidential participants as an increase in the amount spent on fuel as an input to production. Thus Focus on Energy's program spending has an equivalent offsetting reduction in spending by ratepayers. However, because each industry within REMI is associated with a different spending

[8] The offsetting of negative effects for avoided utility costs include reduced payments to the federal government for emissions allowances, fossil fuel imports, need for reserve capacity, and electric grid maintenance. The economic cost of these reductions occurs outside the Wisconsin economy and is thus not modeled.

[9] Incremental cost is defined as the cost difference between a measure's baseline model and efficient model.

[10] A specific program's delivery mechanism, incentive structure, and measures contributed to which industry sector received the spending.

[11] The exception to this rule was the Appliance Recycling Program because the participant bears no incremental cost but still received the incentive. In this case, the incentive was modeled as a change in household income.

multiplier, the effect of Focus on Energy's program spending on the economy does not necessarily offset all ratepayer spending.

- **Participant Bill Reductions:** For most nonresidential participants, the Evaluation Team modeled the cost savings resulting from efficiency gains as a decrease in the amount spent on fuel as an input to production. The exception to this rule was the Schools and Government Program, where participants included local schools and government agencies. Unlike industrial or commercial participants, fuel costs were an operating expense rather than an input to production. As such, cost savings resulting from efficiency gains to these participants result in an increase to local government income. This additional income could be returned to taxpayers. However, for this study the additional income was modeled as an increase to local government spending.[12]

  For residential participants, the Evaluation Team modeled the energy bill reductions as a positive consumption reallocation, which marks an increase in household consumption (REMI models household spending according to Wisconsin-specific demographic profiles). Typically, the energy savings persist through the effective useful life (EUL) of the measures implemented. Some measures have an EUL of up to 25 years.[13] In this analysis, the Evaluation Team modeled measure savings as step functions. This means that savings do not degrade before reaching the EUL; instead, the savings remain constant and then drop to zero upon reaching the EUL. To calculate future energy-bill savings, the Evaluation Team used future energy rates by sector and source for the East North Central census region from the EIA website.[14] The EIA forecast presented the rates in 2011 dollars. To convert to 2012 dollars, the Evaluation Team used the actual consumer price index from the U.S. Bureau of Labor Statistics.[15]

- **Avoided Costs:** When utilities generate less energy, there is also a corresponding reduction in fuel purchases; transmission and distribution on the energy grid; the need to increase capacity; and air pollutants. Focus on Energy provided the avoided capacity and fuel prices for 2012 the Evaluation Team used to calculate the associated avoided costs. The team also used a cost inflation factor of 2.5%, also provided by Focus on Energy, to forecast the avoided costs through the study period. The reduction in pollution yields non-energy benefits—the next section details how the Team monetized emissions benefits for this study.

  The Evaluation Team modeled avoided costs as a positive impact to the utility industry by partially offsetting reductions in utility energy sales (detailed in the next bullet). The approach the Evaluation Team used to model the environmental benefits associated with reduced air pollution as avoided costs was based on two assumptions: (1) the generators would have borne

[12] Regardless of whether the additional income to participants of the Schools and Government Program resulting from energy bill savings is modeled as returned payments to taxpayers or increased local government spending, the additional income has a positive impact on the Wisconsin economy. However, the distribution of these impacts to the government and private sectors would differ (e.g. higher impacts in the private sector would be expected under the returned payments to taxpayers scenario than the scenario reported). In addition, the magnitude of the positive impacts under each scenario would potentially be different.

[13] The Evaluation Team included measures with an EUL longer than 25 years in this analysis by averaging the lifetime energy savings over 25 years rather than the actual EUL.

[14] http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2013&subject=0-AEO2013&table=3-AEO2013&region=1-3&cases=ref2013-d102312a

[15] http://www.seattle.gov/financedepartment/cpi/forecast.htm

compliance costs in the absence of the programs; and (2) the cost savings due to reduced compliance efforts were passed on to the ratepayer.

- **Reduced Energy Sales:** As a result of Focus on Energy participants' reduced energy usage, participating utilities benefit by spending less on fuel and other variable costs, as described above. However, because participants also purchase less energy, participating utilities experience a reduction in energy sales. The reduction in energy sales may cause utilities to collect less revenue than forecasted (i.e. "revenue losses"). In this case, the avoided costs described above may not fully offset the "revenue losses" participating utilities experience from a reduction in energy sales. This could result in "lost fixed cost margins" to the utilities that could adversely affect their financial health.

  To account for both the avoided costs and "revenue losses" that result in "lost fixed cost margins", the Evaluation Team modeled a reduction in utility industry sales equal to the difference between participants' energy bill reductions and the avoided costs experienced by the utility.

  Utilities may seek to recover revenue lost through reduced energy sales through their rates. This could result in rate changes that, all else equal, could increase future rates for all ratepayers. This could result in an increase to the overall cost of energy to ratepayers that did not participate in Focus on Energy programs and a reduction in bill savings received by participants (and those ratepayers who took cost-effective energy-efficiency actions without participating). The REMI model is not designed to assess the potential distributional impacts of these changed individual rate and bill impacts on economic activity. Therefore, such potential distributional impacts are not included within this study.

Model Input Data and Evaluation Scenarios

Economic impacts result from both program-related investments and the energy savings experienced by program participants. Program-related investments come from two sources: Focus on Energy funding and participant funding. Specifically, participants fund a portion of the installed-measure cost that is equal to the incremental cost net of any rebates received.[16]

This section presents the key inputs to the model and describes the evaluation of the impact of various measures.

[16] The Evaluation Team calculated participant measure funding as the measure quantity times the per-unit incremental cost minus incentives received from Focus on Energy.

Program Spending Data

Focus on Energy spent $81,680,222 in programs within the mass market and targeted market sectors during CY 2012. Table 3 – Table 7 on the following pages show details of these expenditures. During CY 2012, Focus on Energy spent:

- $9.4 million on administration for the portfolio, mass market, and targeted market sectors[17]
- $23.1 million implementing the programs
- $48.8 million on incentives provided to participants

Table 3 lists the CY 2012 portfolio level expenditures for Focus on Energy programs.

Table 3. Portfolio: CY 2012 Non-Program Specific Expenditures*

Cost Category	Amount
EM&V	$52,077
Education & Training	$327,496
Administration	$4,280,308
Implementation	$769,200
Total	**$5,429,080**

*Totals may not add up exactly due to rounding.

Table 4 lists the Focus on Energy expenditures for CY 2012 programs in the mass market sector.

[17] This amount includes $379,573 spent on evaluation measurement and verification (EM&V), education, and training in addition to the $1,030,155 spent on Focus on Energy's research program.

Table 4. Mass Market: CY 2012 Program Level Expenditures*

Program Name	Administration	Implementation	Incentive	Total
Appliance Recycling	-	$1,152,282	$404,730	$1,557,012
Assisted Home Performance with ENERGY STAR	-	$254,195	$60,439	$314,634
Express Energy Efficiency	-	$709,441	$855,079	$1,564,520
Home Heating Assistance	-	$481,854	$155,150	$637,004
Home Performance with ENERGY STAR®	-	$1,225,484	$2,434,449	$3,659,933
Multifamily - Direct Install	-	$252,935	$342,626	$595,562
Multifamily - Energy Savings	-	$797,894	$999,068	$1,796,962
New Homes	-	$744,184	$970,050	$1,714,234
Residential Rewards	-	$1,598,067	$3,937,558	$5,535,625
Residential Lighting and Appliance	-	$2,018,369	$5,151,536	$7,169,905
Appliance Plug Load**	-	$12,813	$60,950	$73,763
Efficient Heating and Cooling**	-	$39,479	$653,950	$693,429
ENERGY STAR Lighting**	-	$33,993	$302,428	$336,420
Multifamily - New Construction**	-	$286,183	$594,323	$880,505
Multifamily - Whole Building**	-	$55,180	$221,152	$276,332
Residential Renewables**	-	$20,768	$372,250	$393,018
Targeted Home Performance**	-	$10,577	$24,872	$35,449
Non-specified Mass Market Spending	$1,838,740	$16,800	-	$1,855,540
Total	**$1,838,740**	**$9,710,495**	**$17,540,611**	**$29,089,847**

*Totals may not add up exactly due to rounding.

**Legacy programs not offered in CY 2012.

Table 5 lists the Focus on Energy expenditures for CY 2012 programs in the targeted market sector.

Table 5. Targeted Market: CY 2012 Program Level Expenditures*

Program Name	Administration	Implementation	Incentive	Total
Business Incentives	-	$4,513,737	$7,300,404	$11,814,141
Chains and Franchises	-	$1,119,733	$2,035,702	$3,155,435
Large Energy Customers	-	$1,958,895	$5,352,259	$7,311,154
Small Business	-	$1,292,433	$2,306,427	$3,598,860
Agricultural Custom Energy**	-	$494,632	$1,599,202	$2,093,834
Commercial Custom Energy**	-	$1,092,087	$3,536,275	$4,628,362
Industrial Custom Energy**	-	$1,048,709	$5,237,136	$6,285,845
Schools and Government**	-	$1,109,349	$3,866,681	$4,976,030
Non-Specified Targeted Market Spending***	$2,122,116	$1,175,518	-	$3,297,635
Total	**$2,122,116**	**$13,805,092**	**$31,234,087**	**$47,161,295**

*Totals may not add up exactly due to rounding.

**Legacy programs not offered in CY 2012.

***Total Includes expenditures from programs with no associated energy savings in CY 2012.

Energy Savings Data

The Evaluation Team modeled the economic impacts of the net verified lifecycle energy savings to the residential and nonresidential sectors. As detailed in the following tables, the programs saved a total of 5,061,282,417 kilowatt hours (kWh) and 228,419,473 therms over the course of equipment EULs.

Table 6 lists the lifecycle energy savings for CY 2012 programs in the mass market sector.

Table 6. Mass Market: Summary of Electric and Gas Lifecycle Savings for CY 2012 Programs*

Program Name	Net Lifecycle Electric Savings (kWh)	Net Lifecycle Gas Savings (Therms)
Appliance Recycling	39,016,045	0
Assisted Home Performance with ENERGY STAR®	217,994	104,579
Express Energy Efficiency	28,437,934	5,679,092
Home Heating Assistance	1,898,149	459,362
Home Performance with ENERGY STAR	5,008,201	2,331,933
Multifamily - Direct Install	32,734,204	2,571,981
Multifamily - Energy Savings**	36,028,844	3,309,878
New Homes	74,469,777	14,505,784
Residential Lighting and Appliance	511,590,141	167,477
Residential Rewards	154,668,101	20,623,131
Mass Market Legacy***	163,845,126	15,244,550
Total	**1,047,914,515**	**64,997,767**

*Totals may not add up exactly due to rounding.
**Program includes legacy and 2012 savings.
***Aggregate of legacy programs that were not offered in CY 2012.

Table 7 lists the lifecycle energy savings for CY 2012 programs in the targeted market sector.

Table 7. Targeted Market: Summary of Electric and Gas Savings for CY 2012 Programs*

Program Name**	Net Lifecycle Electric Savings (kWh)	Net Lifecycle Gas Savings (Therms)
Business Incentives***	1,087,246,050	29,260,423
Chains and Franchises***	441,925,827	4,909,425
Large Energy Customers***	680,612,451	42,957,169
Small Business	139,917,058	217,711
Targeted Market Legacy****	1,663,666,517	86,076,976
Total	**4,013,367,903**	**163,421,705**

*Totals may not add up exactly due to rounding.
**Includes only programs with realized energy savings in CY 2012.
***Program includes legacy and 2012 savings.
****Aggregate of legacy programs not offered in CY 2012.

Environmental Benefits Data

An accurate and acceptable method for quantifying the health and quality-of-life benefits for individuals living in Wisconsin of reduced emissions of atmospheric pollutants such as mercury, sulfur dioxide (SO_2), nitrogen oxides (NOx), and carbon dioxide (CO_2) is currently unavailable. However, quantifying the benefits of displaced emissions of NOx and SO_2 for utilities is possible because these emissions are regulated under the Clean Air Act. Cap and trade markets assign these emissions a monetary value that in turn has a measurable effect on the monetary flows through the Wisconsin economy. As such, the Evaluation Team included emissions benefits for NOx and SO_2 in the economic impact.

The Evaluation Team did not model CO_2 emissions benefits in the economic analysis because there are currently no established mechanisms requiring reduced emissions in Wisconsin. As such, there are no trading markets to place a measurable monetary value on CO_2 emissions. Therefore, CO_2 emissions have no associated monetary flow in the economy that is well-defined for the purposes of accurate modeling. However, the Evaluation Team included CO_2 emissions benefits in the simple total resource cost (TRC) test because the Public Service Commission of Wisconsin has monetized the societal benefits at $30 per ton of reduced CO_2 emissions.[18] These benefits were automatically included in the enhanced TRC test.

Monetizing emissions benefits requires three key parameters: lifecycle net energy savings, emissions factors, and the value of the displaced emissions. Emissions factors are the rate at which pollutants are emitted per unit of energy and are most often expressed in tons of pollutant per energy unit (for electric it is tons/MWh). The product of the emissions factor and the net lifecycle energy savings is the total weight of air pollutant displaced by the program. The product of the total tonnage of pollutant displaced and the dollar value of the displaced emissions per ton is the avoided emissions benefit.

Table 8 shows the electric emissions factors[19] and allowance prices[20] used to estimate emissions benefits for the economic impact analysis.

Table 8. Emissions Factors and Allowance Price

Service Fuel Type	NOx	SO_2
Electric Emissions Factor (Tons*/ MWh)	0.0012	0.0008
Allowance Price ($/Ton*)	$4.10	$1.08

The 2012 NOx and SO_2 emissions allowance prices came from the EIA's website. The Evaluation Team calculated the forecasted NOx and SO_2 allowance prices by applying the same 2.5% inflation factor provided by Focus on Energy to forecast avoided fuel and capacity costs.

[18] The Public Service Commission of Wisconsin ordered this monetary value in docket 5-GF-191, Electronic Regulatory Filing System reference number 137513.

[19] PA Consulting Group. *Focus on Energy Evaluation Emission Factors Update.* Wisconsin Public Services Commission. 2009.

[20] http://www.eia.gov/todayinenergy/detail.cfm?id=4830

Table 9 shows the emissions benefits incorporated into the model.

Table 9. Emissions Benefits Modeled

Sector	Net NOx Emissions Benefits (2012)	Net SO_2 Emissions Benefits (2012)	Net NOx Emissions Benefits (Lifetime)	Net SO_2 Emissions Benefits (Lifetime)
Mass Market	$624.01	$109.58	$5,310.04	$932.49
Targeted Market	$1,666.99	$292.74	$21,345.71	$3,748.51
Portfolio	**$2,290.99**	**$402.32**	**$26,655.75**	**$4,681.01**

Evaluation of the Impact of Various Measures

The Public Service Commission of Wisconsin asked the Evaluation Team to analyze the impacts of energy-efficiency and renewable-energy measures separately. The Team allocated overall administrative and implementation costs to the two groups proportional to their contributions to the portfolio.

The following 13 programs provided incentives for renewable-energy measures in CY 2012:

- Efficient Heating and Cooling
- Multifamily - New Construction
- Multifamily - Whole Building
- Multifamily - Energy Savings
- New Homes
- Residential Renewables
- Residential Rewards
- Agricultural Custom Energy
- Business Incentives
- Commercial Custom Energy
- Industrial Custom Energy
- Large Energy Customers
- Schools and Government

Description of the Economic Impacts Modeled

The Evaluation Team used the REMI model to generate economic development impacts organized into four key economic indicators: employment, disposable income, value added, and sales generated. A brief description of each key indicator follows:

- ***Employment*** estimated the number of jobs, full-time and part-time, by place of work.[21]
- ***Disposable income*** equaled personal income minus personal taxes, and represented the change in money available to consumers for purchase of goods and services.
- ***Value added*** was a measure of the contribution of each private industry and of government to the gross regional product, defined as an industry's gross output minus its intermediate inputs.

  The Evaluation Team also measured value added by industry as the sum of: employee compensation, taxes on production and imports less subsidies, and gross operating surplus.
- ***Sales generated*** equaled the total industry output or direct amount of industry sales that resulted from spending to a selected industry.

[21] The Evaluation Team included employees, sole proprietors, and active partners, but not unpaid family workers and volunteers.

Impacts

Summary

Table 10 shows the economic development impacts generated from the CY 2012 Focus on Energy programs and lists impacts in 2012 dollars. The total number of job-years generated in the first year of the study period was 1,423 and the projected cumulative total over the study period is 6,596 job-years. Economic development impacts that occurred in the first year were largely a result of combined direct program spending and associated indirect spending within the economy. The economic development impacts projected to accumulate over the remaining study period result from energy bill savings, which increase spending on goods and services for residential participants and increase production and investment activity for nonresidential participants.

Table 10. Summary of Economic Development Impacts for CY 2012 Focus on Energy Programs

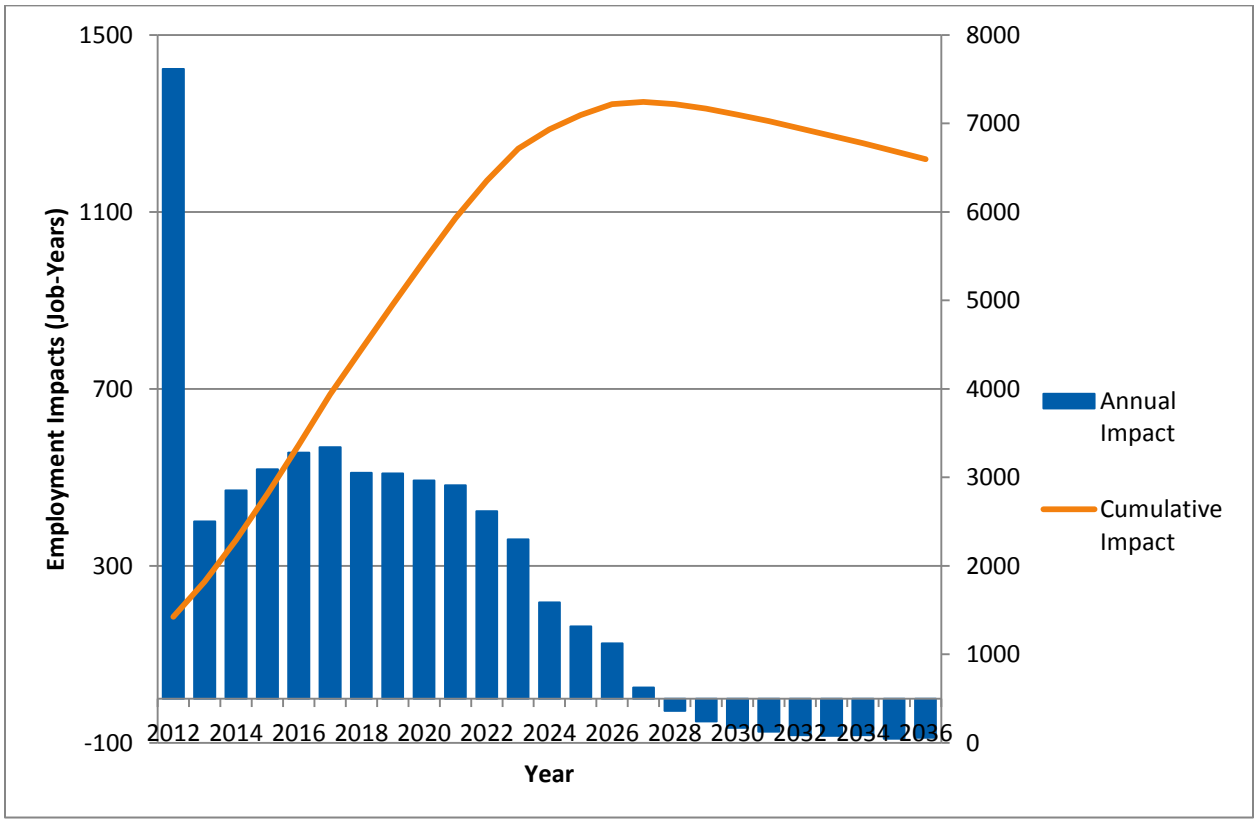
Economic Development Impact	Year 1	Year 5	Year 10	Cumulative Through Year 10	Cumulative Through Study Period
Employment (Job-years)	1,423	556	482	5,930	6,596
Sales Generated ($million)	$396	$78	$98	$1,088	$1,652
Value Added ($million)	$178	$48	$59	$599	$941
Disposable Income ($million)	$112	$32	$33	$389	$517

Detailed Findings

Portfolio Level Impacts

Figure 4 shows the year-by-year employment impacts of Focus on Energy's 2012 program portfolio relative to the employment impacts of the no Focus on Energy programs scenario. It shows the employment impacts of Focus on Energy's portfolio exceed the employment impacts of the scenario with no Focus on Energy programs through the year 2027. Starting in 2028, the employment impacts of the scenario with no Focus on Energy programs exceed the impacts of the Focus on Energy portfolio. Despite this, as can be seen by the orange line below, the cumulative impacts of the Focus on Energy portfolio still substantially exceed the cumulative impacts of the scenario with no Focus on Energy programs.

Figure 4. Employment Impacts of Focus on Energy's Portfolio Relative to No Focus on Energy Programs*



*"Annual Impact" is graphed on the primary axis (left axis) while "Cumulative Impact" is graphed on the secondary axis (right axis).

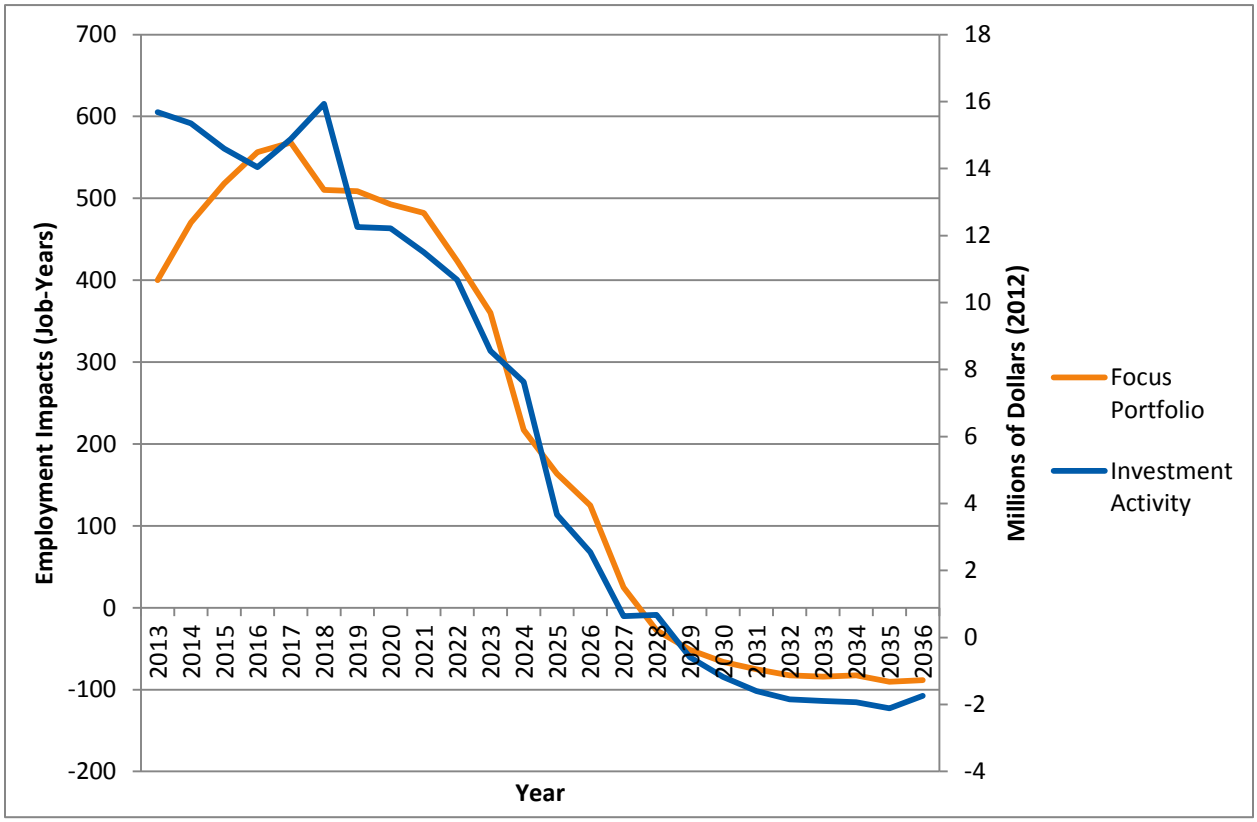
Figure 5 shows the employment impacts of Focus on Energy's 2012 portfolio as compared to the regional investment activity (a result of both direct investments from the portfolio and investments from outside of Wisconsin to satisfy the demand for capital) after the first year of the study period. As illustrated in the figure, the employment impacts of the portfolio closely mirror the trend of regional investment activity. As employment and overall economic activity grows in the region, the optimal capital stock of the region (the region's basic demand for capital) grows as well. To close the gap between the actual and optimal capital stock, the model increases investment into the region. This trend is illustrated on the figure from 2013 to 2027, as positive employment impacts accumulate with positive investment activity.

However, as the measures' EULs expire, the energy-bill savings will decrease in the later years of the study period and economic activity will decline, resulting in decreasing optimal capital stock. As such, there will be disinvestment from the region (negative regional investment activity) to adjust the actual capital stock. This is the primary downward pressure on employment impacts from 2028 through the end of the study period shown in Figure 4.

The negative employment impacts of the portfolio during this period, therefore, are not an indicator of negative economic impacts of Focus on Energy programs but an indicator of the natural fluctuations in

the demand for investment activity in Wisconsin. This trend is also the result of 2012 Focus on Energy programs alone and assumes that ongoing Focus on Energy programs in future years will not occur, which may not be the case in practice.[22]

Figure 5. Focus on Energy's Portfolio Employment Impacts Relative to Regional Investment Activity After the First Year of the Study Period



[22] If Focus on Energy programs did continue in future years, the expected impact on this trend would be different as discussed in Focus on Energy Portfolio Trends section regarding the impacts of the 2009 study, which modeled annual Focus on Energy funding for 10 years.

Table 11 lists the breakout of cumulative net employment impacts by industry sector. The cumulative employment impacts for the private sector of 5,011 job-years significantly outweigh that for the government sector of 1,584.

Table 11. Summary of Employment Impacts by Industry Sector*

Industry Sector (Job-years)	Year 1	Year 5	Year 10	Cumulative Through Year 10	Cumulative Through Study Period
Private	1,177	461	382	4,866	5,011
State Government	63	15	18	195	298
Local Government	183	80	83	870	1,286
*Government***	*246*	*95*	*101*	*1,065*	*1,584*
Net Impact***	**1,423**	**557**	**483**	**5,930**	**6,595**

*Impacts may not add up exactly due to rounding.

**Government impacts are the total of state and local government sector impacts.

***Net impacts are the total of private and government sector impacts.

The primary drivers of state and local government job-years in the first year and cumulatively over the study period are the direct, indirect, and induced effects of program spending and energy-bill savings. As regional investment activity increases (as detailed above in Figure 5), migration increases Wisconsin's population, which in turn increases the need for public services provided by the state and local governments.

The direct effects of the Focus on Energy program spending in the first year attributed to the Public Service Commission of Wisconsin account for 5 of the 63 state government job-years. In addition, the direct, indirect, and induced effects of Schools and Government Program account for approximately 43% of the cumulative local government job-years.

Figure 6 illustrates the cumulative employment impacts by industry sector. The net cumulative employment impact of Focus on Energy's 2012 portfolio is indicated by the line over the bar graph. Due to longer EULs of the Schools and Government Program-installed measures, energy-bill savings for these participants persist longer than that for participants of most of the private sector programs. As such, the share of total employment impacts accruing to the local government sector increases over the study period.

Figure 6. Cumulative Employment Impacts by Industry Sector

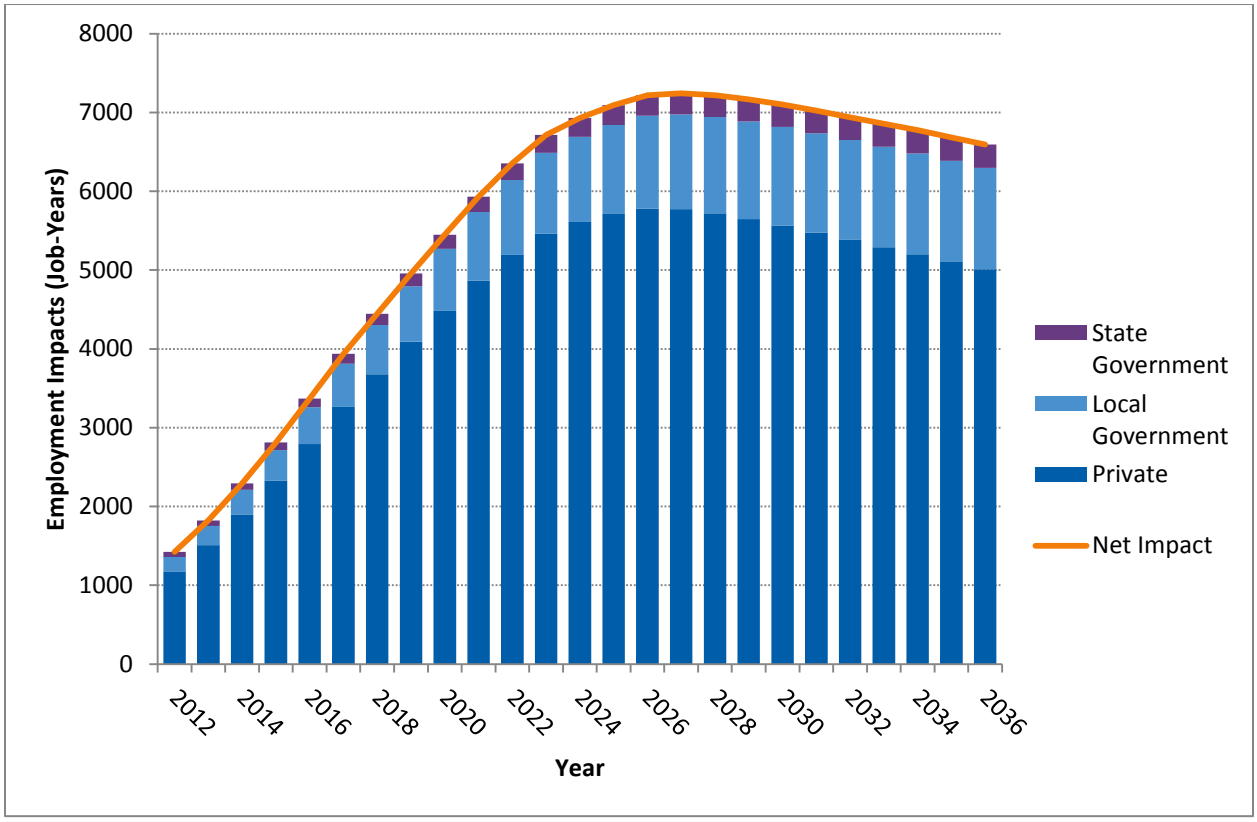
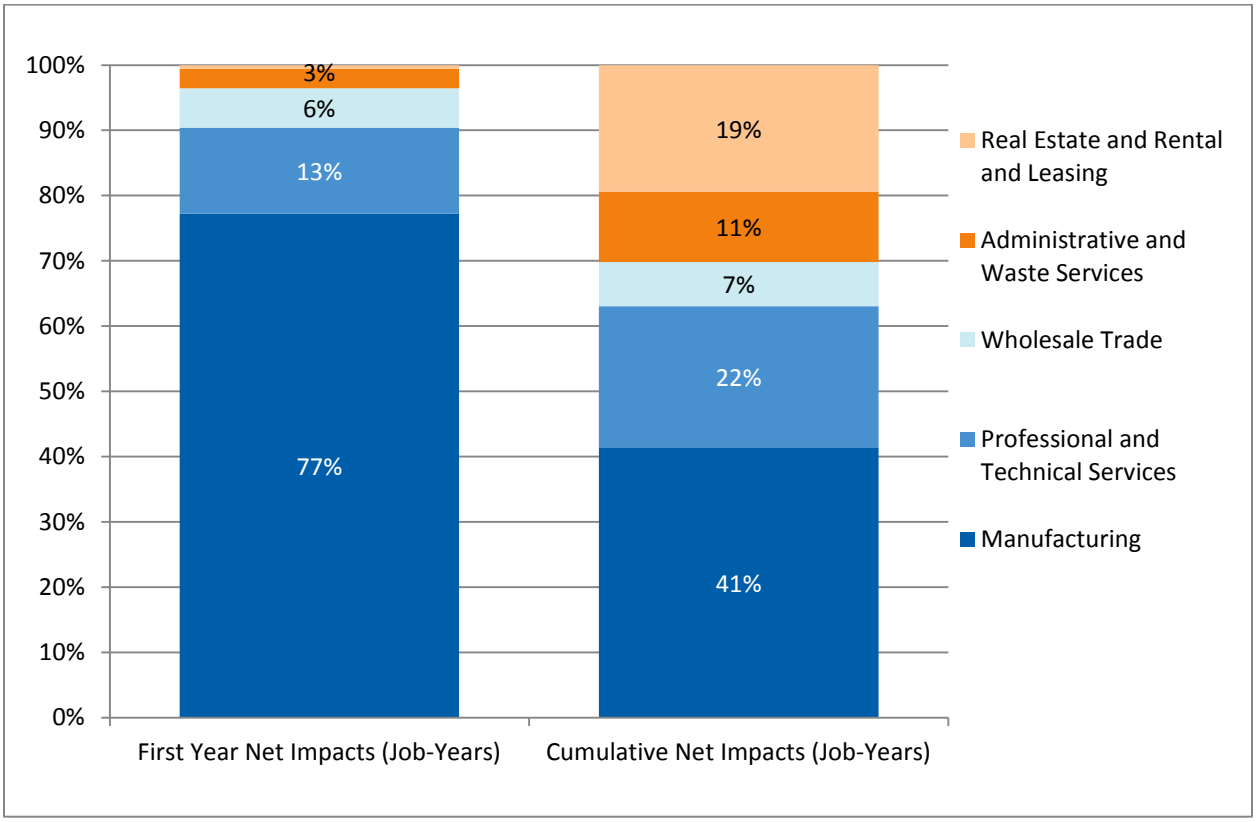


Figure 7 shows the top five private sector industries by job-years added. The percentages indicated on the chart represent each industry's proportion of the total employment in the top five industries. The manufacturing sector comprises the highest portion of jobs both cumulatively and in the study period's first year.

Figure 7. Top Five Private Sector Industries by Net Job-years Added (First Year and Cumulative)*

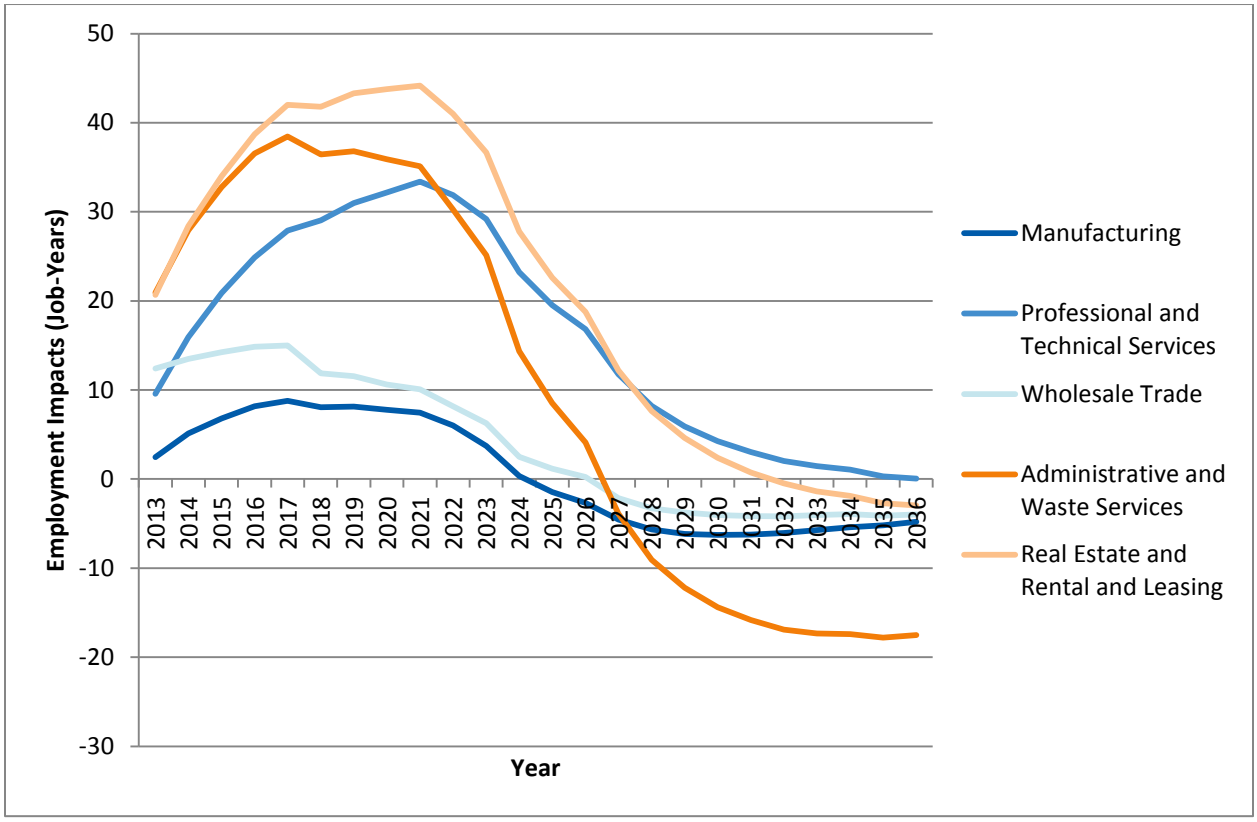


*The "Real Estate and Rental and Leasing" sector accounts for the remaining 1% of net first year job-year impacts.

In the first year of the study, program incentives and participant spending on both energy-efficient and renewable-energy equipment induced regional manufacturing to meet demand for the equipment. This resulted in a high portion of manufacturing employment impacts in the first year. Since in this study incentives and participant spending on program measures only occurred in the first year of the study period, over the remainder of the study period, a larger proportion of employment impacts will accrue in other private sectors besides manufacturing. Thus, the cumulative proportion of manufacturing employment impacts will decrease. Figure 8 illustrates this point, showing projected employment impacts after the first year in the top five private sector industries over time.

In addition to an increase in demand for efficient equipment, the demand for contractors to install this equipment also increased in the first year of the study period. Figure 7 shows this as impacts to the professional and technical services industry sector. These contractors will remain in demand over the course of equipment EUL to address maintenance issues (see Figure 8). As a result, the share of impacts to the professional and technical services industry sector will increase over the study period.

Figure 8. Projected Employment Impacts of the Top Five Private Sector Industries (After the First Year)



Impacts by Sector

Table 12 shows the net employment impact breakdown by sector. Programs in the targeted market sector produced more job-years per one million dollars of funding than programs in the mass market sector in the first year (22 job-years versus 11 job-years, respectively) and cumulatively over the study period (a projected 115 job-years versus 39 job-years, respectively).

Table 12. First Year and Cumulative Net Employment Impacts by Sector*

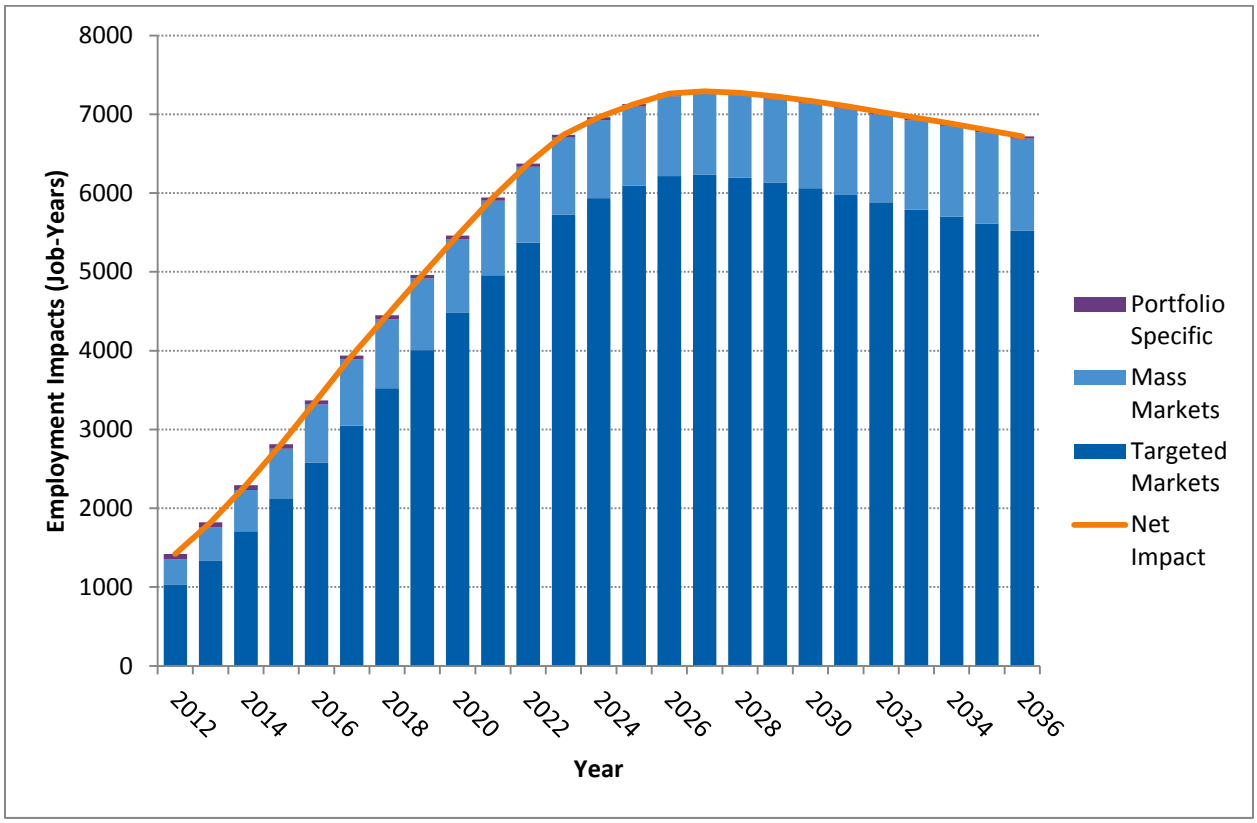
Sector	Budget ($million)	First Year Net Impact (Job-years)	First Year Net Impact per $1M Spent (Job-years/$1M)	Cumulative Net Impact (Job-years)	Cumulative Net Impact per $1M Spent (Job-years/$1M)
Mass Market	29	324	11	1,143	39
Targeted Market	47	1,035	22	5,425	115
Portfolio Specific**	5	65	15	28	5
Net Impact	**82**	**1,423**	**18**	**6,596**	**81**

*Impacts may not divide out and add up exactly due to rounding.

**The portfolio specific impacts result from non-sector-specific Focus on Energy portfolio costs detailed in Table 3.

Figure 9 shows the breakout of cumulative net employment impacts by sector. The employment impact share of the targeted market sector will heavily outweigh the share of the mass market sector over the entire study period.

Figure 9. Cumulative Employment Impacts by Sector



Impacts by Resource

Table 13 shows the net employment impact breakdown by resource. The renewable-energy resource produced more job-years per million dollars of 2012 Focus on Energy funding than the energy-efficiency resource in the first year (28 job-years versus 17 job-years, respectively) but not cumulatively over the study period (a projected 79 job-years versus 81 job-years, respectively).

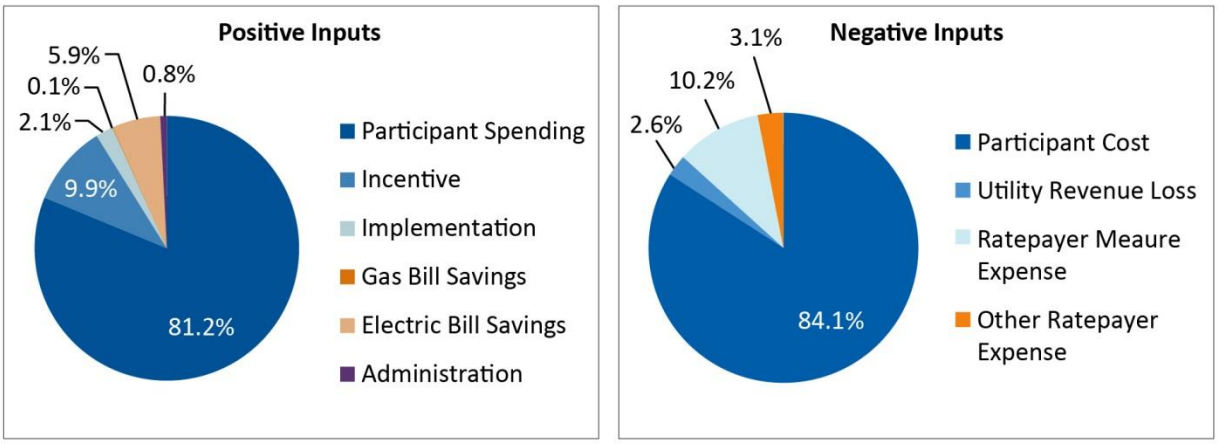
Table 13. First Year and Cumulative Net Employment Impacts by Resource

Resource	Budget ($million)	First Year Net Impact (Job-years)	First Year Net Impact per $1M Spent (Job-years/$1M)*	Cumulative Net Impact (Job-years)	Cumulative Net Impact per $1M Spent (Job-years/$1M)*
Renewable Energy	7	187	28	536	79
Energy Efficiency	75	1,236	17	6,060	81
Net Impact	**82**	**1,423**	**17**	**6,596**	**81**

*Please note that impacts may not divide out and add up exactly due to rounding.

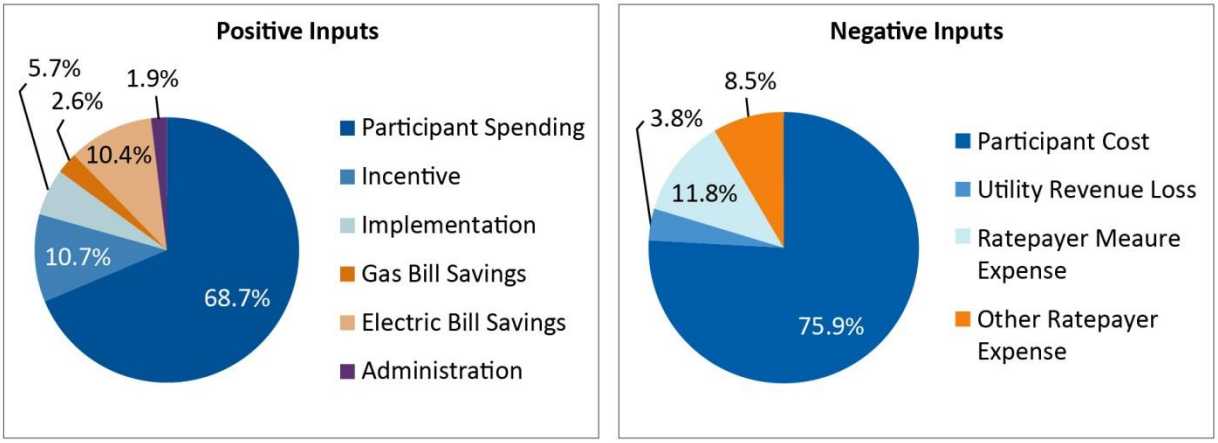
A comparison between Figure 10 and Figure 11 can help explain the greater net employment impact per million dollars of Focus on Energy funding for the renewable-energy resource in the first year. Figure 10 and Figure 11 illustrate the composition of positive and negative inputs modeled for the renewable-energy resource and the energy-efficiency resource, respectively. The share of measure spending (participant and incentive) and measure costs (participant and ratepayer) for the renewable-energy resource exceeds that of the energy-efficiency resource by 11.7% and 6.6%, respectively. Since measure spending (participant and incentive) allots funds derived from a relatively diffuse base (participants and ratepayers) into specific measure industries, the impact of measure spending is greater than that of any other positive input and the impact of measure costs is less than that of any other negative input. In addition, the impact of a large biogas project that was incented as a part of the Focus on Energy programs should be highlighted. This one project accounted for 38% of total renewable-energy measure spending. As such, the biogas project had a proportional impact on the renewable-energy results that may not fully reflect the mix of renewable-energy spending that the program may have in other years.

Figure 10. Composition of Economic Inputs Modeled for Renewable-Energy Resource*



*Spending for EM&V, education, and training were modeled but left out of this figure for simplicity due to their negligible impacts.

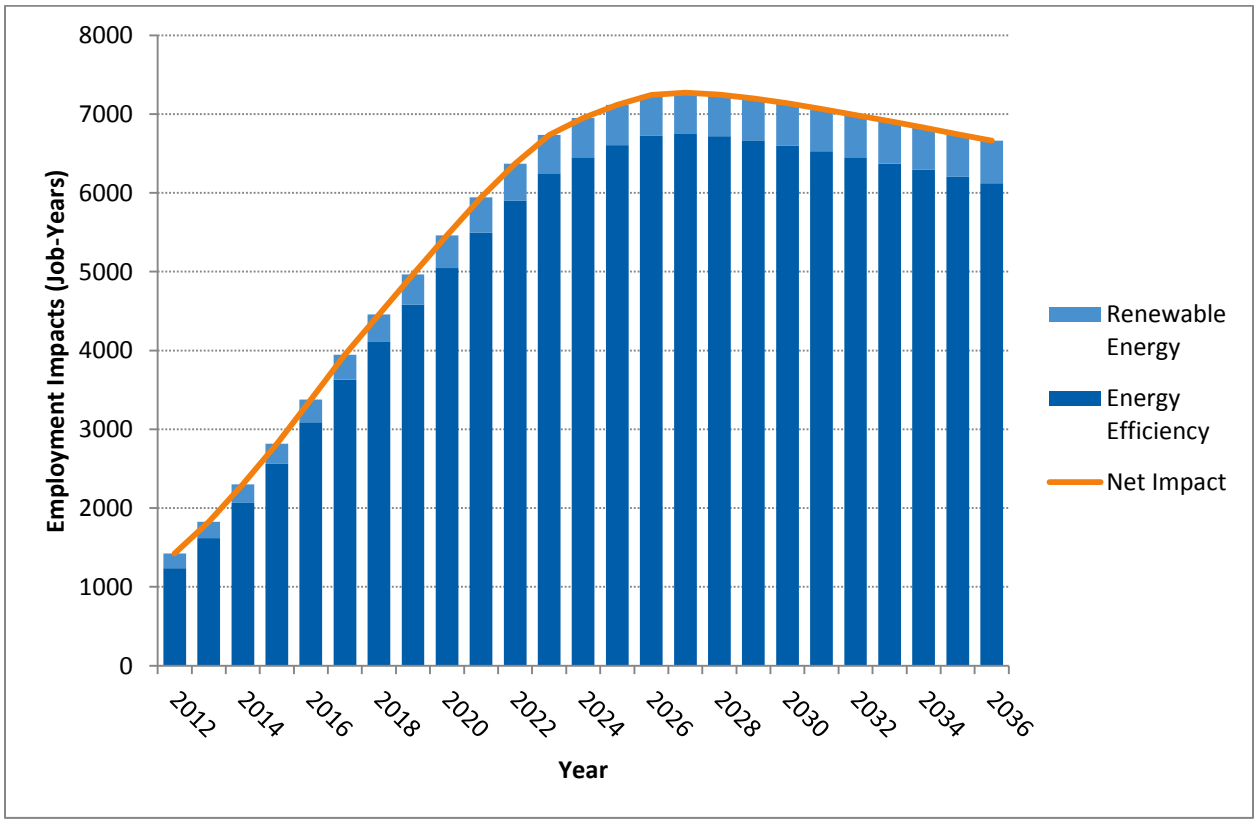
Figure 11. Composition of Economic Inputs Modeled for Energy-Efficiency Resource*



*Spending for EM&V, education, and training were modeled but left out of this figure for simplicity due to their negligible impacts.

Figure 12 shows the breakout of cumulative net employment impacts by resource. The Evaluation Team projects that the employment impact share for the renewable-energy resource will steadily increase over the study period as the EULs of renewable-energy measures persist longer than those of energy-efficiency measures.

Figure 12. Cumulative Employment Impacts by Resource



Focus on Energy Portfolio Trends

Table 14 and Table 15 show the cumulative job-year impacts per one million dollars of Focus on Energy funding from the 2009 and 2012 studies. The 2009 study included Focus on Energy funding year-by-year for the first 10 years of its study period (2002-2011). The current study only includes Focus on Energy funding for the first year (2012) of the study period. This difference contributes to the precipitous increase in the job-year impacts from year 10 to year 25 in the 2009 study as Focus on Energy funding ends in year 10 while the positive impact of energy savings persists through year 25.

In addition, the 2009 study did not model ratepayer (participant and nonparticipant) program payments used to derive Focus on Energy funding. As such, in order to be consistent with the 2009 study, the 2012 study impacts (Table 14) do not account for the cost of the Focus on Energy programs to ratepayers.

The 2009 study reported impacts for residential, nonresidential, and renewable-energy Focus on Energy programs independent of each other (i.e., impacts for renewable-energy measures are not accounted for in the residential and nonresidential programs). For consistency and to avoid double counting, the report presents the 2012 study impacts in this manner.

Table 14. Cumulative Job-year Impacts per Million Dollars of Focus on Energy Funding Without Accounting for Program Costs to Ratepayers

(Job-years/$1M)	Year 1	Year 5	Year 10	Year 25
Residential 2009	19	28	37	75
Residential 2012	14	30	38	51
Nonresidential 2009	25	39	60	257
Nonresidential 2012	25	60	107	113
Renewable Energy 2009	25	19	10	80
Renewable Energy 2012	39	57	82	89

The Evaluation Team also analyzed the impacts of the CY 2012 Focus on Energy programs accounting for the costs of the programs to ratepayers. Table 15 shows these impacts for the 2012 study along with the impacts for the 2009 study. Note that the impacts for the 2009 study in Table 14 and Table 15 are the same.

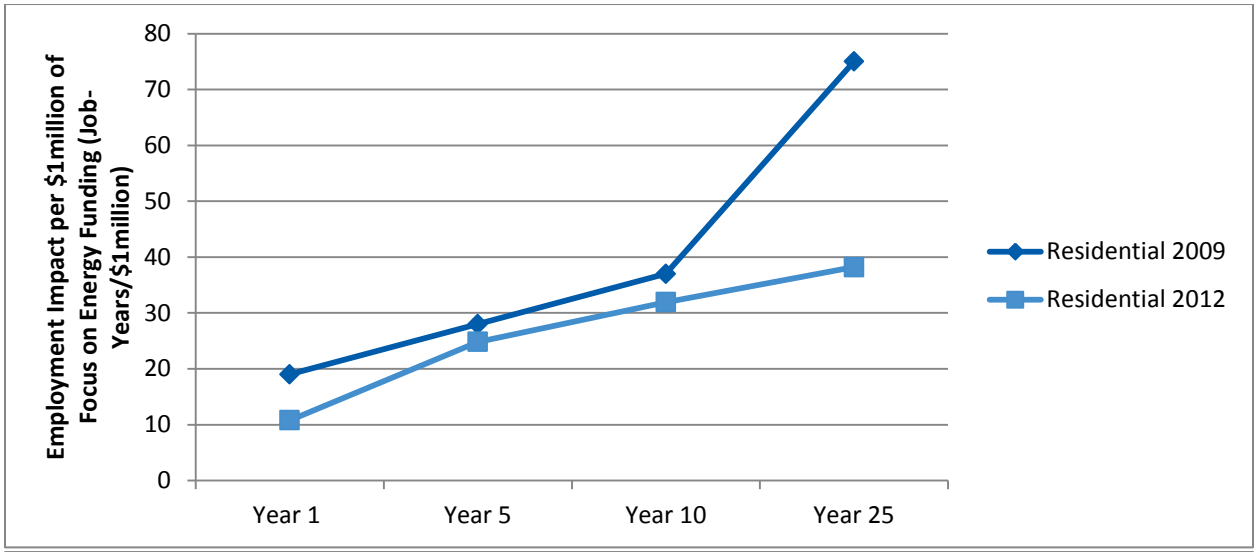
Table 15. Cumulative Job-year Impacts per Million Dollars of Focus on Energy Funding With Accounting for Program Costs to Ratepayers

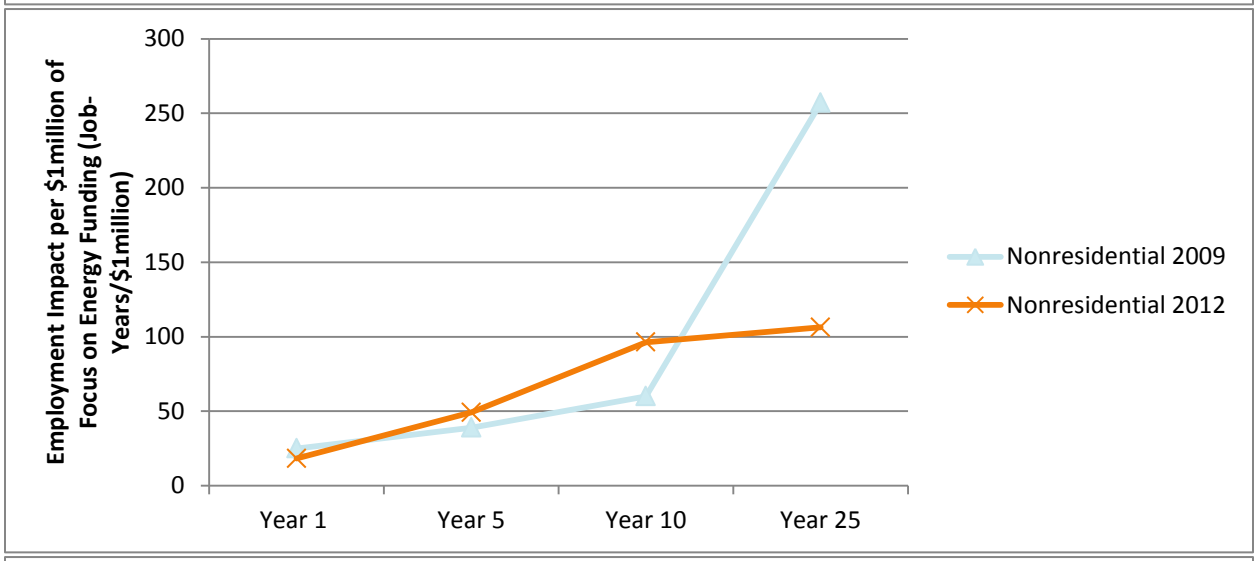
(Job-years/$1M)	Year 1	Year 5	Year 10	Year 25
Residential 2009	19	28	37	75
Residential 2012	11	25	32	38
Nonresidential 2009	25	39	60	257
Nonresidential 2012	18	49	96	106
Renewable Energy 2009	25	19	10	80
Renewable Energy 2012	34	53	82	98

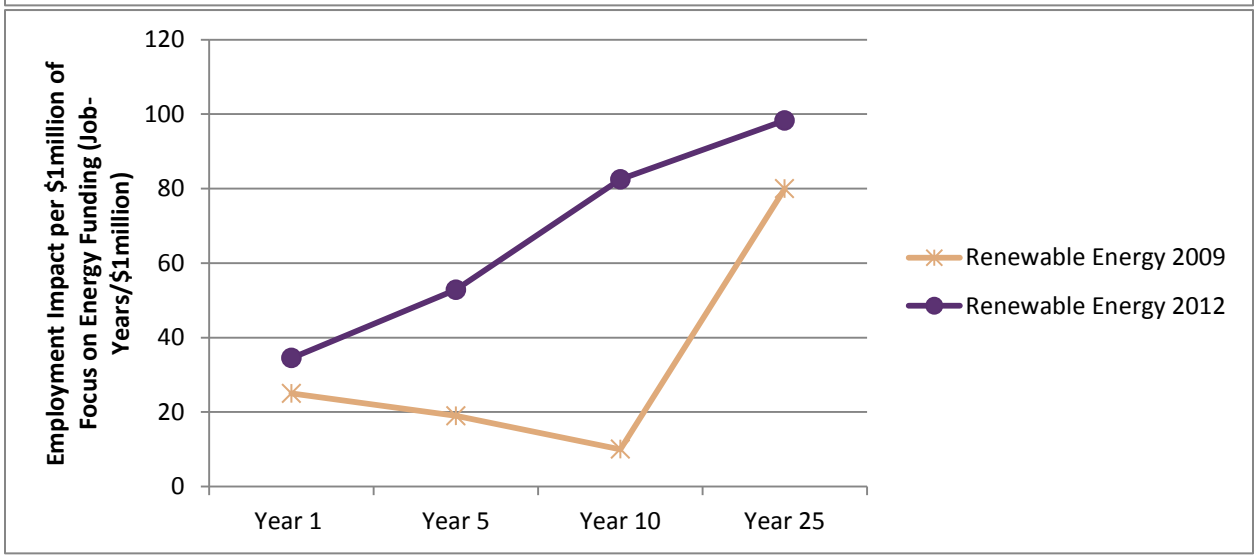
Figure 13 compares the cumulative job-year impacts per million dollars of Focus on Energy funding for 2012 with 2009. The CY 2012 impacts shown in Figure 13 account for program costs to ratepayers (i.e., impacts are from Table 15). The Evaluation Team did this to net all program-related spending and energy-bill savings within the region to zero.[23]

[23] The exception is avoided costs, which are strictly positive inputs to the model due to the negative effects manifesting outside of the Wisconsin economy. This is discussed further in Table 2 and footnote 8.

Figure 13. Cumulative Job-year Impacts per Million Dollars of Focus on Energy Funding by Program







Conclusions

Overall, the CY 2012 Focus on Energy programs helped to create or sustain 1,423 jobs-years in the first year of the study period. The Evaluation Team projects the programs will create 6,596 job-years over the lifetime of the installed measures. Including these impacts into the enhanced TRC calculation yields a benefit-cost ratio of 7.28.

Table 16 lists the results of the enhanced TRC test with economic benefits included (highlighted in orange). The economic benefits included in the TRC test are the cumulative value added impacts (discounted to 2012 dollars) to the Wisconsin region of the Focus on Energy portfolio.

The renewables component in this table accounts for all costs and benefits of renewable measures from both the residential and nonresidential programs. As such, the residential and nonresidential components of the table do not include costs and benefits of renewable measures to avoid double counting.

Table 16. CY 2012 Costs, Benefits, and TRC Ratio by Sector (with Renewables Independent) Including Economic Benefits

	Residential	Nonresidential	Renewables	Total
Incentive Costs*	$15,775,767	$28,090,892	$4,907,389	$48,774,048
Admin Costs	$3,792,038	$3,374,847	$801,764	$7,968,649
Delivery Costs	$8,647,538	$13,780,905	$2,509,083	$24,937,526
Incremental Measure Costs	$38,764,692	$98,249,403	$44,357,850	$181,371,944
Total Non-Incentive Costs	**$51,204,268**	**$115,405,154**	**$47,668,696**	**$214,278,119**
Electric Benefits	$61,608,536	$203,458,650	$28,298,913	$293,366,099
Gas Benefits	$45,627,166	$138,716,232	$437,000	$184,780,398
Emissions Benefits	$30,541,572	$100,147,119	$10,398,860	$141,087,551
Net Economic Benefits[24]	$90,567,212	$794,417,121	$55,953,168	$940,937,500
Total TRC Benefits	**$228,344,486**	**$1,236,739,121**	**$95,087,941**	**$1,560,171,548**
TRC Net Benefits	**$177,140,217**	**$1,121,333,967**	**$47,419,245**	**$1,345,893,429**
TRC Ratio**	**4.46**	**10.72**	**1.99**	**7.28**

*Incentive costs are not included in TRC calculation.

**TRC Ratio equals total TRC benefits divided by non-incentive costs.

Table 17 lists the impacts of the TRC test without the inclusion of economic benefits. The inclusion of economic benefits in TRC test increases the TRC ratio of the residential programs with renewables independent by 66% and the nonresidential programs with renewables independent by 180%. In addition, the independent renewables component of Focus on Energy's portfolio becomes cost effective

[24] The REMI model presents economic impacts as a net figure with economic costs already netted out. As a result, dissociating the economic costs from the economic benefits is not possible.

with a TRC ratio of 1.99, an increase of 143%. Overall, the TRC ratio of the Focus on Energy portfolio increases by 152%.

Table 17. CY 2012 Costs, Benefits, and TRC Ratio by Sector (with Renewables Independent) not Including Economic Benefits

	Residential	Nonresidential	Renewables	Total
Incentive Costs*	$15,775,767	$28,090,892	$4,907,389	$48,774,048
Admin Costs	$3,792,038	$3,374,847	$801,764	$7,968,649
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Incremental Measure Costs	$38,764,692	$98,249,403	$44,357,850	$181,371,944
Total Non-Incentive Costs	**$51,204,268**	**$115,405,154**	**$47,668,696**	**$214,278,119**
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Gas Benefits	$45,627,166	$138,716,232	$437,000	$184,780,398
Emissions Benefits	$30,541,572	$100,147,119	$10,398,860	$141,087,551
Total TRC Benefits	**$137,777,274**	**$442,322,000**	**$39,134,773**	**$619,234,048**
TRC Net Benefits	**$86,573,006**	**$326,916,846**	**($8,533,923)**	**$404,955,929**
TRC Ratio**	**2.69**	**3.83**	**0.82**	**2.89**

*Incentive costs are not included in TRC calculation.

**TRC Ratio equals total TRC benefits divided by non-incentive costs.