Focus on Energy Economic Impacts 2015-2016

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Glossary of Terms

Term	Definition
Avoided Utility Costs	Avoided utility expenditures on fuel, purchased power, and infrastructure due to reduced demand for utility energy resources from Focus on Energy activities and resulting energy savings.
Baseline Energy Payments	Electric and natural gas ratepayer spending on energy and supply chain resources that otherwise would have been saved through Focus on Energy programs.
Bill Reductions	The estimated decrease in participant spending on utility bills resulting from Focus on Energy programs, viewed as cost savings by participants and lost revenues by utilities.
Direct Effects	Impacts that result from changes in demand that are attributable to Focus on Energy, such as program- and project-level investments or reduced demand for energy resources.
Employment	The net number of jobs created. All employment impacts in this analysis are presented as job-years, defined as one full-time equivalent job for one year (2,080 hours). One job-year equals one full-time job lasting one year; two half-time jobs lasting one year each; two full-time jobs lasting a half year each; and so on.
Incentives	Focus on Energy program funds spent on direct financial and service-based incentives that encourage investments in energy-saving technologies and behaviors.
Indirect Effects	Impacts that are generated in supply chains when directly affected industries purchase factor inputs from supporting industries.
Induced Effects	Impacts that result when participating households that save money on energy bills and employees in the directly and indirectly affected industries spend their saved income on goods and services in the regional economy, some of which come from outside Wisconsin.
Net Economic Impacts	The difference between economic impacts from Focus on Energy cash flows and impacts from a hypothetical scenario in which Focus on Energy does not exist and equal funds are instead spent on other goods and services.
Participant Payments	Participant payments for project goods and services, which represent the combination of financial incentives received and participant co-funding.
Personal Income	The net change in money available to Wisconsin consumers for purchasing goods and services, saving money, and paying taxes. Personal income is incorporated into value added impacts, along with profits and taxes, but is presented separately to show impacts specific to Wisconsin households.
Program Payments	Funding for Focus on Energy, which originates from participating utilities' revenues, collected from Wisconsin ratepayers.
Program Spending	Focus on Energy program funds that are spent on technical and customer support, marketing, evaluation, and administrative activities and services.
Sales Generated	Total industry output, or production, including all intermediate goods purchased, employee compensation, and profits. This includes purchases of intermediate goods and is thus greater than value added.
Economic Benefits (Value Added)	The net contribution of each private industry and the government to Wisconsin's gross state product. This is the total net economic benefit to Wisconsin, including wages, profits (minus intermediate goods purchased), and taxes (minus subsidies). All value-added impacts in this analysis are presented as "economic benefits" and refer to marginal (that is, net) impacts on Wisconsin's gross state product.

Executive Summary

This report describes the net statewide economic development impacts of Focus on Energy's 2015-2016 energy efficiency and renewable energy programs. Cadmus analyzed these economic impacts using the Policy Insight+ (PI+) model from Regional Economic Models, Inc. (REMI). The model is an economic forecasting tool that simulates the annual and long-term effects of different spending choices on multiple components of the state economy.

Cadmus used Focus on Energy spending and energy-savings data to model its programs' net economic impacts in REMI PI+. This analysis addressed program activities during the 2015 and 2016 program years; economic impacts identified for 2017 and onward reflect only the long-term effects from measures installed in 2015 and 2016 remaining installed and operational. The economic impacts of measures installed in program years prior to and after these program years are not included in this analysis.

Cadmus determined the unique effects of Focus on Energy's energy efficiency and renewable energy programs on the Wisconsin economy by calculating net economic impacts as the difference between impacts from Focus on Energy's programs and the impacts that would have occurred if the program did not exist (and ratepayers instead spent the same amount of funds on alternative goods, services, and energy). Focus on Energy achieves positive net economic impacts by affecting the flow of money through the Wisconsin and regional economies in three ways:

- ***Direct economic effects*** represent increases in employment, income, and economic activity among industries directly involved with Focus on Energy, such as companies that manufacture, sell, and install energy technologies or firms that provide project services.
- ***Indirect economic effects*** account for increases in employment, income, and economic activity among industries in the energy efficiency and renewable energy supply chains, such as companies that supply raw manufacturing inputs to directly affected industries.
- ***Induced economic effects*** lead to additional increases in employment, income, and economic activity among other industries because Focus on Energy participants and the employees of directly and indirectly affected industries spend money in Wisconsin.

Focus on Energy has positive net economic impacts largely because it increases in-state spending. Utilities import fuel and power from other states, so a significant share of Wisconsin ratepayer funds are spent outside the state economy. Focus on Energy reduces electricity and natural gas purchases by promoting investments in Wisconsin's energy efficiency and renewable energy industries. This provides long-term savings that support increased in-state spending on other local goods and services.

Summary of Study Findings

Table ES-1 summarizes the employment and economic benefit impacts attributable to each program year and to both years combined. Employment impacts are presented in job-years, where one job-year represents a full-time equivalent (FTE) job lasting one year. Economic benefit impacts describe the net effects on Wisconsin's gross state product.

Table ES-1. Summary of Cumulative Economic Development Impacts by Program Year(s)

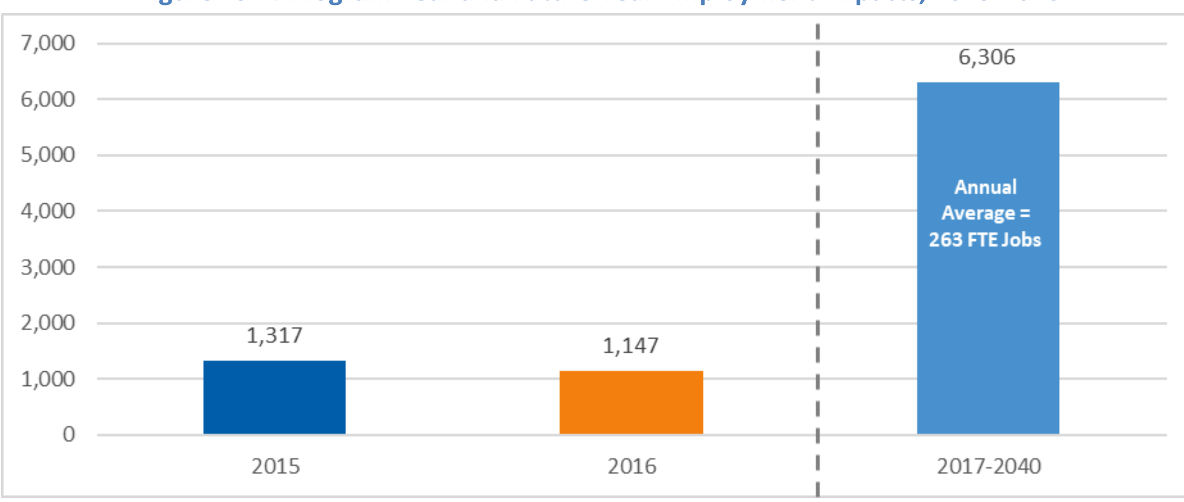
Economic Development Impact	Program Year(s)		
	2015	2016	Combined (2015-2016)[1]
Employment (job-years)	5,131	3,713	8,769
Economic Benefit (millions of 2016 dollars)	$413	$348	$762

[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

These economic benefits accrue to both urban and rural customers. Of the $762 million in economic benefits, $323 million (42%) will accrue to business and residential customers in rural areas.[1] Of the 8,769 FTE job-years created as a result of the 2015-2016 programs, 4,076 FTE job-years (46%) will be created in rural areas. The jobs created in rural areas are also higher paying than those created in urban areas, which tend to be more retail and service oriented.

Figure ES-1 illustrates Focus on Energy's positive net employment impacts from its 2015 and 2016 activities. The program created more than 1,000 FTE jobs in each of 2015 and 2016. Its activities in those years continue to create an average of 263 FTE jobs per year through 2040, as ongoing energy savings reduce operating costs for businesses, increase disposable income for consumers, and allow the money saved to be spent in the Wisconsin economy.

Figure ES-1. Program Year and Future Year Employment Impacts, 2015-2016



[1] For purposes of this analysis, rural areas were defined as those in the 582 zip codes that are eligible to participate in Focus on Energy's 2017-2018 programs for rural customers. These zip codes are defined as primarily rural by the Census Bureau and/or include a significant number of households eligible to receive benefits under federal programs to expand rural broadband service.
Public Service Commission of Wisconsin Final Decision of December 21, 2016. Docket 5-FE-102. PSC REF#: 295732. http://apps.psc.wi.gov/vs2015/ERF_view/viewdoc.aspx?docid=295732

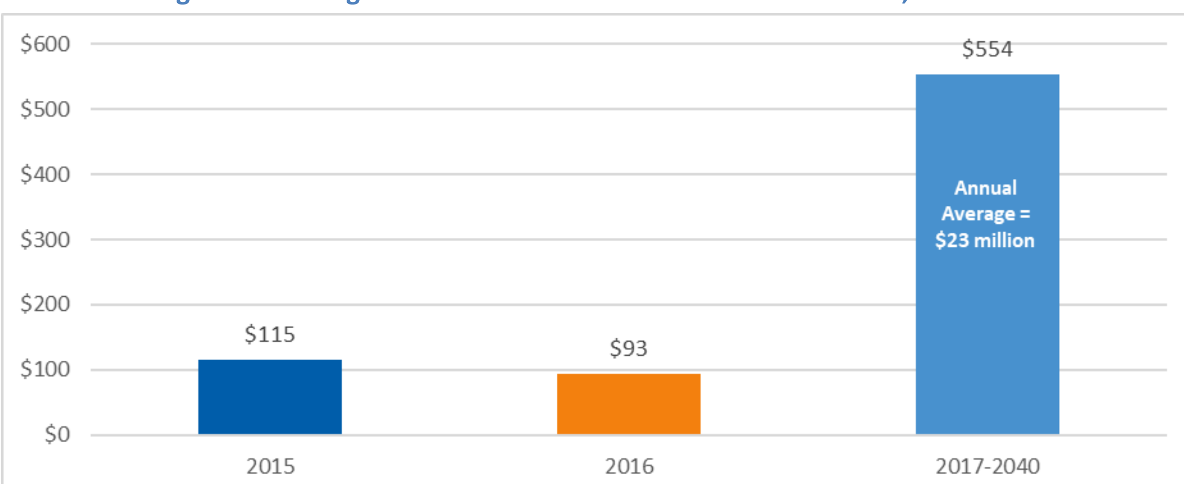
These findings of positive employment impacts are consistent with the results from a 2015 survey of energy efficiency and renewable energy contractors participating in Focus on Energy.[2] Nearly 25% of survey respondents reported that they had hired more staff as a direct result of increased business activity from the Focus on Energy programs.

The largest program year employment increases occurred in the manufacturing sector. Because of increased purchases of energy efficiency and renewable energy technologies, Focus on Energy created more than 700 manufacturing jobs in 2015 and 2016. There are several other private sector occupations that experienced significant job growth:

- Sales and related office and administrative support occupations
- Management, business, and financial occupations
- Computer, mathematical, architecture, and engineering occupations
- Education, training, and library occupations

Figure ES-2 illustrates Focus on Energy's positive net economic benefits, which totaled more than $208 million through 2016 and will total more than $762 million through 2040. These findings are consistent with reports from contractors involved with Focus on Energy: Approximately 59% of contractors who responded to the 2015 program survey reported that their business activity had increased since their involvement with Focus on Energy.

Figure ES-2. Program Year and Future Year Economic Benefits, 2015-2016



[2] Cadmus. "Focus on Energy Calendar Year 2014 Evaluation Report, Volume 1." May 27, 2015. Available online: https://focusonenergy.com/sites/default/files/Evaluation%20Report%202014%20-%20Volume%20I.pdf

When economic benefits are counted, cost-effectiveness findings suggest that Focus on Energy provided $4.77 in benefits for every $1.00 invested during the 2015, 2016, and 2015-2016 program period. Table ES-2 summarizes the benefit/cost ratios previously reported for Focus on Energy, which did not include economic benefits, and shows the revised benefit/cost ratios achieved when economic impacts are included among program benefits.

Table ES-2. Focus on Energy Benefit/Cost Ratios with and without Economic Benefits

Program Year(s)	Without Economic Benefits	With Economic Benefits
2015	$3.51	$5.25
2016	$3.00	$4.32
2015-2016	**$3.24**	**$4.77**

Introduction

Focus on Energy is Wisconsin's statewide energy efficiency and renewable resource program. As required under Wisconsin Statute §196.374(2)(a), Focus on Energy is funded by the state's investor-owned energy utilities and participating municipal utilities and electric cooperatives. APTIM (formerly Chicago Bridge & Iron Company) serves as the Program Administrator and is responsible for designing, managing, and coordinating all of Focus on Energy's programs.

The Public Service Commission of Wisconsin (PSC) provides oversight of Focus on Energy. In 2014, the PSC contracted with a team of energy consulting and market research firms to verify Focus on Energy savings and evaluate the program during the 2015-2016 period. As part of this contract, Cadmus, in partnership with REMI, assesses net statewide economic impacts attributable to Focus on Energy every two years.

Focus on Energy provides information, technical support, and financial incentives to eligible Wisconsin residents and businesses. Focus on Energy participants implement energy projects they otherwise would not have been able to complete, or they complete projects ahead of schedule. Focus on Energy thus helps Wisconsin residents and businesses manage rising energy costs, protect the environment, and promote in-state economic development while controlling the growing demand for electricity and natural gas.

This report presents the net statewide economic development impacts of Focus on Energy for the 2015-2016 period and describes the analytical approach used to calculate those impacts. The analysis entailed reviewing the results of the impact evaluations conducted for each program for 2015 and 2016, then projecting those impacts for the entire program portfolio through the 25-year study period (2015–2040), as summarized in Table 1.

Table 1. Study Period by Program Year

Program Year(s)	Timeframe Modeled for Economic Impacts
2015	2015–2039
2016	2016–2040
2015-2016	2015–2040

The Focus on Energy program portfolio changed somewhat between 2014 and 2016. Appendix C. Focus on Energy Programs by Year lists the programs included in the macroeconomic analysis by market segment and year.

Introduction to Investment and Energy Savings Impacts

Programs offered by Focus on Energy affect the flow of money through the Wisconsin economy and regional economies in multiple ways:

- ***Direct economic effects*** result from changes in demand that are attributable to Focus on Energy, such as program- and project-level investments or reduced demand for energy resources. For example, a participant may spend a combination of program incentives and personal funds on new home insulation, thus directing funds to the insulation industry.
- ***Indirect economic effects*** are generated in supply chains when directly affected industries purchase factor inputs from supporting industries. For example, to meet increased local demand, the insulation industry purchases fiberglass from the fiberglass industry.
- ***Induced economic effects*** occur when participating households that save money on energy bills and employees in the directly and indirectly affected industries spend that income on goods and services in the regional economy, some of which come from outside Wisconsin. For example, program participants save money on energy bills and instead spend that portion of their personal income on other goods and services.

An example of the direct, indirect, and induced cash flows attributable to Focus on Energy is illustrated in Figure 1.

Figure 1. Example of Direct, Indirect, and Induced Cash Flows Attributable to Focus on Energy

Although the REMI PI+ model assumes that total statewide spending is the same with or without Focus on Energy, the total net economic impacts are positive because the way in which money is spent in the Wisconsin economy changes because of a programs' direct, indirect, and induced effects. In the example shown in Figure 1, the program participant directs funds to the insulation industry, increasing demand for those goods and services, which generates effects that are amplified throughout the economy. These program-induced effects result in positive net statewide economic impacts because funds directed to the insulation industry would otherwise be spent primarily (but not solely) on electricity and fuel, much of which is imported into Wisconsin from other state economies.

In addition to the effects from first-year program and project expenditures, the investments made by Focus on Energy and program participants continue to generate positive net impacts in the Wisconsin economy over time. Persistent energy savings resulting from energy-efficient and renewable energy measures allow residential and nonresidential participants to spend less money on energy and more money on other products and services, many of which have more localized supply chains than those associated with energy. Local utilities can reduce the amount of fuel and power imported into the region, while regional supply for energy-efficient and renewable energy measures increases to meet demand within Wisconsin.

Participating utilities benefit from reducing their fuel and power 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 forego revenues equal to reductions in energy sales. The dollar value of these reductions in sales represents a cost to the utilities that is also included in the customized REMI PI+ model.

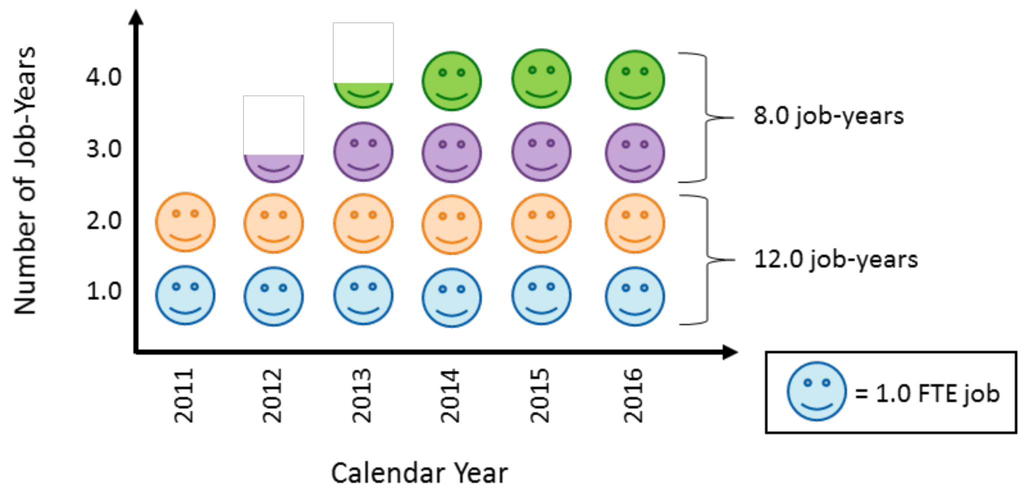
Introduction to Economic Impacts Modeled

Cadmus used a customized REMI PI+ model to estimate Focus on Energy's annual and cumulative statewide impacts on two key economic indicators: employment and economic benefits (value added). Cadmus also estimated net impacts on two additional economic indicators: personal income and sales generated. Each of these indicators is explained below.

- ***Employment*** estimates the number of full- and part-time jobs by place of work. All employment impacts in this analysis are presented as job-years. One job-year is defined as one FTE job for one year (2,080 hours). In other words, one job-year equals one full-time job lasting one year; two half-time jobs lasting one year each; two full-time jobs lasting a half year each; and so on.

  Figure 2 illustrates the difference between number of employees and number of job-years with a hypothetical example. A firm consists of two core members, both full-time employees who work for an entire six-year period. These two full-time employees are measured as 12 job-years. To meet increased demand, the same firm hires one employee to work full time for 4-½ years plus another employee to work half time for one year and full time for three years. Together, these additional employees are measured as eight job-years. In aggregate, these four hypothetical employees contribute a total of 20 job-years over a six-year period.

Figure 2. Determining Job-Year Impacts



One job-year consolidates full- and part-time employment and is a meaningful metric for reporting year-by-year employment impacts for the duration of the study period. Cadmus included employees, sole proprietors, and active partners in the estimated employment impacts (but did not include unpaid family workers or volunteers).

The REMI PI+ model determines employment impacts from estimated changes in output (total production) and labor productivity (total production per job). For instance, estimated increases in employment can result from increased output or decreased labor productivity. Conversely, estimated decreases in employment can result from either decreased output or increased labor productivity.

- ***Value added*** measures the net contribution of each private industry and of government to Wisconsin's gross state product. It describes the total net economic benefit to Wisconsin, including wages, profits (minus intermediate goods purchased), and taxes (minus subsidies). All value-added impacts in this analysis are presented as economic benefits and refer to marginal (net) impacts on Wisconsin's gross state product.

  The REMI PI+ model determines the value added from estimated changes in industry demand and competitiveness. For instance, an increase in demand leads to an increase in value added, while a decrease in demand leads to a decrease in value added.

- ***Personal income*** represents the change in money available to Wisconsin consumers for purchasing goods and services, saving money, and paying taxes. Personal income is incorporated into value added, along with profits and taxes, but is presented separately to demonstrate impacts specific to Wisconsin households.

  The REMI PI+ model calculates personal income as total income received from all sources, including wages and salaries, benefits, proprietor (owner) income, rental income, investment income, and transfer payments from public entities (such as Social Security payments).

Estimated increases or decreases in personal income result from changes in any of these sources.

- ***Sales generated*** equals total industry output, or production, including all intermediate goods purchased, employee compensation, and profits. It includes purchases of intermediate goods, and thus it is greater than value added (net economic benefits).[3]

  The REMI PI+ model determines sales generated from changes in industry demand in all regions across the nation, Wisconsin's share of each national industry, and international exports out of Wisconsin. For example, an increase in sales generated results from an increase in demand, in Wisconsin's market share, or in Wisconsin's international exports.

3 Intermediate goods are semi-finished products used in the production of other goods. For example, an engine part is a final good sold by a shaped metal manufacturer and is an intermediate good used by motorcycle makers. Intermediate goods are counted as part of total sales generated, but are not counted as part of total value added because that would be double-counting from a statewide net economic benefit perspective. Using the motorcycle engine example, the sale of an engine part to a motorcycle maker and the sale of a motorcycle to a consumer would be counted in sales generated. However, only the sale of the final product—the motorcycle—is counted in value added, which represents the net economic benefit to Wisconsin.

Study Findings

Cadmus estimated the net economic development impacts generated from the 2015 and 2016 Focus on Energy programs, separately and in aggregate. The aggregate impacts from 2015-2016 were estimated with a REMI PI^{+} model comprising inputs from both program years. Because of industry interactions, price responses, labor migration, and other dynamic factors in the REMI PI^{+} model, 2015-2016 impacts from multiple years of program and project activity are not exactly equal to the sum of the impacts from each program year considered separately. Table 2 summarizes the net economic development impacts attributable to each program year and to the 2015-2016 combined period.

Table 2. Summary of Cumulative Economic Development Impacts by Program Year(s)

Economic Development Impact	Program Year(s)		
	2015	2016	Combined (2015-2016)[1]
Employment (job-years)	5,131	3,713	8,769
Economic Benefit (millions of 2016 dollars)	$413	$348	$762

[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

Employment and economic benefit impacts from the 2015 program year are higher than those from the 2016 program year because program expenditures and savings achieved were both higher in 2015. Program spending in 2015 was $104.9 million (in 2016 dollars), compared to $97.3 million in 2016. Lifecycle natural gas and electric bill savings from 2015 measure installations total $1,168.7 million (in 2016 dollars), while lifecycle natural gas and electric bill savings from 2016 measure installations total $884.2 million. Decreases in employment are greater than the decreases in economic benefits in part because a significant share of bill savings are spent in low-wage industries such as retail and food service, and the lower bill savings in 2016 therefore support fewer jobs in those industries.

The results presented here also differ from those in the quadrennial (2011–2014) analysis.[4] There are three primary drivers for these differences.

- First, economic assumptions were updated in the REMI model. These updates increased assumed job growth relative to the quadrennial analysis, primarily due to decreases in the model's assumed levels of labor productivity. Decreased labor productivity leads to decreased

[4] Cadmus. "Focus on Energy Economic Impacts 2011–2014" December 2015. Available online: https://focusonenergy.com/sites/default/files/Focus%20on%20Energy%20Economic%20Impacts%202011-2014.pdf

economic benefits, all else being equal, because it leads to lower levels of production and compensation for any given level of employment.

- Second, lifecycle energy savings were higher in 2015 than in the previous years covered in the quadrennial analysis.
- Third, the PSC-approved avoided cost assumptions for the Focus program were reduced in the 2015–2018 quadrennial period from the levels set for the 2011–2014 period, reflecting recent reductions in natural gas prices and projected wholesale electricity costs.

Overall, for a given level of program expenditures, these three effects combined led to higher employment impacts in the current study than in the quadrennial period, but also lower personal income, lower economic benefit (gross state product), and lower sales-generated impacts.

As described in the detailed findings below, energy efficiency and renewable energy investments made through Focus on Energy programs lead to immediate benefits in the year they are made, as well as long-term benefits that accrue while measures remain installed and operational. This analysis addresses program activities during the 2015 and 2016 program years, so economic impacts from 2017 onward reflect only the long-term effects from measures installed in 2015 and 2016. The economic impacts of measures installed in program years prior to and after these program years are not included in this analysis. For details on the immediate impacts in the 2011-2014 time period, see the quadrennial economic impact report.

Detailed Portfolio Impacts

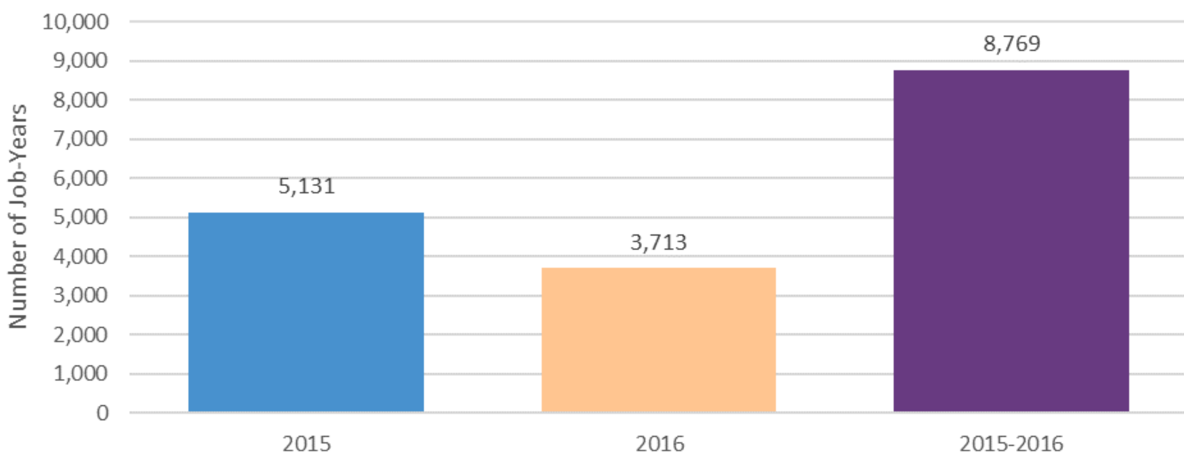
The subsections below provide detailed discussions of the 2015-2016 portfolio impacts according to four indicators of net statewide economic development: employment, economic benefit, personal income, and sales generated.

Employment

Focus on Energy activities generate positive net effects on statewide employment. Findings from a 2014 survey (Cadmus May 2015) revealed that nearly 25% of program Trade Allies hired more staff as a direct result of increased business activity from Focus on Energy. Some of these new employees may have been unemployed previously or may have migrated to Wisconsin to gain employment: both cases represent a scenario in which Focus on Energy generates net job growth in Wisconsin. Equipment manufacturers and wholesalers within the state of Wisconsin will also be likely to hire additional employees to meet increased demand for energy-efficient and renewable energy equipment. These newly hired employees will in turn spend their new wages in the Wisconsin economy, leading to additional induced economic impacts. Energy savings, and resulting bill savings, also lead to additional spending within the Wisconsin economy by businesses and residential customers that would not have occurred absent the energy savings.

Figure 3 shows the cumulative study period net employment impacts of Focus on Energy's 2015 program, 2016 program, and 2015-2016 portfolios, measured relative to a hypothetical baseline scenario in which Focus on Energy programs did not operate. All cumulative Focus on Energy economic development impacts, including employment, exceed the impacts of the scenario in which Focus on Energy hypothetically did not exist. For instance, the REMI PI+ model estimates that the entire 2015-2016 program portfolio will generate 8,769 net job-years between 2015 and 2040.

Figure 3. Cumulative Net Employment Impacts[1]



[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

Program Year and Future Year Employment Growth

Table 3 shows the net program year, future year, and cumulative effects on job growth by program year(s). For example, analysis findings suggest that the entire 2015-2016 program portfolio created 2,464 net job-years from 2015 to 2016 and will generate an additional 6,306 net job-years between 2017 and 2040.

Table 3. Program Year, Future Year, and Cumulative Effects on Job Growth

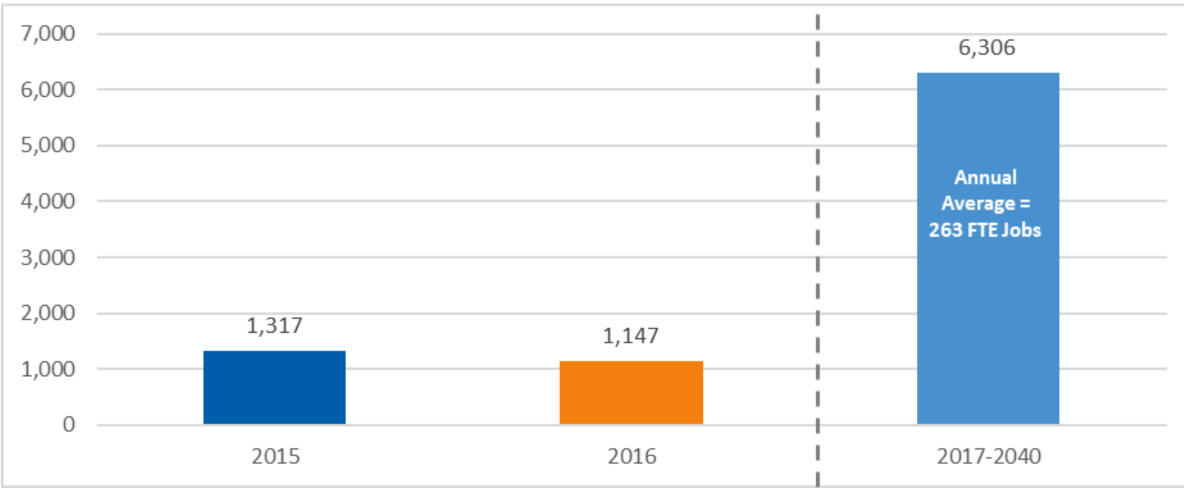
Employment (Job-Years)	Program Year(s)		
	2015	2016	2015-2016[1]
Program Year(s)	1,317	976	2,464
Future Years	3,815	2,737	6,306
Cumulative[2]	**5,131**	**3,713**	**8,769**

[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.
[2] Values may not sum due to rounding.

Figure 4 illustrates the net program year (2015 through 2016) and future year (2017 through 2040) employment impacts of Focus on Energy's 2015-2016 program portfolio relative to the hypothetical scenario in which those programs did not operate in 2015-2016. Throughout the 2015-2016 period, the Focus on Energy program portfolio created FTE jobs proportional to the expenditures in each program year, totaling 2,464 net job-years during the two-year span. The 2015-2016 portfolio is projected to generate an additional 6,306 net job-years after the programs' operational period, representing an average of approximately 263 FTE jobs annually during the 24-year period.

This analysis addresses program activities during the 2015 and 2016 program years, so economic impacts from 2017 onward reflect only the long-term effects from measures installed in 2015 and 2016 remaining installed and operational.[5] The economic impacts of measures installed in program years prior to and after these program years are not included in this analysis.

Figure 4. Program Year and Future Year Effects on Job Growth, 2015-2016 and 2017–2040



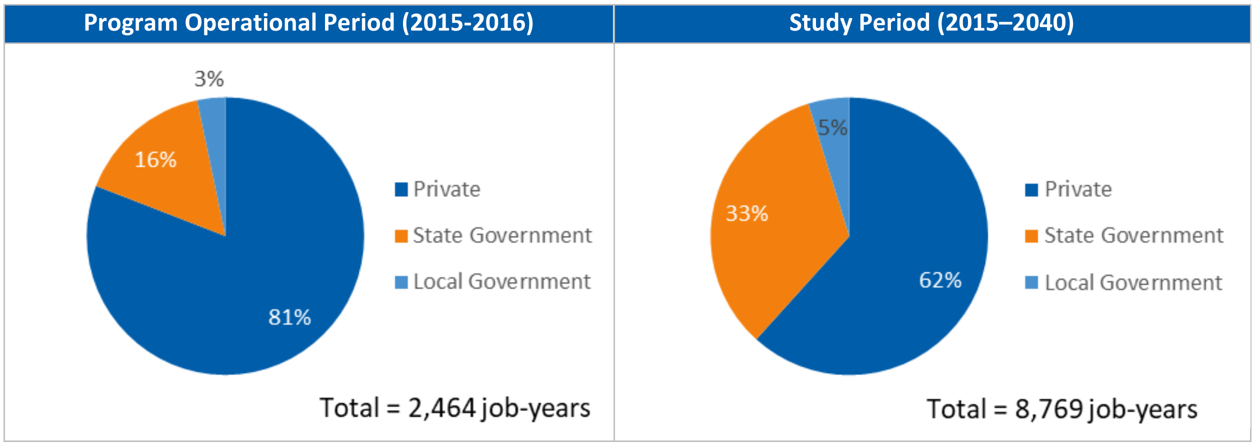
Net Employment Growth by Market Sector

Cadmus also investigated net employment growth by market sector—private, local government, and state government. The primary drivers of job growth in the first year and cumulatively over the study period are the direct, indirect, and induced effects of program investment, project spending, and ongoing energy savings. As economic activity related to Focus on Energy increases, so does Wisconsin's labor workforce.

Figure 5 illustrates the relative share of total job growth attributable to the private, local government, and state government sectors during the operational period (2015-2016) and during the entire study period (2015–2040).

5 The 2016 program year employment impact in Table 3 shows only those impacts from 2016 program expenditures. This differs from the 2016 employment impact in Figure 4, which includes the bill savings impacts that accrue from measures installed in 2015.

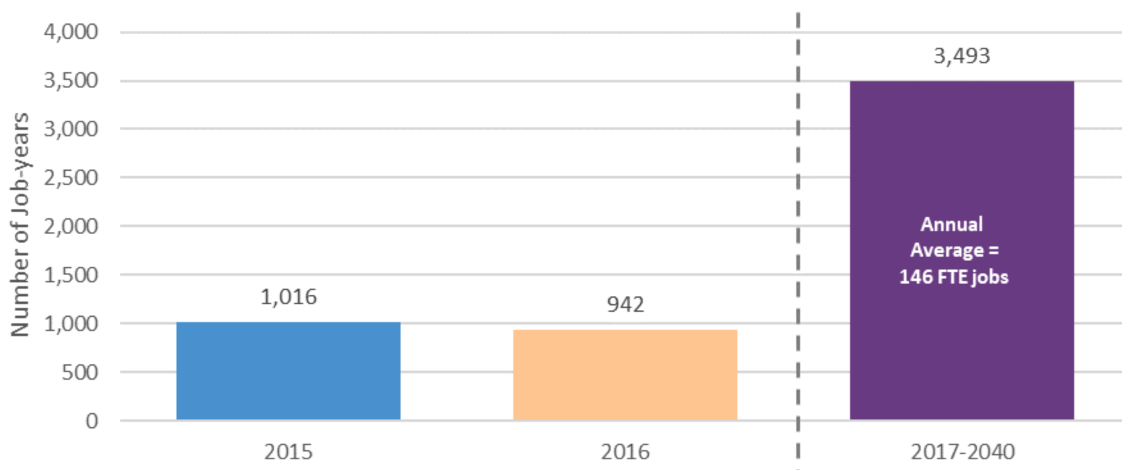
Figure 5. Program Operational Period and Study Period Employment Growth by Sector, 2015-2016 and 2015–2040



Most of the job growth caused by the Focus on Energy 2015-2016 portfolio affects organizations in the private sector and, to a lesser extent, in the state and local government sectors. Compared to the private sector, job growth in the public sector is sustained for a longer period. As a result, the relative share of public sector employment growth is forecasted to increase during the study period, primarily a result of labor migration. As Focus on Energy program expenditures in 2015 and 2016 increased labor demand in the affected industries, individuals moved to Wisconsin from other states to meet that demand. This increase in population causes an increase in demand for social services, such as schools, police, and firefighters, leading to the higher share of public sector job growth after 2016.

Figure 6 shows the program year and projected future year employment growth in the five private sector occupations that experienced the largest program year FTE job creation as a result of 2015-2016 program activities.

Figure 6. Program Year and Future Year Employment Growth in the Top Five Private Sector Occupations, 2015-2016



These five private sector occupations experienced the largest program-year job growth, ranked as follows:[6]

1. Production occupations (713 FTE job-years)
2. Sales and related office and administrative support occupations (403 FTE job-years)
3. Management, business, and financial occupation (350 FTE job-years)
4. Computer, mathematical, architecture, and engineering occupations (325 FTE job-years)
5. Education, training, and library occupations (167 FTE job-years)

During the operational period (2015-2016), purchases of both energy-efficient and renewable energy equipment caused significant increases in demand for production occupations such as HVAC equipment and insulation manufacturing. Program activities in 2015 and 2016 also significantly increased demand for engineering and technical services such as installation contracting and energy auditing. Active programs required administration services and, in the case of Focus on Energy's Appliance Recycling Program, waste management services. Focus on Energy activities expanded opportunities for existing firms and led to the migration of new firms, thus causing higher demand for management services. Finally, increases in Wisconsin's population caused by increased labor demand led to increased employment in the education, training, and library occupations.

Similar to the analysis of total statewide employment growth, the analysis of the 2015-2016 portfolio's occupation-level employment growth reflects only the long-term effects from measures installed in 2015 and 2016 remaining installed and operational. The economic impacts of measures installed in program years prior to and after these program years are not included in this analysis. As shown in Figure 6, the 2015-2016 portfolio is projected to generate 3,493 net job-years across the top five private sector industries between 2017 and 2040, representing an average of approximately 146 FTE jobs annually during the 24-year period.

Economic Benefits

Focus on Energy programs and projects generate new demand for energy efficiency and renewable energy technologies and services, and bring funds back into the Wisconsin economy that would normally be spent on out-of-state energy and fuel imports. Higher demand results in positive impacts on statewide wages, profits, and taxes, which collectively contribute economic benefits to Wisconsin's gross state product. In the 2014 Trade Ally survey referenced earlier (Cadmus May 2015), 59% of program Trade Allies reported

> **"I started my business around the fact that Focus on Energy differentiates me from my competitors."**

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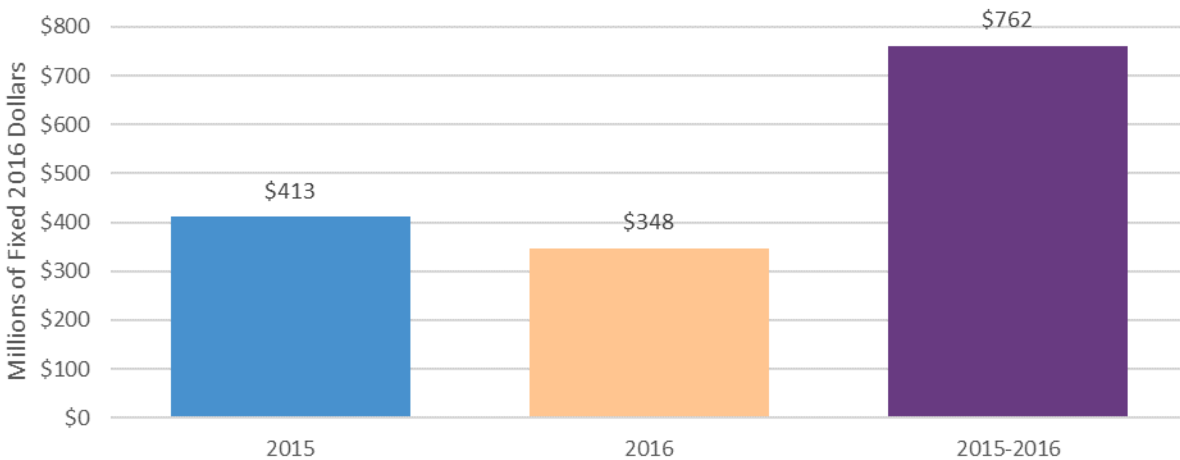
[6] The names and definitions of industry sectors within the REMI PI+ model have changed since the quadrennial analysis, although the substantive differences are, in many cases, small. For example, "production occupations" in the current REMI PI+ model remains closely analogous to the "manufacturing" sector identified in the quadrennial analysis as the sector experiencing the greatest job growth. For further details on changes to the REMI PI+ model, see Appendix D. Changes Since the Quadrennial Report.

increased business activity since their involvement with Focus on Energy. Of these, 41% started selling new products and 27% added new services.

Figure 7 shows the cumulative net economic benefits of Focus on Energy's 2015, 2016, and combined program portfolios relative to a scenario in which the programs did not operate. For instance, model findings indicate that the 2015-2016 program portfolio will generate a total net economic benefit of $762 million between 2015 and 2040.

Figure 7. Cumulative Net Economic Benefit Impacts[1]



[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

Program Year and Future Year Economic Benefits

Table 4 shows the program year, future year, and cumulative net economic benefits, which describe marginal impacts on Wisconsin's gross state product, by program year(s). For example, the analysis suggests that the 2015-2016 program portfolio generated $208 million of economic benefits from 2015 to 2016 and will generate an additional $554 million of economic benefits between 2017 and 2040.

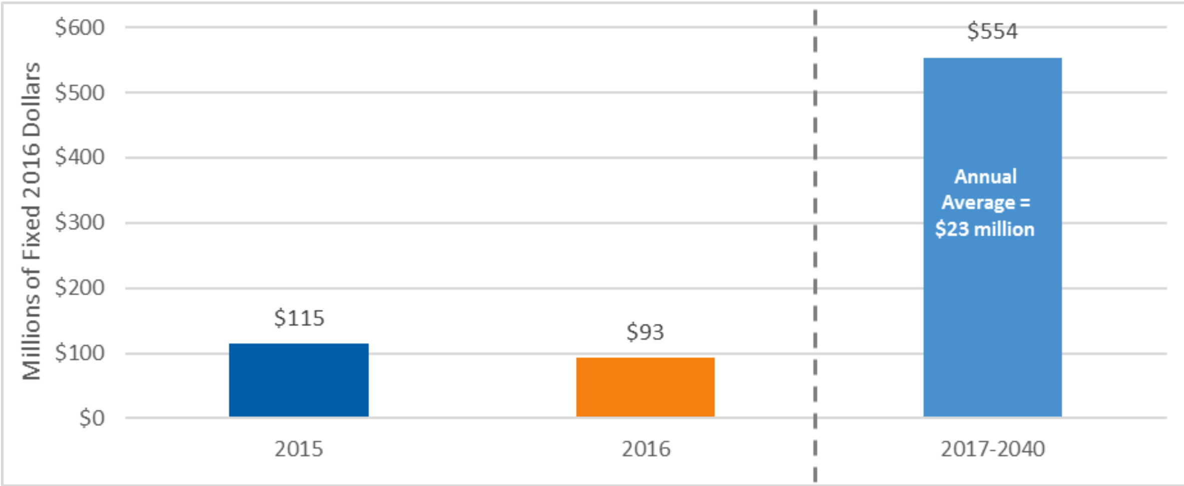
Table 4. Program Year, Future Year, and Cumulative Economic Benefits

Economic Benefit (millions of 2016 dollars)	Program Year(s)		
	2015	2016	2015-2016[1]
Program Year(s)	$115	$103	$208
Future Years	$298	$245	$554
Cumulative	**$413**	**$348**	**$762**

[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

Figure 8 illustrates the net program year (2015-2016) and future year (2017–2040) economic benefits of Focus on Energy's 2015-2016 program portfolio relative to the hypothetical scenario in which the programs did not operate in 2015-2016.

Figure 8. Program Year and Future Year Economic Benefits, 2015-2016



Focus on Energy's program spending and bill savings were higher in 2015 than in 2016, resulting in greater economic benefits in 2015. Overall, a total of $208 million in economic activity is generated during that two-year span. Economic benefits in 2016 are lower when 2015 impacts are included because the first-year bill savings from 2015 ($86,966,388) are greater, and also because 2016 figures include the impact from utilities recovering their lost 2015 revenues. For further illustration of these revenue effects, see Table 17, Table 18, Figure 19, and Figure 20.[7]

The analysis of the 2015-2016 portfolio's economic benefits reflects only the long-term effects from measures installed in 2015 and 2016 remaining installed and operational. The economic impacts of measures installed in program years prior to and after these program years are not included in this analysis. As shown in Figure 8, the 2015-2016 program portfolio is projected to generate an additional $554 million of economic benefits after the programs' operational period, representing an average of approximately $23 million annually during the 24-year period.

Annual and Cumulative Economic Benefits

Program spending and energy savings were higher in 2015 than in 2016, which in turn meant greater impacts in 2015 than in 2016. Economic benefits from energy savings persist through 2040, but are partially offset by revenue effects. Every dollar of business and residential bill savings results in a revenue loss for Wisconsin utilities; however, energy savings also allow Wisconsin utilities to avoid incurring costs for electricity generation and distribution and natural gas distribution. Additionally, a substantial portion of the costs incurred for generation and distribution would have flowed out of state. Thus, the overall impact of the energy savings is positive.

[7] The 2016 program year economic benefit impact in Table 4 shows only those impacts from 2016 program expenditures. This differs from the 2016 economic benefits in Figure 8, which includes the utility revenue effects that result from bill savings from measures installed in 2015.

Similar to employment growth, annual economic benefits are most significant while the Focus on Energy programs are operating. REMI PI+ models that analyze multiple years of program activity all indicate that annual statewide economic benefits remain positive throughout the study period because ongoing energy savings allows consumers to spend relatively more on local goods and services. The REMI PI+ models created for this analysis do not account for sustained Focus on Energy program activity and thus predict annual economic benefits to continue to accrue at lower levels after the programs' operational period. Overall, the analysis predicts net economic benefits cumulatively, in current program years and in future years, that are attributable to each program year and to the entire 2015-2016 program period. Economic benefits in 2017 onward would be higher if they accounted for program expenditures in those years.

Economic Benefit Effects on Annual Portfolio Cost-Effectiveness

In its annual evaluation reports, Cadmus has used the modified total resource cost (TRC) test to measure the net costs of Focus on Energy as a resource option. Results from the modified TRC test represent the balance between costs from direct utility and participant expenditures and benefits from avoided environmental externalities and energy and capacity costs that accrue over time. Although the modified TRC test incorporates a relatively expansive scope of benefits and costs, Cadmus also considered cumulative economic benefits to develop additional TRC tests for each year's program portfolio and for the 2015-2016 portfolio. For all program years, the modified TRC benefit/cost ratio was higher when considering the economic benefits attributable to Focus on Energy.

Table 5 lists the results of the modified TRC tests with and without economic benefits for program year 2015.

Table 5. Program Year 2015 Cost-Effectiveness with and without Economic Benefits

Test Component	Without Economic Benefits	With Economic Benefits
Administrative Costs	$8,492,929	$8,492,929
Delivery Costs	$26,707,516	$26,707,516
Incremental Measure Costs	$202,095,636	$202,095,636
Total Non-Incentive Costs[1]	**$237,296,082**	**$237,296,082**
Electric Benefits	$454,672,669	$454,672,669
Natural Gas Benefits	$268,732,764	$268,732,764
Emissions Benefits	$110,581,131	$110,581,131
Net Economic Benefits	$0	$412,868,851
Total TRC Benefits	**$833,986,564**	**$1,246,855,415**
TRC Benefits Minus Costs	**$596,690,482**	**$1,009,559,333**
TRC Benefit/Cost Ratio	**3.51**	**5.25**

[1] Values may not sum due to rounding.

Table 6 lists the results of the modified TRC tests with and without economic benefits for program year 2016.

Table 6. Program Year 2016 Cost-Effectiveness with and without Economic Benefits

Test Component	Without Economic Benefits	With Economic Benefits
Administrative Costs	$7,934,445	$7,934,445
Delivery Costs	$25,869,078	$25,869,078
Incremental Measure Costs	$228,494,405	$228,494,405
Total Non-Incentive Costs	**$262,297,928**	**$262,297,928**
Electric Benefits	$460,910,375	$460,910,375
Natural Gas Benefits	$221,481,558	$221,481,558
Emissions Benefits	$104,003,542	$104,003,542
Net Economic Benefits	$0	$347,613,194
Total TRC Benefits	**$786,395,475**	**$1,134,008,669**
TRC Benefits Minus Costs	**$524,097,547**	**$871,710,741**
TRC Benefit/Cost Ratio	**3.00**	**4.32**

Table 7 lists the results of the modified TRC tests with and without economic benefits for the entire 2015-2016 program portfolio.

Table 7. 2015-2016 Portfolio Cost-Effectiveness with and without Economic Benefits

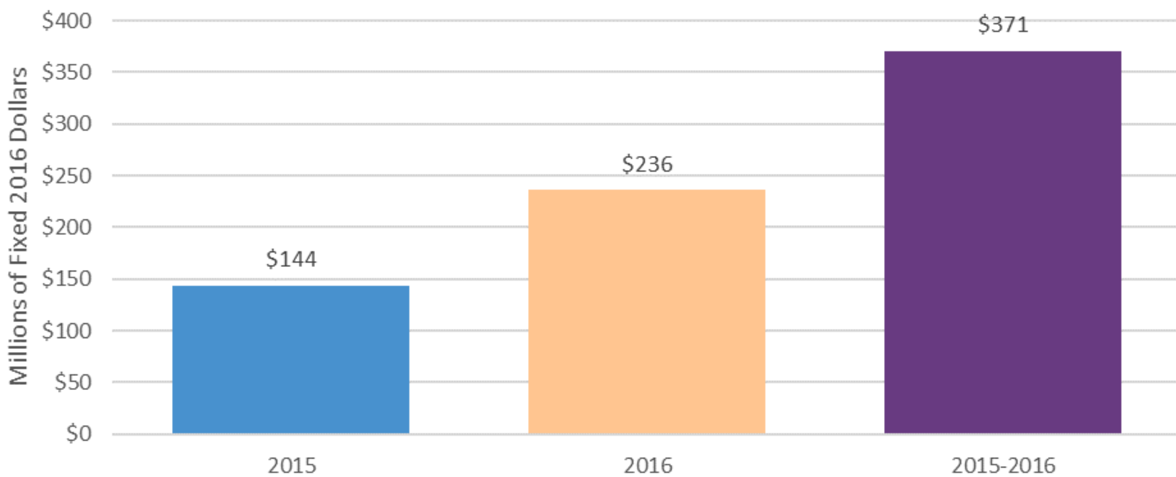
Test Component	Without Economic Benefits	With Economic Benefits
Administrative Costs	$16,427,374	$16,427,374
Delivery Costs	$52,576,595	$52,576,595
Incremental Measure Costs	$430,590,041	$430,590,041
Total Non-Incentive Costs	**$499,594,010**	**$499,594,010**
Electric Benefits	$915,583,045	$915,583,045
Natural Gas Benefits	$490,214,321	$490,214,321
Emissions Benefits	$214,584,673	$214,584,673
Net Economic Benefits	$0	$760,482,045
Total TRC Benefits	**$1,620,382,039**	**$2,380,864,084**
TRC Benefits Minus Costs	**$1,120,788,029**	**$1,881,270,074**
TRC Benefit/Cost Ratio	**3.24**	**4.77**

Personal Income

Focus on Energy generates positive effects on net employment, which in turn results in increased statewide income from new wage and salary payments. Projects that include incentives also result in ongoing energy bill reductions. Personal income increases for employees of directly and indirectly affected industries and for program participants who save money on energy.

Figure 9 shows the cumulative study period impacts on statewide personal income of Focus on Energy's 2015, 2016, and 2015-2016 program portfolios relative to a scenario in which those programs did not exist. For example, model findings suggest that the 2015-2016 program portfolio will generate a total of $371 million in net personal income between 2015 and 2040. Generally, differences in cumulative personal income between program years are driven by the variations in employment growth described above or by changes in labor productivity assumptions within the model.

Figure 9. Cumulative Net Personal Income Increases[1]



[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

Program Year and Future Year Personal Income Increases

Table 8 shows the program year, future year, and cumulative statewide personal income increases by program year(s). The findings indicate that the 2015-2016 program portfolio generated $73 million of new personal income during the operational period and will generate an additional $298 million of net personal income through the end of 2040, which represents an average of about $12 million during each future year.

Table 8. Program Year, Future Year, and Cumulative Personal Income Increases

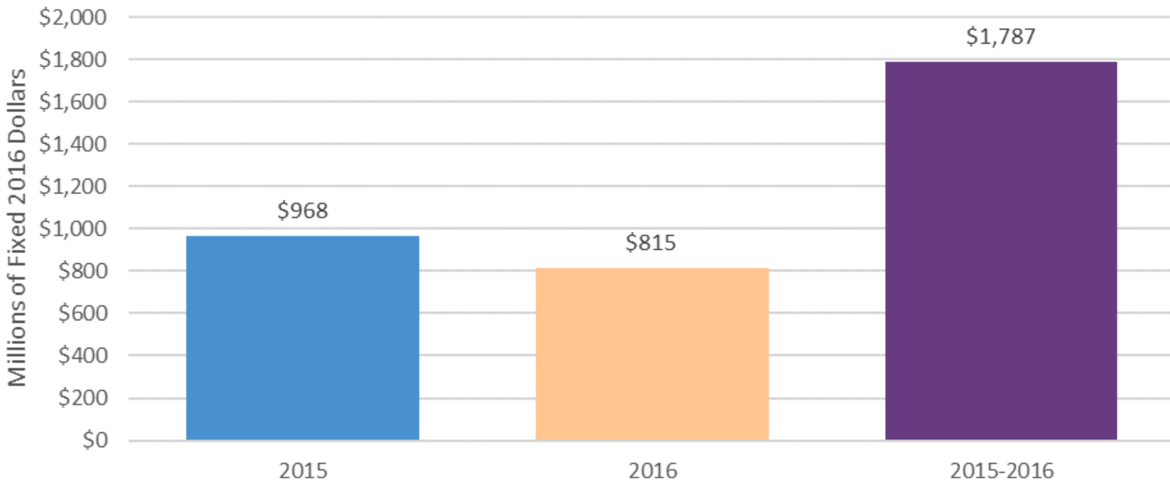
Personal Income (millions of 2016 dollars)	Program Year(s)		
	2015	2016	2015-2016
Program Year(s)	$54	$40	$73
Future Years	$90	$196	$298
Cumulative	**$144**	**$236**	**$371**

Because of the strong correlation between statewide employment and personal income, program year and future year personal income increases accrue over time in much the same manner as employment.

Sales Generated

Figure 10 shows the cumulative sales generated from Focus on Energy's 2015, 2016, and combined program portfolios relative to a scenario in which those programs did not exist. The findings indicate that the 2015-2016 program portfolio will generate a total of $1,787 million in net sales between 2015 and 2040. Differences in cumulative sales generated between program years are driven primarily by the variations in economic benefits described above.

Figure 10. Cumulative Net Sales Generated[1]



[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

Program Year and Future Year Sales Generated

Table 9 shows the program year, future year, and cumulative statewide net sales generated, categorized by program year(s). The findings suggest that the 2015-2016 program portfolio generated $490 million in net sales during the operational period and will generate an additional $1,297 million through the end of the study period, which represents an average of about $54 million per future year.

Table 9. Program Year, Future Year, and Cumulative Sales Generated

Sales Generated (millions of 2016 dollars)	Program Year(s)		
	2015	2016	2015-2016
Program Year(s)	$261	$238	$490
Future Years	$707	$577	$1,297
Cumulative	**$968**	**$815**	**$1,787**

There is a strong correlation between net economic benefits and sales generated: the amount of annual and cumulative sales generated accrues over time in much the same manner as economic benefits.

Analytical Approach

For this analysis, Cadmus primarily aimed to assess the statewide economic development impacts attributable to the 2015 and 2016 Focus on Energy programs and the combined program portfolio. In May 2015, Cadmus completed a Focus on Energy economic impact analysis to determine the statewide economic development effects of 2011–2014 program activities and the resulting energy savings that could accrue through 2038. Since the previous analysis, federal organizations that track and report on economic production and growth have released updated economic data and forecasts. These data contribute to the foundation of REMI PI$^+$ models; therefore, the REMI PI$^+$ model used in this analysis is based on different economic production and growth data than the model used in the 2015 study.

The subsection below describes the REMI PI$^+$ modeling software and the approach used to determine net economic impacts attributable to Focus on Energy program investments, project spending, and ongoing energy savings. The subsequent subsection presents the model inputs used in the REMI PI$^+$ model framework.

Description of Software and Modeling Approach

Studies that assess the net economic development impacts of energy efficiency and renewable resource programs typically use one of two types of modeling analysis.

- The first type uses an input-output (IO) matrix to assess interactions between industries under static economic conditions, which is suitable for determining the approximate impacts of program-related cash flows that lead to ripple effects throughout the economy. However, an IO assessment does not incorporate future economic changes—such as labor migration, price changes, and general economic equilibrium—that affect the economic impacts of ongoing energy savings.
- The second type of analysis incorporates dynamic changes in those variables, and is thus a better option for assessing the near-term and long-term impacts of energy efficiency and renewable resource programs like those offered by Focus on Energy.

The REMI PI$^+$ model used for this analysis incorporates features of both types of economic analysis, as described below.

About the REMI PI$^+$ Model

REMI PI$^+$ is a dynamic economic forecasting model and incorporates an IO matrix, general equilibrium, econometrics, and economic geography:

- The **IO matrix** is at the core of how the REMI PI$^+$ model captures industry-to-industry interactions within a particular region, in this case the state of Wisconsin.

  For example, buying home insulation directs funds to the insulation industry. REMI PI$^+$ includes a set of spending multipliers that account for how the insulation industry interacts with other industries, such as the fiberglass industry.

- **General equilibrium** captures the long-term stabilization of the economic system as supply and demand become balanced.

  For example, as investments in energy-efficient equipment increase, general equilibrium is established as contractors hire more employees to install and maintain the new energy-efficient equipment in the region. Additionally, commercial and industrial program participants have lower long-term energy costs, improving their competitiveness relative to neighboring states and allowing them to capture a greater share of the regional market.

- **Econometrics** estimates responses to economic changes and the speed at which they occur.

  For example, as Focus on Energy program participants demand less energy because they are using more efficient equipment, utilities increase energy rates to maintain revenue and profits. In this case, the econometric factor of “price elasticity of energy demand” describes how utilities change prices to account for reductions in demand.

- **Economic geography** represents spatial characteristics of the economy, such as productivity and competitiveness, arising from industry clustering and labor market access.

  For example, as investments in energy-efficient equipment increase, clusters of specialized labor and firms related to energy efficiency and renewable energy will develop in Wisconsin. In other words, Focus on Energy helps develop the energy efficiency and renewable energy industries in Wisconsin.

Unlike standard IO models, the REMI PI$^+$ model accounts for the expected annual changes in the statewide economy over the entire study period. The economic production and growth data underpinning the model are based on real historical and forecasted conditions. As a result, the REMI PI$^+$ model accounts for near-term conditions that affect calculated investment impacts and spending completed during the program operational period, and the model considers long-term conditions that affect calculated impacts from ongoing energy savings.

Modeling Approach

Cadmus used a customized REMI PI$^+$ model for the state of Wisconsin to determine the net effects on employment growth, economic benefits, personal income increases, and sales generated that could be attributed to the 2015, 2016, and 2015-2016 Focus on Energy program portfolios. The analysis determined impacts across 70 industry sectors within Wisconsin, as defined in the REMI PI$^+$ model.

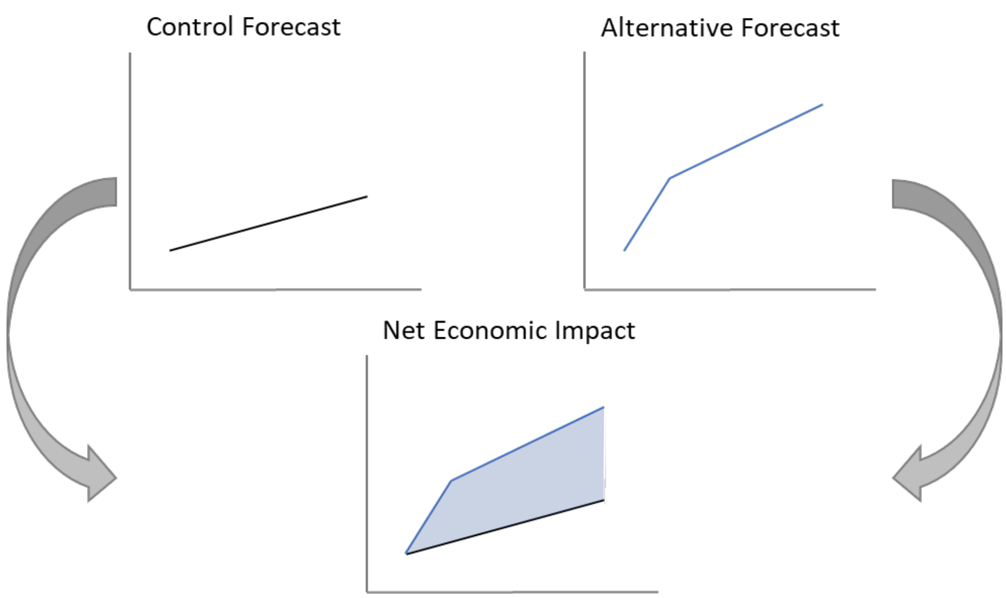
All findings described in this report represent net economic impacts, which means that there has not been a net spending change in Wisconsin as a result of Focus on Energy program activities. For example, the increase in consumer spending on energy-efficient appliances is balanced in the REMI PI$^+$ model by decreases in spending on other goods and services. The result is that total statewide spending remains constant, and calculated economic impacts represent the difference between Focus on Energy program-related cash flows and the cash flows that would have occurred in the programs’ absence.

Cadmus used the REMI PI$^+$ model’s standard regional control to determine net changes in employment and other economic development variables resulting from program activities. For this study, the model’s standard regional control scenario details the impacts of economic activities that would have occurred without Focus on Energy program investments, project spending, and resulting energy savings. These economic activities primarily consist of program participants' fuel and power purchases if they had not received incentives from Focus on Energy to purchase energy-efficient technologies.

The REMI PI+ model calculates a control forecast based on the standard regional control and an alternative forecast derived from model inputs describing all Focus on Energy program-related cash flows between Wisconsin stakeholder groups. The model integrates economic data collected by various federal government agencies. Employment and wage data are from the Bureau of Economic Analysis, Bureau of Labor Statistics, and County Business Patterns database. Information on fuel wholesale and retail costs is from the Energy Information Administration (EIA). Data from the U.S. Census Bureau form the basis for model assumptions of population growth and migration within and between regions.[8]

As Figure 11 illustrates, the REMI PI+ model compares impacts from the control forecast to impacts from the alternative forecast to determine net economic impacts.

Figure 11. Determining Net Economic Impacts with REMI PI+

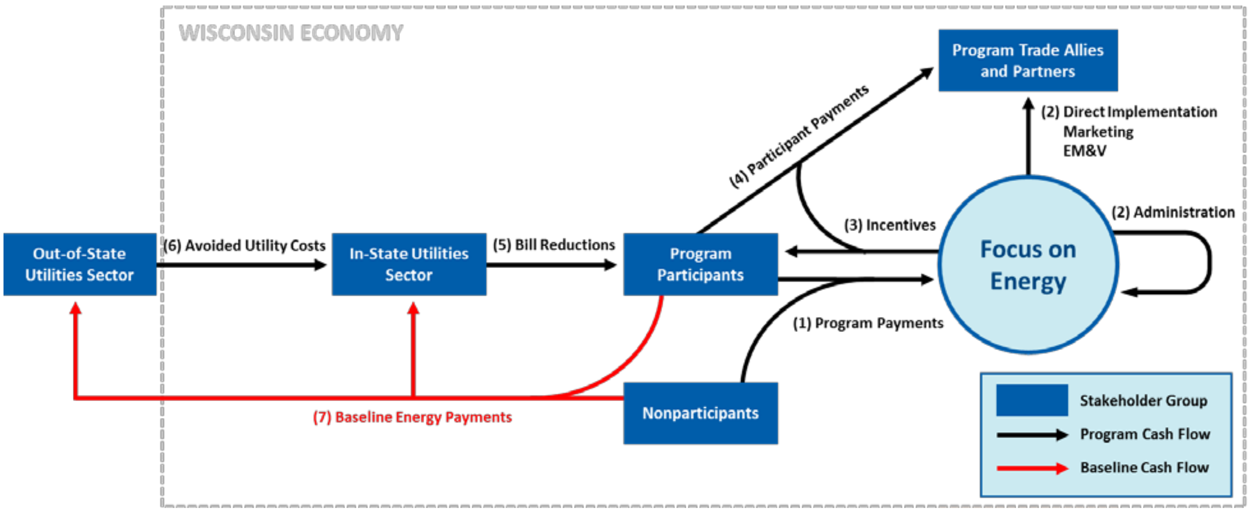


The net economic impacts calculated by REMI PI+ represent the difference between the Focus on Energy program-related economic activities (alternative forecast) and the economic activities that would have occurred if the money invested in Focus on Energy had instead been spent on fuel and power purchases (control forecast).

[8] For a more detailed breakdown of the data sources and estimate procedures included in the REMI PI+ model forecasts, please reference REMI's user documentation online: http://www.remi.com/wp-content/uploads/2017/10/Data-Sources-and-Estimation-Procedures-v2_1.pdf

For each model in this analysis—2015, 2016, and the combined 2015-2016 period—Cadmus customized REMI PI$^+$ so that the alternative forecast modeled program-related cash flows between relevant stakeholder groups. As shown in Figure 12, these cash flows affect the Wisconsin economy in multiple ways—program payments, administration, direct implementation, marketing, evaluation, measurement, and verification [EM&V], incentives, participant payments, bill reductions, avoided utility costs, and baseline energy payments—all of which are described below.

Figure 12. Program and Baseline Scenario Cash Flows



These are the ways in which cash flow affects the Wisconsin economy:

- **Program payments.** Funding for Focus on Energy originates from participating utilities' revenues, which are collected from Wisconsin ratepayers.

  In aggregate, program payments equal program spending and are obtained through a charge embedded in utility bills. Cadmus modeled program payments from residential customers as increases in electricity and natural gas prices and modeled program payments from business customers as increases in the amount spent on fuel as an input to production.

- **Administration, direct implementation, marketing, and EM&V.** Focus on Energy funds are spent on program administration activities and technical and customer support, marketing, and EM&V services provided by program Trade Allies and partners.

  Program spending on administration, technical and customer support, marketing, and EM&V was modeled as either wage increases or direct spending in specific industry sectors. Programs' different delivery mechanisms, incentive structures, and offered measures contributed to which industry sector received spending on a program-by-program basis.

- **Incentives.** Program funds are also spent on direct financial and service-based incentives that encourage investments in energy-saving technologies and behaviors.

  Since incentives offset a portion of the cost of high-efficiency measures, Cadmus generally modeled incentive payments as direct spending to affected industry sectors using the same program-specific categories as program spending. The only exception was the Appliance Recycling Program because the participant bears no cost but still receives an incentive; in this case, Cadmus modeled incentives as a change in statewide household income.

- **Participant payments.** In addition to receiving incentives from Focus on Energy programs, participants provide their own co-funding to complete payments for project goods and services.

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

- **Bill reductions.** Participants save energy as long as the installed measures remain operational, thus benefitting from energy bill reductions, while utilities forego those revenues.

  For the residential programs' participants, Cadmus modeled energy bill reductions as a positive consumption reallocation, which marks an increase in household consumption on other goods and services (the REMI PI^{+} model accounts for Wisconsin-specific spending profiles by demographic group). To calculate future-year bill reductions, Cadmus used forecasted energy rates and savings by fuel type. Forecasted rates came from East North Central census region data from the EIA website.[9] Future dollar values were also discounted to model base-year values using the consumer price index from the Bureau of Labor Statistics.[10]

  For most of the business programs' participants, Cadmus modeled energy bill reductions as decreases in the amount spent on fuel as an input to production. The exception to this rule was the Agriculture, Schools, and Government Program, whose participants included local schools and government agencies. Unlike commercial or industrial participants, fuel costs are an operating expense rather than an input to production. As such, cost savings resulting from efficiency gains result in an increase to local government income; therefore, Cadmus modeled bill reductions from the Agriculture, Schools, and Government Program as increases to local government spending.

- **Avoided utility costs.** As a result of decreased demand for energy resources, Wisconsin utilities benefit from avoided fuel and capacity costs.

  When utilities generate less energy in reaction to decreased demand, there is 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

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9 U.S. Energy Information Administration. "Annual Energy Outlook 2017." Table: Energy Prices by Sector and Source. Accessed July 2017. https://www.eia.gov/outlooks/aeo/data/browser/#/?id=3-AEO2017&sourcekey=0

10 City of Seattle, City Budget Office. "Inflation – Consumer Price Index (CPI)." Accessed December 2017. http://www.seattle.gov/financedepartment/cpi/forecast.htm

prices used to calculate the avoided utility costs. Cadmus used a cost inflation factor of 2.5% provided by Focus on Energy to forecast future-year avoided costs.

Cadmus modeled avoided costs as a positive impact to the utility industry by partially offsetting reductions in utility energy sales, which are negative utility industry impacts equal to the bill reductions described above. To account for the avoided costs and revenue losses from bill reductions, Cadmus modeled a reduction in utility industry sales equal to the difference between participants' bill reductions and the avoided utility costs.

Utilities may seek to recover lost revenues through their rates, which could result in changes that, all else equal, could increase future rates for all Wisconsin ratepayers. This could increase the future cost of energy for ratepayers who did not participate in Focus on Energy programs and reduce the net bill savings of participating ratepayers (and ratepayers who implemented cost-effective energy efficiency measures without participating). The REMI PI^{+} model is not designed to assess the potential distributional effects of these rate changes on regional economic activity. Therefore, such potential distributional impacts are not included in this study.

- **Baseline energy payments.** In the absence of Focus on Energy, Wisconsin ratepayers spend money on energy resources that otherwise would have been saved through the programs. Baseline energy payments were accounted for in the models' control forecasts, and therefore did not require alternative forecast model inputs from Cadmus.

Table 10 specifies the positive and negative model inputs by relevant stakeholder group. Program payments supply funds for program spending and incentives. All other cash flows comprise transfers between stakeholder groups.

Table 10. Summary of Positive and Negative Model Inputs by Cash Flow and Stakeholder Group

Cash Flow	Stakeholder Group					
	Program Participants	Nonparticipants	Focus on Energy	Program Trade Allies and Partners	In-State Utilities	Out-of-State Utilities
Program Payments	Negative	Negative	--	--	--	--
Program Spending	--	--	Positive	Positive	--	--
Incentives	Positive	--	--	--	--	--
Participant Payments	Negative	--	--	Positive	--	--
Bill Reductions	Positive	--	--	--	Negative	--
Avoided Utility Costs	--	--	--	--	Positive	Negative
Baseline Energy Payments	Negative	Negative	--	--	Positive	Positive

Model Input Data

Economic impacts derive from Focus on Energy program investments, project spending, and resulting energy savings. This section presents the key REMI PI⁺ model inputs and describes the evaluation of the impact of various measures. All monetary inputs are presented in fixed 2016 dollars.

Program Spending

Cadmus modeled the economic impacts of portfolio-level, residential program, and business program expenditures. As shown in Table 11, total annual program spending was somewhat higher in 2015 than in 2016. Focus on Energy spent approximately $201 million on administration, education and training, EM&V, implementation, and incentive payments during the programs' 2015-2016 operational period.

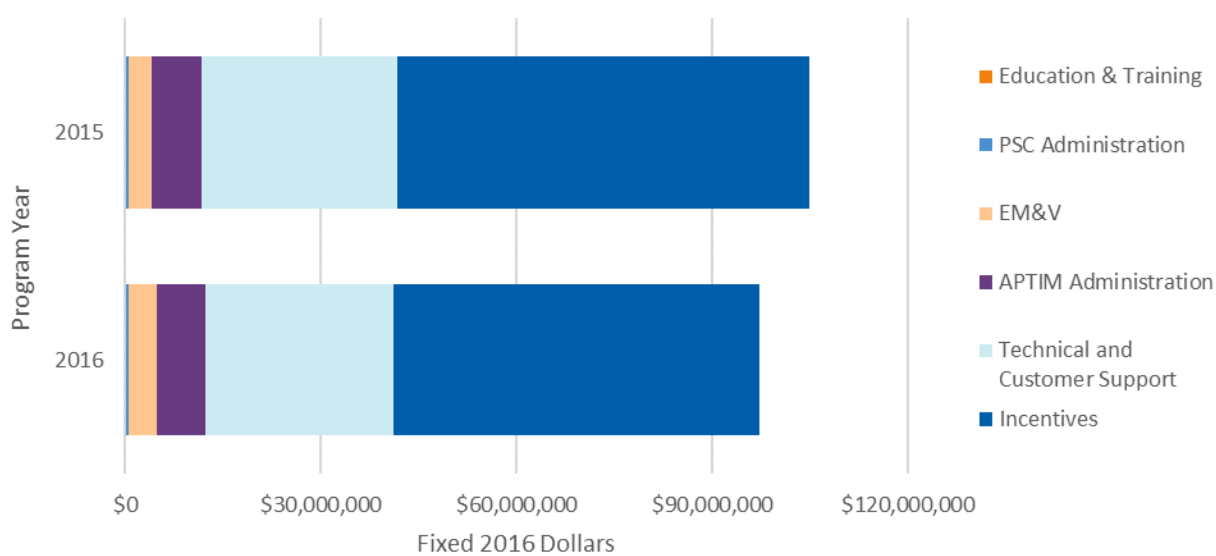
Table 11. Program Spending by Year

Program Year	Total Program Spending
2015	$103,609,270
2016	$97,256,547
2015-2016[1]	**$200,865,818**

[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

As Figure 13 illustrates, a majority of annual program funds were allocated to expenditures on incentive payments and, to a lesser extent, technical and customer support. Combined program spending on education and training, administration, and EM&V comprised a significantly smaller share of total program spending each year.

Figure 13. Annual Program Spending by Category



Participant Payments

In addition to receiving incentives, program participants provided their own co-funding to complete payments for project goods and services. For each program year and the combined 2015-2016 period, Cadmus modeled the economic impacts resulting from participant co-funding payments. As shown in Table 12, annual participant co-funding payments for nonresidential projects were consistently larger than for residential projects.

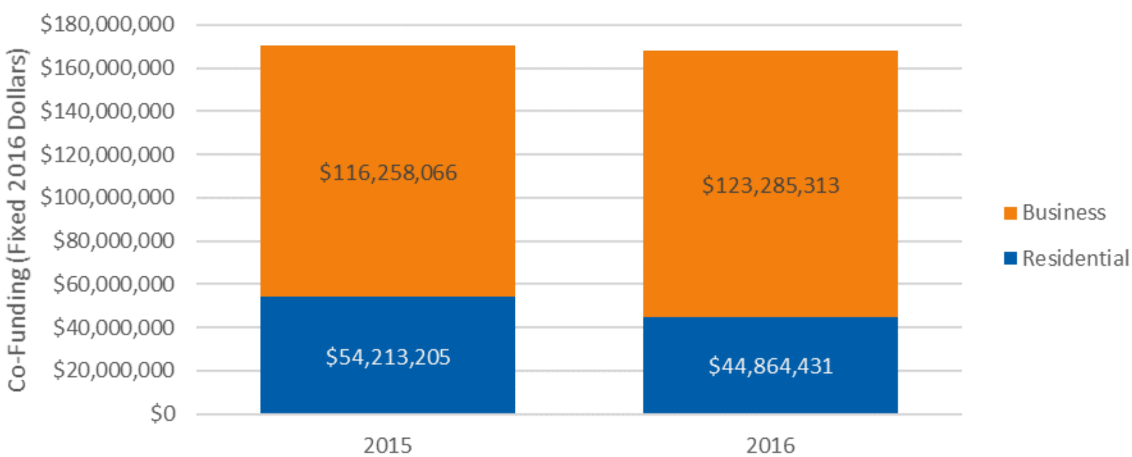
Table 12. Participant Payments by Program Year and Market Segment

Year	Residential	Nonresidential	Total[1]
2015	$53,537,819	$114,809,727	$168,347,545
2016	$44,864,431	$123,285,313	$168,149,745
Total	**$98,402,250**	**$238,095,040**	**$336,497,290**

[1] Values may not sum due to rounding.

As Figure 14 illustrates, participant co-funding payments for nonresidential projects increased slightly from 2015 to 2016; meanwhile, residential participant co-funding payments decreased from 2015 to 2016. Overall participant cofounding was relatively stable between the two years.

Figure 14. Participant Payments by Program Year and Market Segment



Electric Energy Savings

For each program year and the combined period, Cadmus collected net verified electric savings from annual evaluation data. Table 13 presents the first-year, future-year, and lifecycle (cumulative) electric savings by program year and market segment.

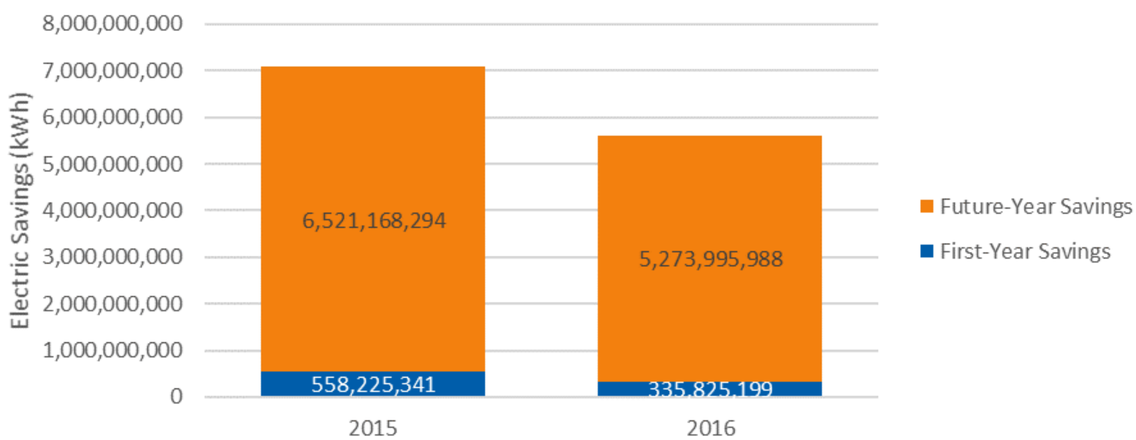
Table 13. First-Year, Future-Year, and Lifecycle Electric Savings (kWh)

Year	Segment	First-Year Savings	Future-Year Savings	Lifecycle Savings
2015	Residential	204,190,265	1,615,683,929	1,819,874,194
	Nonresidential	354,035,076	4,905,484,364	5,259,519,441
	Total	**558,225,341**	**6,521,168,294**	**7,079,393,634**
2016	Residential	43,410,697	729,142,928	772,553,625
	Nonresidential	292,414,502	4,544,853,060	4,837,267,562
	Total	**335,825,199**	**5,273,995,988**	**5,609,821,187**
2015-2016[1]	Residential	247,600,961	2,344,826,857	2,592,427,819
	Nonresidential	646,449,578	9,450,337,424	10,096,787,003
	Total	**894,050,539**	**11,795,164,282**	**12,689,214,821**

[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

As Figure 15 illustrates, first-year electric savings and future-year electric savings are substantially higher in 2015 than in 2016.

Figure 15. First-Year and Future-Year Electric Savings (kWh) by Program Year



Natural Gas Energy Savings

For each program year and the 2015-2016 period, Cadmus organized net verified natural gas savings from annual evaluation data. Table 14 presents the first-year, future-year, and lifecycle natural gas savings by program year and market segment.

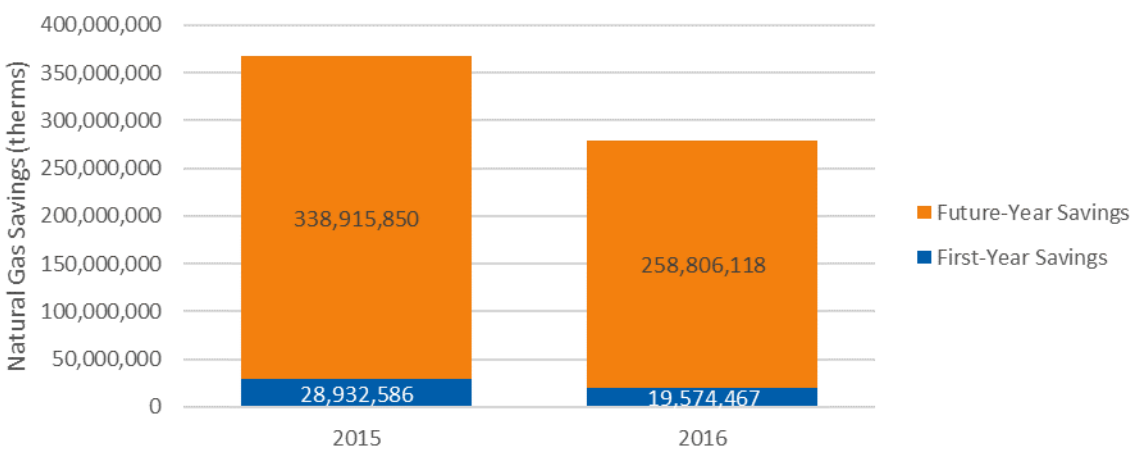
Table 14. First-Year, Future-Year, and Lifecycle Natural Gas Savings (therms)

Year	Segment	First-Year Savings	Future-Year Savings	Lifecycle Savings
2015	Residential	2,025,101	38,558,911	40,584,012
	Nonresidential	26,907,485	300,356,939	327,264,424
	Total	**28,932,586**	**338,915,850**	**367,848,436**
2016	Residential	2,996,290	48,485,812	51,482,103
	Nonresidential	16,578,176	210,320,305	226,898,482
	Total	**19,574,467**	**258,806,118**	**278,380,585**
2015-2016[1]	Residential	5,021,392	87,044,723	92,066,115
	Nonresidential	43,485,661	510,677,245	554,162,906
	Total	**48,507,053**	**597,721,968**	**646,229,021**

[1] Program year impacts do not sum to 2015-2016 impacts due to dynamic factors in the REMI model.

As Figure 16 illustrates, first-year natural gas savings and future-year natural gas savings are substantially higher in 2015 than in 2016.

Figure 16. First-Year and Future-Year Natural Gas Savings (Therms) by Program Year



Electric Bill Reductions

For each program year and the combined 2015-2016 period, Cadmus used net verified electric savings and EIA retail rate data to determine annual electric bill reductions. Table 15 presents the first-year, future-year, and lifecycle electric bill reductions attributable to each program year.

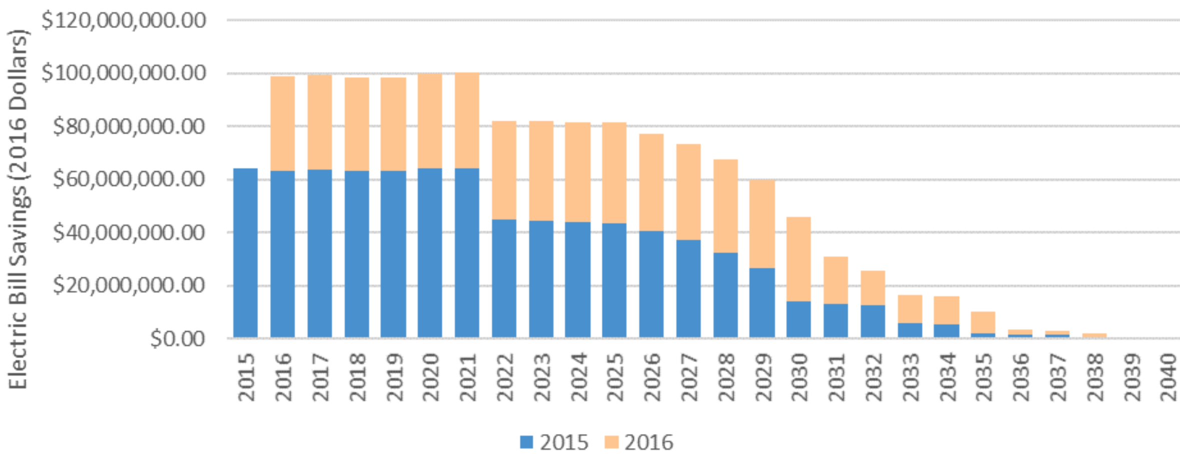
Table 15. First-Year, Future-Year, and Lifecycle Electric Bill Reductions by Program Year

Program Year	First-Year Bill Savings	Future-Year Bill Savings	Lifecycle Bill Savings
2015	$63,559,877	$751,293,466	$814,853,343
2016	$35,041,267	$569,193,611	$604,234,878
Total	**$98,601,144**	**$1,320,487,077**	**$1,419,088,221**

As Figure 17 illustrates, annual electric bill reductions attributable to Focus on Energy projects accumulated as electricity saving measures were implemented during the programs' operational period. Electric bill reductions are projected to reach a maximum of approximately $100 million in 2021, then accrue at a lower rate thereafter as measures installed during the programs' operational period begin to reach their maximum effective useful life.

This analysis addresses program activities during the 2015 and 2016 program years, so economic impacts from 2017 onward reflect only the long-term effects from measures installed in 2015 and 2016 remaining installed and operational. The full effects of Focus on Energy will be higher in future years after taking program activities from 2017 and onward into account. Similarly, economic impacts for 2015 and 2016 reported here do not include the impacts from persistent energy savings driven by measures installed during program years prior to 2015.

Figure 17. Annual Electric Bill Reductions by Program Year



Natural Gas Bill Reductions

For each program year and the 2015-2016 period, Cadmus used net verified natural gas savings and EIA retail rate data to determine annual natural gas bill reductions. Table 16 presents the first-year, future-year, and lifecycle natural gas bill reductions attributable to each program year.

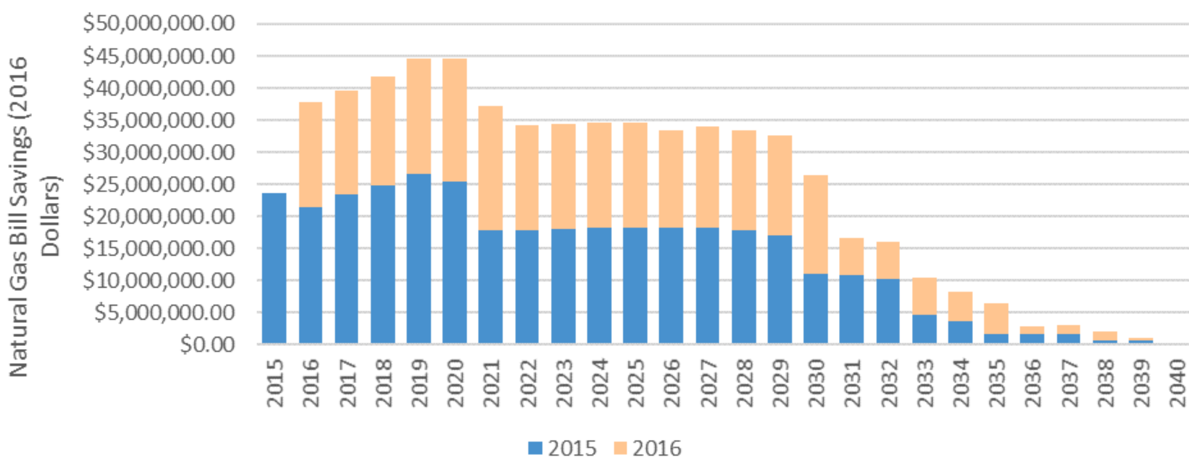
Table 16. First-Year, Future-Year, and Lifecycle Natural Gas Bill Reductions

Program Year	First-Year Bill Savings	Future-Year Bill Savings	Lifecycle Bill Savings
2015	$23,406,511	$330,422,861	$353,829,372
2016	$17,032,782	$262,949,728	$279,982,510
Total	**$40,439,293**	**$593,372,589**	**$633,811,882**

As Figure 18 illustrates, annual natural gas bill reductions attributable to Focus on Energy projects accumulated as natural gas saving measures were implemented during the programs' operational period. Natural gas bill reductions are projected to continue increasing annually beyond the programs' operational period, reaching a maximum of approximately $45 million in 2019, then continuing at a lower rate thereafter. The projected annual reductions in natural gas bills are less than for electric bills mostly because of differences in retail prices, which are generally higher for electricity. Compared to electric bill reductions, natural gas bill reductions reach a peak earlier but persist for longer, mainly because of differences in average measure lifetimes, which are typically longer for natural gas measures.

The full effects of Focus on Energy will be higher in future years after taking program activities from 2017 and onward into account. Similarly, economic impacts for 2015 and 2016 reported here do not include the impacts from persistent energy savings driven by measures installed during program years prior to 2015.

Figure 18. Annual Natural Gas Bill Reductions by Program Year



Electric Utility Net Revenue Effects

As a result of Focus on Energy participants' reduced energy usage, participating utilities benefit by spending less on fuel and other variable costs. 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. Cadmus calculated differences between avoided utility costs and lost utility revenues to determine net revenue effects.

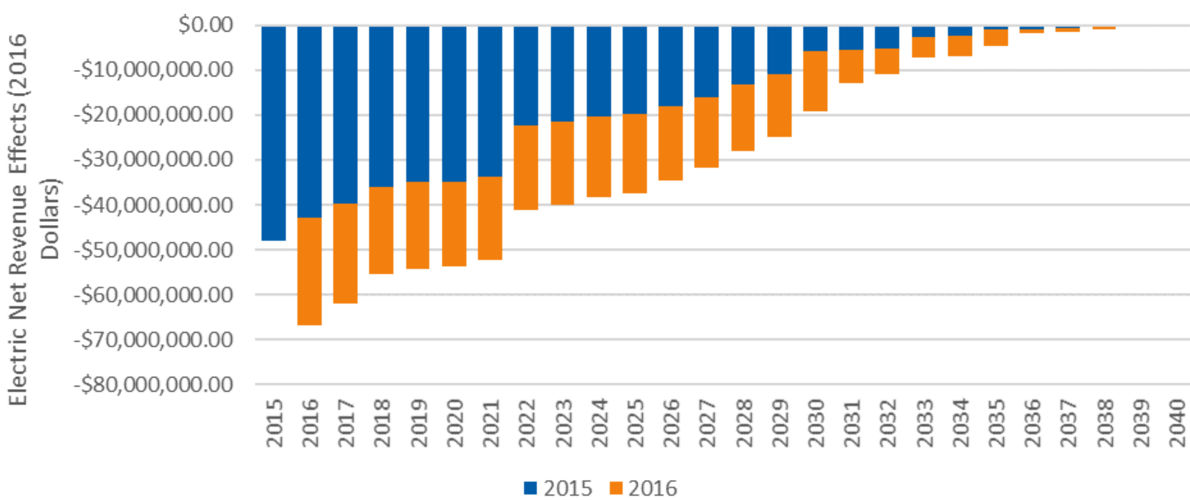
For each year of the study period, Cadmus calculated negative electric utility net revenue effects; in other words, the analysis determined that annual electric avoided costs are less than annual electric revenue losses. Table 17 presents the first-year, future-year, and lifecycle electric utility net revenue effects attributable to each program year.

Table 17. First-Year, Future-Year, and Lifecycle Electric Utility Net Revenue Effects

Program Year	First-Year Effects	Future-Year Effects	Lifecycle Effects
2015	-$47,925,055	-$388,243,476	-$436,168,531
2016	-$23,873,807	-$275,027,335	-$298,901,142
Total	**-$71,798,862**	**-$663,270,811**	**-$735,069,673**

As Figure 19 illustrates, annual electric utility net revenue effects accumulated as electricity saving measures were implemented during the programs' operational period. Electric utility net revenue effects are estimated to have reached a maximum of approximately -$48 million in 2015.

Figure 19. Annual Electric Net Revenue Effects by Program Year



Natural Gas Utility Net Revenue Effects

For each year of the study period, Cadmus calculated negative natural gas utility net revenue effects. Like electric utility revenue effects, forecasted annual natural gas avoided costs are less than annual natural gas revenue losses, resulting in negative net effects on natural gas utility revenues. Table 18 presents the first-year, future-year, and lifecycle natural gas net revenue effects attributable to each program year.

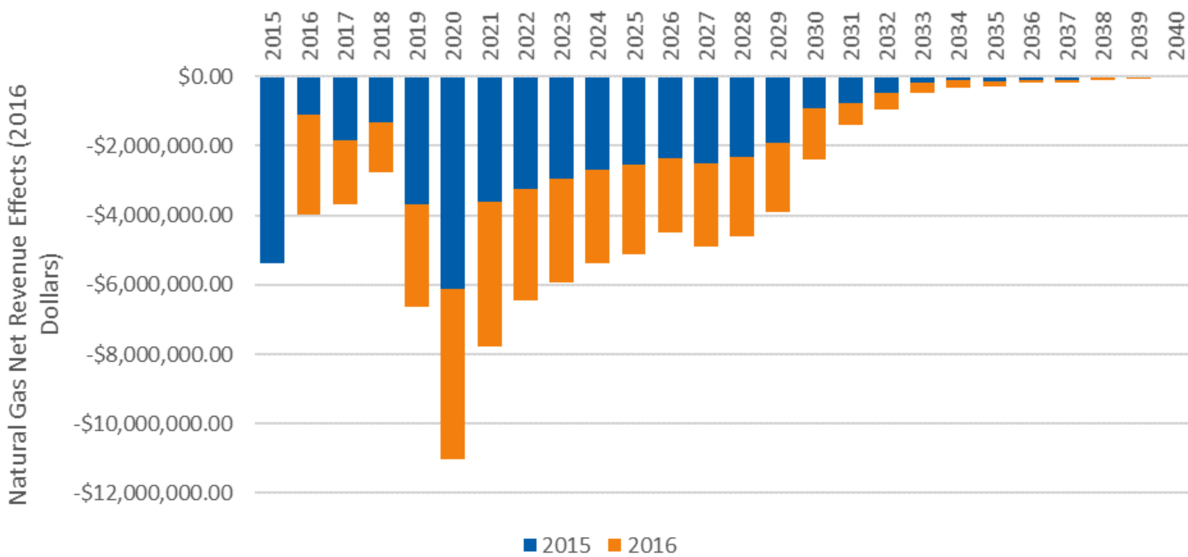
Table 18. First-Year, Future-Year, and Lifecycle Natural Gas Net Revenue Effects

Program Year	First-Year Effects	Future-Year Effects	Lifecycle Effects
2015	-$5,365,378	-$41,025,540	-$46,390,919
2016	-$2,854,365	-$39,168,926	-$42,023,291
Total[1]	**-$8,219,743**	**-$80,194,467**	**-$88,414,210**

[1] Values may not sum due to rounding.

As Figure 20 illustrates, annual natural gas utility net revenue effects are substantially lower than the electric utility net revenue effects described above. Net revenue effects accumulated as natural gas saving measures were implemented during the programs' operational period. Natural gas net revenue effects are projected to reach a minimum of approximately -$5 million in 2015.

Figure 20. Annual Natural Gas Net Revenue Effects by Program Year



Environmental Benefits

There is currently no established method in place for quantifying the Wisconsin health and quality-of-life benefits of reduced emissions of atmospheric pollutants such as mercury, sulfur dioxide (SO_2), nitrogen oxides (NO_X), and carbon dioxide (CO_2). However, it is possible to quantify the benefits of displaced emissions of NO_X and SO_2 for utilities because these emissions are regulated under the federal Clean Air Act. Cap and trade markets assign these emissions a monetary value that in turn has a measurable effect on the Wisconsin economy. As such, Cadmus included emissions benefits for NO_X and SO_2 in the analysis of program year and 2015-2016 economic impacts.

Cadmus did not model CO_2 emissions benefits in the economic analysis because there are no trading markets to place a defined value on displaced CO_2 emissions. Therefore, CO_2 emissions have no distinct monetary value in the Wisconsin economy that is well-defined for accurate modeling. Cadmus did include CO_2 emissions benefits in the cost-effectiveness tests described previously. For purposes of the Focus on Energy cost-effectiveness testing, the PSC has monetized the societal benefits of displaced CO_2 emissions at $15 per ton.[11]

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, most often expressed in tons of pollutant per energy unit (for electric

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[11] The Public Service Commission of Wisconsin ordered this monetary value in Docket 5-FE-100, Electronic Regulatory Filing System, reference number 279739.

energy, this is presented in 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 avoided emissions benefit is the product of the total tonnage of pollutant displaced and the dollar value of the displaced emissions per ton.

Table 19 shows the electric emissions factors and allowance prices used to estimate emissions benefits for the economic impact analysis, which are consistent with those used in other evaluation analyses conducted during the 2015-2016 period.

Table 19. Emissions Factors and Allowance Prices by Pollutant

Service Fuel Type	NO_X	SO_2
Electric Emissions Factor (Tons/MWh)	0.0007	0.00155
Allowance Price ($/Ton)	$7.50	$2.00

The forecasted emissions allowance prices used as a basis for this analysis are from the cost-effectiveness analysis section of the 2016 evaluation report. The allowance prices reported in Table 19 are 2016 prices.

Table 20 shows the emissions benefits incorporated into the REMI PI^+ modeling analysis by pollutant and program year.

Table 20. Lifecycle Emissions Benefits Modeled

Program Year	NO_X Emissions Benefits	SO_2 Emissions Benefits
2015	$37,167	$21,946
2016	$29,448	$16,349
2015-2016	**$66,615**	**$38,295**

Appendix A. Summary of Urban and Rural Program Impacts

In December 2016, the PSC directed Focus on Energy to improve its service to customers in rural areas by offering them enhanced programs during 2017 and 2018 (Docket 5-FE-102). In recognition of this interest in Focus of Energy's impacts on rural areas, Cadmus conducted additional analysis of the statewide economic impacts findings to distinguish between urban and rural areas. For consistency, rural areas were defined as those in the 582 zip codes who are eligible to participate in Focus on Energy's 2017-2018 rural programs, while urban areas were defined as all other zip codes within the state.

Table A-1 summarizes the 2015-2016 results for urban areas by economic development indicator variable.

Table A-1. Cumulative Economic Development Impacts of Measures in Urban Areas, 2015-2016

Economic Development Impact	2015-2016
Employment (jobs)	4,675
Economic Benefit (millions of 2016 dollars)	$436
Personal Income (millions of 2016 dollars)	$177
Sales Generated (millions of 2016 dollars)	$1,085

Table A-2 summarizes the 2015-2016 results for rural areas by economic development indicator variable. Of the $762 million in total economic benefits from 2015-16 programs, $323 million (42%) will accrue to business and residential customers in rural areas. Of the 8,769 FTE job-years that will be created as a result of the 2015-2016 programs, 4,076 FTE job-years (46%) will be created in rural areas. Jobs created in rural areas are projected to be higher paying than those created in urban areas, which tend to be more retail and service oriented.

Table A-2. Cumulative Economic Development Impacts Measures in Rural Areas, 2015-2016

Economic Development Impact	2015-2016
Employment (jobs)	4,076
Economic Benefit (millions of 2016 dollars)	$323
Personal Income (millions of 2016 dollars)	$191
Sales Generated (millions of 2016 dollars)	$698

Appendix B. Potential Study Economic Impact Scenarios

Cadmus prepared REMI PI^+ inputs to understand the economic impacts that may result from the energy savings and expenditures presented in four of the potential scenarios in the Focus on Energy *2016 Energy Efficiency Potential Study*: the Business as Usual scenario, the Mid Achievable Potential scenario, the Economic Potential scenario, and the Combined Utility Cost Test (UCT) scenario. The following sections summarize the methodological framework used to estimate these inputs and present estimates of employment growth and economic benefits that can be attributed to these scenarios. Because the scope of the potential study was limited to energy efficiency activities, these estimates do not include economic impacts from Focus on Energy's renewable energy activities.

B.1 Scenario Input Framework

To estimate the cashflow inputs to the REMI PI^+ model for each of the five scenarios, and ultimately economic impacts for the 2016 program year, Cadmus began with the budget estimates from the *Potential Study* and the 2016 program expenditures and energy savings. To facilitate the preparation of multiple scenario inputs, Cadmus aggregated the 2016 program inputs to the sector level.[12]

Cadmus applied the following assumptions to all scenarios. Some scenario-specific assumptions are listed in each scenario's results section.

- Portfolio-level administration expenditures are fixed at the 2016 level.
- Program-level administration and implementation expenses vary by scenario. The Economic Potential and Combined UCT scenarios assume that a greater share of the overall budget goes to these expenses because of greater difficulty recruiting the number of participants implied by these scenarios.
- Incentive expenditures equal the remainder of the estimated program budget after subtracting portfolio-level and program-level administration and implementation expenditures.
- Total participant incremental costs (i.e., co-funding) are set at a level equal to 300% of total incentives for the Business as Usual scenario, and equal to 100% of total incentives for the Mid Achievable Potential, Economic Potential, and Combined UCT scenarios.

The estimated program, portfolio, and incentive budgets for each scenario are presented in Table B-1 and estimated energy savings for each scenario are presented in Table B-2.

12 While the *Potential Study's* analysis period started in 2019, here Cadmus modeled these energy savings as occurring during the 2016–2019 period to simplify comparisons between the historical 2015-2016 economic impacts and to avoid the forecast-related uncertainty that arises when assuming a future start year in an economic model such as REMI PI^+.

Table B-1. Estimated Annual Budgets for Potential Study Scenarios (2016 $M)

Cost Type	Business as Usual	Mid Achievable	Economic	Combined UCT
Portfolio	$4.5	$4.5	$4.5	$4.5
Program	$31.4	$63.5	$266.6	$309.1
Incentives	$54.2	$137.0	$357.9	$412.8
Total[1]	**$90.1**	**$205.0**	**$629.0**	**$726.5**

[1] Values may not sum due to rounding.

Table B-2. Estimated Annual Average Energy Savings for Potential Study Scenarios

Savings Fuel Type	Business as Usual	Mid Achievable	Economic	Combined UCT
Electric (GWh)	617.0	877.1	1,448.1	1,658.0
Natural Gas (Million Therms)	28.6	40.2	52.0	73.5

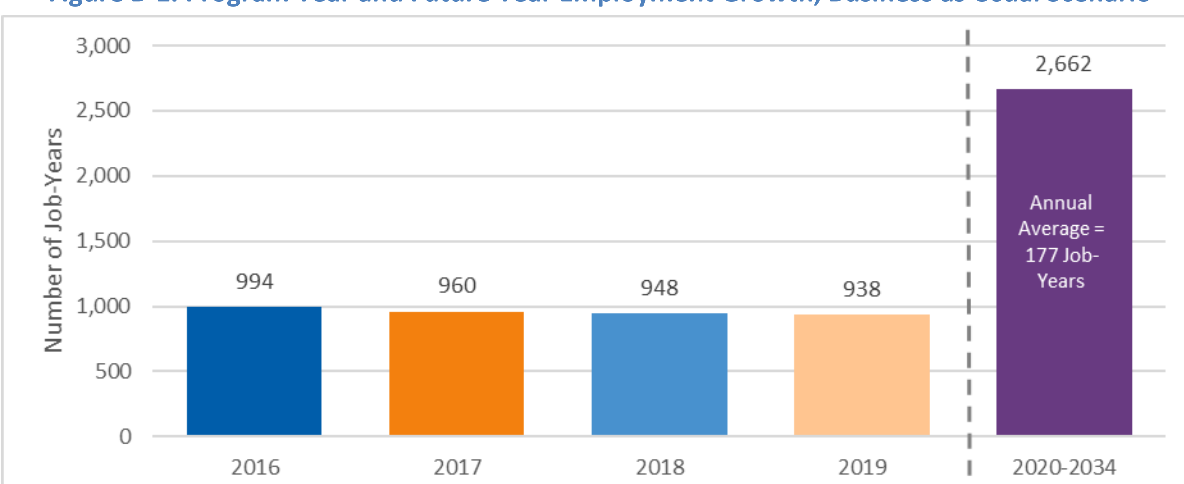
Next, Cadmus calculated distributions of expenditures and energy savings by sector using 2016 program data. Cadmus then applied these distributions to the four scenario estimates of energy savings and program expenditures detailed in Table B-1 and Table B-2 to estimate scenario expenditures and energy savings within each of the relevant market sectors.

B.2 Business as Usual Scenario

B.2.1 Program Year and Future Year Employment Growth

Figure B-1 illustrates the net estimated program year and future year employment impacts that would result from the estimates of program expenditures and energy savings under the Business as Usual scenario in the Focus on Energy *2016 Energy Efficiency Potential Study*. This scenario represents the achievable potential from an incentive equal to 25% of the measure cost and the current levels of Focus of Energy funding. These results are relative to the hypothetical scenario in which no program activity occurs during the 2016–2019 period.

Figure B-1. Program Year and Future Year Employment Growth, Business as Usual Scenario



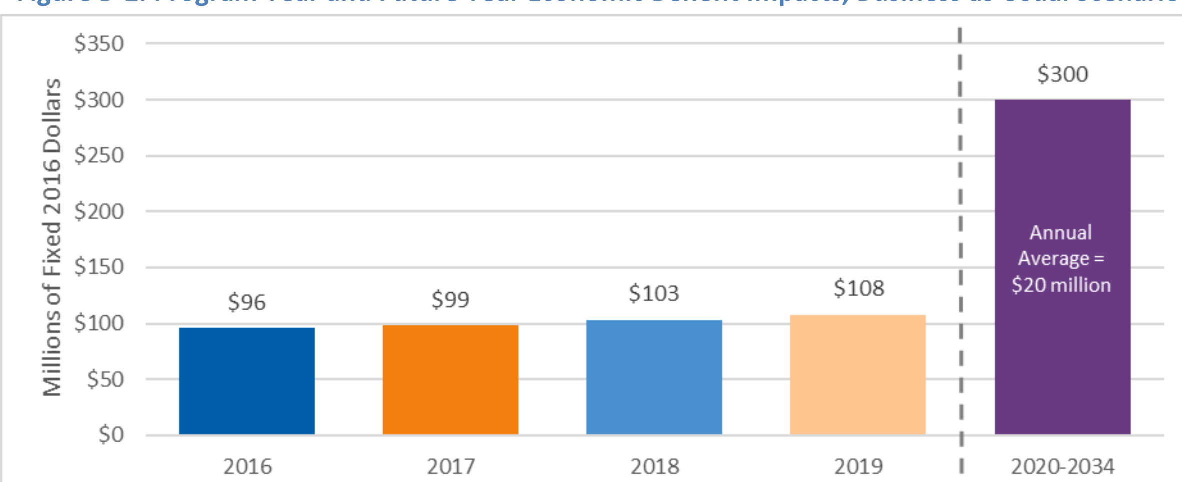
In the Business as Usual scenario, an estimated 6,501 job-years will be created in the 2016–2034 period. An average of 960 job-years will be created in each of the measure installation years (2016–2019) as a result of direct program expenditures for measure installation. Similar to the findings from the 2015-2016 model, ongoing energy savings attributable to 2016–2019 Focus on Energy programs in the Business as Usual scenario will continue to generate employment impacts at lower levels through the duration of the study period. As shown in Figure B-1, an additional 2,662 job years, an average of 177 per year, are projected in the 2020–2034 period due to persistent energy savings from the measures installed between 2016 and 2019.

These results are very similar to an additional run of the 2016 expenditures that, like the *Potential Study*, excluded renewable energy measures. That scenario uses actual program expenditures and energy savings from the 2016 program year and assumes that the same level of expenditures and savings will occur in the 2017–2019 program years. The Business as Usual scenario takes program expenditures and energy savings from estimates reported in the Focus on Energy *2016 Energy Efficiency Potential Study*. The similarity between the economic impact estimates from these two approaches indicates that the estimated budgets and energy savings from the Business as Usual scenario will maintain levels of economic benefits that are comparable to those found from the actual 2016 program expenditures.

B.2.2 Program Year and Future Year Economic Benefits

Figure B-2 illustrates the net estimated program year and future year economic benefits that would result from the estimates of program expenditures and energy savings under the Business as Usual scenario in the Focus on Energy *2016 Energy Efficiency Potential Study*. These results are relative to the hypothetical scenario in which the measures in the Business as Usual scenario are not installed during the 2016–2019 period.

Figure B-2. Program Year and Future Year Economic Benefit Impacts, Business as Usual Scenario



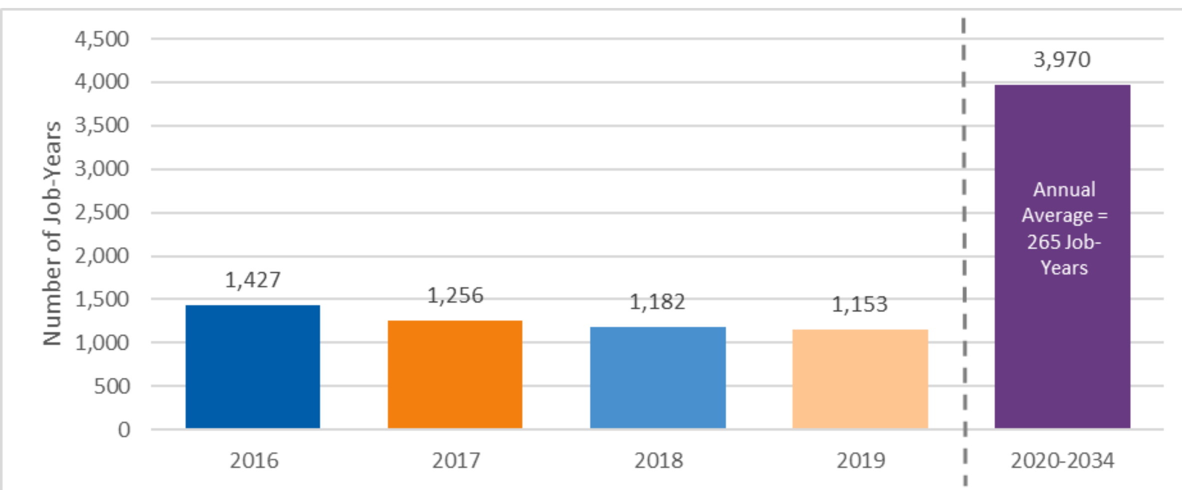
In the Business as Usual scenario, an estimated $706 million in economic benefit (value added) impacts will be created in the 2016–2034 period. An average of $101 million in benefits will be created in each of the measure installation years (2016–2019) as a result of direct program expenditures for measure installation. Similar to the findings from the 2015-2016 model, ongoing energy savings attributable to 2016–2019 Focus on Energy programs in the Business as Usual scenario will continue to generate economic benefit impacts at lower levels through the duration of the study period. As shown in Figure B-2, an additional $300 million in benefits, an average of $20 million per year, are projected in the 2020–2034 period due to persistent energy savings from the measures installed between 2016 and 2019.

B.3 Mid Achievable Potential Scenario

B.3.1 Program Year and Future Year Employment Growth

Figure B-3 illustrates the net estimated program year and future year employment impacts that would result from the estimates of program expenditures and energy savings under the Mid Achievable Potential scenario in the Focus on Energy *2016 Energy Efficiency Potential Study*. Under this scenario, Focus on Energy would pursue all achievable potential if it set an incentive equal to 50% of the measure cost and spent the full amount necessary to capture all measured potential, which would require increased spending at roughly double the current levels of annual Focus on Energy funding. These results are relative to the hypothetical scenario in which no program activity occurs during the 2016–2019 period.

Figure B-3. Program Year and Future Year Employment Growth, Mid Achievable Potential Scenario

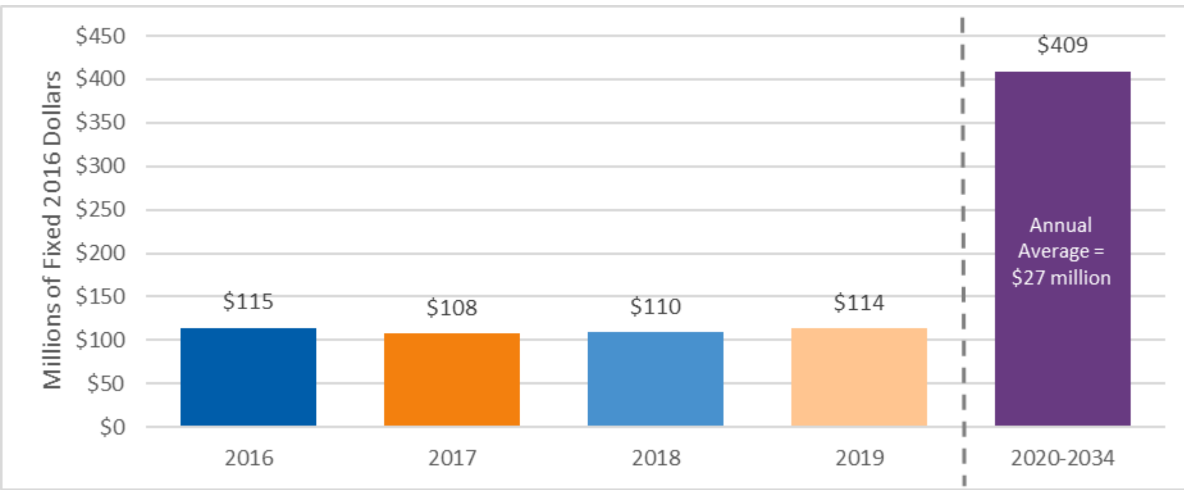


In the Mid Achievable Potential scenario, an estimated 8,988 job-years will be created in the 2016–2034 period. An average of 1,254 jobs-years will be created in each of the measure installation years (2016–2019) as a result of direct program expenditures for measure installation. Similar to the findings from the 2015-2016 model, ongoing energy savings attributable to 2016–2019 Focus on Energy programs in the Mid Achievable Potential scenario will continue to generate employment impacts at lower levels through the duration of the study period. As shown in Figure B-3, an additional 3,970 job years, an average of 265 per year, are projected in the 2020–2034 period due to persistent energy savings from the measures installed between 2016 and 2019. In this scenario, the increased incentive level and Focus on Energy budget results in approximately 1,500 additional job-years when compared to the Business as Usual scenario. The increased energy savings from this scenario drive additional outer-year employment impacts averaging 88 job-years per year more than the impacts from the Business as Usual scenario.

B.3.2 Program Year and Future Year Economic Benefits

Figure B-4 illustrates the net estimated program year and future year economic benefits that would result from the estimates of program expenditures and energy savings under the Mid Achievable Potential scenario in the Focus on Energy *2016 Energy Efficiency Potential Study*. These results are relative to the hypothetical scenario in which the measures in the Mid Achievable Potential scenario are not installed during the 2016–2019 period.

Figure B-4. Program Year and Future Year Economic Benefit Impacts, Mid Achievable Potential Scenario



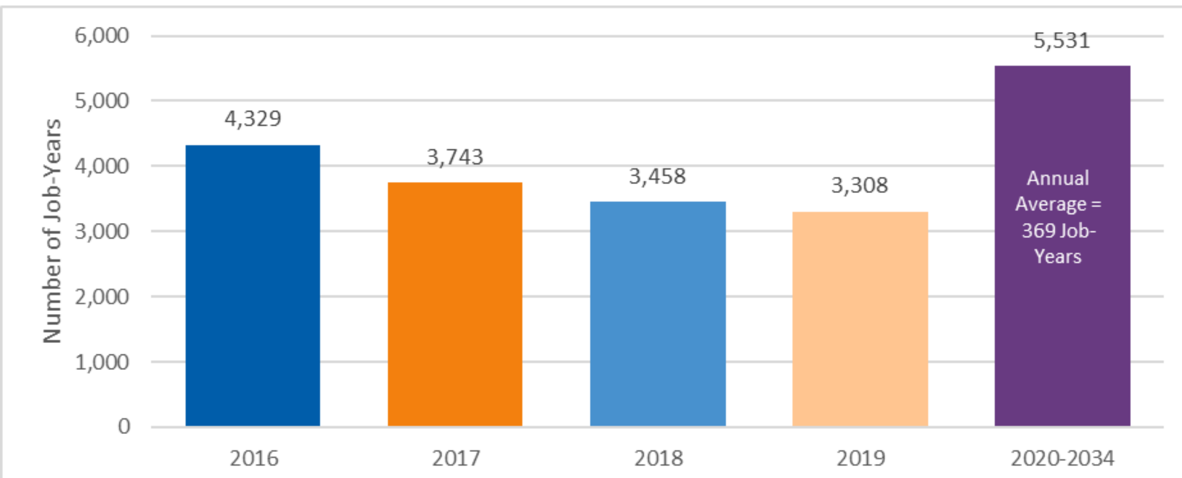
In the Mid Achievable Potential scenario, an estimated $855 million in economic benefit (value added) impacts will be created in the 2016–2034 period. An average of $112 million in benefits will be created in each of the measure installation years (2016–2019) as a result of direct program expenditures for measure installation. Similar to the findings from the 2015-2016 model, ongoing energy savings attributable to 2016–2019 Focus on Energy programs in the Mid Achievable Potential scenario will continue to generate economic benefit impacts at lower levels through the duration of the study period. As shown in Figure B-4, an additional $409 million in benefits, an average of $27 million per year, are projected in the 2020–2034 period due to persistent energy savings from the measures installed between 2016 and 2019. In this scenario, the increased incentive level and Focus on Energy budget results in approximately $150 million in additional economic benefits when compared to the Business as Usual scenario. The increased energy savings from this scenario drive additional outer-year economic benefit impacts averaging $7 million per year more than the impacts from the Business as Usual scenario.

B.4 Economic Potential Scenario

B.4.1 Program Year and Future Year Employment Growth

Figure B-5 illustrates the net estimated program year and future year employment impacts that would result from the estimates of program expenditures and energy savings under the Economic Potential scenario from the Focus on Energy *2016 Energy Efficiency Potential Study*. Under this scenario, Focus on Energy would pursue all cost-effective energy efficiency opportunities in the state that would exist if it maintained current cost-effectiveness policies, set incentives equal to 50% of the measure cost, and spent the full amount necessary to capture all measured potential, which would require increased spending roughly seven times higher than the current levels of annual Focus on Energy funding. These results are relative to the hypothetical scenario in which no program activity occurs during the 2016–2019 period.

Figure B-5. Program Year and Future Year Employment Growth, Economic Potential Scenario

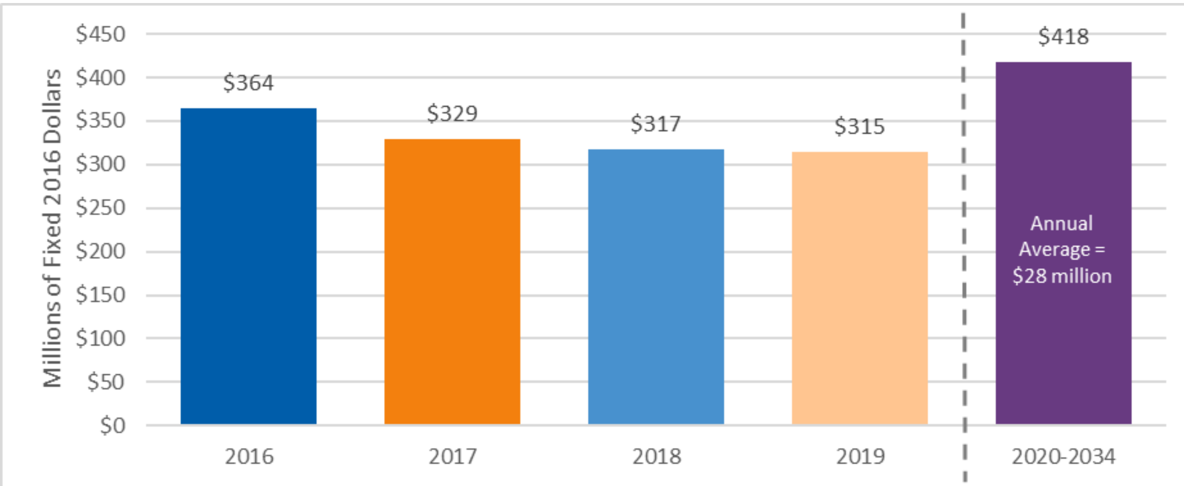


In the Economic Potential scenario, an estimated 20,368 job-years will be created in the 2016–2034 period. An average of 3,709 jobs-years will be created in each of the measure installation years (2016–2019) as a result of direct program expenditures for measure installation. Similar to the findings from the 2015-2016 model, ongoing energy savings attributable to 2016–2019 Focus on Energy programs in the Economic Potential scenario will continue to generate employment impacts at lower levels through the duration of the study period. As shown in Figure B-5, an additional 5,531 job-years, an average of 369 per year, are projected in the 2020–2034 period due to persistent energy savings from the measures installed between 2016 and 2019. In this scenario, the increased incentive level and Focus on Energy budget results in approximately 11,400 additional job-years when compared to the Mid Achievable Potential scenario. The increased energy savings from this scenario drive additional outer-year employment impacts averaging 104 job-years per year more than the impacts from the Mid Achievable Potential scenario.

B.4.2 Program Year and Future Year Economic Benefits

Figure B-6 illustrates the net estimated program year and future year economic benefits that would result from the estimates of program expenditures and energy savings under the Economic Potential scenario from the Focus on Energy *2016 Energy Efficiency Potential Study*. These results are relative to the hypothetical scenario in which the measures in the Economic Potential scenario are not installed during the 2016–2019 period.

Figure B-6. Program Year and Future Year Economic Benefit Impacts, Economic Potential Scenario



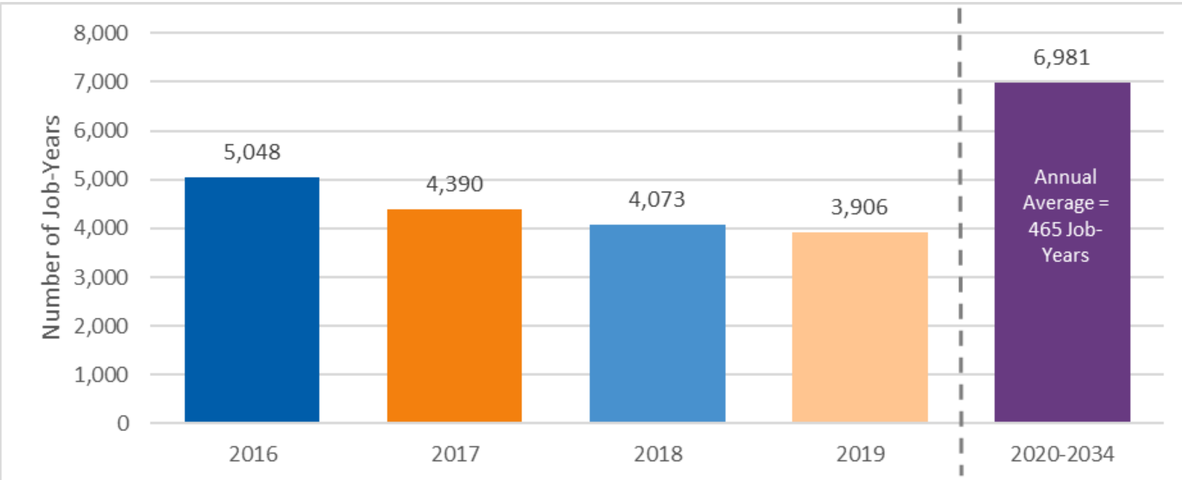
In the Economic Potential scenario, an estimated $1,742 million in economic benefit (value added) impacts will be created in the 2016–2034 period. An average of $331 million in benefits will be created in each of the measure installation years (2016–2019) as a result of direct program expenditures for measure installation. Similar to the findings from the 2015-2016 model, ongoing energy savings attributable to 2016–2019 Focus on Energy programs in the Economic Potential scenario will continue to generate economic benefit impacts at lower levels through the duration of the study period. As shown in Figure B-6, an additional $418 million in benefits, an average of $28 million per year, are projected in the 2020–2034 period due to persistent energy savings from the measures installed between 2016 and 2019. In this scenario, the increased incentive level and Focus on Energy budget results in approximately $887 million in additional economic benefits when compared to the Mid Achievable Potential scenario. The increased energy savings from this scenario drive additional outer-year economic benefit impacts averaging $8 million per year more than the impacts from the Business as Usual scenario.

B.5 Combined UCT Potential Scenario

B.5.1 Program Year and Future Year Employment Growth

Figure B-7 illustrates the net estimated program year and future year employment impacts that would result from the estimates of program expenditures and energy savings under the Combined UCT Potential scenario from the Focus on Energy *2016 Energy Efficiency Potential Study*. Under this scenario, Focus on Energy would pursue all cost-effective energy efficiency opportunities in the state that would exist if it revised current cost-effectiveness policies to use a Utility Cost Test (UCT) with a 0% discount rate, set incentives equal to 50% of the measure cost, and spent the full amount necessary to capture all measured potential, which would require spending roughly eight times the current levels of annual Focus on Energy funding. These results are relative to the hypothetical scenario in which no programs occurred during the 2016–2019 period.

Figure B-7. Program Year and Future Year Employment Growth, Combined UCT Scenario



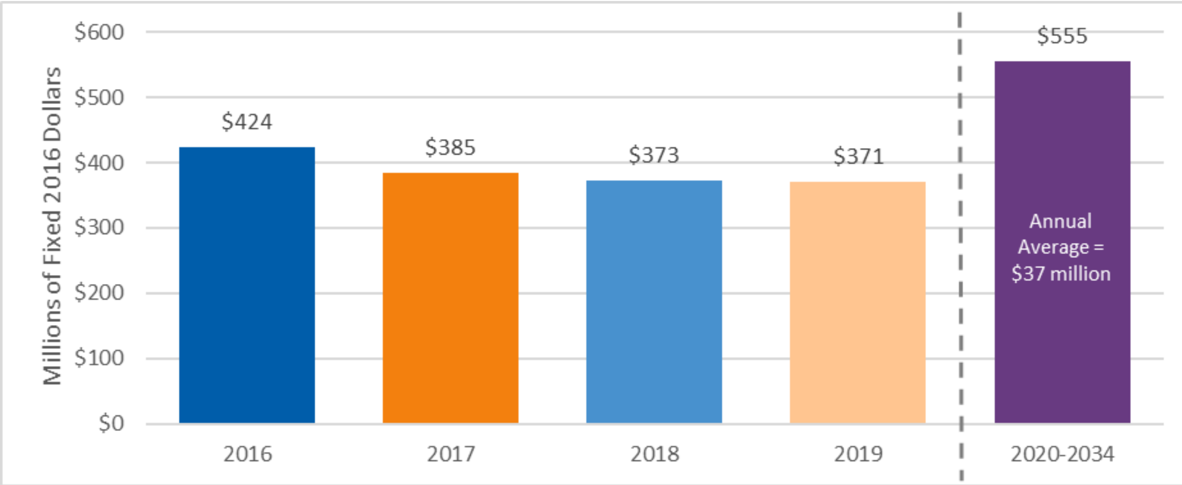
In the Combined UCT scenario, an estimated 24,397 job-years will be created in the 2016–2034 period. An average of 4,354 jobs-years will be created in each of the measure installation years (2016–2019) as a result of direct program expenditures for measure installation. Similar to the findings from the 2015-2016 model, ongoing energy savings attributable to 2016–2019 Focus on Energy programs in the Combined UCT scenario will continue to generate employment impacts at lower levels through the duration of the study period. As shown in Figure B-7, an additional 6,981 job-years, an average of 465 per year, are projected in the 2020–2034 period due to persistent energy savings from the measures installed between 2016 and 2019.

In this scenario, the increased incentive level and Focus on Energy budget results in approximately 4,000 additional job-years when compared to the Economic Potential scenario, and an additional 17,900 job-years when compared to the Business as Usual scenario. The increased energy savings from this scenario drive additional outer-year employment impacts averaging 96 job-years per year more than the impacts from the Economic Potential scenario, and 288 job-years per year more than the impacts from the Business as Usual scenario.

B.5.2 Program Year and Future Year Economic Benefits

Figure B-8 illustrates the net estimated program year and future year economic benefits that would result from the estimates of program expenditures and energy savings under the Combined UCT scenario from the Focus on Energy *2016 Energy Efficiency Potential Study*. These results are relative to the hypothetical scenario in which the measures in the Combined UCT scenario are not installed during the 2016–2019 period.

Figure B-8. Program Year and Future Year Economic Benefit Impacts, Combined UCT Scenario



In the Combined UCT scenario, an estimated $2,108 million in economic benefit (value added) impacts will be created in the 2016–2034 period. An average of $388 million in benefits will be created in each of the measure installation years (2016–2019) as a result of direct program expenditures for measure installation. Similar to the findings from the 2015-2016 model, ongoing energy savings attributable to 2016–2019 Focus on Energy programs in the Combined UCT scenario will continue to generate economic benefit impacts at lower levels through the duration of the study period. As shown in Figure B-8, an additional $555 million in benefits, an average of $37 million per year, are projected in the 2020–2034 period due to persistent energy savings from the measures installed between 2016 and 2019.

In this scenario, the increased incentive level and Focus on Energy budget results in approximately $366 million in additional economic benefits when compared to the Economic Potential scenario, and an additional $1,402 million in economic benefits when compared to the Business as Usual scenario. The increased energy savings from this scenario drive additional outer-year employment impacts averaging $9 million per year more than the impacts from the Economic Potential scenario, and $17 million per year more than the impacts from the Business as Usual scenario.

Appendix C. Focus on Energy Programs by Year

Table C-1 lists the programs included in the macroeconomic analysis by market segment and year.

Table C-1. Residential and Business Programs by Program Year

Residential Programs	Nonresidential Programs
2015	
Appliance Recycling	Agriculture, Schools and Government
Assisted Home Performance with ENERGY STAR	Business Incentives
Design Assistance - Residential	Chains and Franchises
Express Energy Efficiency (E3)	Design Assistance
Enhanced Rewards	Emerging Technology
Home Performance with ENERGY STAR	Large Energy User
Manufactured Home Efficiency Pilot	Renewable Energy Competitive Incentive Program (RECIP) - Agriculture, Schools and Government
Multifamily Direct Install	RECIP - Business Incentives
Multifamily Energy Savings	RECIP - Large Energy Users
New Homes	Renewable Rewards - Business
Residential Lighting	Small Business
Renewable Rewards - Residential	Strategic Energy Management (SEM)
Residential Rewards	On Demand Savings
Smart Thermostat Pilot	
2016	
Appliance Recycling	Agriculture, Schools and Government
Assisted Home Performance with ENERGY STAR	Business Incentives
Design Assistance - Residential	Chains and Franchises
EHCI (Voided due to unclaimed property)	Design Assistance
Home Performance with ENERGY STAR	Emerging Technologies
Home Performance with ENERGY STAR 2012	Large Energy Customers
Lighting and Appliance	Midstream Commercial Kitchen Pilot
Manufactured Homes Efficiency Pilot	Non-Local Government Custom Energy
Multifamily Direct Install	RECIP - Agriculture, Schools and Government
Multifamily Energy Savings	RECIP - Business Incentives
New Homes	RECIP - Large Energy Users
Retail Products Platform	Renewable Rewards - Business
Rural Program Design	Small Business Program
Renewable Rewards - Residential	Strategic Energy Management
Residential Rewards	Unclaimed property expense moved to miscellaneous expense
Seasonal Savings	
Simple Energy Efficiency	
Smart Thermostat Pilot	

Appendix D. Changes since the Quadrennial Report

Since the quadrennial analysis completed in 2015, federal organizations that track and report on economic production and growth have released updated economic data, forecasts, and sector definitions. These data contribute to the assumptions of REMI PI+ models. As expected, the new data differ from the quadrennial analysis data.

Relative to the assumptions of the quadrennial analysis' REMI PI+ model (v1.6.6), the most significant updates to the latest REMI PI+ (v2.1.2) data are updated Bureau of Labor Statistics 2014-2024 Employment Projections and changes in labor productivity, labor compensation rates, and labor force participation responses in historical data and forecasts. For additional details on these changes, see the official REMI Table of Major PI+ changes.[13] It is not possible to determine the exact marginal difference that each change causes in model results because all changes occurred simultaneously, but some inferences can be made about the overall impact and direction.

In aggregate, decreases in the model's assumed labor productivity result in relatively more employment impacts but smaller income, output, and economic benefit impacts for a given level of expenditures. Labor productivity is the ratio of output to employment, so a decrease in productivity must result in a decrease in output for any given level of employment. Similarly, a decrease in labor productivity will result in an increase in the number of employees required to achieve any given level of output. Economic benefits (value added) is equal to output minus intermediate demand, so changes in labor productivity will have a similar impact on economic benefits as they do on output.

In the REMI model, the labor compensation rate is also a function of labor productivity. It is calculated as the ratio of total compensation to total employment. Less productive labor will lead to lower output, and therefore lower total compensation (personal income and fringe benefits) for any given level of employment.

Additionally, employment is reported by occupation in this analysis, rather than by industry as in the quadrennial analysis. For example, instead of referencing employment in the manufacturing sector, this study references employment in production occupations. Employment in production occupations in the current REMI model is broadly analogous to employment in the manufacturing sector in the REMI model from the quadrennial analysis. However, some occupations that would be categorized under the manufacturing sector in the prior analysis, such as an administrative assistant employed by a manufacturing firm, will fall into the "sales and related, office and administrative support occupations" category in the current analysis.

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13 Regional Economic Models, Inc. "Table of Major PI+ Changes – versions PI+ v1.3 through PI+ v2.1." Accessed January 11, 2018. http://www.remi.com/wp-content/uploads/2017/10/PI-Changes-v2_1.pdf