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Focus on Energy 2019–2020 Biennium Economic Impacts

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Table of Acronyms

Acronym	Term
C&I	Commercial and industrial
CY	Calendar year (corresponds with program year)
EIA	U.S. Energy Information Administration
EM&V	Evaluation, measurement, and verification
EPA	U.S. Environmental Protection Agency
GWh	Gigawatt per hour (1 million kWh)
kWh	Kilowatt per hour
MThm	Thousand therms
MWh	Megawatt per hour (1,000 kWh)
NTG	Net-to-gross
PSC	Public Service Commission of Wisconsin
SPECTRUM	Statewide Program for Energy Customer Tracking, Resource Utilization, and Data Management
T&D	Transmission and Distribution
TRC (MTRC)	Total Resource Cost test (Modified Total Resource Cost test)
TRM	Technical reference manual

Glossary of Terms

Term	Definition
Customer funding	Payments by Wisconsin customers that fund Focus on Energy offerings.
Direct spending	Focus on Energy program funds spent on administration, implementation, marketing, EM&V services, and incentives.
Disposable personal income	After-tax money available to Wisconsin consumers to spend and/or save at their discretion.
Economic benefits (Value added)	Contributions of private industries and government to Wisconsin's gross state product. Describes the total wealth created regionally, including wages, profits, and taxes.
Employment	The number of jobs that last a year. Full-time and part-time jobs are counted equally.
Incentives	Focus on Energy program funds that encourage participation and investment in energy-saving technologies and behaviors.
Net economic impacts	The difference between economic impacts created by Focus on Energy and a hypothetical ("baseline") scenario where Focus on Energy does not exist and equal funds are spent on other goods and services.
Participant utility bill savings	The estimated decrease in participant spending on utility bills resulting from Focus on Energy offerings. Utility bill savings by participants result in revenue losses for utilities.
Participant co-funding	Participant payments to complete Focus on Energy projects. The combination of incentives and participant co-funding represents the full cost of energy efficiency and renewable energy projects.
Revenue requirements	Mandates for utilities to generate certain amounts of revenue. Because Focus on Energy creates energy savings that reduce utilities revenues, utilities may increase energy prices in order to meet revenue requirements.
Utility avoided 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.

Executive Summary

Cadmus estimated the net economic impacts of Focus on Energy's 2019–2020 energy efficiency and renewable energy portfolio using the Energy, Environment & Economy (E3+) macroeconomic modeling software from Regional Economic Models, Inc. (REMI).

The analysis includes all energy efficiency and renewable energy investments made through Focus on Energy in each of the 2019 and 2020 calendar years (CY2019 and CY2020, respectively) and the long-term impacts of those investments persisting through 2044. The resulting net economic impacts represent the difference between the Wisconsin economy with and without investment in Focus on Energy. In the latter ("baseline") case, Wisconsin customers do not fund Focus on Energy and, therefore, no energy-saving projects occur.

It is worthwhile to note that while this analysis focuses specifically on the net economic impacts attributable to Focus on Energy investments made in CY2019 and CY2020, these investments build upon the ongoing economic impacts created by program activities from previous years. Likewise, current and future Focus on Energy investments will generate economic impacts that will add on to the benefits from prior years, ensuring more economic benefits for longer.

Focus on Energy achieves positive net economic impacts because it increases in-state spending. Focus on Energy not only increases spending on industries related to energy efficiency and renewable energy but also results in participants saving money on their utility bills. Money that would have been spent on fuel imports (electric and natural gas[1]) is instead spent locally on goods and services, boosting Wisconsin's regional industries and statewide economy. Moreover, emissions reductions generated by energy savings make Wisconsin a more attractive place to live, thus increasing in-migration and stimulating additional economic activity.

Table ES-1 summarizes the net economic impacts attributable to the CY2019 and CY2020 program years and to the 2019–2020 biennium in aggregate. Cadmus used changes in employment, economic benefit ("value added"), and disposable personal income[2] as its key indicators of changes in economic activity for this analysis. Focus on Energy investments and activity during the 2019–2020 biennium is projected to add more than 8,400 jobs, $970 million in economic benefits, and $870 million in disposable personal income to the Wisconsin economy through 2044.

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[1] Per the U.S. EIA State Profile for Wisconsin, Wisconsin consumes more electricity than it generates, and it imports all its natural gas. Accessed 12/16/2021. https://www.eia.gov/state/analysis.php?sid=WI.

[2] Definitions for these key indicators can be found in *Analysis Findings*.

Table ES-1. Cumulative Net Economic Impacts through 2044

Key Economic Indicator	CY2019	CY2020	Biennium[1]
Employment (jobs)	4,250	4,210	8,430
Economic Benefit (millions of dollars[2])	$479	$487	$972
Disposable Personal Income (millions of dollars[2])	$403	$465	$872

[1] Program year impacts do not sum to biennium impacts because of dynamic factors in the REMI model.
[2] Fixed 2020 U.S. dollars.

Table ES-2 shows economic impacts normalized by Focus on Energy spending. Direct spending includes costs of administration and implementation; incentives paid to participants; costs of evaluation, measurement, and verification (EM&V); and bonuses paid to Focus on Energy's administrator for performance in the previous 2015–2018 quadrennium. Every $1 million spent on Focus on Energy increases statewide employment by 42 jobs, and every dollar spent generates an additional $4.84 of economic benefit and $4.35 of disposable personal income through 2044.

Table ES-2. Cumulative Net Economic Impacts, Normalized for Direct Spending

Key Economic Indicator	Normalized Impacts		
	CY2019	CY2020	Biennium
Employment per $1MM spent	40	45	42
Economic Benefit[1] per dollar spent[2]	$4.47	$5.21	$4.84
Disposable Personal Income[1] per dollar spent	$3.76	$4.97	$4.35

[1] Fixed 2020 U.S. dollars.
[2] The ratio of economic benefits per dollar spent is distinct from the benefit/cost ratio used to measure portfolio cost-effectiveness, which is discussed in further detail in *Impact of Economic Benefits on Cost-Effectiveness*.

Focus on Energy investments in energy efficiency and renewable energy during the 2019–2020 biennium will cumulatively add more than $970 million in economic benefits to the Wisconsin economy through 2044. On average, biennial Focus on Energy investments are projected to generate nearly $39 million of economic benefits per year for the next 25 years.

Nearly all of Wisconsin's industries will experience employment gains, with the largest increases in cumulative net employment projected to occur in the health care, retail, and manufacturing sectors. Increased purchases of energy efficient and renewable energy technologies through Focus on Energy impacted specialized fields in the short-term, and the benefits of participant utility bill savings and emissions reductions will impact Wisconsin's largest sectors in the long-term. Seven sectors are projected to create at least 500 net jobs through 2044 (at least 20 net jobs per year) because of Focus on Energy investments during the 2019-2020 biennium:

1. Health care and social assistance (1,300 jobs)
2. Retail (1,260 jobs)
3. State and local government (1,080 jobs)
4. Manufacturing (1,080 jobs)

5. Accommodation and food services (850 jobs)
6. Professional, scientific, and technical services (690 jobs)
7. Other services (except public administration) (630 jobs)

Focus on Energy increases disposable personal income by $370 per household through 2044. Cumulative disposable personal income gains of $870 million—nearly $35 million annually on average for the next 25 years—will benefit more than 2.3 million Wisconsin households. Additionally, the 2019–2020 biennium will save an estimated $1.45 billion on participants' utility bills through 2044.

Introduction

The purpose of this macroeconomic impact analysis is to quantify the net economic impacts created by Focus on Energy within the Wisconsin economy. 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 customers of the state's investor-owned energy utilities and participating municipal utilities and electric cooperatives. APTIM serves as the Program Administrator and is responsible for designing, managing, and coordinating Focus on Energy's offerings.

The Public Service Commission of Wisconsin (PSC) provides oversight of Focus on Energy. The PSC contracted with Cadmus to verify Focus on Energy's energy savings, including environmental and non-energy benefits, and evaluate its 2019–2022 Quadrennium III achievements. As part of this evaluation, Cadmus quantified net economic impacts attributable to Focus on Energy during the 2019-2020 biennium. Statewide impacts include employment, economic benefits (value added), and disposable personal income.

Focus on Energy provides information, technical support, and financial incentives to eligible Wisconsin residents and businesses to complete energy-saving projects. Focus on Energy thus helps Wisconsin residents and businesses manage rising energy costs, protect the environment, and promote in-state economic activity while controlling the growing demand for electricity and natural gas.

As with previous studies, Cadmus used the Energy, Environment & Economy (E3+) macroeconomic modeling software from Regional Economic Models, Inc. (REMI) to assess Focus on Energy's economic impacts. Cadmus calculates net economic impacts as the difference between the economic impacts created by Focus on Energy and a baseline scenario in which Focus on Energy does not exist.

This analysis covers Focus on Energy projects completed during the biennium (either calendar year 2019 or CY2020) and their persisting impacts. For modeling purposes, Cadmus set the persistence to end after 25 years, corresponding to the high end of project effective useful life (EUL) seen in Focus on Energy's portfolio. As such, the CY2019 analysis period runs through 2043, and the CY2020 and biennium analyses run through 2044. In a supplement to the analysis, Cadmus also estimated the net economic impacts of energy conservation potential scenarios for the 2023–2026 quadrennium that were outlined in the 2021 Focus on Energy potential study.[3] For details and model results pertaining to those scenarios, see *Appendix A: Potential Study Scenarios*.

How Focus on Energy Improves Wisconsin's Economy

Changes in spending, captured in the form of changes in consumption and investment within various sectors and industries, produces ripple effects throughout a regional economy, affecting supply chains and household spending. Changes in consumption and investment affect consumer demand, which

[3] Cadmus, *2021 Focus on Energy Energy Efficiency Potential Study Report*. 2021, September 10. https://focusonenergy.com/sites/default/files/inline-files/Potential_Study_Report-FoE_Efficiency-2021.pdf.

impacts employment and compensation in industries both directly and indirectly related to the changes in spending. Money continues to cycle through the regional economy—individuals continue to spend and save, and businesses continue to invest and meet increases in demand—until the ripple effects caused by the initial changes in spending disappear.

Although changes in direct spending by utilities and participants occur only during CY2019 and CY2020, the energy efficiency and renewable energy projects completed during the 2019–2020 biennium generate long-term energy impacts. Most notably, persisting energy bill savings allow 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 (T&D) avoided costs, emission allowance costs, and capacity costs. However, because participating households and businesses purchase less energy after participating in Focus on Energy offerings, utilities also forego revenues from energy sales. To meet revenue requirements, Cadmus assumes in its models that utilities will recoup a portion of lost revenues by increasing retail rates they will charge their customers in future years.

Additional functionality of REMI's E3+ model includes the net economic impacts of emissions reductions. Emissions reductions make Wisconsin a more attractive place to live, thereby increasing in-migration and stimulating additional economic activity through bolstering the labor force and consumption on regional goods and services.

Key Changes

Main differences between the current economic impact analysis (for the 2019–2020 biennium) and the previous economic impact analysis (for the 2015–2018 quadrennium) are updated input values used to calculate avoided costs of energy. Periodically, as needed, the PSC and the Evaluation Work Group (EWG) update methodology, data, and/or assumptions related to the calculation of utility avoided costs.

In 2020, the input values used to calculate the avoided costs of electricity ($/kWh) and natural gas ($/thm) were updated, resulting in avoided cost values decreasing by roughly 30% to 33%, respectively. Because avoided costs act as a benefit to utilities by helping offset revenue losses, the decrease in avoided costs reduces net economic benefits. In 2020, the PSC also began to incorporate T&D avoided costs ($/kW-yr). The inclusion of T&D increases avoided costs benefit estimations for utilities (and, thus, net economic benefits). These changes are explained in *Changes to Electric Avoided Cost Assumptions* and *Changes to Natural Gas Avoided Cost Assumptions*, and the effects of the changes are explained in *Impact of Updated Electric Avoided Costs* and *Impacts of Updated Natural Gas Avoided Costs*.

Analysis Findings

Consistent with previous analyses, Cadmus reports the net economic impacts of Focus on Energy according to three key indicators:

- ***Employment*** counts the change in the number of full- and part-time jobs lasting a year. Full-time and part-time jobs are counted at equal weight.[4]
- ***Economic benefits (value added)*** measure the changes in contributions of each private industry and of government to Wisconsin's gross state product. It describes the total wealth created in Wisconsin, including wages, profits, and taxes. Throughout this report, economic benefits are presented in fixed 2020 U.S. dollars.
- ***Disposable personal income*** represents the change in after-tax money available to Wisconsin consumers to spend and/or save at their discretion. REMI accounts for all income sources, including wages and salaries, benefits, proprietor (owner) income, rental income, investment income, and transfer payments from public entities such as Social Security. Like economic benefits, disposable personal income is presented in fixed 2020 U.S. dollars.

During the CY2019 and CY2020 program years, net economic impacts decrease because customers spend money (above what they would have spent in the baseline scenario, absent Focus on Energy) to fund Focus on Energy offerings and help pay for their energy efficiency and renewable energy projects. However, following the program years in which initial investments are made, each Focus on Energy project generates positive net economic impacts for decades. The net economic impacts presented in this report capture the cumulative net economic impacts generated during the lifecycle of all Focus on Energy projects completed in CY2019 and CY2020, which can last up to 25 years.

Summary of Net Economic Impacts

Table 3 summarizes net economic impacts attributable to each program year. Through 2044, the Focus on Energy 2019–2020 biennium will add more than 8,400 jobs, almost $1 billion in economic benefit, and more than $870 million in disposable personal income to the Wisconsin economy.

Table 3. Cumulative Net Economic Impacts

Key Economic Indicator	CY2019	CY2020	Biennium[1]
Employment (jobs)	4,250	4,210	8,430
Economic Benefit (millions of dollars[2])	$479	$487	$972
Disposable Personal Income (millions of dollars[2])	$403	$465	$872

[1] Program year impacts do not perfectly sum to biennium impacts because of dynamic factors in the REMI model.
[2] Fixed 2020 U.S. dollars.

[4] This is not the same as number of employed individuals, some of whom may have more than one job.

When normalized for spending on administration, implementation, incentives, and evaluation, measurement, and verification (EM&V) services, Focus on Energy is projected to generate roughly 42 jobs per $1 million of direct spending and returns on investment of more than $4 of economic benefits and disposable personal income per dollar of direct spending.

Table 4. Cumulative Net Economic Impacts, Normalized for Direct Spending

Key Economic Indicator	Normalized Impacts		
	CY2019	CY2020	Biennium
Employment per $1MM spent	40	45	42
Economic Benefit[1] per dollar spent	$4.47	$5.21	$4.84
Disposable Personal Income[1] per dollar spent	$3.76	$4.97	$4.35

[1] Fixed 2020 U.S. dollars.

Interpreting Results

The following sections show net economic impacts attributable exclusively to the Focus on Energy 2019–2020 biennium. While this analysis focuses specifically on CY2019 and CY2020, these investments build upon the ongoing economic impacts created by program activities from previous years. Likewise, current and future Focus on Energy investments will generate economic impacts that will add on to the benefits from prior years, ensuring more economic benefits for longer.

For example, in 2022, CY2019 and CY2020 investments are projected to add roughly 240 and 160 jobs, respectively (Figure 1, in *Employment*); combined, they will add approximately 400 jobs. However, as noted, this study omits ongoing impacts created in previous program years. 2015–2018 quadrennial investments[5]—which, like 2019–2020 biennial investments, will create ongoing future impacts for up to 25 years—are projected to add nearly 2,000 jobs in 2022, bringing the total employment impact in 2022 of the last six Focus on Energy program years to 2,400 jobs added. Each previous and future program year of Focus on Energy activity would contribute similarly additive employment effects, underscoring the importance of sustained investment by Focus on Energy in energy efficiency and renewable energy.

Employment

Focus on Energy's energy efficiency and renewable energy offerings, and the investments that fund them, increase employment statewide. Trade Allies and equipment installers who participate in Focus on Energy benefit from increased business activity and may hire more staff. New employees may have been unemployed or moved to Wisconsin seeking employment, both scenarios representing increases in employment and the labor force. In turn, newly hired employees spend their wages locally on goods and services, stimulating the Wisconsin economy. Ongoing energy savings from energy efficiency result in long-term utility bill savings that spur additional spending on local goods and services by participating

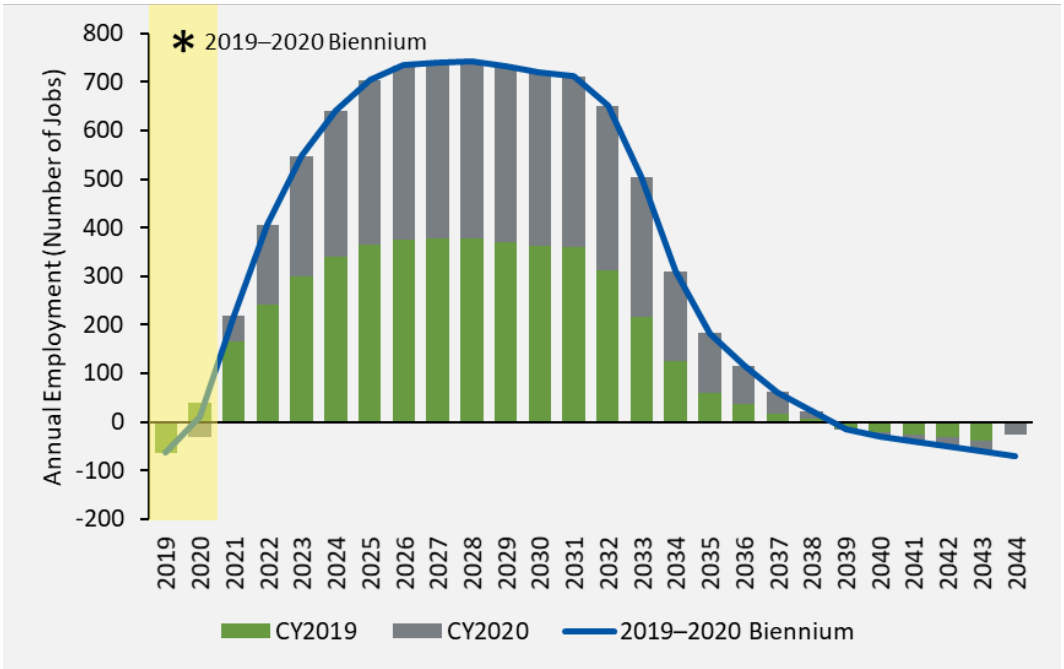
[5] Cadmus, *Focus on Energy 2015–2018 Quadrennium Economic Impact Analysis*. 2020, July 3. https://www.focusonenergy.com/sites/default/files/inline-files/Evaluation_Report-Economic_Impacts_2015-2018.pdf.

businesses and residential customers, which would not have occurred in the baseline scenario absent Focus on Energy.

Like other forms of investment, the completion of Focus on Energy projects requires initial investments from utilities and participants that redirect spending toward energy efficiency and away from typical patterns of consumption in order to cultivate long-lasting benefits. As such, the Wisconsin economy incurs a nominal loss of jobs up front to ensure nearly two decades of employment growth thereafter.

Figure 1 shows changes in annual employment by program year.[6] As energy savings accumulate, annual employment growth increases rapidly and peaks at 740 annual jobs in 2028. Employment impacts begin to taper off in 2039 as energy-efficient measures reach the end of their EULs, representing the Wisconsin economy returning to its baseline equilibrium in the absence of Focus on Energy.

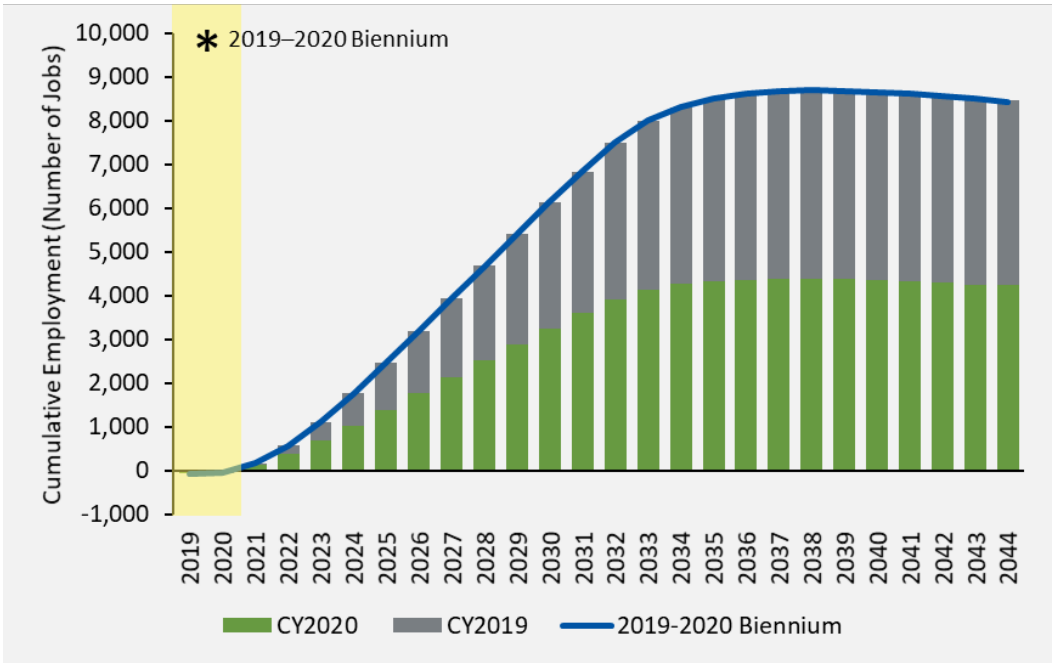
Figure 1. Annual Jobs Added by Program Year



Similarly, Figure 2 shows how annual employment changes in Figure 1 accumulate over time.

[6] The employment impacts in Figure 1 are presented as a table in *Appendix C: Annual Net Employment Impacts*.

Figure 2. Cumulative Jobs Added by Program Year



Cumulative employment gains realized by Focus on Energy 2019 and 2020 investments will reach their peak of nearly 8,700 jobs in 2038. Afterward, employment contracts slightly as the effects of initial direct spending and ongoing energy savings wear off. By the end of the analysis window in 2044, Focus on Energy will have added roughly 8,400 jobs in total. The five industries with the greatest employment increases are:

- Health care and social assistance (1,300 jobs)
- Retail (1,260 jobs)
- State and local government (1,080 jobs)
- Manufacturing (1,080 jobs)
- Accommodation and food services (850 jobs)

Economic Benefits

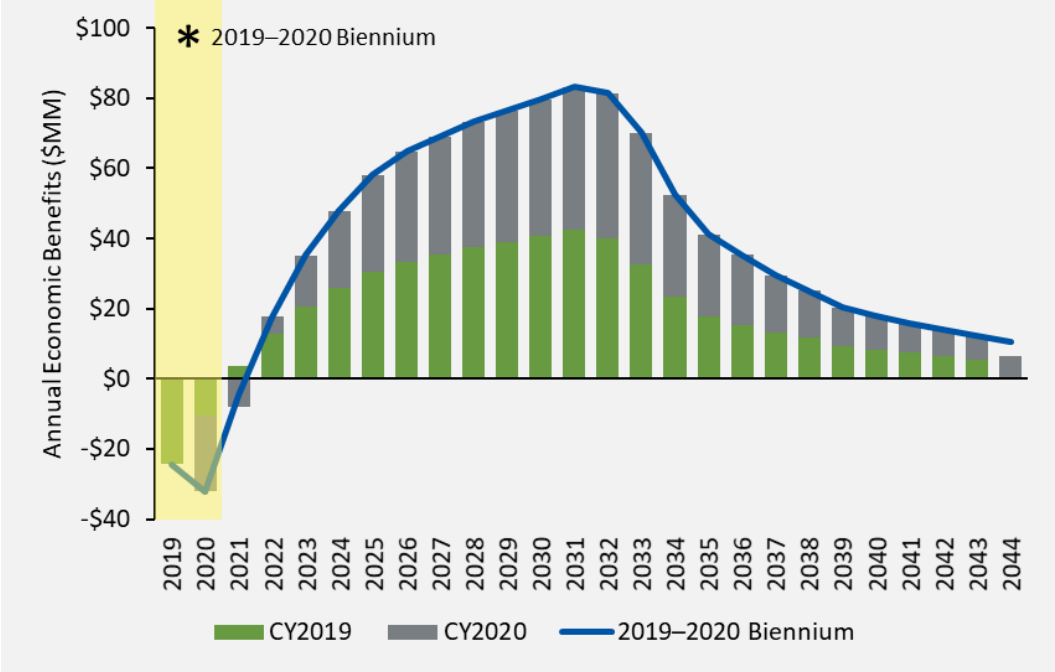
Focus on Energy offerings not only stimulate demand for energy efficiency and renewable energy technologies and services but also redirect money spent on fuel imports from out-of-state back into the Wisconsin economy.[7] This results in additional positive impacts on statewide wages, profits, and taxes, which boost economic benefits in the form of value added to Wisconsin's gross state product.

Figure 3 shows economic benefits by year. Because the initial costs of Focus on Energy outweigh the immediate benefits, annual economic benefits dip during initial program years. However, they rapidly

[7] Per the U.S. Energy Information Administration (EIA), Wisconsin consumes almost six times as much energy as it produces: https://www.eia.gov/state/?sid=WI.

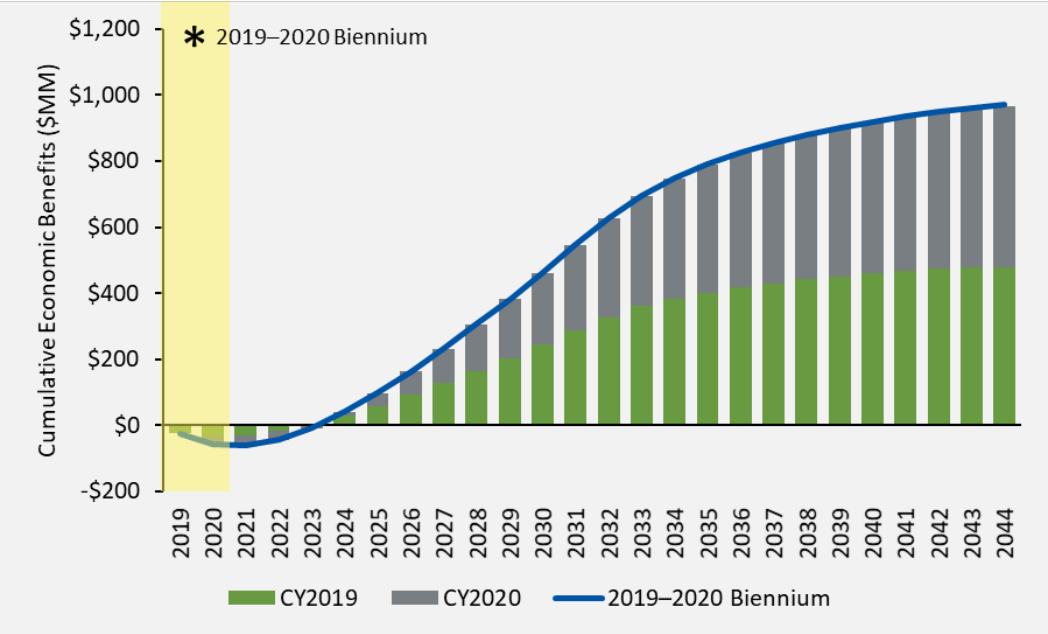
increase to a peak of $83 million in 2031, then taper off as the Wisconsin economy returns to its baseline equilibrium. Additionally, the ongoing positive economic benefits created by previous program years of Focus on Energy investments (such as the 2015–2018 quadrennium) offset the economic costs of funding the CY2019 and CY2020 program years—a pattern that continues indefinitely, for as long as Focus on Energy is administered.

Figure 3. Annual Economic Benefits by Program Year



Similarly, Figure 4 shows how the annual economic benefits in Figure 3 accumulate over time. Cumulative economic benefits generated by Focus on Energy CY2019 and CY2020 investments will reach their peak of more than $970 million at the end of analysis window in 2044.

Figure 4. Cumulative Economic Benefits by Program Year



Impact of Economic Benefits on Cost-Effectiveness

The PSC currently considers the Modified Total Resource Cost (MTRC) test to be the primary test in assessing the cost-effectiveness of individual offerings and the entire Focus on Energy portfolio.[8] The test's purpose is to determine if the total costs incurred by residents, businesses, and Focus on Energy in delivering energy efficiency and renewable energy offerings are outweighed by the total benefits they receive. The MTRC accounts for benefits in the form of avoided utility and environmental costs from avoided energy consumption. Economic benefits are not among the component benefits accounted for by the MTRC.

In addition to the MTRC test, Cadmus calculates an expanded TRC test that incorporates economic benefits. This section shows how MTRC test results change when the economic benefits derived from this analysis are included. Economic impact analyses are intended to create estimates of the magnitude of economic benefits, not develop exact dollar values for economic benefits. However, because cost-effectiveness is calculated using exact dollar values, and to remain consistent with prior economic impact analyses, Cadmus provides dollar values for economic benefits in the tables below. Rounding these estimates (to the closest $1 million, for example) would have a very small effect on total TRC benefits and the TRC benefit/cost (B/C) ratios.

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[8] The use of the modified TRC test as the primary cost-effectiveness test is directed by the PSC. Public Service Commission of Wisconsin. September 3, 2014. *Quadrennial Planning Process II – Scope.* Order PSC Docket 5-FE-100, REF#: 215245. Order was updated on June 6, 2018. *Quadrennial Planning Process III.* Order PSC Docket 5-FE-101, REF#: 343509. http://apps.psc.wi.gov/vs2015/ERF_view/viewdoc.aspx?docid=343909.

Table 5 lists the results of the modified and expanded TRC tests for CY2019. Economic benefits attributable to Focus on Energy activity in CY2019 increase total TRC benefits from $600 million to $1.1 billion and the B/C ratio from 2.58 to 4.61.

Table 5. CY2019 Total Resource Cost (TRC) Test Results

Test Component	Modified TRC (Without Economic Benefits)	Expanded TRC (With Economic Benefits)
Administrative Costs	$4,938,358	$4,938,358
Delivery Costs	$33,090,816	$33,090,816
Incremental Measure Costs	$197,512,151	$197,512,151
Total TRC Costs	**$235,541,325**	**$235,541,325**
Electric Benefits	$340,572,539	$340,572,539
Natural Gas Benefits	$147,319,948	$147,319,948
Emissions Benefits	$118,803,890	$118,803,890
T&D Benefits	$0	$0
Economic Benefits	$0	$478,568,517
Total TRC Benefits	**$606,696,377**	**$1,085,264,894**
TRC Benefits Minus Costs	**$371,155,052**	**$849,723,569**
TRC Benefit/Cost Ratio	**2.58**	**4.61**

Table 6 lists the results of the modified and expanded TRC tests for CY2020. Economic benefits attributable to Focus on Energy activity in CY2020 increase total TRC benefits from $700 million to $1.2 billion and the B/C ratio from 2.43 to 4.15.

Table 6. CY2020 Total Resource Cost (TRC) Test Results

Test Component	Modified TRC (Without Economic Benefits)	Expanded TRC (With Economic Benefits)
Administrative Costs	$2,788,738	$2,788,738
Delivery Costs	$30,544,175	$30,544,175
Incremental Measure Costs	$251,020,645	$251,020,645
Total TRC Costs	**$284,353,558**	**$284,353,558**
Electric Benefits	$393,460,787	$393,460,787
Natural Gas Benefits	$126,950,324	$126,950,324
Emissions Benefits	$116,464,956	$116,464,956
T&D Benefits	$54,665,398	$54,665,398
Economic Benefits	$0	$487,342,144
Total TRC Benefits	**$691,541,465**	**$1,179,490,463**
TRC Benefits Minus Costs	**$407,187,907**	**$895,136,905**
TRC Benefit/Cost Ratio	**2.43**	**4.15**

Table 7 lists the results of the modified and expanded TRC tests for the biennium. Economic benefits attributable to Focus on Energy biennium activity increase total TRC benefits from $1.3 billion to roughly $2.3 billion and improve the B/C ratio from 2.50 to 4.37.

Table 7. 2019–2020 Biennium Total Resource Cost (TRC) Test Results

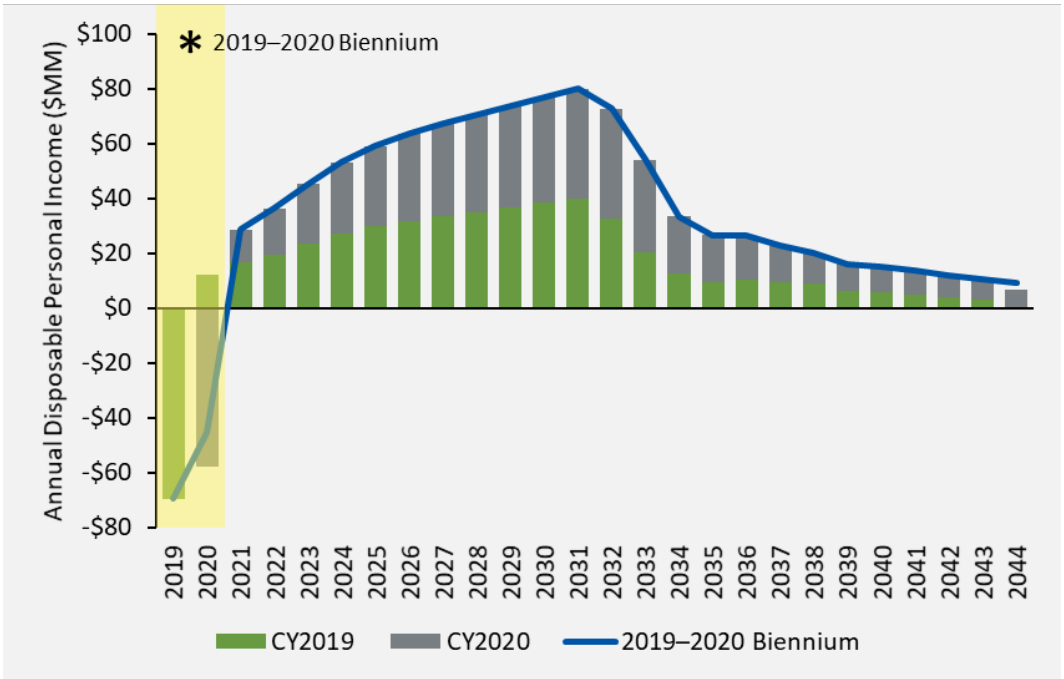
Test Component	Modified TRC (Without Economic Benefits)	Expanded TRC (With Economic Benefits)
Administrative Costs	$7,727,096	$7,727,096
Delivery Costs	$63,634,991	$63,634,991
Incremental Measure Costs	$448,532,796	$448,532,796
Total TRC Costs	**$519,894,883**	**$519,894,883**
Electric Benefits	$734,033,326	$734,033,326
Natural Gas Benefits	$274,270,272	$274,270,272
Emissions Benefits	$235,268,846	$235,268,846
T&D Benefits	$54,665,398	$54,665,398
Economic Benefits	$0	$971,880,778
Total TRC Benefits	**$1,298,237,842**	**$2,270,118,620**
TRC Benefits Minus Costs	**$778,342,959**	**$1,750,223,737**
TRC Benefit/Cost Ratio	**2.50**	**4.37**

Disposable Personal Income

Direct spending that funds Focus on Energy and the utility bill savings generated by energy efficiency and renewable energy projects increase labor demand. In turn, the regional economy sees increases in employment and compensation, generating more disposable personal income that can be saved or re-spent at the individual's discretion on goods and services in Wisconsin's sectors and industries, stimulating further regional economic activity.

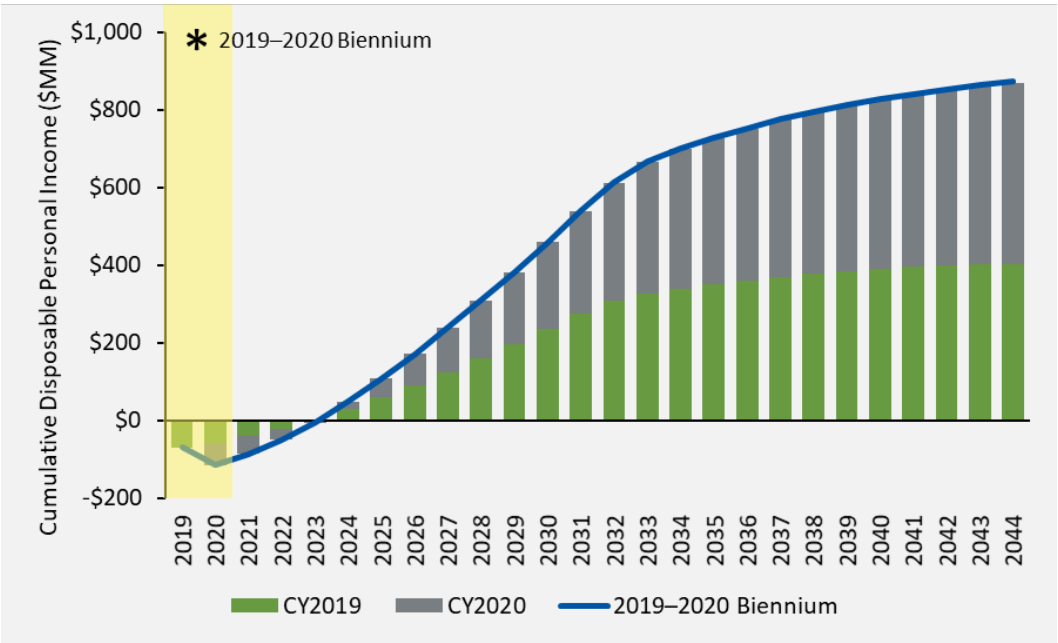
Figure 5 illustrates how disposable personal income changes over time. Synchronously with economic benefits (Figure 3), disposable personal income dips during the CY2019 and CY2020 program years as initial costs of funding Focus on Energy outweigh the immediate benefits generated by energy efficiency and renewable energy projects. Disposable personal income rapidly increases then peak at $80 million in 2031, afterward tapering off as the Wisconsin economy slowly returns to its baseline equilibrium. Like economic benefits, the ongoing positive disposable personal income impacts created in previous program years (such as the 2015–2018 quadrennium) offset the small declines during the CY2019 and CY2020 program years.

Figure 5. Annual Disposable Personal Income Gains by Program Year



Similarly, Figure 6 shows how disposable personal income in Figure 5 accumulates over time. Cumulative disposable personal income created by Focus on Energy 2019 and 2020 investments will peak at roughly $870 million in 2044.

Figure 6. Cumulative Disposable Personal Income Gains by Program Year



Household Disposable Personal Income Impacts

The United States Census Bureau[9] estimates there are more than 2.3 million occupied households in the state of Wisconsin. With cumulative disposable personal gains nearing $870 million, it can be estimated that Focus on Energy will create an average of $370 in additional disposable personal income per household through 2044.

[9] United States Census Bureau QuickFacts, Wisconsin: https://www.census.gov/quickfacts/WI.

Analytical Approach

This section describes the REMI E3+ modeling software, the approach used to determine net economic impacts attributable to Focus on Energy, and the model inputs used in the REMI E3+ model framework.

REMI E3+ Modeling Software

Studies that assess the net economic impacts of energy efficiency and renewable energy programming and investment typically use one of two types of modeling analysis:

1. 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.
2. 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.

REMI E3+ features both types of economic analysis, incorporating an IO matrix, general equilibrium, econometrics, and economic geography:

- The **IO matrix** is at the core of how the REMI E3+ 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 E3+ 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 energy-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 E3+ model accounts for the expected annual changes in the statewide economy over the entire analysis period. The economic production and growth data underpinning the model are based on real historical and forecasted conditions. As a result, the REMI E3+ 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

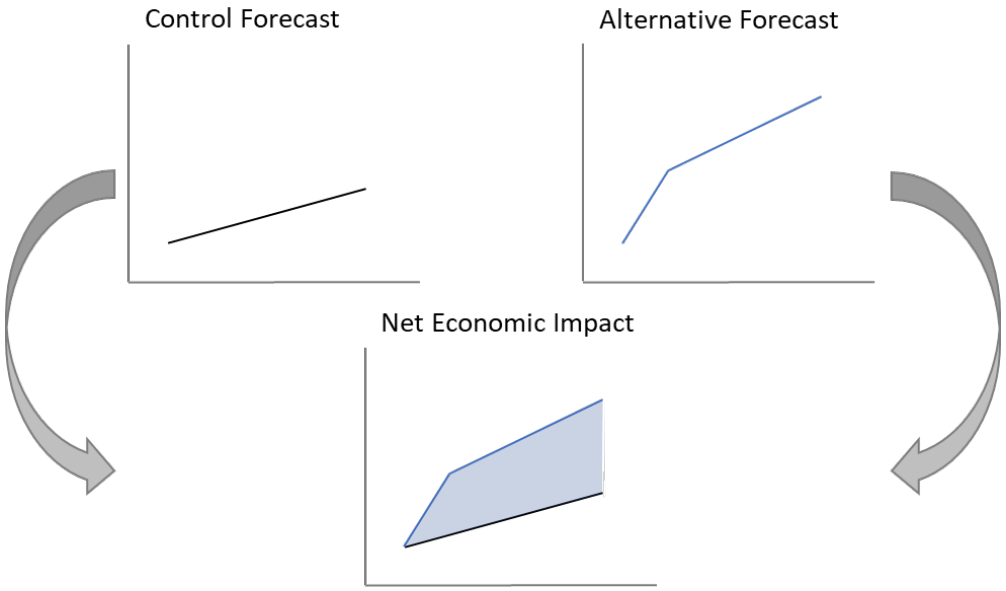
Cadmus used a customized REMI E3+ model for the state of Wisconsin to determine the net impacts on economic benefits (value added), employment, and disposable personal income resulting from Focus on Energy investments in energy efficiency and renewable energy programming during the biennium, both by program year and in aggregate.

Most critically, spending in one sector of the Wisconsin economy must be offset by spending elsewhere, such that money is neither created nor destroyed. For example, increased consumer spending on energy-efficient appliances (in order to participate in Focus on Energy) is offset by decreased spending on other goods and services that would have occurred in the absence of Focus on Energy. Additionally, investments in Focus on Energy must be funded by customers through added rates to their utility bill payments. As a result, total statewide spending remains constant, and modeled results represent the difference between an economy with and without Focus on Energy ("net economic impacts").

Cadmus used the REMI E3+ model's standard regional control as the baseline scenario ("control forecast") against which the economic impacts created by Focus on Energy ("alternative forecast") can be compared. The standard regional control captures the impacts of economic activity that would have occurred without Focus on Energy investments in energy efficiency and renewable energy, project spending by customers, and the resulting energy savings and emissions reductions. This baseline economic activity is comprised primarily of participants' consumption of fuel and power had they not received incentives from Focus on Energy to purchase energy-efficient or renewable energy technologies or services.

As Figure 7 illustrates, the REMI E3+ model compares the differences in impacts from the control and alternative forecasts to estimate the net economic impacts created by Focus on Energy.

Figure 7. Determining Net Economic Impacts with REMI E3+

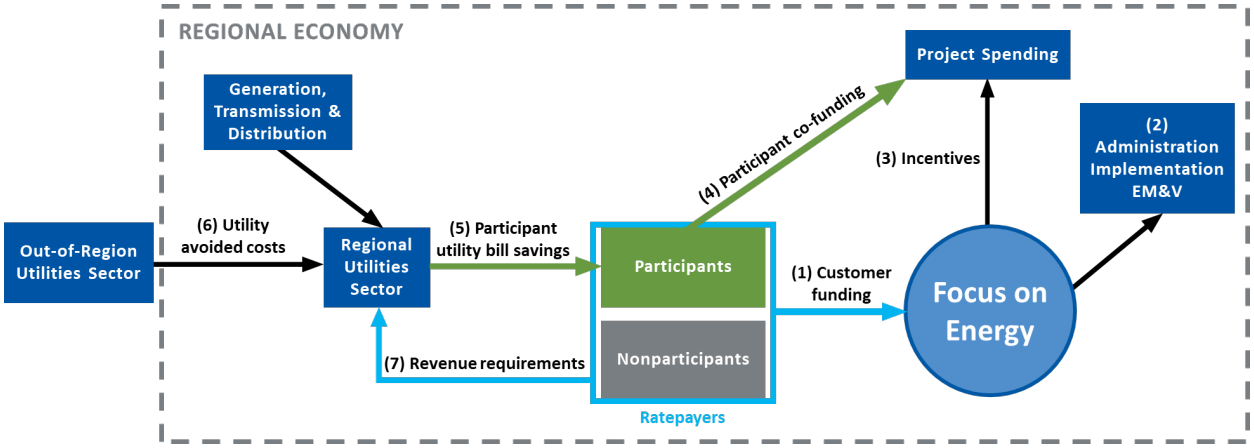


The REMI E3+ model calculates the control forecast based on the standard regional control and the alternative forecast based on user-customized model inputs (which, for this analysis, reflect economic activity related to Focus on Energy). The model integrates economic data collected by various federal 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 U.S. 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.[10]

For each program year of the biennium and in aggregate, Cadmus customized REMI E3+ inputs to model Focus on Energy-related cash flows among relevant stakeholder groups, as shown in Figure 8.

[10] For a more detailed breakdown of the data sources and estimate procedures included in the REMI E3+ model forecasts, please reference REMI's user documentation online: https://www.remi.com/wp-content/uploads/2019/11/Model-Equations.pdf.

Figure 8. Economic Cash Flows Attributable to Focus on Energy



These cash flows—consisting of customer funding; spending on administration, implementation, and evaluation, measurement, and verification (EM&V); incentives; participant co-funding; participant utility bill savings; utility avoided costs; and revenue requirements—affect the Wisconsin economy as follows:

(1) Customer funding. Funding for Focus on Energy originates from participating utilities' revenues, which are collected from Wisconsin customers through a charge embedded in their utility bills.

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

(3) Incentives. Focus on Energy funds are also spent on direct financial and service-based incentives that encourage investments in energy-saving technologies and behaviors.

- For accounting purposes, **customer funding** equals **direct spending** plus **incentives.** In other words, utility expenditures on Focus on Energy are offset dollar-for-dollar by customer funding.

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

- Because participants choose to invest in energy efficiency or renewable energy ("Project Spending", Figure 8), Cadmus assumes that participants would have spent these funds elsewhere in Wisconsin's economy. Accordingly, **participant co-funding** is offset by an equal-and-opposite decrease in customer spending in other industries.[11]

(5) Participant utility bill savings. Participants save energy for as long as energy-efficient and renewable energy measures remain installed and operational, as informed by EULs deemed by the Wisconsin technical reference manual (TRM). Those energy savings translate to participant utility bill savings.

[11] Assigned automatically by REMI.

- Every dollar saved by participants results in a dollar of lost revenues by utilities.

(6) Utility avoided costs. As a result of decreased demand for energy resources, Wisconsin utilities benefit from avoided fuel costs, calculated as function of energy savings.

(7) Revenue requirements. Utilities may seek to recover lost revenues (caused by **participant utility bill savings**) by increasing future retail rates paid by Wisconsin customers. When utilities increase rates, energy costs increase for all customers, resulting in higher utility bill payments and, thus, higher future revenues that help recover lost revenues. Cadmus assumes utilities pay a small return on investment to shareholders and reinvest the remaining recovered lost revenues in utility infrastructure.

Lastly, energy savings that generate **participant utility bill savings** and **utility avoided costs** also generate **emissions reductions**, which are not shown in Figure 8. With REMI's E3+ model, Cadmus can account for emission reductions as a non-cash flow input that affects Wisconsin's "attractiveness," leading to in-migration and additional stimulus of economic activity, including but not limited to higher labor force participation and employment and increased retail and real estate activity.

Table 8 summarizes model inputs according to their positive and negative impacts on relevant stakeholder groups.

Table 8. Summary of Positive and Negative Model Impacts by Cash Flow

Cash Flow	Positive Impacts	Negative Impacts
Customer funding	N/A	Reduces consumption and investments in other sectors of regional economy
Direct spending	Funds program administration, implementation, marketing, and EM&V	N/A
Incentives	Reduces up-front cost of project or measure for participant	N/A
Participant co-funding	Increases consumption on goods and services in sectors specific to Focus on Energy activity	Reduces consumption and investments on other goods/services by participants
Participant utility bill savings	Increases residential disposable income for savings and/or spending; Reduces commercial costs of production	Reduces utility revenue
Utility avoided costs	Reduces generation and T&D costs for in-state utilities	N/A
Revenue requirements	Partially offsets utility revenue losses, which utilities reinvest in infrastructure	Partially increases future bill rates charged to customers on their utility bills
Emissions reductions[1]	Increases "attractiveness" of Wisconsin, which stimulates more economic activity	N/A

[1] Not shown in Figure 8.

Model Input Data

This section describes evaluated spending and monetized energy savings data for energy efficiency and renewable energy projects completed through Focus on Energy, which Cadmus translated into REMI E3+ model inputs. All monetary inputs are presented in fixed 2020 U.S. dollars.[12]

For more information about the bolded terminology used in this section, refer to *Modeling Approach*.

First-Year Spending

First-year spending consists of direct spending by utilities on Focus on Energy offerings (including administrative costs and incentives) and project co-funding by participants.

Direct Spending

Direct spending on Focus on Energy offerings is comprised of **administration, implementation, and EM&V** costs and **incentives** and is funded by customers in participating utility service territories.

As shown in Table 9, direct spending totaled roughly $200 million during the 2019–2020 biennium. Cadmus sourced direct spending data from Baker Tilly and Statewide Energy Efficiency and Renewable Administration (SEERA) annual expense reports.[13]

Table 9. Focus on Energy Direct Spending by Category

Program Year	Direct Spending Categories ($1000s)				
	Administration	Implementation	Incentives	EM&V	Total
CY2019	$3,327[1]	$35,144	$66,426	$2,156	**$107,054**
CY2020	$6,576	$26,780	$55,649	$4,609	**$93,604**
Biennium	**$9,894**	**$61,924**	**$122,075**	**$6,765**	**$200,658**

[1] Includes the Program Administrator's final bonus ($400,000) for the 2015–2018 quadrennium. Cadmus assumed 50% of the final bonus accrued outside of the analysis region (Wisconsin).

Participant Co-Funding

While some participants benefit from free direct-to-customer offerings such as appliance recycling and mail-order packs of energy-efficient measures, many Focus on Energy participants pay the cost of their energy efficiency and renewable energy projects that is not covered by utility incentives. **Participant co-**

[12] Calculated using the U.S. Bureau of Labor Statistics (BLS) consumer price index (CPI) for the Illinois-Indiana-Wisconsin region: https://data.bls.gov/cgi-bin/dsrv.

[13] Baker Tilly currently serves as the Focus on Energy Compliance Agent. SEERA is the legal entity (non-profit) formed by Energy Utilities to fulfill their obligations under Wisconsin Statute § 196.374(2)(a). SEERA creates and funds the statewide energy efficiency and renewable energy programs.

funding represents customer spending on energy efficiency and renewable energy that would have otherwise been spent elsewhere in the Wisconsin economy.[14]

Table 10 shows participant co-funding by program year and customer segment. Co-funding exceeded $330 million for the biennium, with commercial and industry (C&I) co-funding comprising more than 70% of all co-funding.

Table 10. Participant Co-Funding by Customer Segment

Program Year	Participant Co-Funding ($1000s)[1]		
	Residential	C&I	Total
CY2019	$42,275	$97,784	**$140,058**
CY2020	$51,084	$141,620	**$192,704**
Biennium	**$93,358**	**$239,404**	**$332,762**

[1] Totals may not sum due to rounding.

Energy Savings

The main benefit of Focus on Energy is participant energy savings. In its role as Evaluation Contractor for Focus on Energy, Cadmus calculates gross reported, gross verified, and net verified energy savings. For evaluation purposes, Cadmus uses net verified gross savings to calculate **participant utility bill savings** and **utility avoided costs**. These data are extracted from SPECTRUM, Focus on Energy's database.

Figure 9 illustrates first-year and future electric net verified savings by program year. Lifecycle savings, which represent the sum of first-year and future savings, vary based on the EULs of energy efficiency and renewable energy measures installed in each customer segment by program year. Residential participation generated 23% of first-year net verified energy savings (207 GWh) and 24% of lifecycle net verified energy savings (3,317 GWh).

[14] In SPECTRUM, participant co-funding is represented by net verified incremental costs. Net verified energy savings account for various market and behavioral forces for which adjustments are made to gross verified energy savings. The ratio between net and gross verified savings (net-to-gross, or NTG) is then applied incremental costs so that energy savings and incremental costs are scaled proportionally.

Figure 9. First-Year and Future Electric Net Verified Energy Savings (GWh)

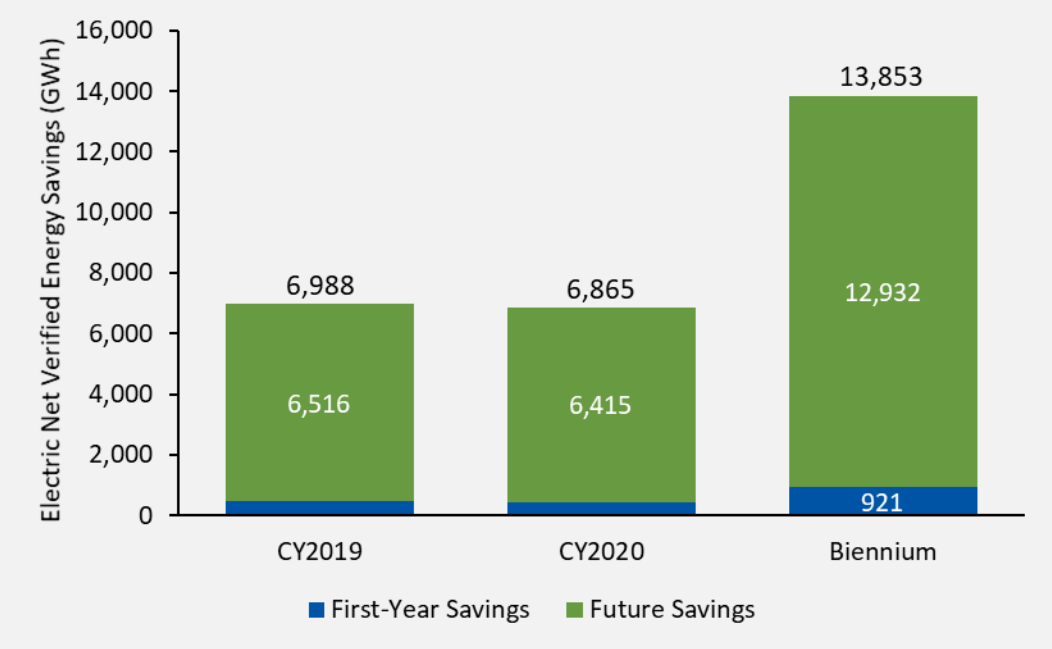


Figure 10 illustrates net verified demand reduction by program year. Residential participation generated 22% of net verified demand reduction (27.5 MW).

Figure 10. Electric Net Verified Demand Reduction (MW)

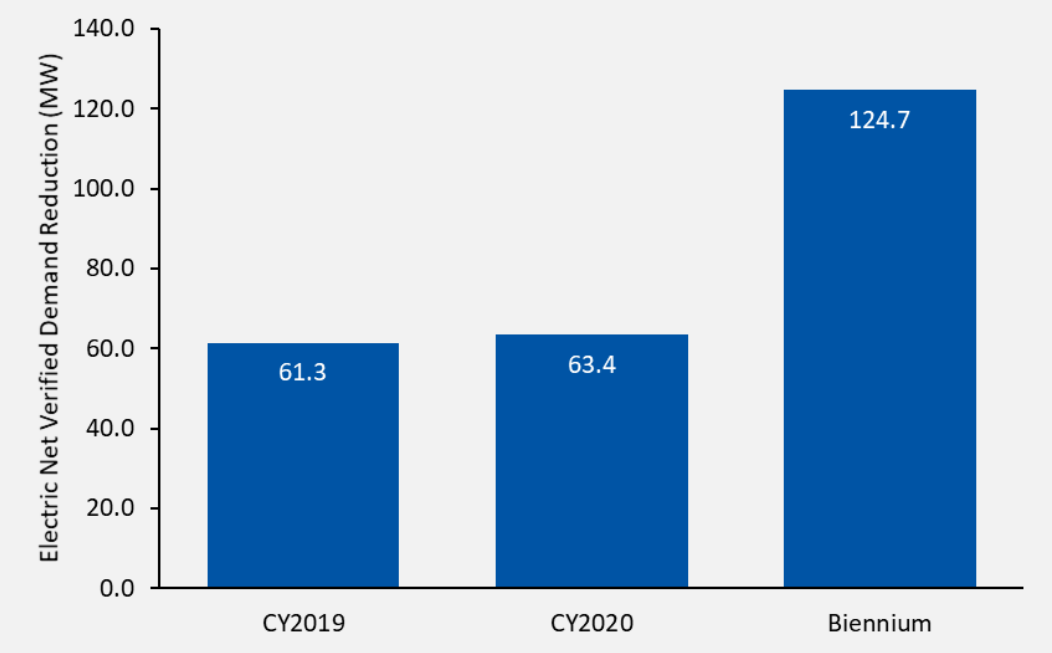
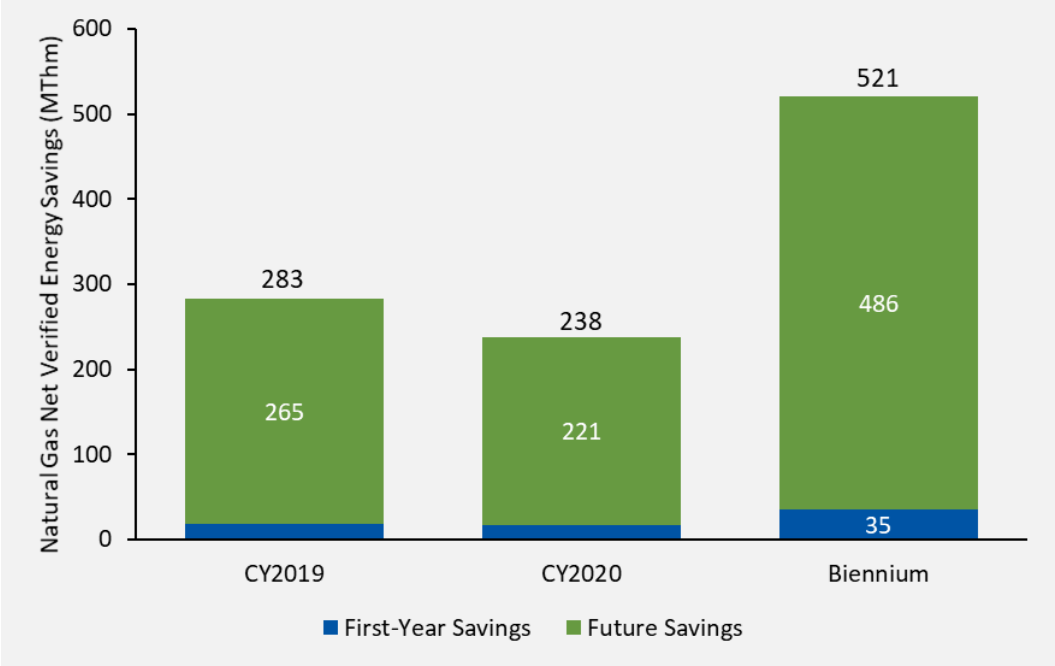


Figure 11 illustrates first-year and future natural gas net verified energy savings by program year. Residential participation generated 15% of first-year net verified energy savings (5,411 MThm) and 27% of lifecycle net verified energy savings (88,135 MThm).

Figure 11. First-Year and Future Natural Gas Net Verified Energy Savings (MThm)



Participant Bill Savings

Customers benefit from participating in Focus on Energy by saving energy, which helps them save money on their utility bills. Cadmus used net verified savings and retail rate data and projections[15] to calculate bill savings for participants, which recur annually until energy efficiency and renewable energy projects reach the end of their EULs, as deemed by the TRM.

Electric Bill Savings

Table 11 presents first-year and lifecycle electric bill savings attributable to each Focus on Energy program year. The biennium totaled nearly $100 million of first-year electric bill savings and will produce roughly $1.45 billion of lifecycle electric bill savings through 2044.

Table 11. Participant Electric Bill Savings

Program Year	Participant Electric Bill Savings ($1000s)[1]	
	First-Year	Lifecycle
CY2019	$48,613	$732,872
CY2020	$47,603	$717,487
Biennium	**$96,216**	**$1,450,358**

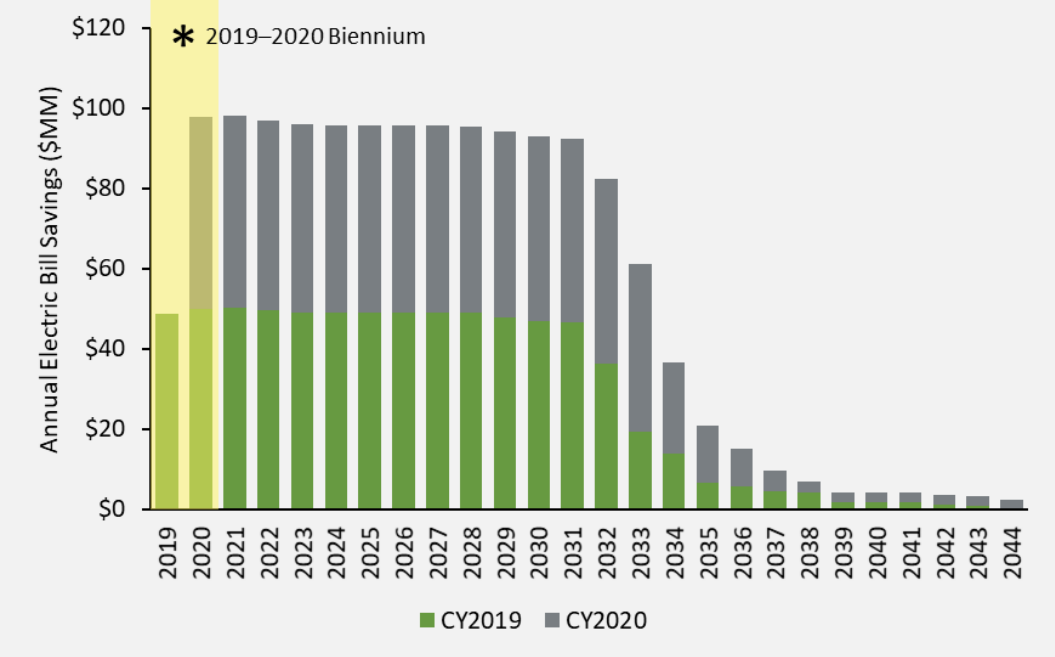
[1] Totals may not sum due to rounding.

Figure 12 illustrates the ongoing annual electric bill savings attributable to each Focus on Energy program year. Electric bill savings peak at roughly $50 million annually per program year ($100 million

[15] U.S. Energy Information Administration Annual Energy Outlook 2021: https://www.eia.gov/outlooks/aeo/data/browser/.

annually for the biennium), begin to taper off about 12 years after energy efficiency and renewable energy projects are originally completed, and fall below $10 million annually by 2037.

Figure 12. Participant Annual Electric Utility Bill Savings by Program Year



Natural Gas Bill Savings

Table 12 presents first-year and lifecycle natural gas bill savings attributable to each Focus on Energy program year. Because of the COVID-19 pandemic and accompanying economic uncertainty, fewer business and industrial customers completed energy projects in CY2020. In sum, the biennium created more than $21 million in first-year natural gas bill savings and will create more than $335 million in lifecycle natural gas bill savings through 2044.

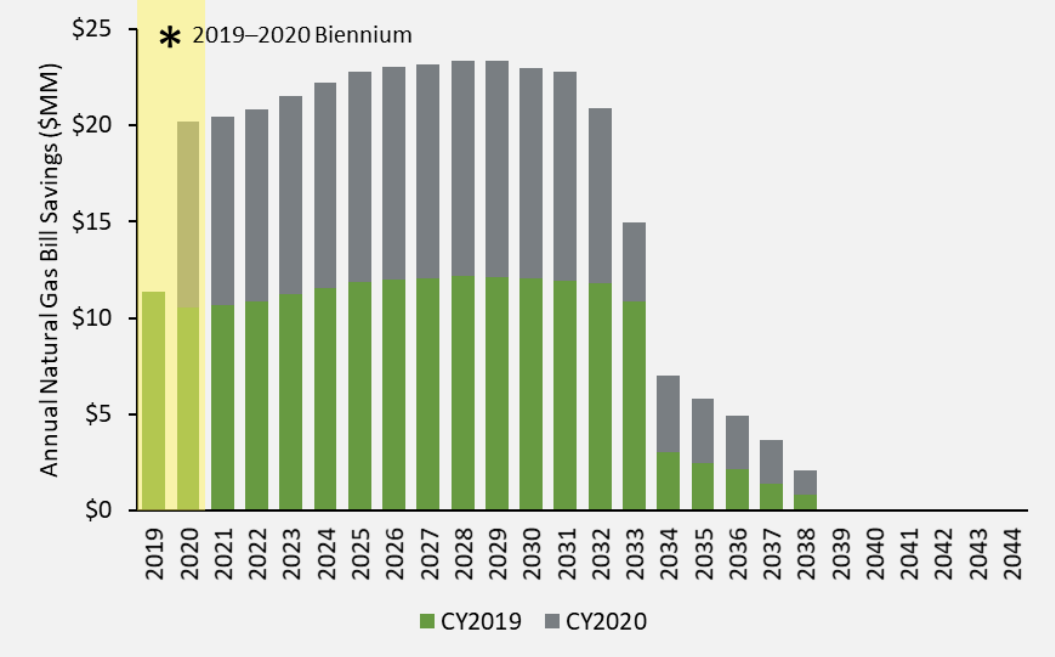
Table 12. Participant Natural Gas Bill Savings

Program Year	Participant Natural Gas Bill Savings ($1000s)[1]	
	First-Year	Lifecycle
CY2019	$11,375	$183,071
CY2020	$9,678	$154,455
Biennium	**$21,053**	**$337,525**

[1] Totals may not sum due to rounding.

Figure 13 illustrates the ongoing annual natural gas bill savings attributable to each program year of Focus on Energy investments and activity. Natural gas bill savings peak at roughly $23 million annually for the biennium in 2028, taper off after 2033, and cease completely by 2039.

Figure 13. Participant Annual Natural Gas Bill Savings by Program Year



Utility Avoided Costs

Some of the energy that Wisconsin utilities sell to customers is purchased from out-of-state. When participants conserve energy through Focus on Energy, utilities benefit from avoiding the cost of purchasing energy. Ahead of the CY2020 program year, the PSC made the decision[16] to account for the electric T&D avoided cost benefits attributable to Focus on Energy programs. For this analysis, Cadmus included T&D avoided cost benefits retroactively for CY2019.

Cadmus used net verified energy savings (kWh) and net verified demand savings (kW) along with data provided by the PSC to calculate avoided costs of energy and T&D, which recur annually until energy efficiency and renewable energy projects reach the end of their EULs, as deemed by the TRM.

Electric Avoided Costs

Table 13 presents first-year and lifecycle electric avoided costs attributable to each Focus on Energy program year. Energy savings generated roughly $40 million of first-year electric avoided costs and nearly $700 million of lifecycle electric avoided costs through 2044.

[16] Public Service Commission of Wisconsin, Quadrennial Planning Process Final Decision, Accessed February 10, 2022: https://apps.psc.wi.gov/ERF/ERFview/viewdoc.aspx?docid=406591

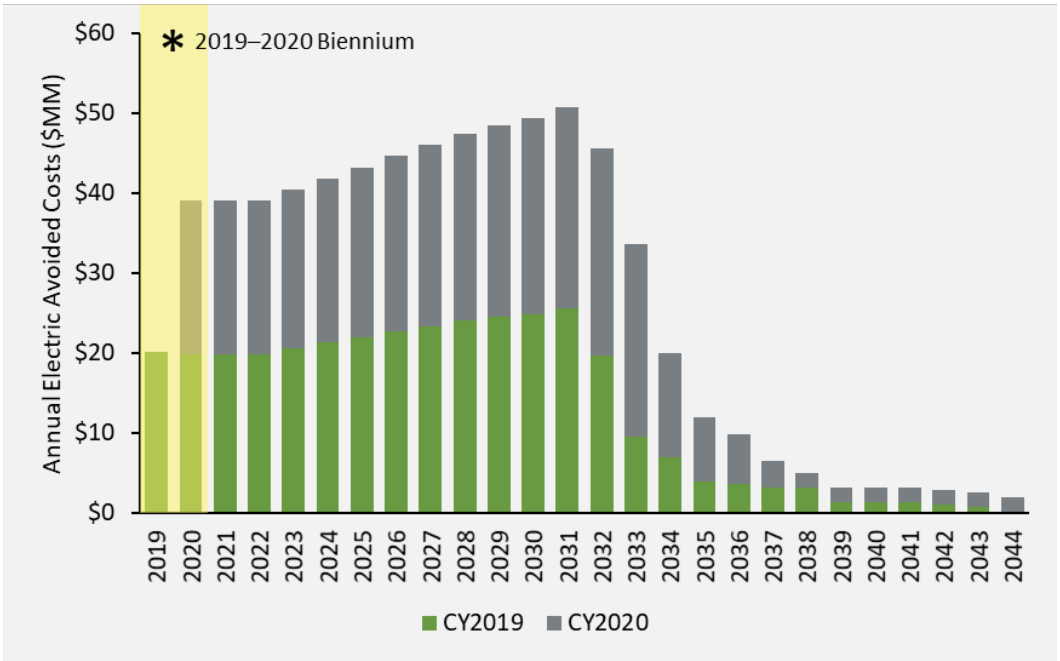
Table 13. Utility Electric Avoided Costs

Program Year	Utility Electric Avoided Costs ($1000s)[1]	
	First-Year	Lifecycle
CY2019	$20,052	$344,048
CY2020	$19,233	$353,868
Biennium	**$39,285**	**$697,917**

[1] Totals may not sum due to rounding.

Figure 14 illustrates the ongoing annual electric avoided costs attributable to each Focus on Energy program year. Electric avoided costs peak at roughly $51 million in 2031, at which point they taper off, eventually falling to $3 million annually in 2039.

Figure 14. Utility Annual Electric Avoided Costs by Program Year



Changes to Electric Avoided Cost Assumptions

Periodically, as needed, the PSC and EWG update methodology, data, and/or assumptions related to the calculation of avoided costs. In 2020, the PSC updated the avoided cost of the generation of electricity, forecasted from 2020 through 2050. The PSC also decided to include T&D avoided cost benefits ahead of the CY2020 program year. For this analysis, Cadmus applied T&D avoided costs to CY2019 as well.

Table 14 compares the forecasted avoided costs of energy per Megawatt-hour (MWh) of electricity between the previous quadrennium (2015–2018) and the current quadrennium (2019–2022).

Table 14. Avoided Costs of Electricity ($/MWh) by Quadrennial Forecast

Year	2015–2018 Quad	2019–2022 Quad
2019	$29.145	$30.929[1]
2020	$35.252	$30.929
2021	$41.359	$30.929
2022	$47.467	$30.928
2023	$49.753	$32.294
2024	$52.040	$33.659
2025	$54.327	$35.025
2026	$56.614	$36.390
2027	$58.900	$37.756
2028	$60.863	$39.133
2029	$62.825	$40.511
2030	$64.787	$41.889
2031	$66.749	$43.266

Year	2015–2018 Quad	2019–2022 Quad
2032	$68.712	$44.644
2033	$68.712	$46.022
2034	$68.712	$47.400
2035	$68.712	$48.777
2036	$68.712	$50.155
2037	$68.712	$51.533
2038	$68.712	$52.910
2039	$68.712	$54.288
2040	$68.712	$55.666
2041	$68.712	$57.043
2042	$68.712	$58.421
2043	$68.712	$59.799
2044	$68.712	$61.176

[1] Because the current forecast begins in 2020, Cadmus used the avoided cost of electricity in 2020 for 2019.

The difference between previously and currently forecasted avoided costs of electricity grows as large as 23.5 cents per kWh (in 2031) and approximately amounts to a 30% decrease in avoided costs overall. The effects of changes to electric avoided cost assumptions are described in further detail in *Impact of Updated Electric Avoided Costs*.

Table 15 shows the forecasted avoided costs of T&D per kilowatt (kW).

Table 15. Avoided Costs of T&D ($/kW-yr)

Year	2019–2022 Quad
2019	$66.40
2020	$66.47
2021	$66.54
2022	$66.61
2023	$66.69
2024	$66.76
2025	$66.85
2026	$66.93
2027	$67.02
2028	$67.11
2029	$67.21
2030	$67.31
2031	$67.41

Year	2019–2022 Quad
2032	$67.51
2033	$67.62
2034	$67.73
2035	$67.85
2036	$67.97
2037	$68.09
2038	$68.21
2039	$68.34
2040	$68.47
2041	$68.61
2042	$68.74
2043	$68.88
2044	$69.03

Natural Gas Avoided Costs

Table 16 presents first-year and lifecycle natural gas utility avoided costs attributable to each Focus on Energy program year. Energy savings generated roughly $19 million of first-year natural gas avoided costs and will generate nearly $320 million of lifecycle natural gas avoided costs through 2044.

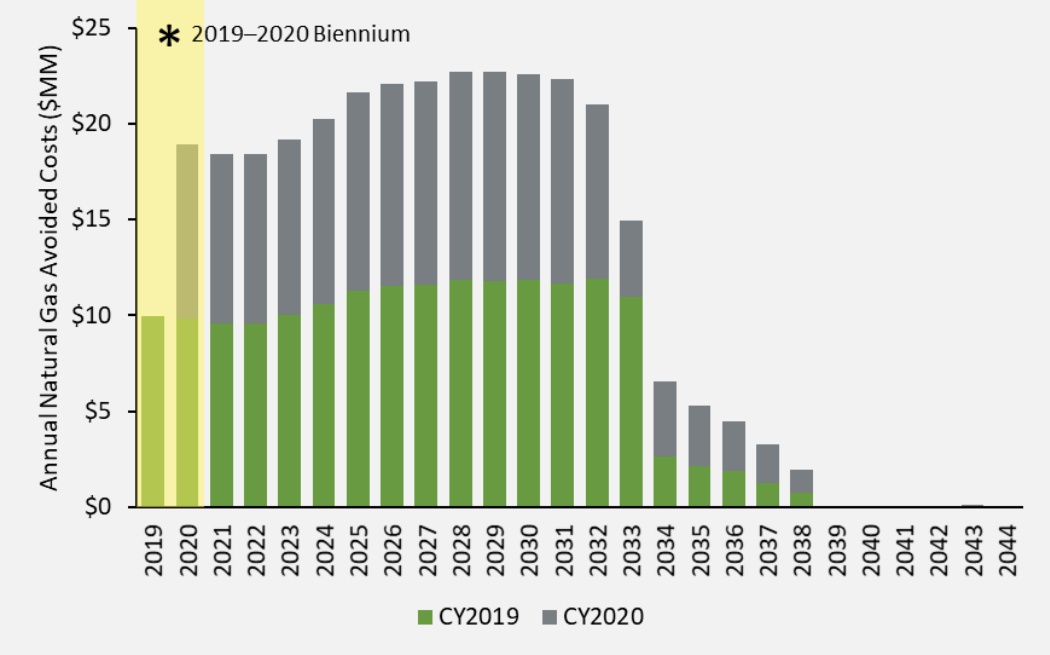
Table 16. Utility Natural Gas Avoided Costs

Program Year	Utility Natural Gas Avoided Costs ($1000s)[1]	
	First-Year	Lifecycle
CY2019	$9,957	$172,704
CY2020	$9,036	$146,258
Biennium	**$18,993**	**$318,962**

[1] Totals may not sum due to rounding.

Figure 15 illustrates the ongoing annual natural gas avoided costs attributable to each Focus on Energy program year. Natural gas avoided costs peak at roughly $23 million in 2029, taper off after 2033, and cease almost completely by 2039.

Figure 15. Annual Utility Natural Gas Avoided Costs by Program Year



Changes to Natural Gas Avoided Cost Assumptions

In 2020, the PSC also updated the avoided cost of natural gas generation, forecasted through 2050.

Table 17 compares the forecasted avoided costs per therm of natural gas between the previous quadrennium (2015–2018) and the current quadrennium (2019–2022).

Table 17. Avoided Costs of Natural Gas ($/therm) by Quadrennial Forecast

Year	2015–2018 Quad	2019–2022 Quad	Year	2015–2018 Quad	2019–2022 Quad
2019	$0.778	$0.538[1]	2032	$1.062	$0.677
2020	$0.731	$0.538	2033	$1.100	$0.688
2021	$0.779	$0.524	2034	$1.125	$0.695
2022	$0.805	$0.524	2035	$1.157	$0.702
2023	$0.828	$0.546	2036	$1.200	$0.715
2024	$0.855	$0.577	2037	$1.207	$0.719
2025	$0.874	$0.617	2038	$1.213	$0.721
2026	$0.895	$0.629	2039	$1.240	$0.724
2027	$0.917	$0.633	2040	$1.278	$0.735
2028	$0.935	$0.647	2041	$1.278	$0.732
2029	$0.965	$0.650	2042	$1.278	$0.740
2030	$1.008	$0.657	2043	$1.278	$0.750
2031	$1.030	$0.654	2044	$1.278	$0.764

[1] Because the current forecast begins in 2020, Cadmus used the avoided cost of natural gas in 2020 for 2019.

The difference between previously and currently forecasted avoided costs of natural gas grows as large as 54.3 cents per therm (in 2040) and approximately amounts to a 33% decrease in avoided costs overall. The effects of changes to natural gas avoided cost assumptions are described in further detail in *Impacts of Updated Natural Gas Avoided Costs*.

Net Revenue Effects

Net revenue effects describe the competing impacts of energy savings. Utilities benefit by spending less on fuel and other variable costs associated with energy and T&D (avoided costs). However, participants consuming less energy means utilities sell less energy, resulting in participant bill savings but also less utility revenue. In most cases, including for Wisconsin utilities, the costs of lost revenue exceed the benefits of avoided costs, which may cause utilities to collect less revenue than forecasted.

Net revenue effects are calculated as the difference between revenue losses and avoided costs. In Wisconsin, utilities charge more to deliver energy to customers (retail rates) than what they pay to purchase energy from out-of-state and to transmit and distribute electricity (avoided costs). Thus, when participants save energy, the loss in revenue from each unit of energy saved exceeds its avoided cost, which results in negative net revenue effects that exert downward pressure on net economic impacts.

As described in *Modeling Approach*, utilities may seek to recover lost revenues on a lagged schedule by increasing retail rates charged to customers in future years to fulfill revenue requirements. In coordination with the EWG, Cadmus developed an approach to address this effect. For this analysis, it is assumed that half of revenues lost to energy savings annually will be recovered by utilities in the following year.

Electric Net Revenue Effects

Table 18 presents the first-year and lifecycle electric net revenue effects attributable to each Focus on Energy program year. Lifecycle net revenue effects of electric energy savings sum to roughly –$750 million through 2044.

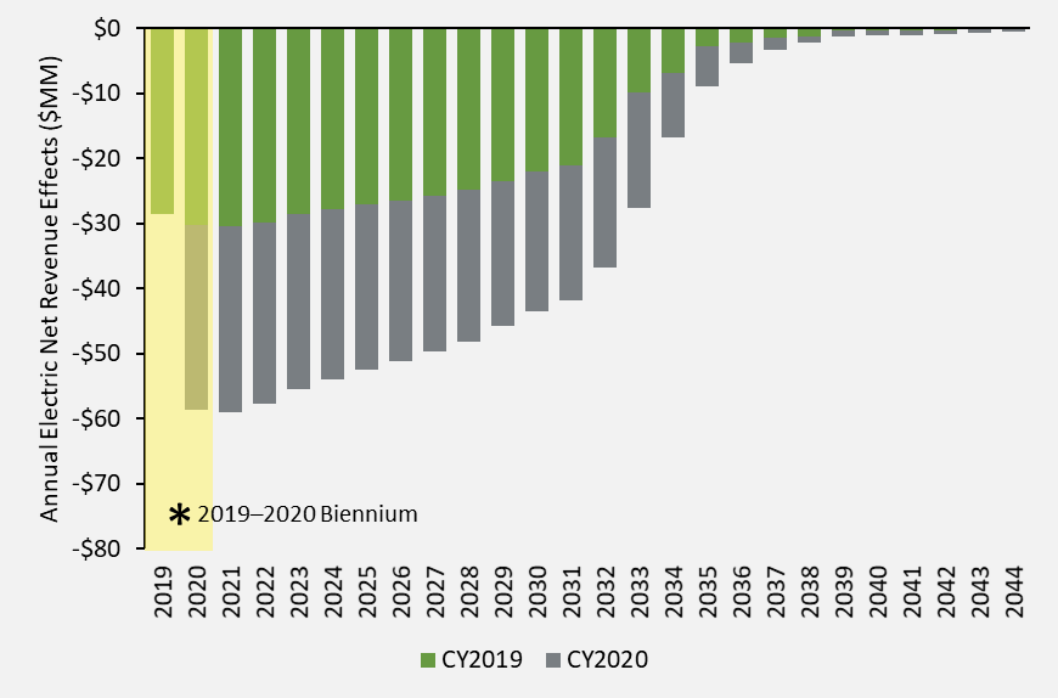
Table 18. Utility Electric Net Revenue Effects

Program Year	Electric Net Revenue Effects ($1000s)[1]	
	First-Year	Lifecycle
CY2019	–$28,561	–$388,823
CY2020	–$28,370	–$363,618
Biennium	**–$56,931**	**–$752,442**

[1] Totals may not sum due to rounding.

Figure 16 illustrates the annual utility electric net revenue effects that accumulate from energy savings generated by Focus on Energy participants. Electric net revenue effects are expected to reach an annual peak of nearly –$60 million in 2021, taper off slowly through 2031, then fade quickly until 2039, consistent with annual participant bill savings and utility avoided costs. The inclusion of T&D avoided cost benefits reduces peak annual electric net revenue effects by –$10 million.

Figure 16. Annual Utility Electric Net Revenue Effects by Program Year



Impact of Updated Electric Avoided Costs

Electric avoided costs are lower for the 2019–2020 biennium analysis than for the 2015–2018 quadrennium (*Changes to Electric Avoided Cost Assumptions*), resulting in utilities recovering a larger amount of lost revenues from customers in future years (*Net Revenue Effects*) and leading to smaller economic benefits.

Cadmus estimated the impacts using the previous and current studies' electric avoided costs, as shown in Table 19. Changes to electric avoided costs—consisting of lower avoided costs of electricity and the inclusion of T&D avoided costs—reduce projected employment growth by roughly 2,400 jobs, economic benefits by $400 million, and disposable personal income gains by $300 million through 2044.

Table 19. Effects of Updated Electric Avoided Costs on Cumulative Net Economic Impacts[1]

Net Economic Impact Category	Current Avoided Costs	Previous Avoided Costs	Difference[2]
Employment (jobs)	8,430	10,840	–2,420 (–22%)
Economic Benefit (millions of dollars[3])	$972	$1,377	–$406 (–29%)
Disposable Personal Income (millions of dollars[3])	$872	$1,169	–$296 (–25%)

[1] Values reflect net economic impacts for biennium in aggregate.
[2] Differences in net economic impacts account only for changes to electric avoided costs. For changes to natural gas avoided costs, see *Impacts of Updated Natural Gas Avoided Costs*.
[3] Fixed 2020 U.S. dollars.

Natural Gas Net Revenue Effects

Table 20 presents the first-year and lifecycle natural gas net revenue effects attributable to each Focus on Energy program year. Lifecycle net revenue effects of natural gas energy savings sum to nearly –$19 million through 2044.

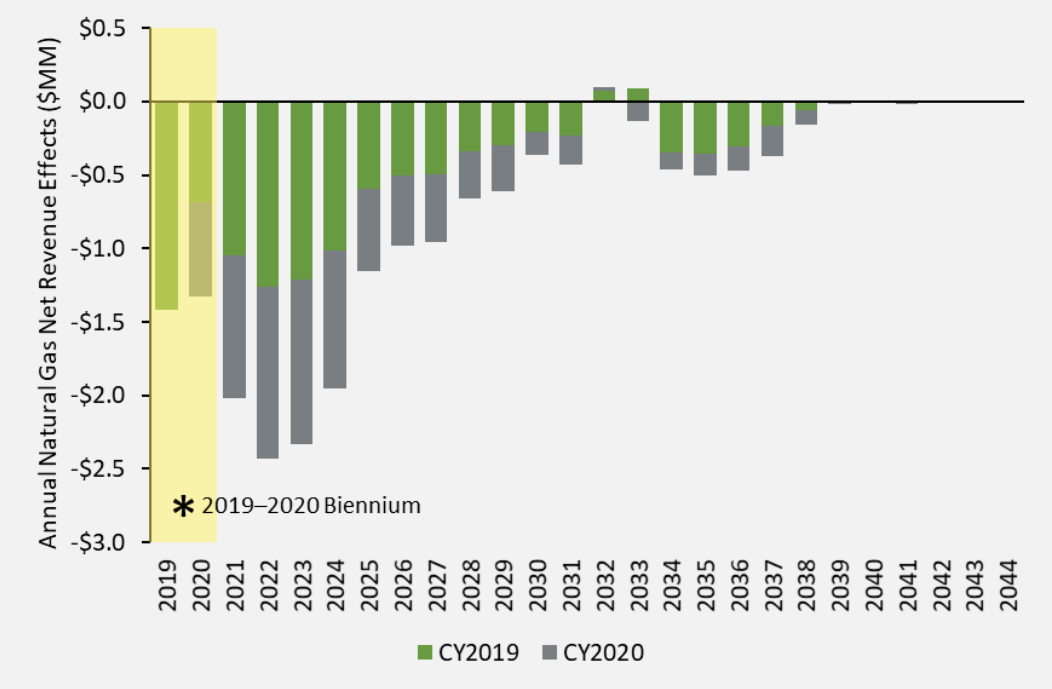
Table 20. Utility Natural Gas Net Revenue Effects

Program Year	Natural Gas Net Revenue Effects ($1000s)[1]	
	First-Year	Lifecycle
CY2019	–$1,418	–$10,367
CY2020	–$642	–$8,197
Biennium	**–$2,060**	**–$18,563**

[1] Totals may not sum due to rounding.

Figure 17 illustrates the annual utility natural gas net revenue effects that accumulate from energy savings generated by Focus on Energy participants. Natural gas net revenue effects are expected to reach an annual peak of –$2.5 million in 2022, taper off slowly through 2031, then fade until 2039, consistent with annual participant bill savings and utility avoided costs.

Figure 17. Annual Utility Natural Gas Net Revenue Effects by Program Year



Impacts of Updated Natural Gas Avoided Costs

Natural gas avoided costs are lower for the 2019–2020 biennium analysis than for the 2015–2018 quadrennium (*Changes to Natural Gas Avoided Cost Assumptions*), resulting in utilities recovering a larger amount of lost revenues from customers in future years (*Net Revenue Effects*) and leading to smaller economic benefits.

Cadmus estimated the impacts using the previous and current studies' natural gas avoided costs, as shown in Table 21. Changes to natural gas avoided cost assumptions reduce projected employment growth by roughly 1,500 jobs, economic benefits by $240 million, and disposable personal income gains by $180 million through 2044.

Table 21. Effects of Updated Natural Gas Avoided Costs on Cumulative Net Economic Impacts[1]

Net Economic Impact Category	Current Avoided Costs	Previous Avoided Costs	Difference[2]
Employment (jobs)	8,430	9,900	–1,470 (–15%)
Economic Benefit (millions of dollars[3])	$972	$1,212	–$240 (–20%)
Disposable Personal Income (millions of dollars[3])	$872	$1,051	–$179 (–17%)

[1] Values reflect net economic impacts for biennium in aggregate.
[2] Differences in net economic impacts account only for changes to natural gas avoided costs. For changes to electric avoided costs, see *Impact of Updated Electric Avoided Costs*.
[3] Fixed 2020 U.S. dollars.

Emissions Reductions

To quantify emissions reductions, Cadmus used emissions factors[17,18] that depict the rates at which a unit of energy emits pollutants. Table 22 shows emission reduction factors specific to each fuel type and pollutant, including nitrogen oxides (NO_X), sulfur dioxide (SO_2), and fine particulate matter ($PM_{2.5}$).

Table 22. Emissions Factors by Pollutant and Fuel Type

Fuel Type	Emission Factors (Tons/Unit)		
	NO_X	SO_2	$PM_{2.5}$
Electricity (tons/MWh)	7.8 E-04	1.6 E-03	8.0 E-05
Natural gas (tons/therm)	4.7 E-06	3.0 E-08	3.8 E-08

The product of the emissions factors and the net lifecycle energy savings establishes the total weight (in tons) of emissions reduced by energy saved through Focus on Energy projects. Table 23 shows cumulative emissions reductions for each pollutant and program year.

Table 23. Lifecycle Emissions Reductions (Tons) by Pollutant

Program Year	Lifecycle Emissions Reductions (Tons)[1]		
	NO_X	SO_2	$PM_{2.5}$
CY2019	–6,780	–11,261	–666
CY2020	–6,473	–11,061	–639
Biennium	**–13,252**	**–22,322**	**–1,306**

[1] Totals may not sum due to rounding.

[17] Electric emissions derived from U.S. Environmental Protection Agency's (EPA) AVERT (AVoided Emissions and geneRation Tool): https://www.epa.gov/statelocalenergy/avoided-emissions-and-generation-tool-avert.

[18] Natural gas emissions factors derived from EPA's AP-42: Compilation of Air Emissions Factors: https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors.

Appendix A: Potential Study Scenarios

In 2021, Cadmus published an assessment that estimated the energy efficiency potential of conservation resources available to Focus on Energy over a 12-year period, from 2023 through 2034.[19] This potential study was intended to provide information to the PSC and stakeholders in planning for Focus on Energy's 2023–2026 quadrennium. To enhance the information provided by the potential study, Cadmus conducted a supplemental net economic impact analysis for the forthcoming CY2023 through CY2026 program years based on the direct spending and 25 years of projected energy savings that were estimated by the potential study. This analysis investigates multiple scenarios from the potential study, each with varying magnitudes of energy-saving potential and impacts:

- **Current policy (CP) potential**, a subset of optimized potential, is constrained by the current Focus on Energy budget and in consideration of the equitable balance of current customer program contributions, such as splits between fuels and customer segments. This scenario resembles current and historical Focus on Energy portfolio design most closely and has the smallest budget and energy-saving potential of the scenarios analyzed in this study.
  - **Current policy +50% funding (CP+50)** represents current policy potential where Focus on Energy's annual budget increases by 50%.
  - **Current policy +100% funding (CP+100)** represents current policy potential where Focus on Energy's annual budget increases by 100%.
- **Economic potential (EP)** represents all theoretical savings opportunities that are cost-effective to implement now, according to the Modified Total Resource Cost (MTRC) test, regardless of barriers to participation and budget constraints.[20] Among the scenarios analyzed in this study, the economic potential scenario has the largest budget and energy-saving potential.
- **Optimized potential (OP)**, a subset of economic potential, represents all theoretical cost-effective savings opportunities that could realistically be realized if Focus on Energy funding were not constrained. It represents the portion of economic potential that might be assumed reasonably attainable over the course of the planning horizon, given minimal implementation barriers to impede customer participation.

Table A-24 presents average annual budget estimates for each potential study scenario described above. Administration costs and incentives are informed by the potential study while all other costs (including non-program costs, EM&V costs, and the Program Administrator's performance bonus actual data from the 2019–2020 biennium, and annual budget estimates) range from $99 million to $199 million.

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[19] Cadmus, *2021 Focus on Energy Energy Efficiency Potential Study Report*. 2021, September 10. https://focusonenergy.com/sites/default/files/inline-files/Potential_Study_Report-FoE_Efficiency-2021.pdf.

[20] Economic potential is a subset of technical potential, which represents the theoretical maximum of technically feasible, commercially available energy-saving opportunities, regardless of costs or market barriers.

Table A-24. Potential Study Annual Budget Estimates ($1000s)

Potential Study Scenario	Administration Costs and Incentives[1]	Portfolio Costs[2]	Annual Total[3]
Current Policy	$87,273	$11,503	**$98,776**
Current Policy +50% Spending	$130,910		**$142,412**
Current Policy +100% Spending	$174,546		**$186,049**
Optimized Potential	$137,248		**$148,751**
Economic Potential	$187,723		**$199,226**

[1] Based on the potential study.
[2] Based on actual portfolio (non-program) costs from the 2019–2020 biennium. Includes EM&V costs and the Program Administrator's performance bonus.
[3] Totals do not include budget allocation for renewable project incentives.

Table A-25 presents average annual first-year gross energy savings estimates for each scenario. Gross energy savings estimates are informed by the potential study, while net energy savings (Table A-29) are derived by applying net-to-gross (NTG) ratios from the 2019–2020 biennium to gross energy savings.

Table A-25. Potential Study Annual First-Year Gross Energy Savings Estimates

Potential Study Scenario	MWh	MW	MThm	MMBtu
Current Policy	784,002	138	12,010	**3,876**
Current Policy +50% Spending	1,068,982	204	19,716	**5,619**
Current Policy +100% Spending	1,161,220	228	32,557	**7,218**
Optimized Potential	988,257	177	30,170	**6,389**
Economic Potential	1,250,794	252	36,887	**7,956**

Figure A-18 shows cumulative employment impacts for each scenario. Increasing the current policy budget by 50% ($43.6 million more per program year) would add roughly 6,250 more jobs to the Wisconsin economy compared to the current policy—which is projected to add more than 16,000 jobs through 2050—and doubling the current policy budget ($87.3 million more) would add more than 10,000 additional jobs.

Figure A-18. 2023-2026 Quadrennium Cumulative Jobs Added by Potential Study Scenario

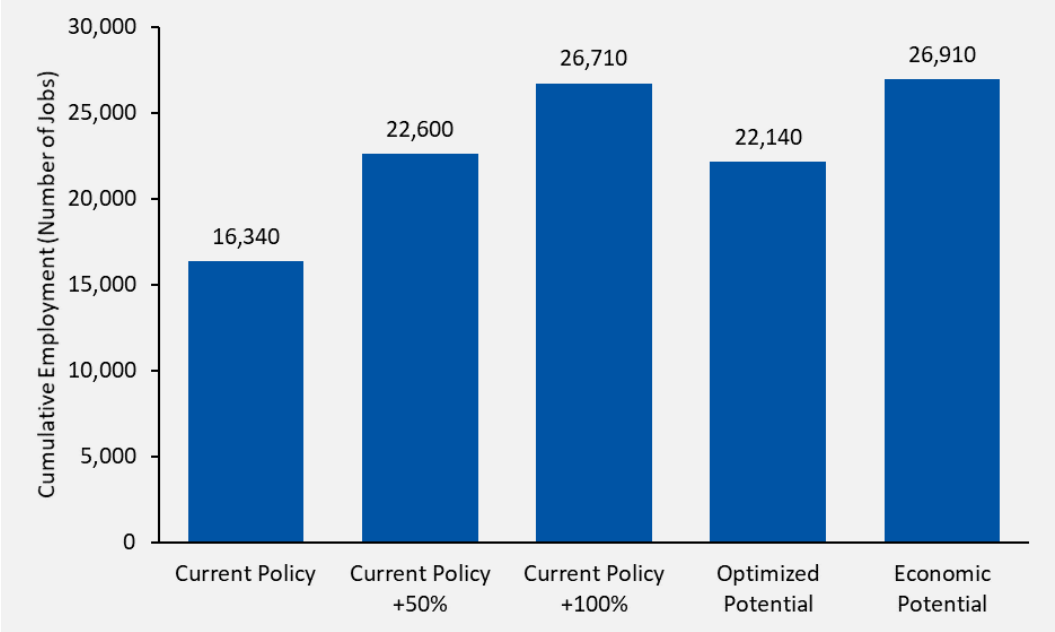
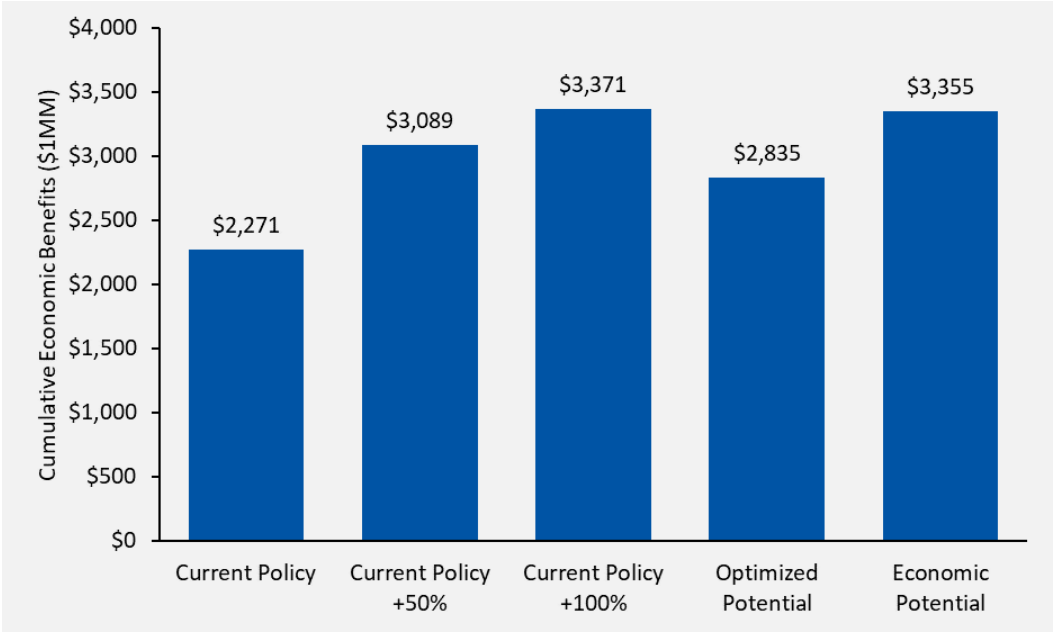


Figure A-19 shows cumulative economic benefits. Increasing the current policy budget by 50% would add more than $800 million in economic benefits to the Wisconsin economy compared to the current policy, and doubling the current policy budget would add more than $1.1 billion in additional benefits.

Figure A-19. 2023-2026 Quadrennium Cumulative Economic Benefits by Potential Study Scenario



The following subsections describe methodology, inputs, and results for each scenario in further detail.

Methodology and Model Input Data

The potential study defined each scenario's budget and energy savings, along with their allocations across customer segments (residential and non-residential) and fuel types (gas and electric). This section describes how Cadmus translated the potential study projections into economic impact model inputs.

Direct Spending

Direct spending includes administration costs, participant incentives, and participant project co-funding expenses. Using each potential study scenario's 12-year budget estimate, Cadmus calculated average annual administration costs and incentives[21] to apply to each of the four program years in the 2023–2026 quadrennium, as shown in Table A-26. For non-program direct spending not accounted for in the potential study, Cadmus used annual averages of actual costs incurred during the 2019–2020 biennium.

Table A-26. Potential Study Analysis Budget Model Inputs ($1000s)

Potential Study Scenario	Annual Average Budget Items			2023–2026 Quad Total[3]
	Program Costs[1]	Portfolio Costs[2]	Total	
Current Policy	$87,273	$11,503	**$98,776**	**$395,104**
Current Policy +50% Spending	$130,910		**$142,412**	**$569,650**
Current Policy +100% Spending	$174,546		**$186,049**	**$744,196**
Optimized Potential	$137,248		**$148,751**	**$595,005**
Economic Potential	$187,723		**$199,226**	**$796,903**

[1] Based on the potential study. Includes utility administration costs and incentives.
[2] Based on actual portfolio (non-program) costs from the 2019–2020 biennium. Includes EM&V costs and the Program Administrator's performance bonus.
[3] [2023–2026 Quad Total] = 4 * [Annual Average].

Incremental project costs consist of utility incentives and participant co-funding expenses. Table A-27 shows model inputs for participant co-funding annually and for the quadrennium. Cadmus assumed co-funding amounts change proportionally with incentive allocations for each customer segment.

Table A-27. Potential Study Analysis Co-Funding Model Inputs ($1000s)

Potential Study Scenario	Participant Co-Funding	
	Annual Average	2023–2026 Quad Total[1]
Current Policy	$117,747	**$470,989**
Current Policy +50% Spending	$165,447	**$661,788**
Current Policy +100% Spending	$229,998	**$919,994**
Optimized Potential	$175,358	**$701,433**
Economic Potential	$232,068	**$928,273**

[1] [2023–2026 Quad Total] = 4 * [Annual Total].

[21] For example, the potential study provides a 12-year budget estimate of $1,047,277,309 under the Current Policy scenario. The average annual value is calculated as $1,047,277,309 ÷ 12 = $87,273,109.

Energy Savings

Energy savings, which inform participant bill savings and utility avoided costs, are derived from the 12-year annual savings estimates provided by the potential study, summarized in Table A-28.

Table A-28. Potential Study First-Year Gross Energy Savings

Potential Study Scenario	Annual Average Gross Savings				2023–2026 Quad MMBtu[1]
	MWh	MW	MThm	MMBtu	
Current Policy	784,002	138	12,010	**3,876**	**15,504**
Current Policy +50% Spending	1,068,982	204	19,716	**5,619**	**22,476**
Current Policy +100% Spending	1,161,220	228	32,557	**7,218**	**28,871**
Optimized Potential	988,257	177	30,170	**6,389**	**25,556**
Economic Potential	1,250,794	252	36,887	**7,956**	**31,826**

[1] [2023–2026 Quad Total] = 4 * [Annual Total].

To determine the net energy savings attributable to Focus on Energy, Cadmus converted 12-year gross savings to annual gross savings and applied sector- and fuel-specific NTG ratios from the 2019–2020 biennium.[22,23] Then, to convert first-year net savings to lifecycle net savings, Cadmus applied EULs for energy efficiency projects completed during the 2019–2020 biennium. Project EULs range from one to 25 years and, when weighted by scenario-specific customer segment energy savings, range from 15.0 to 15.4 years.

Table A-29 shows first-year net energy savings estimates for each program year and for the 2023–2026 quadrennium. To inform participant bill savings and utility avoided costs, Cadmus used the retail rate and avoided cost forecasts from the 2019–2020 biennium analysis (see *Participant Bill Savings* and *Utility Avoided Costs*).

Table A-29. Potential Study Analysis First-Year Net Energy Savings Model Inputs

Potential Study Scenario	Annual Average Net Savings			2023–2026 Quad MMBtu[1]
	MWh	MThm	MMBtu	
Current Policy	494,779	9,148	2,603	**13,056**
Current Policy +50% Spending	664,254	15,091	3,776	**19,002**
Current Policy +100% Spending	706,336	25,407	4,951	**25,216**
Optimized Potential	601,582	23,728	4,425	**22,638**
Economic Potential	741,347	28,965	5,426	**27,773**

[1] [2023–2026 Quad Total] = 4 * [Annual Total].

[22] Cadmus, *Focus on Energy Calendar Year 2019 Evaluation Report, Volume I*. 2020, June 2. https://www.focusonenergy.com/sites/default/files/Annual_Report-CY_2019_Volume_I.pdf.

[23] Cadmus, *Focus on Energy Calendar Year 2020 Evaluation Report, Volume I*. 2021, May 21. https://focusonenergy.com/sites/default/files/inline-files/Evaluation_Report-2020-Volume_I.pdf.

Analysis Findings: Potential Study Scenarios

This section summarizes net economic impacts for each potential study scenario.

Current Policy Potential

Current policy (CP) potential, a subset of optimized potential, is constrained by the current Focus on Energy budget and in consideration of the equitable balance of current customer program contributions, such as splits between fuels and customer sectors. This scenario resembles current and historical Focus on Energy portfolio design most closely.

Table A-30 summarizes projected net economic impacts that would be attributable to each program year of the 2023–2026 quadrennium under current policy. In this funding scenario, Focus on Energy would add more than 16,300 jobs, almost $2.3 billion in economic benefit, and more than $1.8 billion in disposable personal income to the Wisconsin economy through 2050.

Table A-30. 2023–2026 Quadrennium Cumulative Net Economic Impacts: Current Policy

Key Economic Indicator	CY2023	CY2024	CY2025	CY2026	Total
Employment (jobs)	4,010	4,090	4,220	4,280	**16,340**
Economic Benefit (millions of dollars[1])	$515	$544	$578	$605	**$2,271**
Disposable Personal Income (millions of dollars[1])	$398	$427	$476	$500	**$1,806**

[1] Fixed 2020 U.S. dollars.

Current Policy +50% Spending

Current policy +50% funding (CP+50) represents current policy potential where Focus on Energy's administration costs and incentives are increased by 50%.

Table A-31 summarizes projected net economic impacts that would be attributable to each program year of the 2023–2026 quadrennium under current policy with 50% more funding. In this funding scenario, Focus on Energy would add 22,600 jobs, more than $3 billion in economic benefit, and more than $2.2 billion in disposable personal income to the Wisconsin economy through 2050. Compared to the current policy scenario, an increase in annual direct spending of roughly $47.6 million corresponds with more than 6,200 additional jobs and $800 million in additional economic benefits.

Table A-31. 2023–2026 Quadrennium Cumulative Net Economic Impacts: Current Policy +50%

Key Economic Indicator	CY2023	CY2024	CY2025	CY2026	Total
Employment (jobs)	5,520	5,650	5,850	5,930	**22,600**
Economic Benefit (millions of dollars[1])	$698	$738	$787	$824	**$3,089**
Disposable Personal Income (millions of dollars[1])	$483	$526	$604	$639	**$2,256**

[1] Fixed 2020 U.S. dollars.

Current Policy +100% Spending

Current policy +100% funding (CP+100) represents current policy potential where Focus on Energy's administration costs and incentives are increased by 100%.

Table A-32 summarizes projected net economic impacts that would be attributable to each program year of the 2023–2026 quadrennium under current policy with twice as much funding. In this funding scenario, Focus on Energy would add more than 26,700 jobs, nearly $3.4 billion in economic benefit, and more than $2.2 billion in disposable personal income to the Wisconsin economy through 2050. Compared to the current policy scenario, an increase in annual direct spending of roughly $87.3 million corresponds with more than 10,300 additional jobs and $1.1 billion in additional economic benefits.

Table A-32. 2023–2026 Quadrennium Cumulative Net Economic Impacts: Current Policy +100%

Key Economic Indicator	CY2023	CY2024	CY2025	CY2026	Total
Employment (jobs)	6,500	6,650	6,890	6,990	**26,710**
Economic Benefit (millions of dollars[1])	$760	$804	$861	$901	**$3,371**
Disposable Personal Income (millions of dollars[1])	$460	$511	$602	$644	**$2,219**

[1] Fixed 2020 U.S. dollars.

Optimized Potential

Optimized potential (OP) represents all theoretical cost-effective savings opportunities that could realistically be realized if Focus on Energy funding were not constrained. It represents the portion of economic potential that might be assumed reasonably attainable over the course of the planning horizon, given minimal implementation barriers to impede customer participation.

Table A-33 summarizes projected net economic impacts attributable to the CY2023 through CY2026 program years assuming fully realized optimized potential. Focus on Energy would add more than 22,000 jobs, $2.8 billion in economic benefit, and $1.6 billion in disposable personal income.

Table A-33. 2023–2026 Quadrennium Cumulative Net Economic Impacts: Optimized Potential

Key Economic Indicator	CY2023	CY2024	CY2025	CY2026	Total
Employment (jobs)	5,380	5,520	5,750	5,840	**22,140**
Economic Benefit (millions of dollars[1])	$637	$676	$728	$763	**$2,835**
Disposable Personal Income (millions of dollars[1])	$324	$371	$464	$503	**$1,645**

[1] Fixed 2020 U.S. dollars.

Economic Potential

Economic potential (OP) represents all theoretical savings opportunities that are cost-effective to implement now, according to the Modified Total Resource Cost (MTRC) test, regardless of barriers to participation and budget constraints.

Table A-34 summarizes projected net economic impacts attributable to the CY2023 through CY2026 program years assuming fully realized economic potential. Focus on Energy would add more than 26,900 jobs, $3.3 billion in economic benefit, and $1.6 billion in disposable personal income.

Table A-34. 2023–2026 Quadrennium Cumulative Net Economic Impacts: Economic Potential

Key Economic Indicator	CY2023	CY2024	CY2025	CY2026	Total
Employment (jobs)	6,500	6,680	7,010	7,130	**26,910**
Economic Benefit (millions of dollars[1])	$748	$796	$864	$907	**$3,355**
Disposable Personal Income (millions of dollars[1])	$297	$358	$486	$537	**$1,650**

[1] Fixed 2020 U.S. dollars.

Appendix B: Revised Cost-Effectiveness Results

Cadmus conducts the Focus on Energy economic impact analysis every two years. When Cadmus published its CY2019 and CY2020 Annual Evaluation Reports, the results of this analysis were not yet available. To make up for this lack of data, Cadmus used economic benefits from the final year (CY2018) of the previous analysis (2015–2018 quadrennium[24]) in its expanded TRC cost-effectiveness test, which consists of the modified TRC test plus economic benefits. This appendix summarizes how expanded TRC test results (documented in the CY2019 and CY2020 Annual Evaluation Reports) change when incorporating updated economic benefits from this analysis.

Table B-35 shows how expanded TRC test results change when outdated CY2018 economic benefits are replaced with updated CY2019 economic benefits. Cumulative economic benefits for CY2019 are estimated to be roughly $45 million lower than they would be if using CY2018 economic benefits, reducing the expanded TRC B/C ratio slightly from 4.80 to 4.61. This decrease in cost-effectiveness is attributable primarily to differences in avoided cost assumptions, as outlined in *Changes to Electric Avoided Cost Assumptions* and *Changes to Natural Gas Avoided Cost Assumptions*.

Table B-35. Revised CY2019 Expanded Total Resource Cost Test Results

Test Component	Modified TRC (Without Economic Benefits)	Expanded TRC With CY2018 Benefits	Expanded TRC With CY2019 Benefits
Administrative Costs	$4,938,358	$4,938,358	$4,938,358
Delivery Costs	$33,090,816	$33,090,816	$33,090,816
Incremental Measure Costs	$197,512,151	$197,512,151	$197,512,151
Total TRC Costs	**$235,541,325**	**$235,541,325**	**$235,541,325**
Electric Benefits	$340,572,539	$340,572,540	$340,572,539
Natural Gas Benefits	$147,319,948	$147,319,948	$147,319,948
Emissions Benefits	$118,803,890	$118,803,890	$118,803,890
T&D Benefits	$0	$0	$0
Economic Benefits	$0	$523,938,334	$478,568,517
Total TRC Benefits	**$606,696,377**	**$1,130,634,711**	**$1,085,264,894**
TRC Benefits Minus Costs	**$371,155,052**	**$895,093,387**	**$849,723,569**
TRC Benefit/Cost Ratio	**2.58**	**4.80**	**4.61**

Table B-36 shows how expanded TRC test results change when outdated CY2018 economic benefits are replaced with updated CY2020 economic benefits. Cumulative economic benefits for CY2019 are estimated to be more than $50 million lower than they would be if using CY2018 economic benefits, reducing the expanded TRC B/C ratio slightly from 4.32 to 4.15. This decrease in cost-effectiveness is attributable primarily to differences in avoided cost assumptions, as outlined in *Changes to Electric Avoided Cost Assumptions* and *Changes to Natural Gas Avoided Cost Assumptions*.

[24] Adjusted for inflation each CY.

Table B-36. Revised CY2020 Expanded Total Resource Cost Test Results

Test Component	Modified TRC (Without Economic Benefits)	Expanded TRC With CY2018 Benefits	Expanded TRC With CY2020 Benefits
Administrative Costs	$2,788,738	$2,788,738	$2,788,738
Delivery Costs	$30,544,175	$30,544,175	$30,544,175
Incremental Measure Costs	$251,020,645	$251,020,645	$251,020,645
Total TRC Costs	**$284,353,558**	**$284,353,558**	**$284,353,558**
Electric Benefits	$393,460,787	$393,460,787	$393,460,787
Natural Gas Benefits	$126,950,324	$126,950,324	$126,950,324
Emissions Benefits	$116,464,956	$116,464,956	$116,464,956
T&D Benefits	$54,665,398	$54,665,398	$54,665,398
Economic Benefits	$0	$537,531,292	$487,342,144
Total TRC Benefits	**$691,541,465**	**$1,229,072,757**	**$1,179,490,463**
TRC Benefits Minus Costs	**$407,187,907**	**$944,719,198**	**$895,136,905**
TRC Benefit/Cost Ratio	**2.43**	**4.32**	**4.15**

Table B-37 shows how expanded TRC test results change when outdated CY2018 economic benefits are replaced with updated CY2019 and CY2020 economic benefits. Cumulative economic benefits for the biennium are estimated to be nearly $90 million lower than they would be if using CY2018 economic benefits, reducing the expanded TRC B/C ratio slightly from 4.54 to 4.37. This decrease in cost-effectiveness is attributable primarily to differences in avoided cost assumptions, as outlined in *Changes to Electric Avoided Cost Assumptions* and *Changes to Natural Gas Avoided Cost Assumptions*.

Table B-37. Revised 2019–2020 Biennium Expanded Total Resource Cost Test Results

Test Component	Modified TRC (Without Economic Benefits)	Expanded TRC With CY2018 Benefits	Expanded TRC With CY2020 Benefits
Administrative Costs	$7,727,096	$7,727,096	$7,727,096
Delivery Costs	$63,634,991	$63,634,991	$63,634,991
Incremental Measure Costs	$448,532,796	$448,532,796	$448,532,796
Total TRC Costs	**$519,894,883**	**$519,894,883**	**$519,894,883**
Electric Benefits	$734,033,326	$734,033,326	$734,033,326
Natural Gas Benefits	$274,270,272	$274,270,272	$274,270,272
Emissions Benefits	$235,268,846	$235,268,846	$235,268,846
T&D Benefits	$54,665,398	$54,665,398	$54,665,398
Economic Benefits	$0	$1,061,469,626	$971,880,778
Total TRC Benefits	**$1,298,237,842**	**$2,359,707,468**	**$2,270,118,620**
TRC Benefits Minus Costs	**$778,342,959**	**$1,839,812,585**	**$1,750,223,737**
TRC Benefit/Cost Ratio	**2.50**	**4.54**	**4.37**

Appendix C: Annual Net Employment Impacts

Table C-29 summarizes the annual net employment impacts (jobs added) attributable to each program year of the 2019–2020 biennium. Program year impacts do not sum to biennium impacts because of dynamic factors in the REMI model.

Table C-38. Annual Jobs Added by Program Year

Year	CY2019	CY2020	Biennium
2019	-60	n/a	-60
2020	40	-30	10
2021	170	50	220
2022	240	160	410
2023	300	250	550
2024	340	300	640
2025	360	340	700
2026	380	360	730
2027	380	360	740
2028	380	360	740
2029	370	360	730
2030	360	360	720
2031	360	350	710
2032	310	340	650
2033	220	290	510
2034	130	190	310
2035	60	120	180
2036	40	80	120
2037	20	40	60
2038	10	20	20
2039	-10	0	-10
2040	-20	-10	-30
2041	-30	-10	-40
2042	-30	-20	-50
2043	-40	-20	-60
2044	n/a	-30	-70
Total	**4,250**	**4,210**	**8,430**