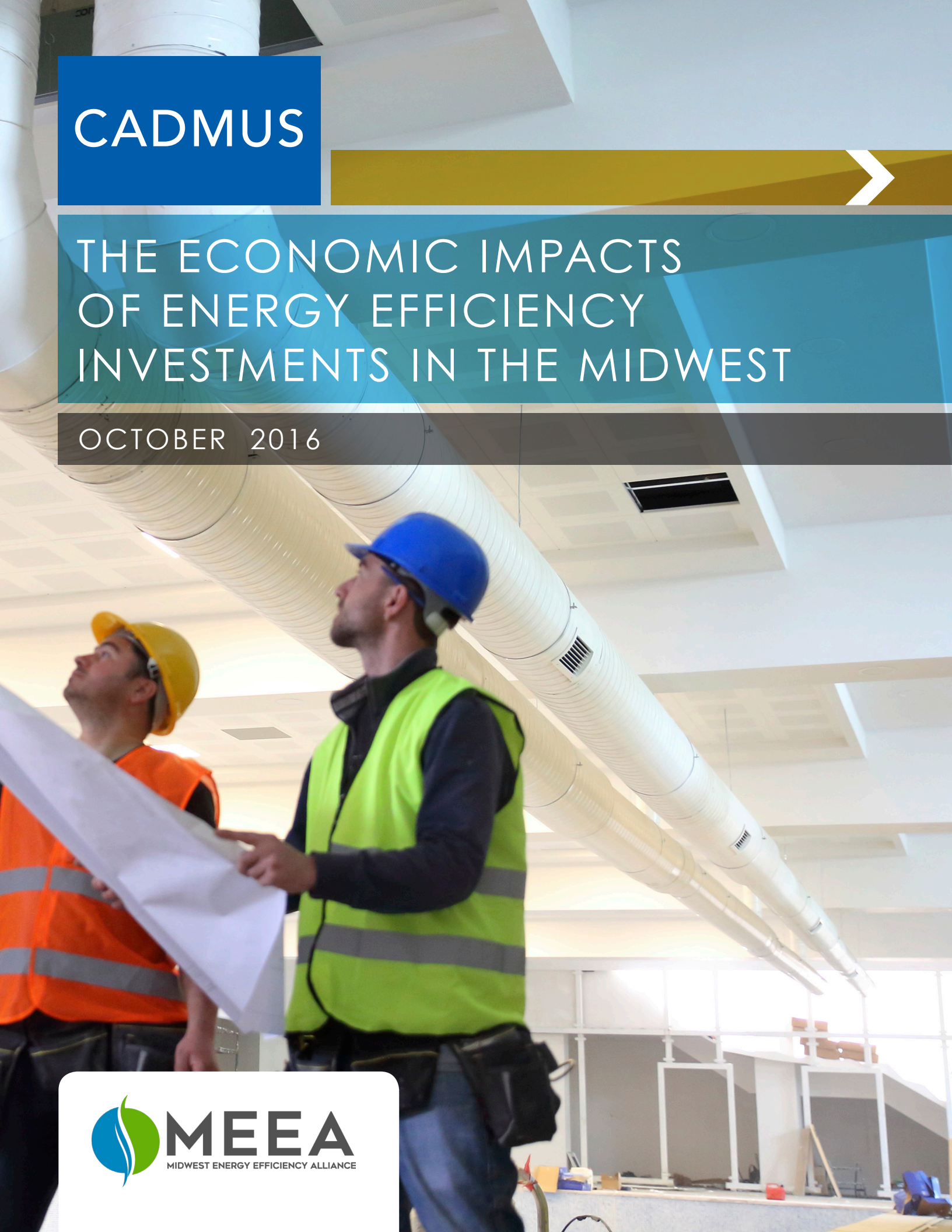

CADMUS

THE ECONOMIC IMPACTS OF ENERGY EFFICIENCY INVESTMENTS IN THE MIDWEST

OCTOBER 2016

MEEA
MIDWEST ENERGY EFFICIENCY ALLIANCE

TABLE OF CONTENTS

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INTRODUCTION

This report describes the net economic impacts of energy efficiency programs funded by utilities in the Midwest region. The Midwest Energy Efficiency Alliance (MEEA) commissioned Cadmus to model the first-year and forecasted impacts of 2014 utility program spending and savings across 13 Midwest states: Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. Specifically, Cadmus estimated the net impacts of utility program activities on four economic sub-regions: Michigan, Ohio, Indiana, and the Rest of the Midwest.

Cadmus also analyzed the economic impacts from just in-state efficiency program activities in Michigan, Ohio, and Indiana. Detailed findings from each of these state-specific analyses are provided in separate sections of this report.

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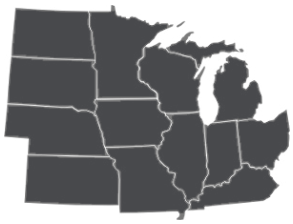
EXECUTIVE SUMMARY



ECONOMIC IMPACTS OF ENERGY EFFICIENCY

MIDWEST REGION

Multi-Year Impacts of 2014 Programs

104,925
JOBS CREATED

$8.771 BILLION
BOOST TO REGIONAL INCOME

78,499 GWh
ELECTRICITY SAVED

1.449 BILLION
THERMS GAS SAVED

EMISSIONS AVOIDED

111,630,380 TONS CO_2
278,548 TONS SO_2
112,742 TONS NO_x

ENERGY EFFICIENCY INVESTMENTS ARE CREATING JOBS AND INCREASING INCOMES IN THE MIDWEST.

Analysis conducted by Cadmus concludes that 2014 energy efficiency investments in the Midwest have yielded, and will continue to generate, net benefits for the regional economy. In 2014 alone, these benefits included over **18,600 new jobs**, nearly **$1.2 billion in increased regional income**, over **$1.8 billion in total net economic value**, and more than **$3.3 billion in net sales**.

The analysis also concludes that the economic impacts of energy efficiency investments endure, providing positive returns for Midwest residents and businesses long after the utilities' initial investments. Over the entire 25-year study period, the 2014 energy efficiency programs are estimated to **create nearly 105,000 jobs, increase net regional income by almost $8.8 billion, add over $13.7 billion of total value to the region's economy**, and **generate about $23 billion in net sales**.

Overall, energy efficiency investment has grown substantially in the Midwest since 2000. In 2000, total investment in energy efficiency across 13 states was $151 million. By 2016, Midwest investment in energy efficiency will exceed $1.8 billion. This investment leads directly to significant energy savings and economic benefits. Energy efficiency programs provide direct investment into the region's economy, creating real jobs and having a lasting impact.

MEEA
MIDWEST ENERGY EFFICIENCY ALLIANCE

Cadmus modeled annual impacts on employment, personal income, value added, and sales over a 25-year study period for each economic sub-region, as shown in Table 1.

As Figure 1 illustrates, energy efficiency investments affect the flow of money through the economy in three ways. ***Direct economic effects*** represent impacts on industries directly involved with utility programs, such as firms that manufacture energy technologies or provide project services. ***Indirect economic effects*** account for impacts on industries in the energy efficiency supply chain, such as firms that supply raw manufacturing inputs to the directly affected industries. ***Induced economic effects*** lead to additional impacts on other industries as utility program participants and employees of directly and indirectly affected industries spend money in the economy.

Midwest utilities' investments in energy efficiency create jobs, generate new income, and increase regional spending.

Over a 25-year period, the 2014 programs alone are estimated to:

***create nearly 105,000 regional jobs**

***increase regional income by almost $8.8 billion**

***add over $13.7 billion in regional economic value**

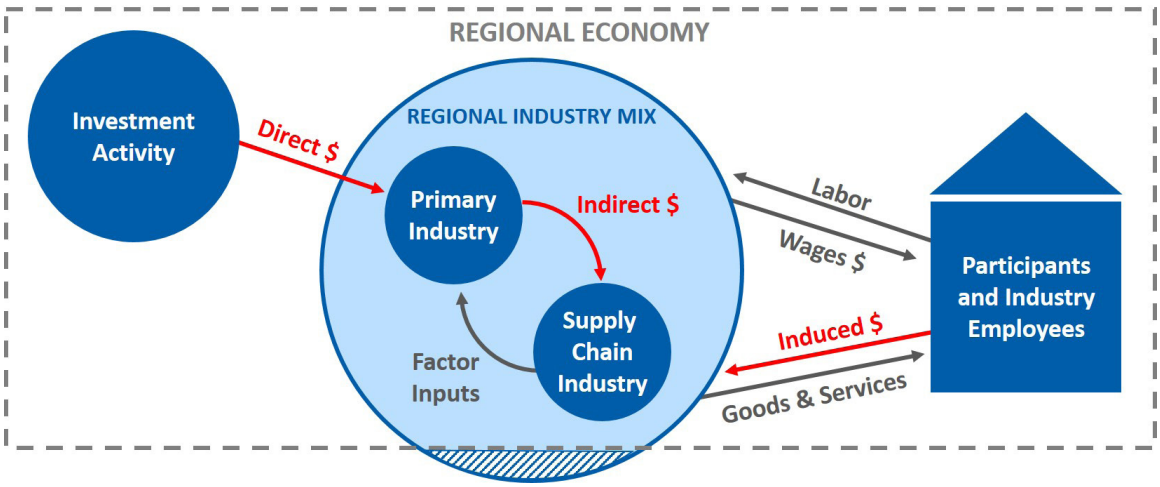
***generate about $23 billion in regional sales**

Table 1. Summary Findings

Economic Indicator	Net Study Period Impacts				
	Michigan	Ohio	Indiana	Rest of Midwest	Midwest Region Total*
Employment (jobs)	17,112	15,930	8,869	63,014	**104,925**
Personal Income (millions of 2015 dollars)	$1,517	$1,369	$727	$5,158	**$8,771**
Value Added (millions of 2015 dollars)	$2,191	$2,153	$1,089	$8,315	**$13,749**
Sales (millions of 2015 dollars)	$3,551	$3,700	$1,882	$13,859	**$22,992**

*Totals may not sum due to rounding.

Figure 1. How Energy Efficiency Investments Affect the Flow of Money Through the Economy



Although the modeling analysis assumes total statewide and regional spending is the same with or without programs, net impacts are positive because the *nature* of spending within the state and regional economies changes as a result of direct, indirect, and induced program effects. In the example shown in Figure 1, efficiency investments result in positive net economic impacts because funds that are directed to mainly local industries would otherwise have been spent primarily (but not exclusively) on energy resources, some of which are imported into the region.

In addition to the effects from program year expenditures, efficiency investments continue to generate positive net economic benefits as long as energy savings continue. Ongoing energy savings allow participants to spend less money on energy and more on other products and services, many of which have relatively localized supply chains. Furthermore, Midwest utilities benefit from reduced fuel and power purchases, transmission and distribution costs, emission allowance costs, and supply capacity requirements. However, customers purchase less energy after participating in energy efficiency programs; therefore, utilities also forego revenues equal to sales reductions.[1]

The 2014 programs will create nearly 105,000 jobs through 2038.

ANALYSIS FINDINGS

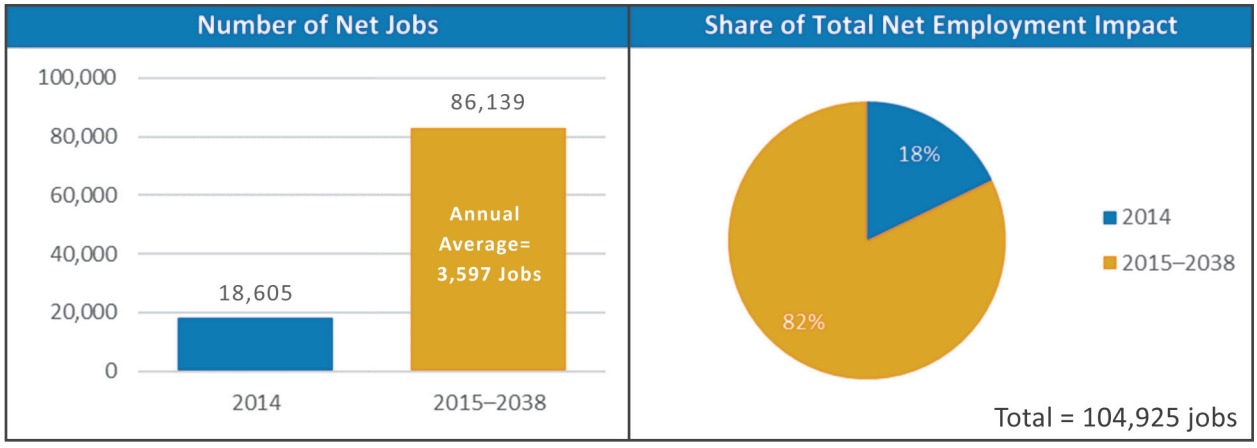
Cadmus aggregated the net economic impacts of 2014 program spending and energy savings in Michigan, Ohio, Indiana, and the Rest of the Midwest to determine total impacts across the 13-state MEEA region.

The following sections describe detailed employment, income, value added, and sales impact findings for the Midwest region and for each sub-region included in the analysis.[2]

REGIONAL EMPLOYMENT

Midwest utilities' efficiency programs generate positive near-term and long-term net employment effects. Figure 2 shows the net first-year and future-year regional job impacts. Analysis findings indicate that the 2014 programs created more than 18,600 net jobs in the first year, or approximately 18% of the study period total (nearly 105,000 jobs). Primarily due to increased sales of energy efficient equipment and program support services, more than half of these near-term employment effects were in the manufacturing and professional services sectors. Modeling also shows that spending on regional consumer goods and services will increase and remain relatively high mainly due to ongoing energy cost savings, resulting in another 86,319 net jobs—an average of 3,597 per year—through 2038.

Figure 2. First-Year and Future-Year Regional Employment Impacts



[1] The dollar value of these reductions represents a cost to the utilities, which we also considered in our analysis.

[2] Detailed descriptions of the impacts from just in-state efficiency program activities are provided for Michigan, Ohio, and Indiana in separate sections of this report.

REGIONAL PERSONAL INCOME

As a result of increased regional employment and ongoing energy cost savings, Midwest energy efficiency programs lead to positive net gains in near-term and long-term personal income. Figure 3 shows the net first-year and future-year regional personal income impacts. The modeling analysis revealed that the regional 2014 programs generated almost $1.2 billion of net personal income the first year, or about 13% of the study period total (nearly $8.8 billion). Ongoing energy savings benefits will continue generating an average of $317 million of net personal income per year--a total of more than $7.6 billion--from 2015 to 2038.

Energy efficiency programs generated almost $1.2 billion boost to regional income in 2014 alone

REGIONAL VALUE ADDED

Efficiency investments and savings generate new demand for products and services that are provided largely by local industries, which adds net value to the regional economy. Figure 4 illustrates the net first-year and future-year value added impacts. The analysis findings show that the 2014 utility programs added over $1.8 billion of net economic value the first year, representing approximately 13% of the study period total (more than $13.7 billion). The programs' ongoing effects will add an average of $496 million per year--a total of over $11.9 billion--from 2015 to 2038.

Ongoing program effects will add an average of $496 million of net economic value per year—a total of over $11.9 billion—from 2015 to 2038.

Figure 3. First-Year and Future-Year Regional Personal Income Impacts

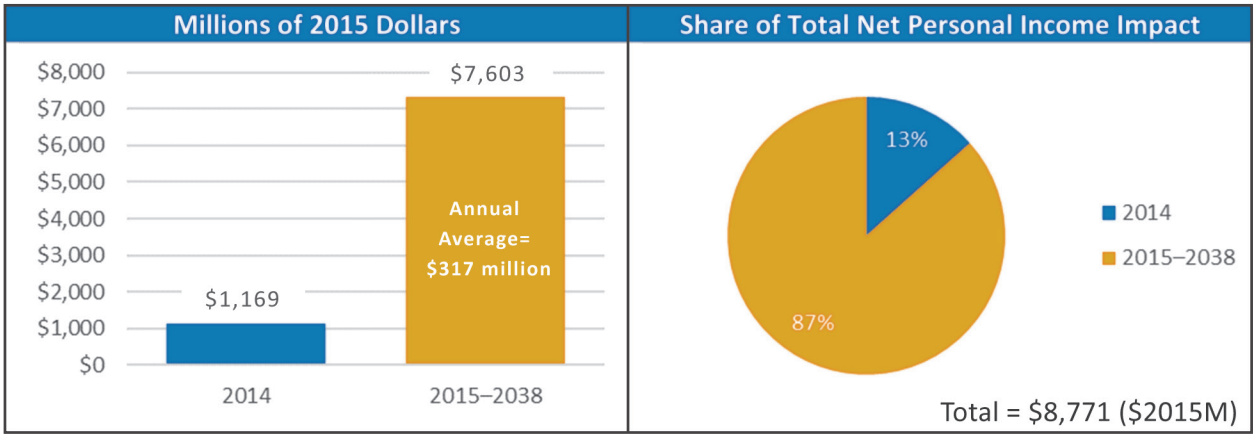


Figure 4. First-Year and Future-Year Regional Value Added Impacts

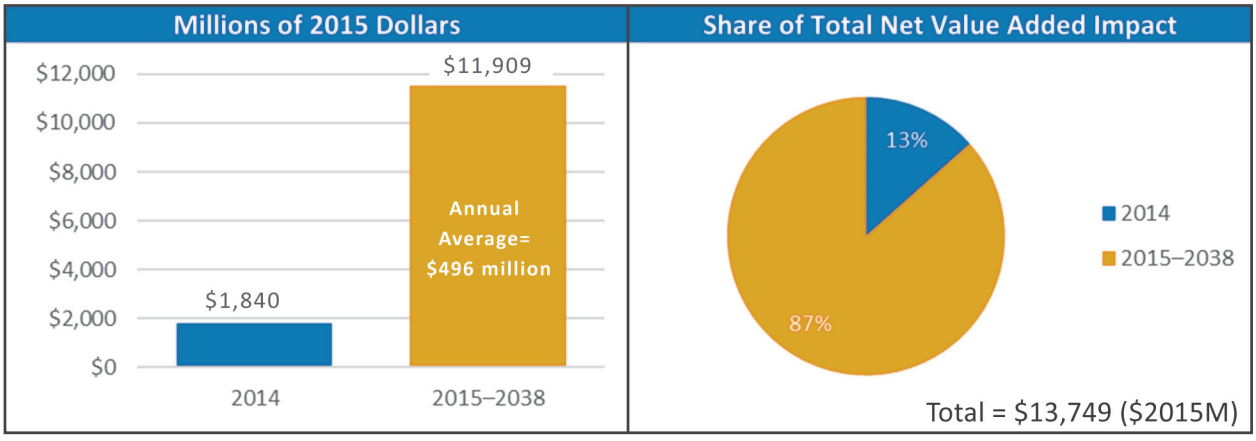
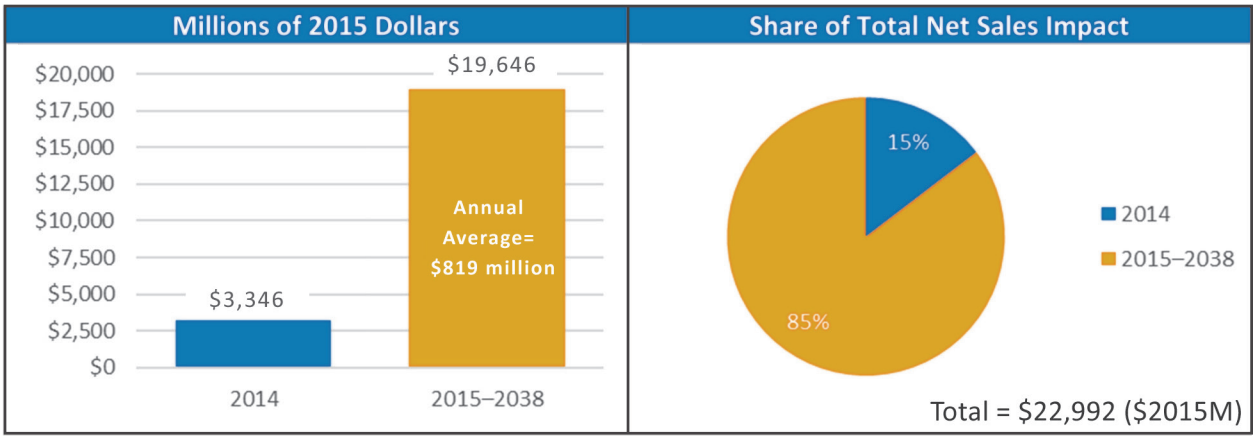


Figure 5. First-Year and Future-Year Regional Sales Impacts



REGIONAL SALES

Energy efficiency program activities and resulting energy savings lead to positive net sales impacts in the Midwest region. Figure 5 shows the net first-year and future-year sales impacts. Model findings suggest that the 2014 programs generated $3.3 billion of net sales the first year, or around 15% of the study period total (nearly $23 billion). The programs will generate an average of $819 million of net sales per year—a total of nearly $20 billion—from 2015 to 2038.

The 2014 programs will generate nearly $23 billion of net sales through 2038.

IMPACTS BY SUB-REGION

For each sub-region included in the analysis, Cadmus determined the net economic impacts attributable to in-region program activities as well as the spillover impacts of program activities in the other sub-regions. The following sections summarize these findings for Michigan, Ohio, Indiana, and the Rest of the Midwest.

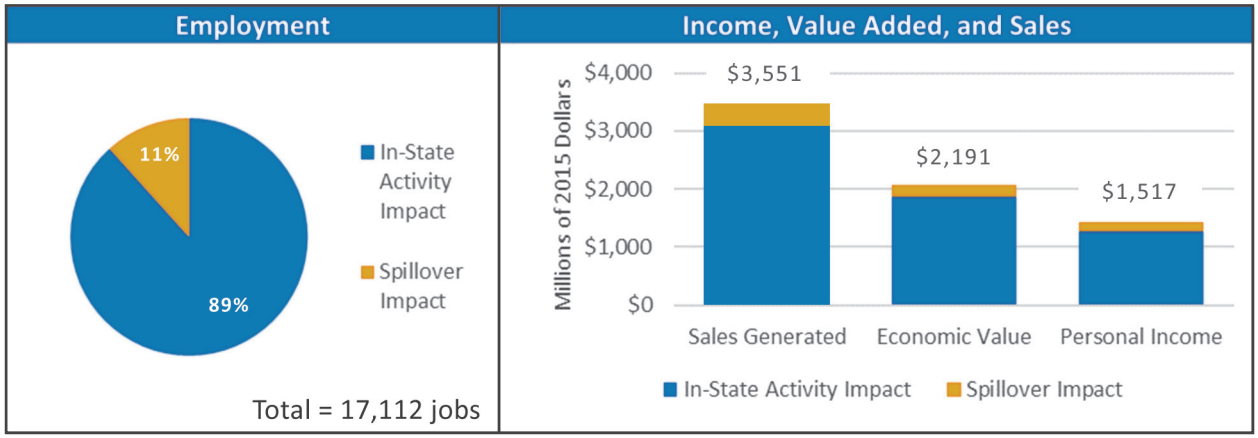
MICHIGAN

As shown in Table 2 and Figure 6, the Michigan economy benefits mainly from in-state energy efficiency program activities, although a small portion of statewide employment, income, value added, and sales impacts result from program activities in other Midwest states. These spillover impacts represent a small percentage of Michigan's total impacts. Energy efficiency investments and savings are relatively high in Michigan (Table 2), and these activities result in similarly high net economic impacts. However, the impacts are relatively local. The Michigan economy's own manufacturing, professional services, and consumer goods and services industries are large enough to satisfy a substantial majority of in-state increases in demand.

Table 2. In-State Activity and Spillover Impacts on the Michigan Economy

Economic Indicator	In-State Activity Impacts		Spillover Impacts		Michigan Total
	Value	Percent of Total	Value	Percent of Total	
Employment (jobs)	15,203	89%	1,909	11%	**17,112**
Personal Income (millions of 2015 dollars)	$1,353	89%	$164	11%	**$1,517**
Value Added (millions of 2015 dollars)	$1,975	90%	$216	10%	**$2,191**
Sales (millions of 2015 dollars)	$3,190	90%	$362	10%	**$3,551**

Figure 6. In-State Activity and Spillover Impacts on the Michigan Economy



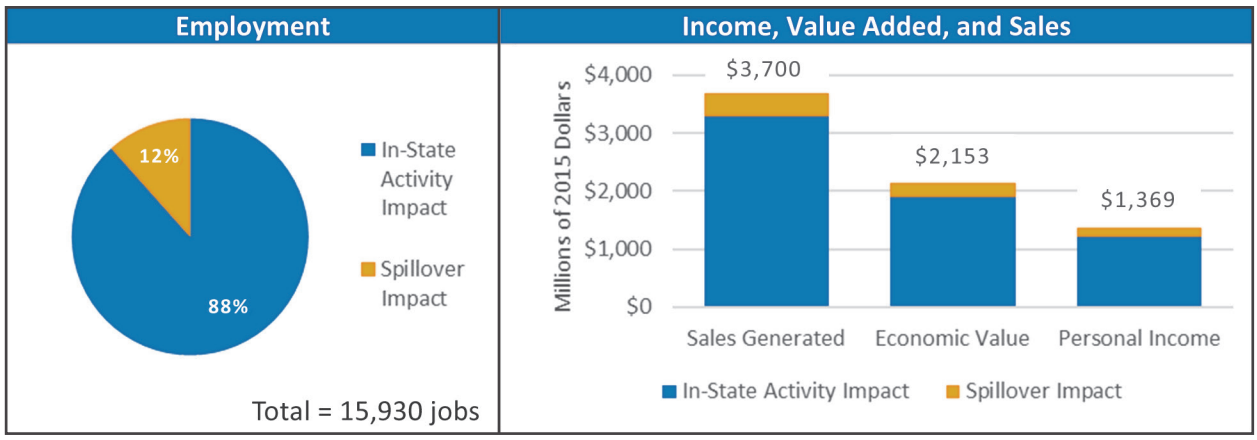
OHIO

As shown in Table 3 and Figure 7, the Ohio economy also benefits mainly from in-state energy efficiency program activities, although a small share of statewide employment, income, value added, and sales impacts result from program activities in other states included in the Midwest region analysis. These spillover impacts account for a low percentage of Ohio's total impacts. Similar to Michigan, energy efficiency investments and savings are comparatively high in Ohio (Table 2), and these activities result in correspondingly high net economic impacts. Furthermore, the impacts are relatively local because Ohio's industries are large enough to satisfy a significant majority of increased in-state demand.

Table 3. In-State Activity and Spillover Impacts on the Ohio Economy

Economic Indicator	In-State Activity Impacts		Spillover Impacts		Ohio Total
	Value	Percent of Total	Value	Percent of Total	
Employment (jobs)	14,002	88%	1,928	12%	**15,930**
Personal Income (millions of 2015 dollars)	$1,211	88%	$158	12%	**$1,369**
Value Added (millions of 2015 dollars)	$1,891	88%	$263	12%	**$2,153**
Sales (millions of 2015 dollars)	$3,277	89%	$423	11%	**$3,700**

Figure 7. In-State Activity and Spillover Impacts on the Ohio Economy



INDIANA

As shown in Table 4 and Figure 8, the Indiana state economy benefits considerably from in-state energy efficiency program activities, although a comparatively large portion of statewide employment, income, value added, and sales impacts result from program activities in other Midwest states. The magnitude of these spillover impacts, as well as their percentage of total statewide impacts, is comparatively high in Indiana partly because in-state energy efficiency program investments and savings are lower (Table 2), and partly because the Indiana economy's own manufacturing, professional services, and retail services industries are smaller than in neighboring states. In effect, a larger portion of in-state demand is met with supply from out-of-state industries.

REST OF THE MIDWEST

As shown in Table 5 and Figure 9, analysis findings show that the Rest of the Midwest sub-region benefits almost exclusively from in-region energy efficiency program activities, and just a small portion of the sub-region's employment, income, value added, and sales impacts result from program activities in Michigan, Ohio, and Indiana. These spillover impacts represent a relatively small percentage of the sub-region's total impacts for two reasons. First, total spending and savings across the sub-region are independently high (Table 2), and these activities result in similarly high net economic impacts. Second, the Rest of the Midwest sub-region is a group of 10 contiguous state economies that shares just its eastern border with Michigan, Ohio, and Indiana (i.e., the only other states included in the analysis). As a result, most increases in demand for energy efficiency are satisfied with goods and services supplied by industries located within the sub-region itself.

Table 4. In-State Activity and Spillover Impacts on the Indiana Economy

Economic Indicator	In-State Activity Impacts		Spillover Impacts		Indiana Total
	Value	Percent of Total	Value	Percent of Total	
Employment (jobs)	6,238	70%	2,631	30%	**8,869**
Personal Income (millions of 2015 dollars)	$513	71%	$214	29%	**$727**
Value Added (millions of 2015 dollars)	$804	74%	$285	26%	**$1,089**
Sales (millions of 2015 dollars)	$1,348	72%	$535	28%	**$1,882**

Figure 8. In-State Activity and Spillover Impacts on the Indiana Economy

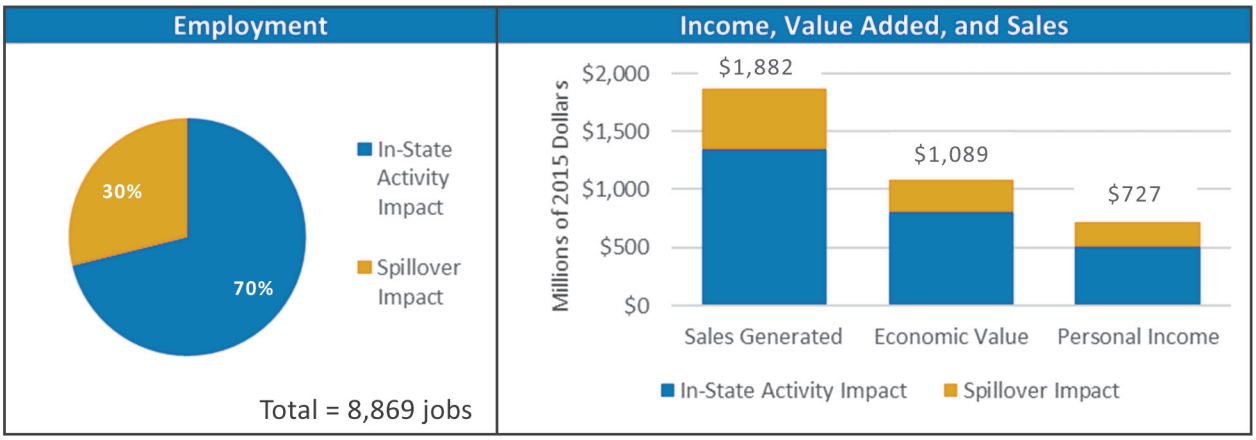
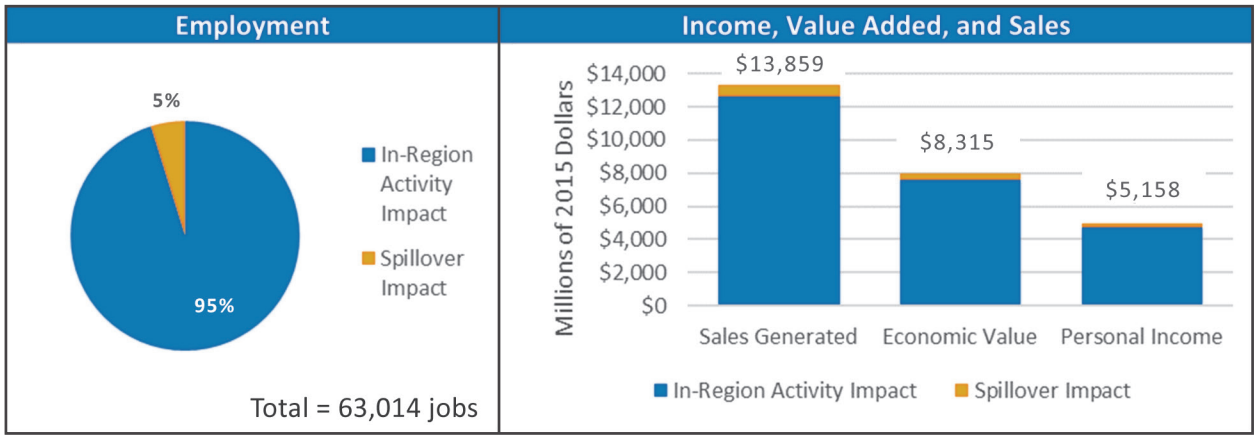


Table 5. In-Region Activity and Spillover Impacts on the Rest of the Midwest Economy

Economic Indicator	In-Region Activity Impacts		Spillover Impacts		Rest of the Midwest Total
	Value	Percent of Total	Value	Percent of Total	
Employment (jobs)	60,007	95%	3,007	5%	**63,014**
Personal Income (millions of 2015 dollars)	$4,959	96%	$199	4%	**$5,158**
Value Added (millions of 2015 dollars)	$7,896	95%	$419	5%	**$8,315**
Sales (millions of 2015 dollars)	$13,136	95%	$722	5%	**$13,859**

Figure 9. In-Region Activity and Spillover Impacts on the Rest of the Midwest Economy



ANALYSIS METHOD

Cadmus assessed the impacts of 2014 energy efficiency programs administered over 200 utilities across the 13-state Midwest region. Appendix D provides a complete list of utilities by state.

We estimated the net economic impacts of annual program spending and resulting energy savings for each utility using the Regional Economic Models, Inc. Policy Insight+ (REMI PI+) model, a dynamic economic forecasting tool.[3] We determined net annual impacts on four key economic indicators.[4]

1. ***Employment*** is an estimate of the number of jobs by place of work. For the purposes of this multiyear analysis, a job is defined as one full-time equivalent job for one year (i.e., 2,080 hours). In other words, a job 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.
2. ***Personal income*** represents the change in money available to Midwest customers for purchasing goods and services, saving money, and paying taxes.
3. ***Value added*** measures the net contribution of each private industry and of government to the Midwest's gross regional product or to a given state's gross state product. It represents total net economic benefits, including wages, profits (minus intermediate goods purchased), and taxes (minus subsidies).

[3] http://www.remi.com/

[4] This Midwest region analysis was over a 25-year study period, from 2014–2038.

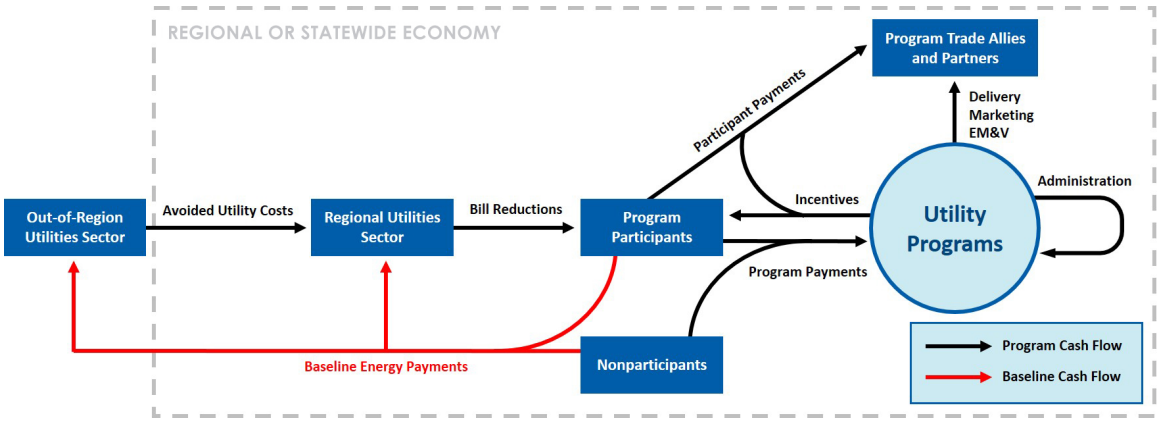
4. ***Sales*** equal total industry output, or production, including all intermediate goods purchased, employee compensation, and profits. Sales include purchases of intermediate goods and are therefore greater than value added.

To isolate the net regional or statewide effects on these variables from each program scenario, Cadmus modeled six cash flows against the REMI PI+ model's built-in forecast of the baseline economy.

1. ***Program Payments.*** Funding for the programs originates from utility revenues, which are collected from Midwest ratepayers and equal total program spending.
2. ***Program Spending.***[5] Program funds are spent on administration activities, as well as on delivery and other services provided by program trade allies and partners.
3. ***Incentives.*** Program funds are also spent on direct financial and service-based incentives that encourage customers to invest in energy efficiency.
4. ***Participant Payments.***[6] To complete project payments, participants provide their own co-funding in addition to receiving incentives.
5. ***Bill Reductions.***[7] Participants save energy for as long as installed efficiency measures remain operational,[8] benefitting from energy bill reductions while utilities forego those revenues.
6. ***Avoided Utility Costs.***[9] As a result of decreased demand for energy resources, utilities benefit from avoided fuel, supply capacity, and emissions costs.

Figure 10 illustrates these cash flows, as well as the cash flows that occur in a program's absence.

Figure 10. Energy Efficiency Program and Baseline Scenario Cash Flows



[5] E Source DSM Insights database. Available online: https://www.esource.com/about-dsminsights.

[6] Cadmus developed program-specific assumptions about participant co-funding using findings from a Lawrence Berkeley National Laboratory analysis comparing participant and administrator costs. "The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs: Estimates at the National, State, Sector, and Program Level." April 2015. Available online: https://emp.lbl.gov/sites/all/files/total-cost-of-saved-energy.pdf.

[7] MEEA collected annual electric and gas energy savings by program from DSM Insights and Cadmus calculated bill reductions by multiplying those annual energy savings by annual average retail rates. To develop rate forecasts, Cadmus used 1997–2014 annual average rates by fuel type and end-use sector from the Energy Information Administration (EIA). Available online: http://www.eia.gov/electricity/.

[8] Cadmus modeled energy savings from the utility programs across the 25-year study period. We generated measure life data using weighted averages reported by utilities to the EIA via 2014 EIA-861 forms. Available online: http://www.eia.gov/electricity/data/eia861/index.html.

[9] Cadmus used CO_2, NO_X, and SO_2 emissions costs from other Midwest evaluations as a basis for estimating the economic benefits of reduced emissions. We used state-level supply mix forecasts and Levelized Avoided Cost of Energy forecasts from the 2015 EIA Annual Energy Outlook report to estimate avoided fuel and capacity costs. Available online: http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.

Table 6. 2014 Utility Reported Spending and Lifetime Savings, by State

State	Spending (Millions of $2015)	GWh Savings	therm Savings*	Avoided CO_2 (tons)	Avoided SO_2 (tons)	Avoided NO_x (tons)
Illinois	$346.4	8,737	310,881,694	18,013,384	31,185	10,208
Indiana	$126.9	6,894	21,437,150	7,481,057	23,281	7,266
Iowa	$184.5	7,098	97,547,514	9,980,063	30,442	10,953
Kansas	$0.5	9	NR	10,493	8	10
Kentucky	$48.1	3,767	15,519,685	4,142,658	9,195	3,858
Michigan	$220.0	11,663	376,847,434	21,303,908	64,534	23,625
Minnesota	$163.0	11,106	403,698,727	19,098,952	25,632	26,843
Missouri	$37.0	4,415	NR	4,333,918	9,841	4,718
Nebraska	$20.3	2,351	NR	2,722,321	6,203	3,771
North Dakota	$0.4	25	NR	31,119	190	66
Ohio	$210.9	16,212	NR	13,029,988	62,886	13,863
South Dakota	$5.3	167	NR	166,709	504	470
Wisconsin	$93.0	6,055	222,781,830	11,315,810	14,647	7,091
Total	$1,456.2	78,499	1,448,714,034	111,630,380	278,548	112,742

*Kansas, Missouri, Nebraska, North Dakota, Ohio, and South Dakota utilities do not report gas savings.

Table 6 summarizes the 2014 reported spending and lifetime savings data used to develop REMI PI+ model inputs for each state in the Midwest region. Spending varied by state across the region, from as low as $385,457 in North Dakota to $346,397,221 in Illinois. Although returns on investment differ from state to state,[10] energy savings and avoided emissions tend to correlate with spending – larger investments lead to greater savings.

CONCLUSION

Midwest utilities' energy efficiency programs create jobs, boost personal income, and increase spending. The 2014 programs alone are estimated to create nearly 105,000 regional jobs, increase regional income by almost $8.8 billion, add over $13.7 billion of value to the regional economy, and generate about $23 billion in regional sales between 2014 and 2038. Model findings suggest that program year activities generate substantial positive net impacts on all four economic indicators analyzed, and that additional positive net impacts result from sustained energy savings through most of the study period. Sub-region analyses of the Michigan, Ohio, Indiana, and Rest of the Midwest economies reveal that a majority of economic impacts from utility efficiency programs are local, although spillover impacts from activities in other areas are also positive to varying degrees.

Cadmus also analyzed the economic impacts from just in-state efficiency program activities in Michigan, Ohio, and Indiana. Detailed findings from each of these state-specific analyses are provided in separate sections of this report.

[10] Energy savings and emission reduction returns on investment may vary by state for many reasons, including energy efficiency market size and potential, program offerings, and power supply resource mix.

APPENDIX A: THE ECONOMIC IMPACTS OF ENERGY EFFICIENCY INVESTMENTS IN MICHIGAN

CADMUS

EXECUTIVE SUMMARY

ECONOMIC IMPACTS OF ENERGY EFFICIENCY

MICHIGAN

Multi-Year Impacts of 2014 Programs

15,203

JOBS CREATED

$1.353 BILLION

BOOST TO STATEWIDE INCOME

11,663 GWh

ELECTRICITY SAVED

377 MILLION

THERMS GAS SAVED

EMISSIONS AVOIDED

21,303,908 TONS CO_2

64,534 TONS SO_2

23,625 TONS NO_x

ENERGY EFFICIENCY INVESTMENTS ARE CREATING JOBS AND INCREASING INCOMES IN MICHIGAN.

Analysis conducted by Cadmus concludes that 2014 energy efficiency investments in Michigan have yielded, and will continue to generate, net benefits for the Michigan state economy. In 2014 alone, these benefits included over **3,100 new jobs**, more than **$200 million in increased statewide income**, about **$325 million in total net economic value**, and nearly **$550 million in net sales**.

The analysis also concludes that the economic impacts of energy efficiency investments persist, providing positive returns for Michigan residents and businesses long after the utilities' initial investments. Over the entire 25-year study period, the 2014 energy efficiency programs are estimated to **create more than 15,200 jobs, increase net statewide income by almost $1.4 billion, add nearly $2 billion of total value to the state's economy**, and **generate approximately $3.2 billion in net sales**.

Passed in 2009, Michigan Public Act 295 requires electric utilities to meet a 1% annual energy optimization target and requires natural gas utilities to meet a 0.75% annual energy optimization target. By 2014, utility-funded energy efficiency investment had grown to more than $200 million per year. Since 2015, the Michigan state legislature has been engaged in a statewide energy policy debate about keeping the current energy efficiency structure or moving to a voluntary standard.

By following approved energy efficiency plans, program activity in 2015 resulted in additional positive net impacts. Modeling shows that between 2015 and 2039 the 2015 programs will probably generate between about 7,350 and 14,800 jobs, $675 million to $1.4 billion in statewide income, $1 to $2 billion in economic value, and $1.6 to $3.3 billion in sales.

MEEA
MIDWEST ENERGY EFFICIENCY ALLIANCE

INTRODUCTION

This report describes the net statewide economic benefits of Michigan energy efficiency programs. As requested by MEEA, Cadmus determined the net economic impacts of four program scenarios. First, we compared the net benefits of (1) actual 2014 program spending and savings to those of (2) planned 2015 program spending and savings. Then, to assess the effects from potential increases or decreases to planned activities and outcomes, Cadmus also calculated the net benefits of (3) a one-third increase and (4) a one-third decrease to planned 2015 spending and savings.

Cadmus modeled annual statewide impacts on employment, personal income, value added, and sales over a 25-year study period for each program scenario. Table 1 summarizes the net study period impacts on each of these economic indicators by program spending and savings scenario.

As Figure 1 illustrates, energy efficiency investments affect the flow of money through the state and regional economies in three ways. ***Direct economic effects*** represent impacts on industries directly involved with utility programs, such as firms that manufacture energy technologies or provide project services. ***Indirect economic effects*** account for impacts on industries in the energy efficiency supply chain, such as firms that supply raw manufacturing

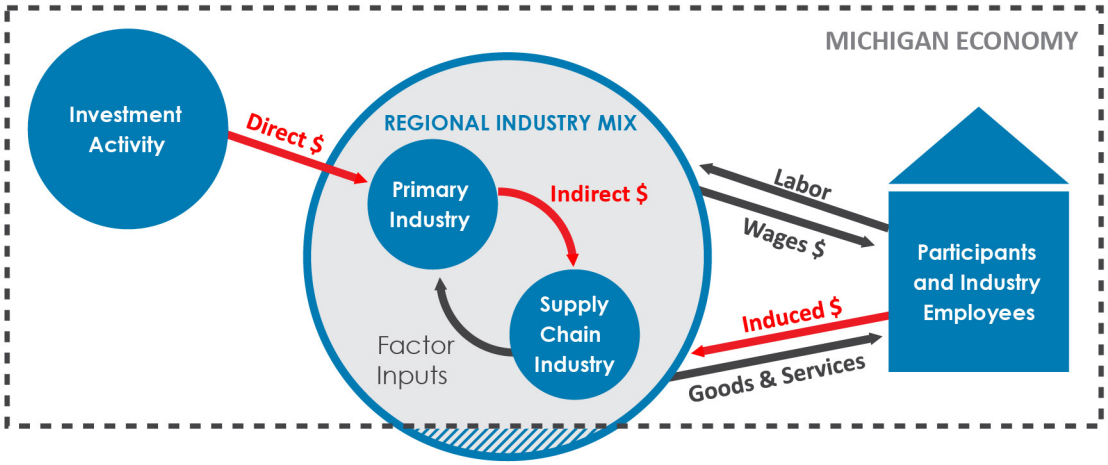
Michigan investments in energy efficiency create jobs, generate new income, and increase in-state spending. For example, the 2014 programs alone are estimated to create more than 15,200 jobs, increase statewide income by nearly $1.4 billion, add nearly $2 billion of economic value, and generate almost $3.2 billion in sales between 2014 and 2038.

These economic impacts increase or decrease with the level of investment. For example, as the estimated impacts of 2015 programs reveal, positive economic effects will decrease if program spending and savings decrease.

Table 1. Summary Findings

Economic Indicator	Net Study Period Impacts			
	2014 Actual	2015 Plan	2015 High	2015 Low
Employment (jobs)	15,203	11,067	14,762	7,356
Personal Income (millions of 2015 dollars)	$1,353	$1,020	$1,355	$675
Value Added (millions of 2015 dollars)	$1,975	$1,571	$2,035	$1,013
Sales (millions of 2015 dollars)	$3,190	$2,521	$3,286	$1,636

Figure 1. How Energy Efficiency Investments Affect the Flow of Money Through the Economy



inputs to the directly affected industries. ***Induced economic effects*** lead to additional impacts on other industries as utility program participants and employees of directly and indirectly affected industries spend money in the economy.

Although the modeling analysis assumes total statewide spending is the same with or without programs, net impacts are positive because the *nature* of spending within the state economy changes as a result of direct, indirect, and induced program effects. In the example shown in Figure 1, efficiency investments result in positive net statewide economic impacts because funds that are directed to mainly local industries would otherwise have been spent primarily (but not exclusively) on energy resources, some of which are imported into Michigan.

In addition to the effects from program year expenditures, efficiency investments continue to generate positive net economic benefits as long as energy savings continue. Ongoing energy savings allow participants to spend less money on energy and more on other products and services, many of which have relatively localized supply chains. Furthermore, Michigan utilities benefit from reduced fuel and power purchases, transmission and distribution costs, emission allowance costs, and supply capacity requirements. However, customers purchase less energy after participating in energy efficiency programs; therefore, utilities also forego revenues equal to sales reductions.[1]

ANALYSIS FINDINGS

Cadmus compared the net economic benefits of actual 2014 program spending and energy savings in Michigan to the net benefits of planned 2015 spending and savings. To estimate a possible range of benefits from *actual* 2015 program spending and savings, which may vary from the plans, Cadmus also determined the net economic benefits from a one-third increase and a one-third decrease to planned 2015 spending and savings. The following sections describe detailed findings from our analyses.

2014 AND 2015 PROGRAM PORTFOLIO IMPACTS

As Table 2 summarizes, Michigan program spending and lifetime savings changed from 2014 to 2015. The planned 2015 portfolio included a slight increase

Table 2. 2014 and 2015 Utility Spending and Lifetime Savings, by Program Customer Segment

Program Customer Segment	Spending (Millions of $2015)	GWh Savings	therm Savings	Avoided CO_2 (tons)	Avoided SO_2 (tons)	Avoided NO_x (tons)
2014 Actual						
Residential	$103.0	5,139	172,809,935	9,559,036	28,957	10,209
Nonresidential	$88.2	6,512	203,395,369	11,716,542	35,491	13,386
Cross-Cutting	$28.8	11	642,130	28,330	86	29
Total Portfolio	$220.0	11,663	376,847,434	21,303,908	64,534	23,624
2015 Plan						
Residential	$99.2	3,565	152,961,903	7,546,752	22,861	8,249
Nonresidential	$90.8	5,748	187,227,913	10,551,938	31,963	12,020
Cross-Cutting	$32.2	56	1,735,164	100,270	304	103
Total Portfolio	$222.2	9,369	341,924,980	18,198,960	55,128	20,372

[1] The dollar value of these reductions represents a cost to the utilities, which we also considered in our analysis.

in total nonresidential program spending of $2.7 million despite decreases in lifetime nonresidential electric and gas savings of about 764 GWh and more than 16 million therms, respectively. The 2015 plans also included decreases in residential program spending, electric savings, and gas savings of more than $3.8 million, nearly 1,600 GWh, and almost 20 million therms, respectively. Cross-cutting programs, which affect all customer segments and include portfolio-level initiatives such as customer education and program evaluation, received higher levels of investment in 2015, while savings increased from about 11 to 56 GWh and from 642,130 to 1,735,164 therms. Overall, the 2015 plans included an increase in total portfolio spending of over $2.2 million, as well as decreases in electric savings of nearly 2,300 GWh, and gas savings of about 35 million therms.

The economic impacts of energy efficiency portfolios depend somewhat on the levels of investment and energy savings, but also on the mix of programs. This is largely because a program's effect on industries in the state and regional economies depends on customer segment, the type of efficiency measure(s) promoted, and the incentive(s) offered.

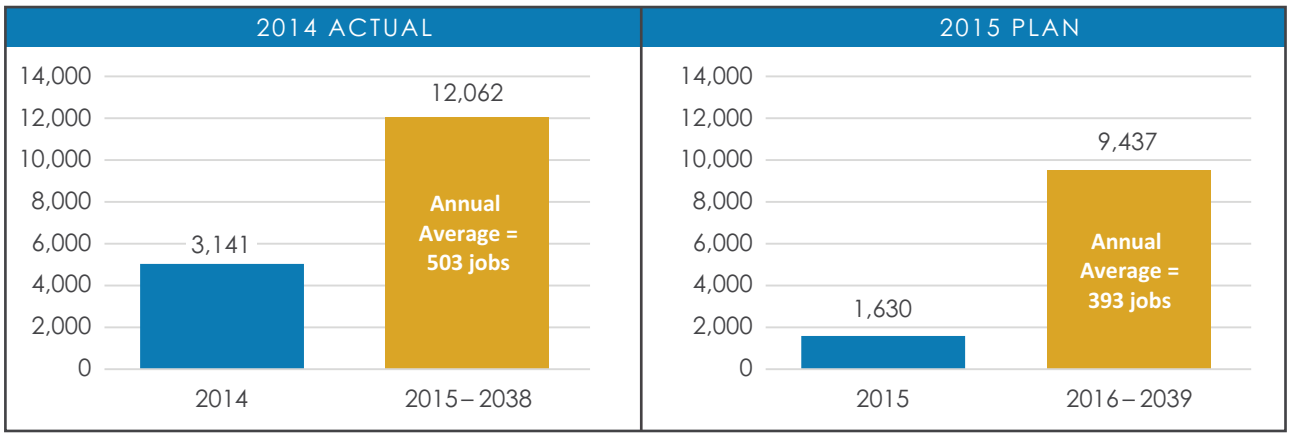
As shown in Table 3, changes in Michigan utilities' program spending and savings led to nonlinear changes in statewide employment, personal income, value added, and sales impacts because the mix of programs in Michigan utilities' portfolios also changed. The reduction in residential and nonresidential energy efficiency program investment from 2014 to 2015, combined with an increase in cross-cutting program investment and savings, led to economic benefit reductions that were greater in percentage terms than the portfolio changes. This was especially true for program-year impacts, which decreased by about 50% across all economic indicators. Although both program scenarios result in positive net effects over the 25-year study period, differences in 2015 plans compared to 2014 actuals resulted in aggregate decreases ranging from 21% (value added and sales), to 25% (personal income), and 27% (employment).

Details of the net statewide employment, personal income, value added, and sales benefits of the 2014 actual and 2015 planned program portfolios are outlined in the following sections.

Table 3. Changes in Net Economic Impacts from 2014 Actual to 2015 Plan

Economic Indicator	2014 Actual	2015 Plan	Change (%)
Program Year Employment (jobs)	3,141	1,630	-48%
Future Year Employment (jobs)	12,062	9,437	-22%
Total Study Period Employment (jobs)	15,203	11,067	-27%
Program Year Personal Income ($2015 Millions)	$204	$111	-46%
Future Year Personal Income ($2015 Millions)	$1,149	$909	-21%
Total Study Period Personal Income ($2015 Millions)	$1,353	$1,020	-25%
Program Year Value Added ($2015 Millions)	$324	$153	-53%
Future Year Value Added ($2015 Millions)	$1,652	$1,418	-14%
Total Study Period Value Added ($2015 Millions)	$1,975	$1,571	-21%
Program Year Sales ($2015 Millions)	$547	$281	-49%
Future Year Sales ($2015 Millions)	$2,642	$2,241	-15%
Total Study Period Sales ($2015 Millions)	$3,190	$2,521	-21%

Figure 2. First-Year and Future-Year Employment Impacts (Jobs), by Program Year



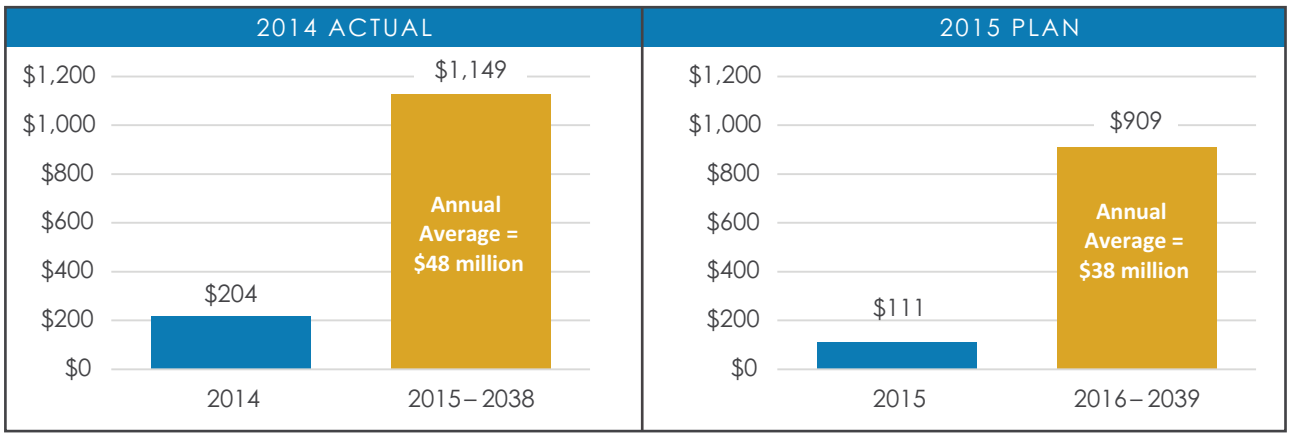
EMPLOYMENT

Efficiency programs generate positive near-term and long-term net employment effects. Figure 2 shows the net first-year and future-year job impacts by program year. Analysis findings indicate that actual 2014 programs created over 3,100 net jobs in the first year and will help create another 12,062 net jobs—an average of 503 per year—through 2038. Planned 2015 programs generated about half as many as jobs as 2014 programs in the first year, with 1,630 net jobs created, and are expected to help create more than 9,437 additional net jobs—an average of 393 per year—through the end of the study period.

PERSONAL INCOME

Michigan energy efficiency programs also lead to positive net gains in near-term and long-term personal income. Figure 3 shows the net first-year and future-year statewide income impacts by program year. The modeling analysis revealed that the 2014 programs generated about $204 million of net income the first year and will continue generating an average of $48 million per year—a total of more than $1.1 billion—from 2015 to 2038. Planned 2015 programs delivered $111 million of net income in the first year and are predicted to generate $909 million of additional net income—about $38 million per year--through the end of the study period.

Figure 3. First-Year and Future-Year Personal Income Impacts (Millions of $2015), by Program Year



VALUE ADDED

Efficiency investments and savings generate new demand for products and services that are provided largely by local industries, which adds net value to the statewide economy. Figure 4 illustrates the net first-year and future-year value added impacts by program year. The analysis findings show that the 2014 program portfolio added about $324 million of net economic value the first year and an average of $69 million per year—a total of nearly $1.7 billion—from 2015 to 2038. Planned 2015 programs created $153 million of additional net economic value in the first year and are predicted to generate approximately $59 million per year—a total of more than $1.4 billion—through 2039.

SALES

Energy efficiency program activities and resulting energy savings lead to positive net sales impacts in Michigan. Figure 5 shows the net first-year and future-year sales impacts by program year. Model findings suggest that the 2014 programs generated $547 million of net sales the first year and an average of $110 million per year—a total of over $2.6 billion—from 2015 to 2038. Planned 2015 programs generated $281 million of net sales in the first year and are predicted to help generate just over $2.2 billion of additional sales—approximately $93 million per year—from 2016 to 2039.

Figure 4. First-Year and Future-Year Value Added Impacts (Millions of $2015), by Program Year

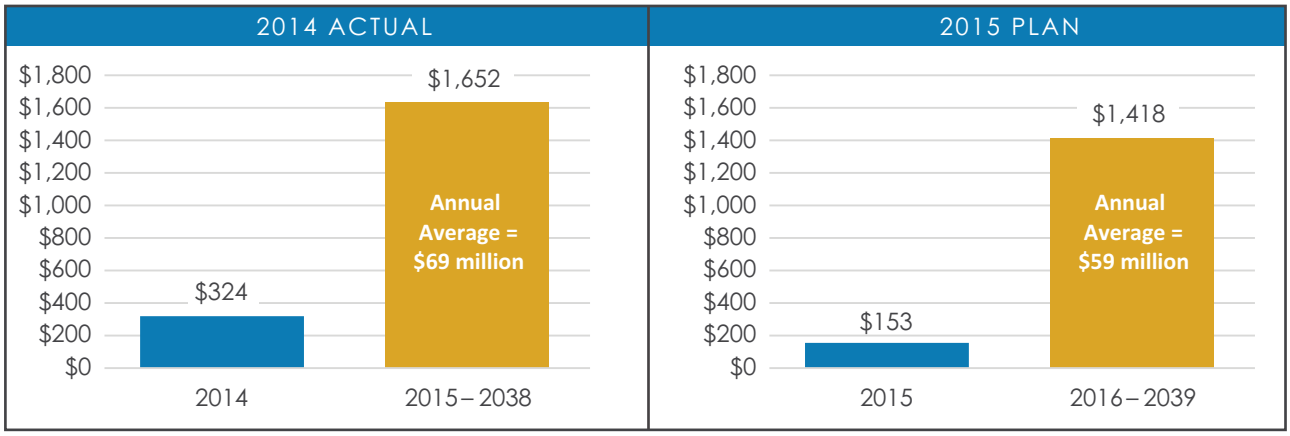
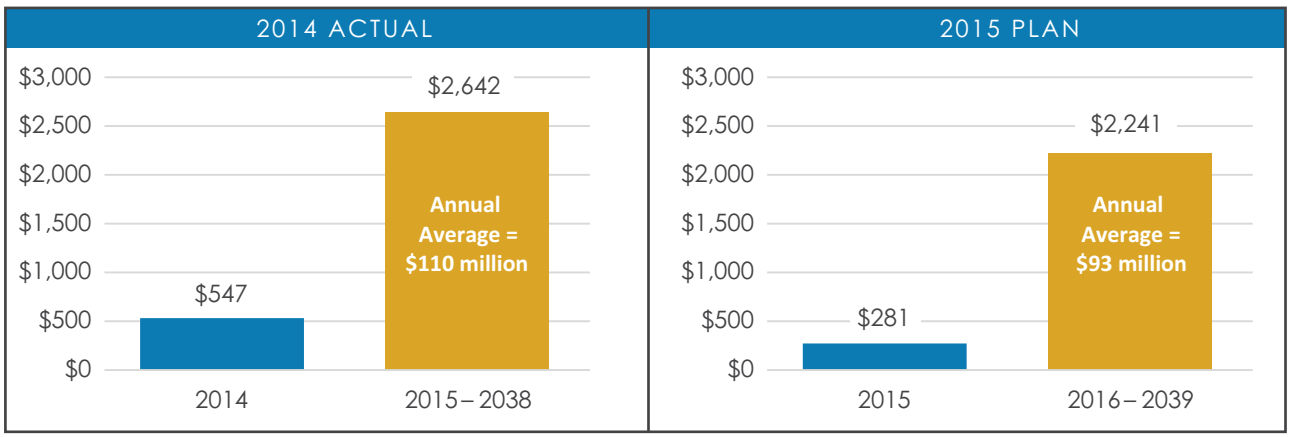


Figure 5. First-Year and Future-Year Sales Impacts (Millions of $2015), by Program Year



IMPACTS FROM CHANGES TO 2015 PROGRAM PORTFOLIO PLANS

Since actual program spending and savings may deviate from planned activities and outcomes, Cadmus conducted a sensitivity analysis of the 2015 program portfolio. Static percentage changes to spending and savings across the entire portfolio of programs lead to approximately—but not exactly—equal percentage changes in net economic benefits. More specifically, a one-third increase to planned 2015 program spending and savings results in an approximately one-third increase to all four economic indicators. Total study period employment and income impacts increase by about 33% each, while value added and sales impacts increase by about 30% each. On the other hand, a one-third decrease to planned 2015 spending and savings results in just greater than a one-third decrease to all four economic indicators. Aggregate study period employment and income benefits remain positive but decrease by 34% each, while sales and value added impacts remain positive but decrease by 35% and 36%, respectively.

As Figure 6 shows, the analysis findings reveal that a one-third increase to 2015 program spending and savings results in a total employment impact of 14,762 net jobs, a total net increase of 3,695 jobs over the entire period (2015–2039). Findings also show that a one-third decrease to planned spending and savings generates total employment impacts of 7,356 net jobs, representing a total net decrease of 3,711 jobs through 2039.

As Figure 7 demonstrates, analysis findings show that a one-third increase to 2015 spending and savings generates total study period income, value added, and sales impacts of approximately $1.4 billion, $2 billion, and nearly $3.3 billion, respectively. A one-third decrease to planned spending and savings leads to total study period income, value added, and sales impacts of about $675 million, $1 billion, and $1.6 billion, respectively.

Figure 6. Study Period Employment Impacts (Jobs), by 2015 Scenario

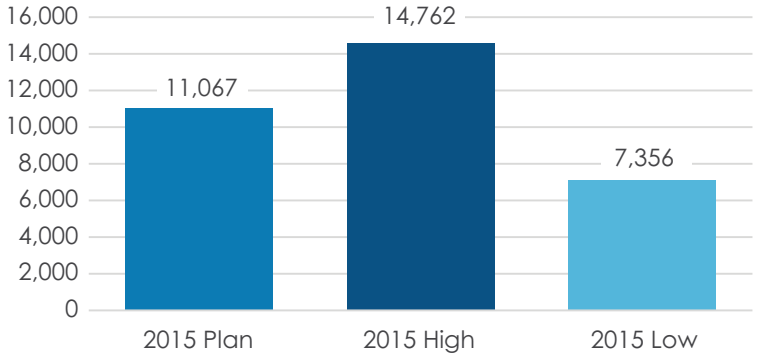
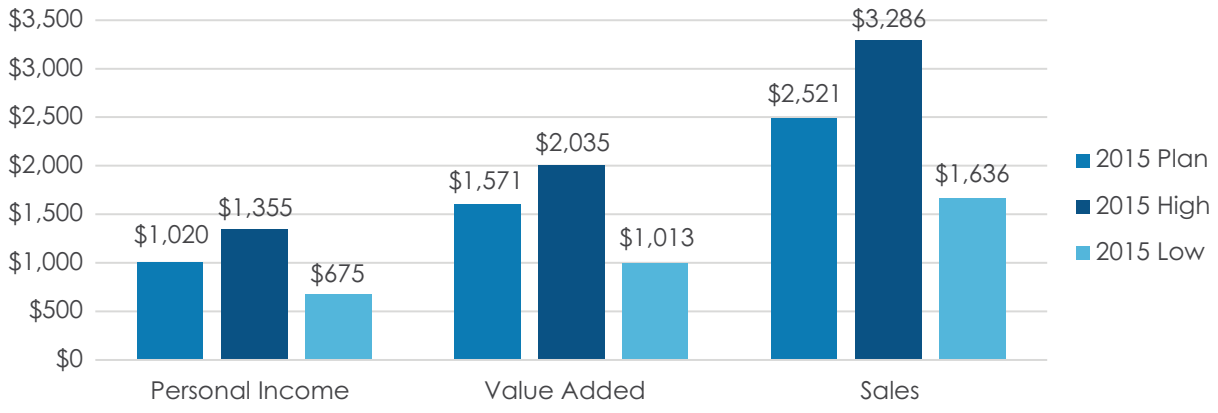


Figure 7. Study Period Income, Value Added, and Sales Impacts ($2015 Million), by 2015 Scenario



ANALYSIS METHOD

Two Michigan utilities were included in the analysis: Consumers Energy and DTE Energy. Cadmus estimated the net economic impacts of annual program spending and resulting energy savings for each utility using the Regional Economic Models, Inc. Policy Insight+ (REMI PI+) model, a dynamic economic forecasting tool.[2]

For each program scenario analyzed, we determined net first-year and future-year impacts on four key economic indicators across a 25-year study period: (1) employment; (2) personal income; (3) value added; and (4) sales. To isolate the net statewide effects on these variables from each program scenario, Cadmus modeled six cash flows against the REMI PI+ model's built-in forecast of the baseline economy: (1) program payments; (2) program spending; (3) incentives; (4) participant payments; (5) bill reductions; and (6) avoided utility costs.[3]

CONCLUSION

Michigan utilities' energy efficiency programs create local jobs, boost statewide income, and increase in-state spending. The 2014 programs alone are estimated to create more than 15,200 jobs, increase statewide income by nearly $1.4 billion, add nearly $2 billion of economic value, and generate almost $3.2 billion in sales between 2014 and 2038. Utilities plan to reduce investment and energy savings in 2015. As a result, the planned 2015 programs are estimated to generate lower—but still positive—impacts on the Michigan economy. Model findings suggest that depending on actual levels of investment and savings, the 2015 programs will create between 7,356 and 14,762 jobs, increase statewide income by $675 million to $1.4 billion, add between $1 and $2 billion of economic value, and generate $1.6 to $3.3 billion in sales between 2015 and 2039. In any case, energy efficiency investments generate positive impacts on the Michigan economy.

[2] http://www.remi.com/

[3] A separate section of this report, "The Economic Impacts of Energy Efficiency Investments in the Midwest," includes a detailed description of each economic indicator and modeled cash flow analyzed in this study.

APPENDIX B: THE ECONOMIC IMPACTS OF ENERGY EFFICIENCY INVESTMENTS IN OHIO

CADMUS

EXECUTIVE SUMMARY

ECONOMIC IMPACTS OF ENERGY EFFICIENCY

OHIO

Multi-Year Impacts of 2014 Programs

14,002

JOBS CREATED

$1.211 BILLION

BOOST TO STATEWIDE INCOME

16,212 GWh

ELECTRICITY SAVED

EMISSIONS AVOIDED

13,029,988 TONS CO_2

62,886 TONS SO_2

13,863 TONS NO_x

ENERGY EFFICIENCY INVESTMENTS ARE CREATING JOBS AND INCREASING INCOMES IN OHIO.

Analysis conducted by Cadmus concludes that 2014 energy efficiency investments in Ohio have yielded, and will continue to generate, net benefits for the Ohio state economy. In 2014 alone, these benefits included nearly **3,000 new jobs,** more than **$175 million in increased statewide income,** about **$270 million in total net economic value,** and over **$500 million in net sales.**

The analysis also concludes that the economic impacts of energy efficiency investments endure, providing positive returns for Ohio residents and businesses long after the utilities' initial investments. Over the entire 25-year study period, the 2014 energy efficiency programs are estimated to **create over 14,000 jobs, increase net statewide income by more than $1.2 billion, add almost $1.9 billion of total value to the state's economy,** and **generate nearly $3.3 billion in net sales.**

In 2014, the Ohio state legislature imposed a two-year freeze on the state energy efficiency resource standard mandate. Since early 2016, the Ohio state legislature has been engaged in a statewide debate on the future of energy policy.

Formal energy efficiency standards support a targeted investment that leads to larger energy savings and economic benefits. Energy efficiency programs provide direct investment into the state's economy, creating real jobs and having a lasting impact.

MEEA
MIDWEST ENERGY EFFICIENCY ALLIANCE

INTRODUCTION

This report describes the net statewide economic benefits of Ohio energy efficiency programs. As requested by MEEA, Cadmus determined the net economic impacts of 2014 program portfolio spending and savings.

Cadmus modeled annual statewide employment, personal income, value added, and sales benefits over a 25-year study period. Table 1 summarizes the net study period impacts on each of these economic indicators.

As Figure 1 illustrates, energy efficiency investments affect the flow of money through the state and regional economies in three ways. ***Direct economic effects*** represent impacts on industries directly involved with utility programs, such as firms that manufacture energy technologies or provide project services. ***Indirect economic effects*** account for impacts on industries in the energy efficiency supply chain, such as firms that supply raw manufacturing inputs to the directly affected industries. ***Induced economic effects*** lead to additional impacts on other industries as utility program participants and employees of directly and indirectly affected industries spend money in the economy.

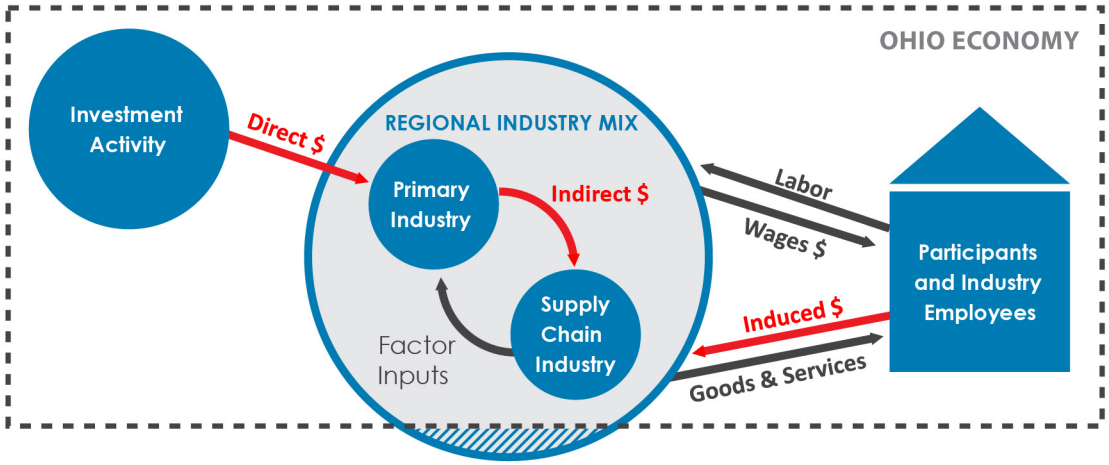
Ohio investments in energy efficiency create jobs, generate new income, and increase in-state spending.

The 2014 programs alone are estimated to create more than 14,000 jobs, increase statewide income by over $1.2 billion, add nearly $1.9 billion of economic value, and generate almost $3.3 billion in sales between 2014 and 2038.

Table 1. Summary Findings

Economic Indicator	Net Study Period Impacts
	2014 Actual
Employment (jobs)	14,002
Personal Income (millions of 2015 dollars)	$1,211
Value Added (millions of 2015 dollars)	$1,891
Sales (millions of 2015 dollars)	$3,277

Figure 1. How Energy Efficiency Investments Affect the Flow of Money Through the Economy



Although the modeling analysis assumes total statewide spending is the same with or without programs, net impacts are positive because the *nature* of spending within the Ohio economy changes as a result of direct, indirect, and induced program effects. In the example shown in Figure 1, efficiency investments result in positive net statewide economic impacts because funds that are directed to mainly local industries would otherwise have been spent primarily (but not exclusively) on energy resources, some of which are imported into Ohio.

In addition to the effects from program year expenditures, efficiency investments continue to generate positive net economic benefits for as long as energy savings continue. Ongoing energy savings allow participants to spend less money on energy and more on other products and services, many of which have relatively localized supply chains. Furthermore, Ohio utilities benefit from reduced fuel and power purchases, transmission and distribution costs, emission allowance costs, and supply capacity requirements. However, customers purchase less energy after participating in energy efficiency programs; therefore, utilities also forego revenues equal to sales reductions.[1]

ANALYSIS FINDINGS

Cadmus estimated the net impacts on the Ohio economy of actual 2014 program spending and energy savings. The following sections describe detailed findings from our analysis.

2014 PROGRAM PORTFOLIO SPENDING AND SAVINGS

As shown in Table 2, Ohio utilities invested nearly $211 million (2015 dollars) in their 2014 energy efficiency program portfolios. They spent about 49% of that amount on residential programs, 48% on nonresidential programs, and 3% on cross-cutting initiatives such as customer education or program evaluation. The statewide program portfolio achieved over 16,000 GWh of lifetime electric savings (Ohio utilities do not report gas savings), saving over 13 million tons of CO_2, nearly 63,000 tons of SO_2, and almost 14,000 tons of NO_x. Of the total energy savings achieved, residential programs saved nearly 43%, nonresidential programs saved more than 55%, and cross-cutting initiatives saved about 2%.

2014 PROGRAM PORTFOLIO ECONOMIC IMPACTS

The economic impacts of any energy efficiency portfolio depend partly on the total level of investment and energy savings, and partly on the mix of programs. A program's net effect on the statewide economy depends on which industries are directly affected, as well as on the participant customer segment, the type of efficiency measure(s) promoted, and the incentive(s) offered. Then, the magnitude of those impacts

Table 2. 2014 Utility Spending and Savings, by Program Customer Segment

Program Customer Segment	Spending (Millions of $2015)	GWh Savings	therm Savings	Avoided CO_2 (tons)	Avoided SO_2 (tons)	Avoided NO_x (tons)
2014 Actual						
Residential	$104.1	4,576	NR	3,677,844	17,750	3,913
Nonresidential	$101.2	11,597	NR	9,328,850	44,985	9,917
Cross-Cutting	$5.5	39	NR	31,294	151	33
Total Portfolio	$210.9	16,212	NR	13,029,988	62,886	13,863

* Ohio utilities do not report gas savings; therefore, no gas savings are included in the analysis.

[1] The dollar value of these reductions represents a cost to the utilities, which we also considered in our analysis.

depends on the levels of investment and energy savings. As shown in Table 3, the Ohio utilities' 2014 programs should result in positive net economic impacts in both the near- and long-term.

Details of the net statewide employment, personal income, value added, and sales impacts of the 2014 program portfolio are outlined in the following sections.

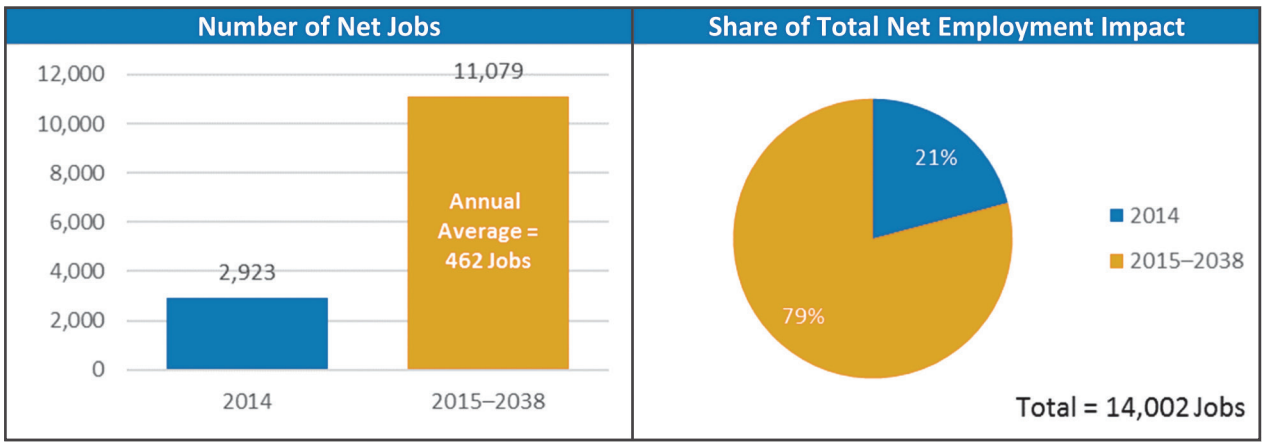
EMPLOYMENT

Program spending and energy savings generate positive net effects on statewide employment in the near term and over time. Figure 2 shows the net first-year and future-year job impacts. Analysis findings suggest that the 2014 programs created nearly 3,000 net jobs in the first year, or approximately 21% of the study period total (over 14,000 jobs). Modeling also shows that ongoing energy savings will help create another 11,079 net jobs—an average of 462 per year—through the end of the study period.

Table 3. Net Program-Year and Future-Year Economic Impacts from 2014 Programs

Economic Indicator	Net Impact
Program Year Employment (jobs)	2,923
Future Year Employment (jobs)	11,079
Total Study Period Employment (jobs)	14,002
Program Year Personal Income ($2015 Millions)	$176
Future Year Personal Income ($2015 Millions)	$1,035
Total Study Period Personal Income ($2015 Millions)	$1,211
Program Year Value Added ($2015 Millions)	$270
Future Year Value Added ($2015 Millions)	$1,621
Total Study Period Value Added ($2015 Millions)	$1,891
Program Year Sales ($2015 Millions)	$506
Future Year Sales ($2015 Millions)	$2,771
Total Study Period Sales ($2015 Millions)	$3,277

Figure 2. First-Year and Future-Year Employment Impacts



PERSONAL INCOME

As a result of increased statewide employment and ongoing energy cost savings, Ohio efficiency programs also yield positive near-term and long-term personal income effects. Figure 3 shows the net first-year and future-year statewide income impacts. The modeling analysis shows that the 2014 programs generated about $176 million of net income the first year, or about 15% of the study period total (over $1.2 billion). Ongoing energy savings benefits will continue generating an average of $43 million of net personal income per year—a total of more than $1 billion—from 2015 to 2038.

VALUE ADDED

Ohio efficiency investments and energy savings generate new demand for products and services that are produced by relatively local industries, which adds net value to the statewide economy. Figure 4 illustrates the net first-year and future-year value added impacts. The analysis suggests that the 2014 programs added about $270 million of net economic value the first year, or approximately 14% of the study period total (nearly $1.9 billion). Benefits from ongoing energy savings will generate an average of $68 million of net economic value per year—a total of more than $1.6 billion—from 2015 to 2038.

Figure 3. First-Year and Future-Year Personal Income Impacts

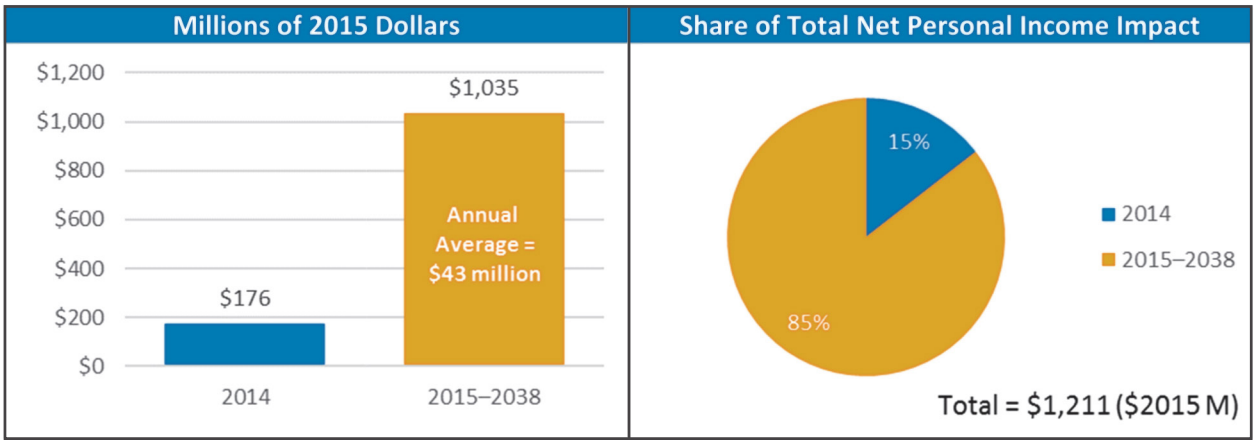


Figure 4. First-Year and Future-Year Value Added Impacts

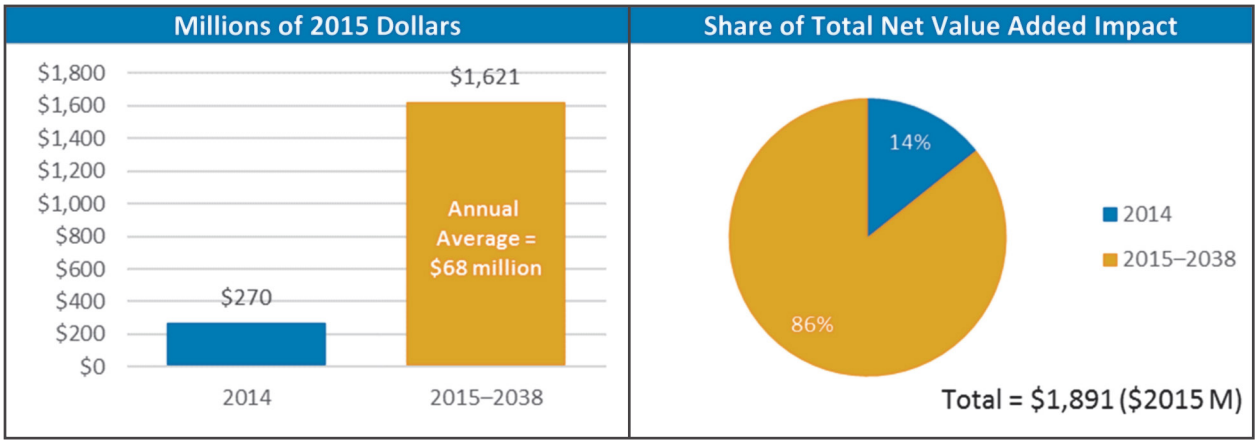
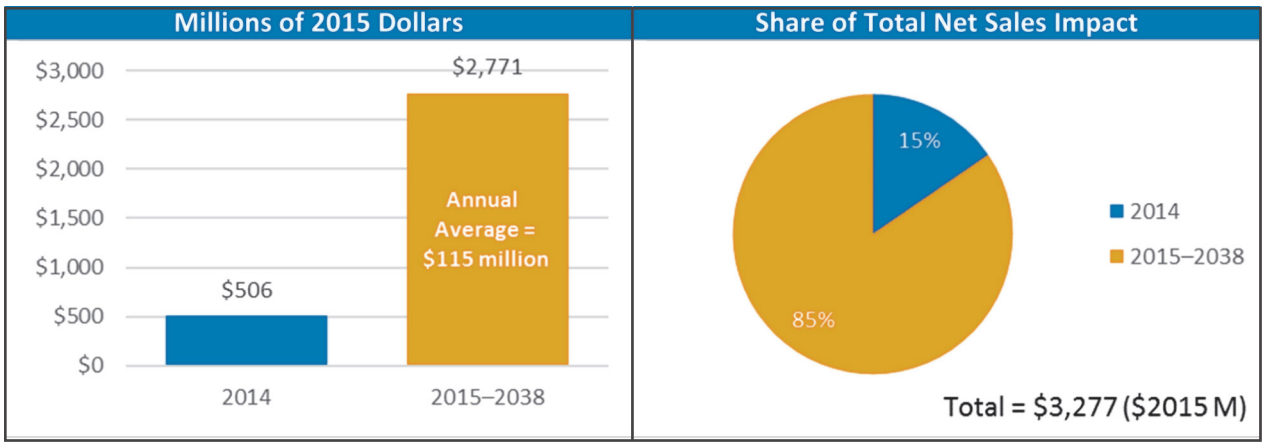


Figure 5. First-Year and Future-Year Sales Impacts



SALES

Efficiency program activities and resulting energy savings lead to positive net sales impacts in Ohio. Figure 5 shows the net first-year and future-year sales impacts by program year. Model findings suggest that the 2014 programs generated about $506 million of net sales the first year, or around 15% of the study period total (almost $3.3 billion). Spending of new income and energy cost savings will lead to an average of $115 million of net sales per year—a total of nearly $2.8 billion—from 2015 to 2038.

ANALYSIS METHOD

Six Ohio utilities were included in this analysis: American Electric Power Ohio, Dayton Power and Light, Duke Energy, First Energy Illuminating Company, First Energy Ohio Edison, and First Energy Toledo Edison. Cadmus estimated the net economic impacts of annual program spending and resulting energy savings for each utility using the Regional Economic Models, Inc. Policy Insight+ (REMI PI+) model, a dynamic economic forecasting tool.[2]

We determined net first-year and future-year impacts on four key economic indicators across a 25-year study period: (1) employment; (2) personal income; (3) value added; and (4) sales. To isolate the net statewide effects on these variables, Cadmus modeled six cash flows against the REMI PI+ model's built-in forecast of the baseline economy: (1) program payments; (2) program spending; (3) incentives; (4) participant payments; (5) bill reductions; and (6) avoided utility costs.[3]

CONCLUSION

Ohio utilities' energy efficiency programs affect the flow of money through the state economy, creating local jobs, boosting statewide income, and increasing in-state spending. The 2014 programs alone are estimated to create more than 14,000 jobs, increase statewide income by over $1.2 billion, add nearly $1.9 billion of economic value, and generate almost $3.3 billion in sales between 2014 and 2038.

[2] http://www.remi.com/

[3] A separate section of this report, "The Economic Impacts of Energy Efficiency Investments in the Midwest," includes a detailed description of each economic indicator and modeled cash flow analyzed in this study.

APPENDIX C: THE ECONOMIC IMPACTS OF ENERGY EFFICIENCY INVESTMENTS IN INDIANA

CADMUS

EXECUTIVE SUMMARY

ECONOMIC IMPACTS OF ENERGY EFFICIENCY

INDIANA

Multi-Year Impacts of 2014 Programs

6,238

JOBS CREATED

$513 MILLION

BOOST TO STATEWIDE INCOME

6,894 GWh

ELECTRICITY SAVED

21.4 MILLION

THERMS GAS SAVED

EMISSIONS AVOIDED

7,481,057 TONS CO_2

23,282 TONS SO_2

7,266 TONS NO_x

ENERGY EFFICIENCY INVESTMENTS ARE CREATING JOBS AND INCREASING INCOMES IN INDIANA.

Analysis conducted by Cadmus concludes that 2014 energy efficiency investments in Indiana have yielded, and will continue to generate, net benefits for the Indiana state economy. In 2014 alone, these benefits included nearly **1,700 new jobs,** more than **$85 million in increased statewide income,** about **$147 million in total net economic value,** and over **$250 million in net sales**.

The analysis also concludes that the economic impacts of energy efficiency investments persist, providing positive returns for Indiana residents and businesses long after the utilities' initial investments. Over the entire 25-year study period, the 2014 energy efficiency programs are estimated to **create over 6,200 jobs, increase net statewide income by more than $510 million, add over $800 million of total value to the state's economy,** and **generate nearly $1.4 billion in net sales.**

In 2014, the Indiana State Legislature repealed the statewide energy efficiency mandate requiring utilities to meet minimum energy efficiency targets. Indiana efficiency programming is now accomplished through voluntary utility efforts within an integrated resource planning process. As of June 2016, the Indiana Utility Regulatory Board is in the process of rulemaking to create an integrated resource planning process.

In 2015, with reduced investment in energy efficiency under the new voluntary standard, program activity resulted in lower impacts. Modeling shows that between 2015 and 2039 the 2015 programs are likely to generate between around 3,500 and 5,500 jobs, $300 to $450 million in statewide income, $490 to $780 million in economic value, and $820 million to $1.3 billion in sales.

MEEA
MIDWEST ENERGY EFFICIENCY ALLIANCE

INTRODUCTION

This report describes the net statewide economic benefits of Indiana energy efficiency programs. As requested by MEEA, Cadmus determined the net economic impacts of four program scenarios. First, we compared the net benefits of (1) actual 2014 program spending and savings to those of (2) planned 2015 program spending and savings. Then, to assess the effects from potential increases or decreases to planned activities and outcomes, Cadmus also calculated the net benefits of (3) a one-third increase and (4) a one-third decrease to planned 2015 spending and savings.

Cadmus estimated annual statewide impacts on employment, personal income, value added, and sales over a 25-year study period for each program scenario. Table 1 summarizes the net study period impacts on each of these economic indicators by program spending and savings scenario.

As Figure 1 illustrates, energy efficiency investments affect the flow of money through the state and regional economies in three ways. **Direct economic effects** represent impacts on industries directly involved with utility programs, such as firms that manufacture energy technologies or provide project services. **Indirect economic effects** account for impacts on industries in the energy efficiency supply chain, such as firms that supply raw manufacturing inputs to the directly affected industries. **Induced economic effects** lead to additional impacts on other industries as utility

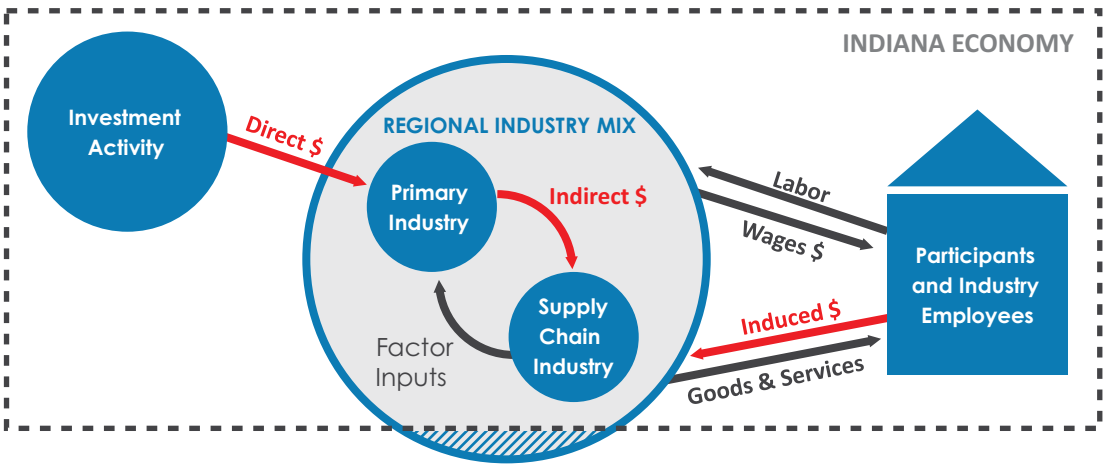
Indiana investments in energy efficiency create jobs, generate new income, and increase in-state spending. For example, the 2014 programs alone are estimated to generate more than 6,000 jobs, increase statewide income by over $500 million, add more than $800 million of economic value, and generate over $1.3 billion in sales between 2014 and 2038.

These economic impacts increase or decrease with the level of investment. For example, as the estimated impacts of planned 2015 programs reveal, positive economic effects will decrease if program spending and savings decrease.

Table 1. Summary Findings

Economic Indicator	Net Study Period Impacts			
	2014 Actual	2015 Plan	2015 High	2015 Low
Employment (jobs)	6,238	4,765	5,471	3,486
Personal Income (millions of 2015 dollars)	$513	$403	$456	$300
Value Added (millions of 2015 dollars)	$804	$661	$781	$492
Sales (millions of 2015 dollars)	$1,348	$1,107	$1,316	$822

Figure 1. How Energy Efficiency Investments Affect the Flow of Money Through the Economy



program participants and employees of directly and indirectly affected industries spend money in the economy.

Although the modeling analysis assumes total statewide spending is the same with or without programs, net impacts are positive because the *nature* of spending within the state economy changes as a result of direct, indirect, and induced program effects. In the example shown in Figure 1, efficiency investments result in positive net statewide economic impacts because funds that are directed to mainly local industries would otherwise have been spent primarily (but not exclusively) on energy resources, some of which are imported into Indiana.

In addition to the effects from program year expenditures, efficiency investments continue to generate positive net economic benefits as long as energy savings continue. Ongoing energy savings allow participants to spend less money on energy and more on other products and services, many of which have relatively localized supply chains. Furthermore, Indiana utilities benefit from reduced fuel and power purchases, transmission and distribution costs, emission allowance costs, and supply capacity requirements. However, customers purchase less energy after participating in energy efficiency programs; therefore, utilities also forego revenues equal to sales reductions.[1]

ANALYSIS FINDINGS

Cadmus compared the net impacts on the Indiana economy of actual 2014 program spending and energy savings to the net benefits of planned 2015 spending and savings. To approximate a range of benefits from *actual* 2015 program spending and energy savings, which may deviate from the plans, Cadmus also modeled the net economic benefits from a one-third increase and a one-third decrease to planned 2015 spending and savings. The following sections describe findings from our analyses.

2014 AND 2015 PROGRAM PORTFOLIO IMPACTS

As shown in Table 2, Indiana utilities changed their program portfolios from 2014 to 2015, including decreasing total investment and electric savings and increasing gas savings across the entire program portfolio. Compared to 2014, the 2015 planned portfolio reduced residential investment

Table 2. 2014 and 2015 Utility Spending and Lifetime Savings, by Program Customer Segment

Program Customer Segment	Spending (millions of $2015)	GWh Savings	therm Savings	Avoided CO_2 (tons)	Avoided SO_2 (tons)	Avoided NO_x (tons)
2014 Actual						
Residential	$58.9	1,673	14,404,210	2,084,114	6,486	2,024
Nonresidential	$65.9	5,221	7,032,940	5,396,903	16,796	5,242
Cross-Cutting*	$2.2	0	0	40	0	0
Total Portfolio	$126.9	6,894	21,437,150	7,481,057	23,282	7,266
2015 Plan						
Residential	$54.3	1,328	18,849,415	1,870,259	5,820	1,816
Nonresidential	$51.6	4,677	18,270,000	5,183,813	16,133	5,035
Cross-Cutting	$0.9	0	0	0	0	0
Total Portfolio	$106.8	6,005	37,119,415	7,054,072	21,953	6,851

*2014 Cross-cutting programs saved 41,000 kWh, 0.13 tons of SO_2, and 0.04 tons of NO_x.

[1] The dollar value of these reductions represents a cost to the utilities, which we also considered in our analysis.

by nearly $5 million, nonresidential investment by more than $14 million, and cross-cutting (i.e., non-segment specific) investment by more than $1 million for a total portfolio reduction of approximately $20 million (16% change). The planned funding changes primarily affected electric programs, reducing total electric portfolio investment by 17%, particularly programs targeting commercial and industrial customers. However, investment shrank by only 1% for gas programs across the portfolio, as utilities diverted nearly all cross-cutting spending on gas-related initiatives to residential and nonresidential gas programs.

As a result of these spending changes, Indiana utilities expected increases in lifetime gas savings of over 4 million therms for residential programs and more than 11 million therms for nonresidential programs. Planned lifetime electric savings decreased by about 345 GWh for residential programs and 544 GWh for nonresidential programs. Cross-cutting programs did not record any therm savings in 2014, and the 2015 plans did not include electric or gas savings. Across the entire portfolio, Indiana utilities voluntarily planned for a total reduction in lifetime electric savings of approximately 889 GWh (13% change) and a total increase in lifetime gas savings of nearly 16 million therms (73% change).

The economic impacts of energy efficiency portfolios depend partly on the total level of investment and energy savings, and partly on the mix of programs. This is mainly because a program's effect on industries in the state and regional economies depends on customer segment, the type of efficiency measure(s) promoted, and the incentive(s) offered.

As shown in Table 3, changes in Indiana utilities' program spending and savings led to nonlinear changes in statewide employment, personal income, value added, and sales impacts because the mix of programs in Indiana utilities' portfolios also changed. The significant decrease in 2015 portfolio investment led to decreases in employment that were larger than decreases to other economic indicators. Overall, net economic impacts declined more than total investment in percentage terms.

Details of the net statewide employment, personal income, value added, and sales benefits of the 2014 actual and 2015 planned program portfolios are outlined in the following sections.

Table 3. Changes in Net Economic Impacts from 2014 Actual to 2015 Plan

Economic Indicator	2014 Actual	2015 Plan	Change (%)
Program Year Employment (jobs)	1,662	1,039	-37%
Future Year Employment (jobs)	4,576	3,726	-19%
Total Study Period Employment (jobs)	6,238	4,765	-24%
Program Year Personal Income ($2015 Millions)	$86	$49	-43%
Future Year Personal Income ($2015 Millions)	$427	$354	-17%
Total Study Period Personal Income ($2015 Millions)	$513	$403	-21%
Program Year Value Added ($2015 Millions)	$147	$78	-47%
Future Year Value Added ($2015 Millions)	$657	$582	-11%
Total Study Period Value Added ($2015 Millions)	$804	$661	-18%
Program Year Sales ($2015 Millions)	$252	$143	-43%
Future Year Sales ($2015 Millions)	$1,096	$964	-12%
Total Study Period Sales ($2015 Millions)	$1,348	$1,107	-18%

EMPLOYMENT

Program spending and energy savings generate positive net effects on statewide employment in the near term and over time. Figure 2 shows the net first-year and future-year job impacts by program year. Analysis findings suggest that actual 2014 programs created 1,662 net jobs in the first year and will help create another 4,576 net jobs—an average of 191 per year—through the end of the study period (2038). Planned 2015 programs created 1,039 net jobs in the first year and are expected to help create an additional 3,726 net jobs—an average of 155 per year—through the end of the study period (2039).

PERSONAL INCOME

Indiana efficiency programs also produce positive near-term and long-term statewide personal income effects. Figure 3 shows the net first-year and future-year statewide income impacts by program year. The model findings show that the 2014 programs generated about $86 million of net income the first year and will generate about $427 million—an average of $18 million per year—through 2038. Planned 2015 programs provided $49 million of net income in the first year and are predicted to generate about $354 million of additional net income—about $15 million per year—through 2039.

Figure 2. First-Year and Future-Year Employment Impacts (Jobs), by Program Year

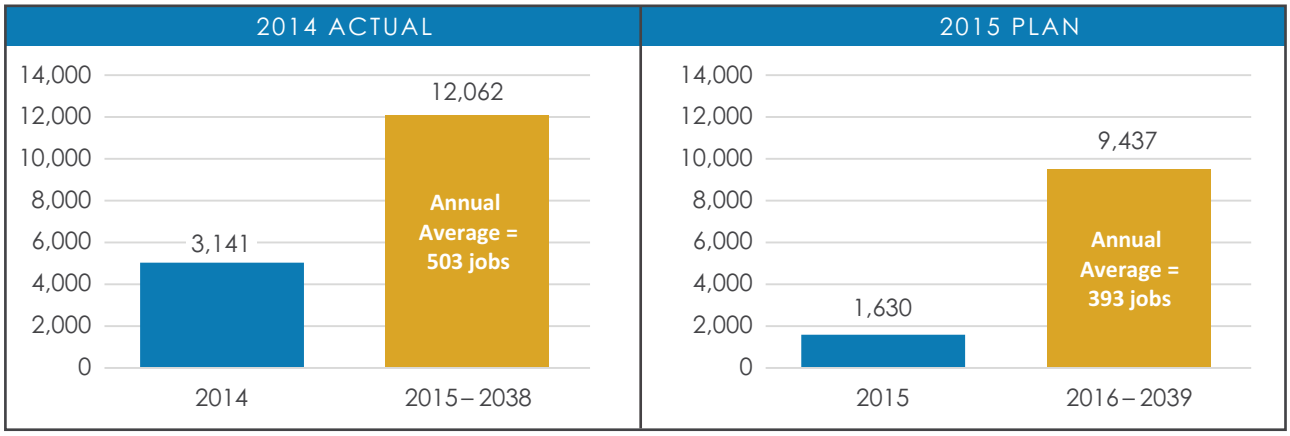


Figure 3. First-Year and Future-Year Personal Income Impacts (Millions of $2015), by Program Year

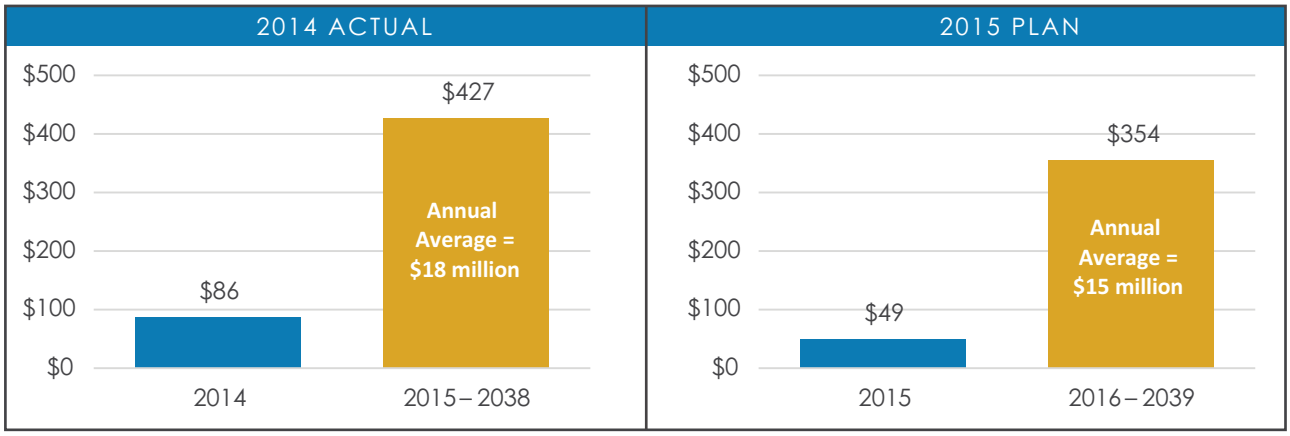
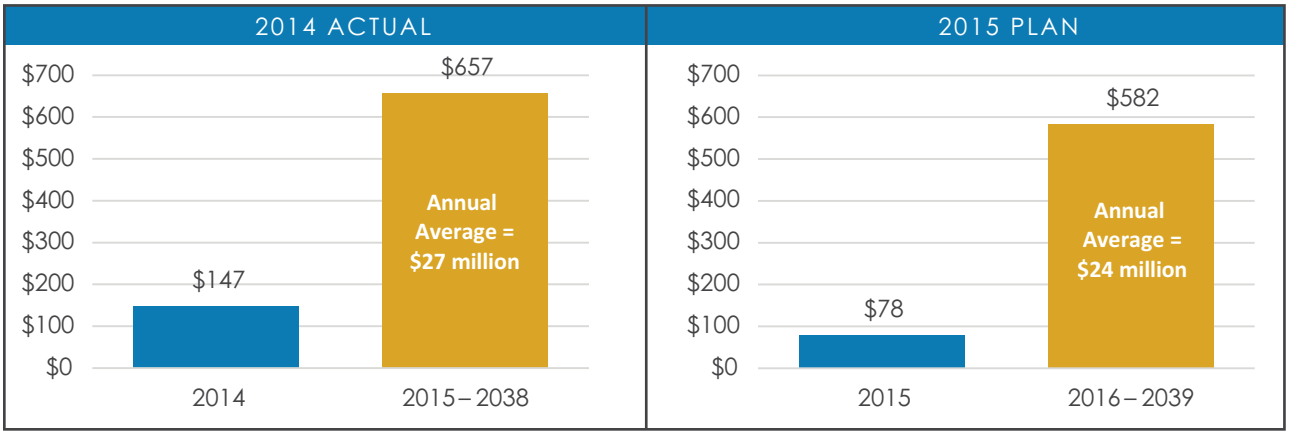


Figure 4. First-Year and Future-Year Value Added Impacts (Millions of $2015), by Program Year



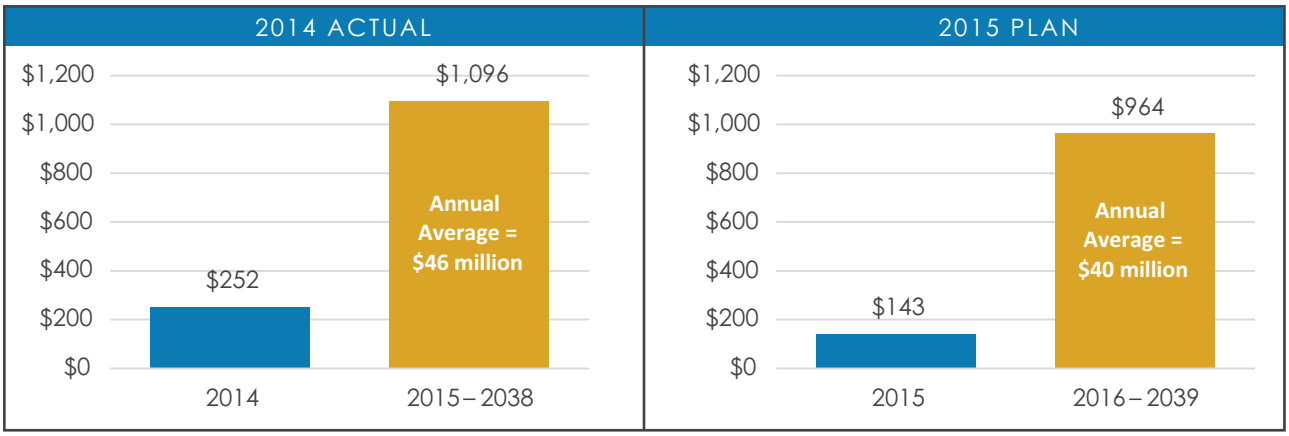
VALUE ADDED

Indiana efficiency investments and energy savings generate new demand for products and services that are produced by relatively local industries, which adds net value to the statewide economy. Figure 4 illustrates the net first-year and future-year value added impacts by program year. The analysis suggests that the 2014 program portfolio added about $147 million of net economic value the first year and about $657 million—an average of $27 million per year—through the end of the study period. Planned 2015 programs created $78 million of additional net economic value in the first year and are predicted to generate approximately $582 million—an average of $24 million per year—through 2039.

SALES

Efficiency program activities and resulting energy savings also lead to positive net sales impacts in Indiana. Figure 5 shows the net first-year and future-year sales impacts by program year. Model findings show that the 2014 programs generated about $252 million of net sales the first year and a total of almost $1.1 billion—an average of $46 million per year—through the end of the study period. Planned 2015 programs generated $143 million of net sales in the first year and are predicted to add almost $1 billion of additional sales—an average of about $40 million per year—through 2039.

Figure 5. First-Year and Future-Year Sales Impacts (Millions of $2015), by Program Year



IMPACTS FROM CHANGES TO 2015 PROGRAM PORTFOLIO PLANS

Since actual program spending and savings may deviate from plans, Cadmus conducted a sensitivity analysis of just the planned 2015 program investments and resulting savings. Fixed percentage changes to spending and savings across the entire portfolio lead to nonlinear percentage changes to net economic benefits. More precisely, a one-third increase to planned 2015 program spending and savings results in a roughly one-sixth increase to all four economic indicators. Sales impacts would experience the largest growth (19%) from an increase to 2015 planned spending and savings, whereas personal income would experience the smallest growth (13%).

On the other hand, a one-third decrease to planned 2015 spending and savings results in an approximately one-fourth decrease to all four economic indicators. Compared to the effects expected from 2015 plans, employment benefits from reduced spending and savings would decrease the most (-27%) and personal income benefits would decrease the least (-25%). Ultimately, the predicted effects from significant percentage increases or decreases to planned 2015 program investments and savings result in unequal but also significant percentage increases or decreases in economic benefits.

As shown in Figure 6, the findings suggest that a one-third increase to 2015 program spending and savings generates total employment impacts of 5,471 net jobs, representing a net increase of 706 jobs over the entire study period. Findings also suggest that a one-third decrease to planned spending and savings generates total employment impacts 3,486 net jobs, a total net decrease of 1,279 jobs through 2039.

As Figure 7 illustrates, analysis findings show that a one-third increase to 2015 spending and savings generates total study period income, value added, and sales impacts of approximately $456 million,

Figure 6. Study Period Employment Impacts (Jobs), by 2015 Scenario

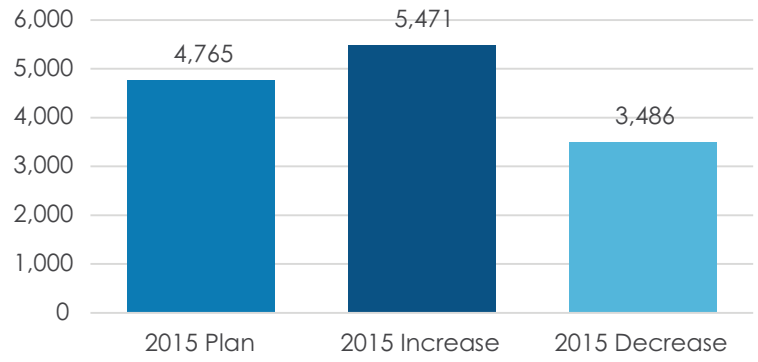
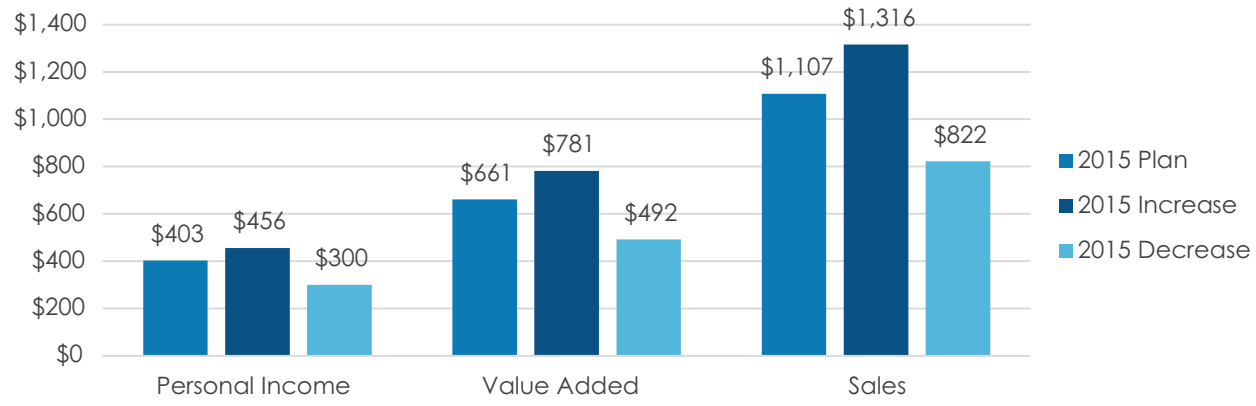


Figure 7. Study Period Income, Value Added, and Sales Impacts ($2015 Million), by 2015 Scenario



$781 million, and $1.3 billion, respectively. A one-third decrease to planned spending and savings leads to total study period income, value added, and sales impacts of about $300 million, $492 million, and $822 million, respectively.

ANALYSIS METHOD

Six Indiana utilities were included in this analysis: Duke Energy, Indiana Power & Light Company, the Indiana Municipal Power Agency, Indiana Michigan Power, Northern Indiana Public Service Company, and Vectren Corporation. Cadmus estimated the net economic impacts of annual program spending and resulting energy savings for each utility using the Regional Economic Models, Inc. Policy Insight+ (REMI PI+) model, a dynamic economic forecasting tool.[2]

For each program scenario analyzed, we determined net first-year and future-year impacts on four key economic indicators across a 25-year study period: (1) employment; (2) personal income; (3) value added; and (4) sales. To isolate the net statewide effects on these variables from each program scenario, Cadmus modeled six cash flows against the REMI PI+ model's built-in forecast of the baseline economy: (1) program payments; (2) program spending; (3) incentives; (4) participant payments; (5) bill reductions; and (6) avoided utility costs.[3]

CONCLUSION

Indiana utilities' energy efficiency programs create local jobs, boost statewide income, and increase in-state spending. The 2014 programs alone are estimated to create more than 6,000 jobs, increase statewide income by over $500 million, add more than $800 million of economic value, and generate over $1.3 billion in sales between 2014 and 2038. Utilities plan to reduce investment and energy savings in 2015. As a result, the planned 2015 programs are estimated to generate lower—but still positive—impacts on the Indiana economy. Model findings suggest that depending on actual levels of investment and savings, the 2015 programs will create between 3,486 and 5,471 jobs, increase statewide income by $300 to $456 million, add between $492 and $781 million of economic value, and generate $822 million to $1.3 billion in sales between 2015 and 2039. In any case, energy efficiency investments generate positive impacts on the Indiana economy.

[2] http://www.remi.com/

[3] A separate section of this report, "The Economic Impacts of Energy Efficiency Investments in the Midwest," includes a detailed description of each economic indicator and modeled cash flow analyzed in this study.

APPENDIX D: UTILITIES BY STATE

Table 1. Utilities by State

State	Utility Program Administrator
Illinois	Ameren Illinois
	Commonwealth Edison
	Nicor Gas
	North Shore Gas
	Peoples Gas
Indiana	Duke Energy Indiana
	Indiana Michigan Power
	Indiana Municipal Power Agency
	Indianapolis Power and Light
	NIPSCO
	Vectren
Iowa	Alliant Energy
	Black Hills Energy
	MidAmerican Energy
Kansas	Butler Rural Electric Cooperative Association, Inc.
	DS&O Electric Cooperative, Inc.
	City of Gardner
	City of Kansas City
	Kansas City Power and Light Company
	Kansas Gas & Electric Company
	Sedgwick County Electric Cooperative Association, Inc.
	Westar Energy, Inc.
Kentucky	AEP Kentucky Power
	Louisville Gas &Electric and Kentucky University
Michigan	Alger Delta
	Baraga
	Bay City
	Bayfield
	Charlevoix
	Chelsea
	Cherryland
	Clinton
	Cloverland/Edison
	Coldwater
	Consumers Energy
	Croswell
	Crystal Falls
	Dagget Electric Company
	Detroit PLD
	Dowagiac

State	Utility Program Administrator
Michigan	DTE
	Eaton Rapids
	Escanaba
	Gladstone
	Grand Haven
	Great Lakes
	Harbor Springs
	Hart
	Hillsdale
	Holland
	L'Anse
	Lansing Board of Water and Light
	Lowell
	Marquette
	Marshall
	Midwest
	Negaunee
	Newberry
	Niles
	Norway
	Ontonagon
	Paw Paw
	Petoskey
	Portland
	Presque Isle
	Sebewaing
	South Haven
	St. Louis
	Stephenson
	Sturgis
	Thumb
	Traverse City
	Tri-County
	Union City
	Wakefield
	Wyandotte
	Zeeland
Minnesota	Adrian Public Utilities Commission
	Alliant Energy
	Bagley Public Utilities Comm
	Beltrami Electric Cooperative, Inc.

State	Utility Program Administrator
Minnesota	City of Alexandria
	City of Anoka
	City of Arlington
	City of Austin
	City of Barnesville
	City of Benson
	City of Breckenridge
	City of Brewster
	City of Chaska
	City of Detroit Lakes
	City of East Grand Forks
	City of Jackson
	City of Lake City
	City of Luverne
	City of Marshall
	City of Moorhead
	City of Mora
	City of Owatonna
	City of Saint Peter
	City of Sauk Centre
	City of St. James
	City of Staples
	City of Thief River Falls
	City of Virginia
	City of Wadena
	City of Waseca
	City of Windom
	City of Worthington
	Clearwater-Polk Electric Cooperative, Inc.
	Fairmont Public Utilities Commission
	Freeborn-Mower Cooperative Services
	Grand Rapids Public Utilities Commission
	Great Plains Natural Gas Company
	Great River Energy
	Interstate Power and Light Company
	Litchfield Public Utilities
	Melrose Public Utilities
	Mille Lacs Energy Cooperative
	Minnesota Energy Resources Corporation
	Minnesota Power
	New Prague Utilities Commission

State	Utility Program Administrator
Minnesota	New Ulm Public Utilities Commission
	North Itasca Electric Cooperative, Inc.
	Otter Tail Power
	P K M Electric Cooperative, Inc.
	People's Cooperative Services
	Princeton Public Utilities Commission
	Red Lake Electric Cooperative, Inc.
	Red River Valley Cooperative Power Association
	Rochester Public Utilities
	Roseau Electric Cooperative, Inc.
	Shakopee Public Utilities Commission
	Sioux Valley SW Electric Cooperative
	Sleepy Eye Public Utility Commission
	Stearns Cooperative Electric Association
	Steele-Waseca Cooperative Electric
	Tri-County Electric Cooperative
	Wild Rice Electric Cooperative, Inc.
	Willmar Municipal Utilities
	Xcel Energy
Missouri	Ameren Missouri
Nebraska	Burt County Public Power District
	Butler Public Power District
	Cedar-Knox Public Power District
	City of Gothenburg
	City of Holdrege
	City of Minden
	City of North Platte
	Dawson Power District
	Elkhorn Rural Public Power District
	Highline Electric Association
	KBR Rural Public Power District
	Lincoln Electric System
	Loup River Public Power District
	Municipal Energy Agency of Nebraska
	Nebraska Public Power District
	Norris Public Power District
	North Central Public Power District
	Northeast Nebraska Public Power District
	Omaha Public Power District
	Panhandle Rural Electric Member Association
	Perennial Public Power District

State	Utility Program Administrator
Nebraska	South Central Public Power District
	Southern Public Power District
	Stanton County Public Power District
	Wheat Belt Public Power District
North Dakota	Capital Electric Cooperative, Inc.
	KEM Electric Cooperative, Inc.
	McKenzie Electric Cooperative, Inc.
	McLean Electric Cooperative, Inc.
	North Central Electric Cooperative, Inc.
	City of Valley City
	Verendrye Electric Cooperative, Inc.
	Cass County Elec Cooperative, Inc.
	Roughrider Electric Cooperative
Ohio	AEP Ohio
	Dayton Power and Light
	Duke Energy Ohio
	First Energy Illuminating Company
	First Energy Ohio Edison
	First Energy Toledo Edison
South Dakota	City of Brookings
	Butte Electric Coop, Inc.
	East River Elec Power Coop, Inc.
	City of Flandreau
	City of Fort Pierre
	LaCreek Electric Assn, Inc.
	Lake Region Electric Assn, Inc.
	MidAmerican Energy Company
	Northern States Power Company
	NorthWestern Energy
	Otter Tail Power Company
	Sioux Valley Southwest Electric Cooperative
	Black Hills Power, Inc.
	City of Vermillion
	City of Volga
	Watertown Municipal Utilities
	West River Electric Association, Inc.
	Winner Municipal Utility
	Town of Pickstown
Wisconsin	Focus on Energy

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