



CADMUS

THE ECONOMIC IMPACTS
OF ENERGY EFFICIENCY
INVESTMENTS IN MICHIGAN

OCTOBER 2016



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PREPARED BY:

Charles Bicknell
Tyler Browne
Alex Chamberlain
David Molner

The Cadmus Group, Inc.
100 Fifth Avenue, Suite 100
Waltham, MA 02451

PREPARED FOR:

Midwest Energy Efficiency Alliance
20 North Wacker Drive, Suite 1301
Chicago, IL 60606



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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



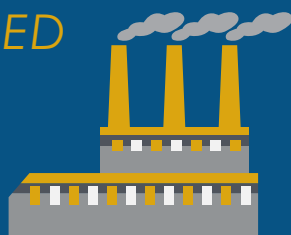
377 MILLION
THERMS GAS SAVED

EMISSIONS AVOIDED

21,303,908 TONS CO₂

64,534 TONS SO₂

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.



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

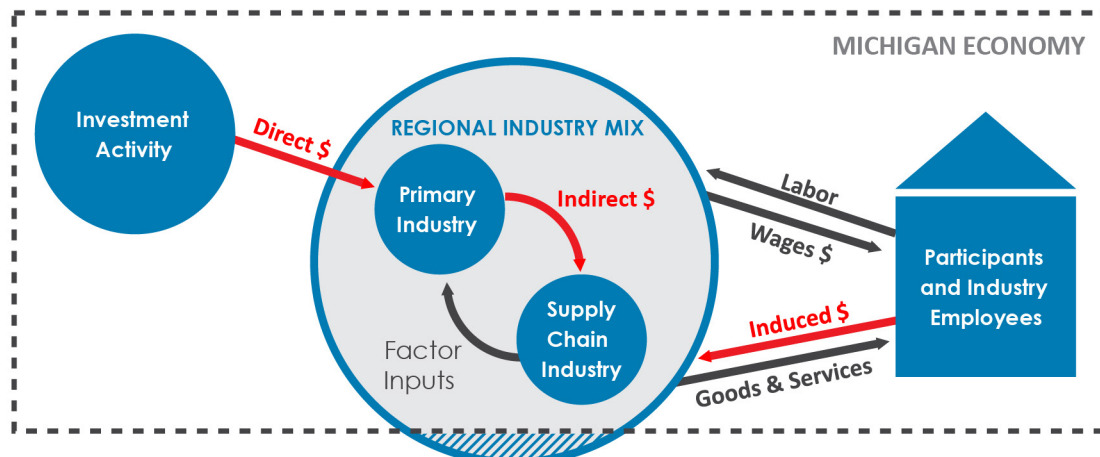
Michigan investments in energy efficiency create jobs, generate new income, and increase in-state spending. For example, the 2014 programs alone are estimated to create more than 15,200 jobs, increase statewide income by nearly \$1.4 billion, add nearly \$2 billion of economic value, and generate almost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

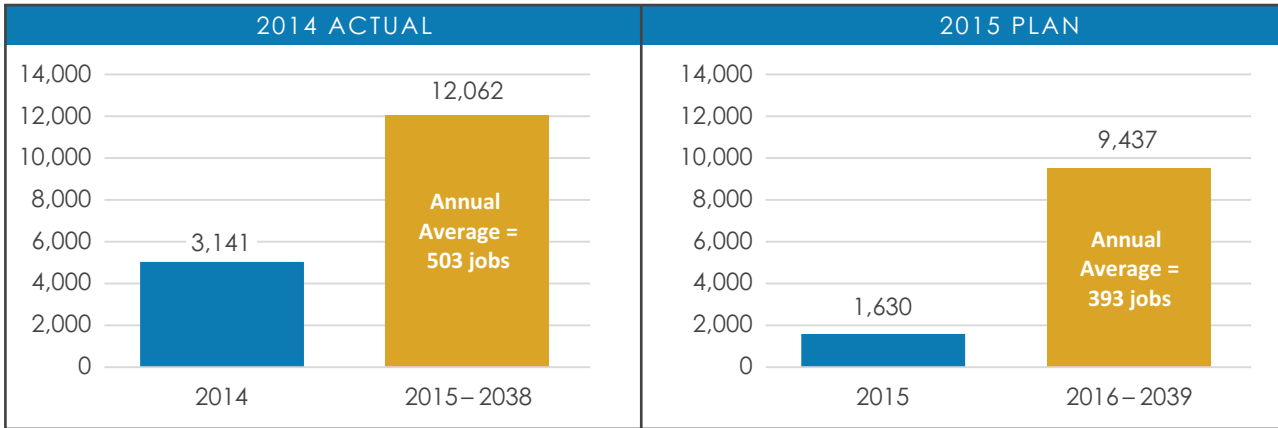
As shown in Table 3, changes in Michigan utilities' program spending and savings led to nonlinear changes in statewide employment, personal income, value added, and sales impacts because the mix of programs in Michigan utilities' portfolios also changed. The reduction in residential and nonresidential 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



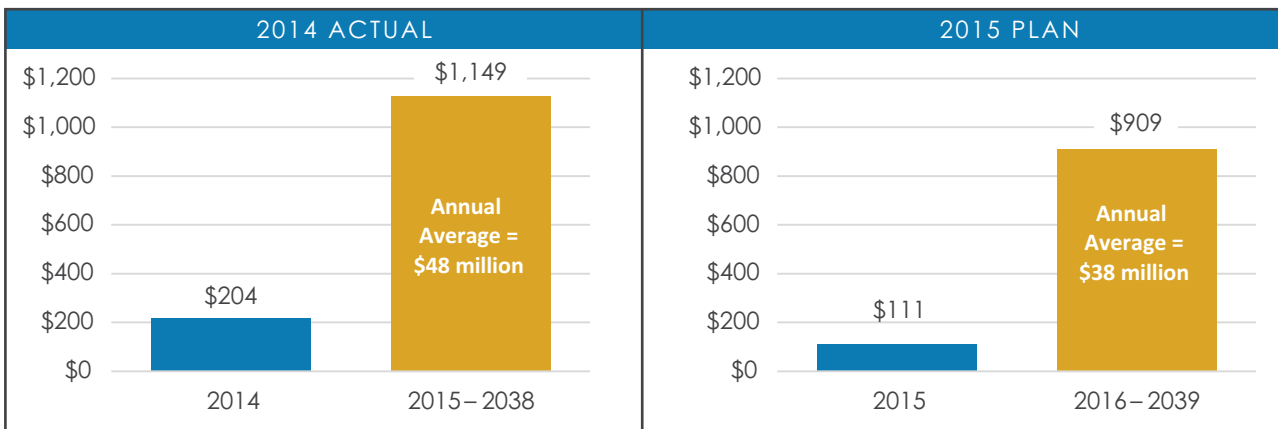
EMPLOYMENT

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 help 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

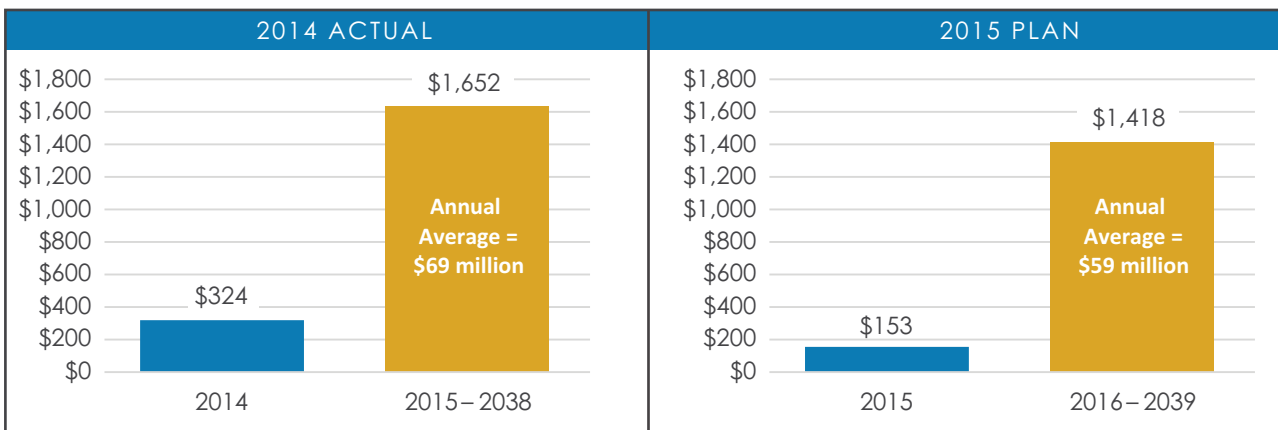
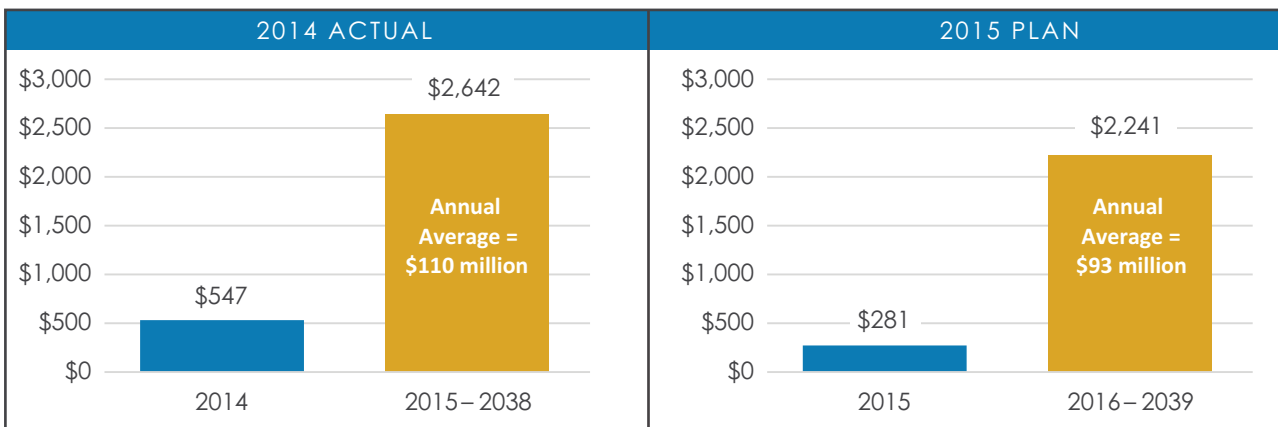


Figure 5. First-Year and Future-Year Sales Impacts (Millions of \$2015), by Program Year



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

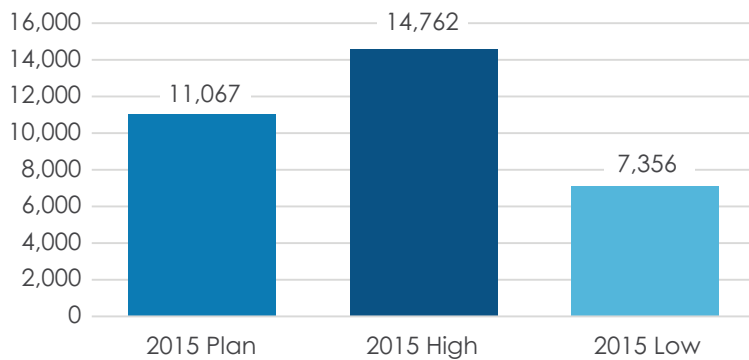
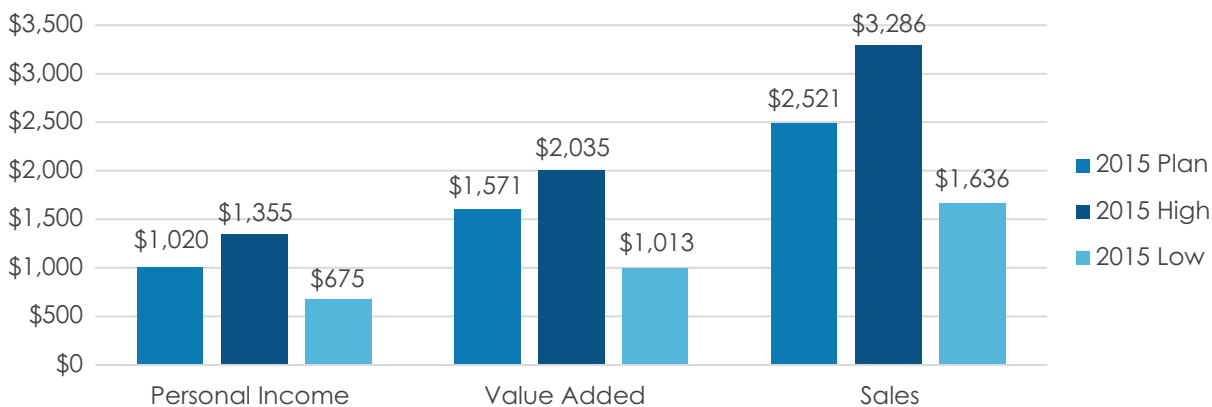


Figure 7. Study Period Income, Value Added, and Sales Impacts (\$2015 Million), by 2015 Scenario



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.

CADMUS

CADMUS
16 N. Carroll Street, Suite 900
Madison, WI 53703
Phone: 608.250.1920

www.cadmusgroup.com

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