

Public Service Commission of Wisconsin

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November 16, 2012

Dear Readers:

In November 2011, the Public Service Commission of Wisconsin (Commission) contracted with a third-party evaluator, the Cadmus Group (Cadmus), to provide statutorily-required evaluation, measurement, and verification of the Focus on Energy program. The completed report, along with an executive summary, follows this cover letter.

During 2011, Focus on Energy remained highly cost-effective, with benefits exceeding costs by a ratio of 2.46 to 1. Over the course of the year, Focus on Energy provided energy efficiency and renewable resource incentives to over 180,000 residential customers and 13,000 non-residential customers. Verified energy savings as a result of Focus on Energy projects amounted to 441 gigawatt-hours, or the equivalent of providing electricity to about 45,000 homes for one year.

Overall, the Cadmus report focuses on activities and achievements for calendar year 2011, which was characterized by significant transitions in program administration, implementation and design. State law requires the Commission to competitively bid for a program administrator, and as a result of that process, a new administrator was selected in 2011. As that transition took place, the new program administrator and new contracts took some time to get up and running, but the result will be a leaner, more efficient program.

In its statutorily-required quadrennial planning docket, the Commission established a four-year goal for Focus on Energy. This four-year goal covers calendar years 2011 through 2014. While the 2011 annual target fell short, the program administrator will still be held accountable through its performance contract for the achievement of the overall four-year goals. In short, any savings not realized in 2011 will need to be made up in the three subsequent years of the contract. The program administrator believes that comprehensive program redesign and expanded program participation opportunities have put the Focus on Energy programs on the right path to achieving the Commission-established four-year savings goals.

Sincerely,

Ellen Nowak
Commissioner

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REPORT

THE
CADMUS
GROUP, INC.

Focus on Energy Calendar Year 2011 Evaluation Report

October 31, 2012

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Table of Contents

EXECUTIVE SUMMARY	1
Summary of Findings	2
INTRODUCTION	4
The 2011 Evaluation	4
Overview of Evaluation Activities	5
Descriptions of Programs	5
Apartment and Condo Efficiency Services (ACES) Whole-Building Existing Program	5
Apartment and Condo Efficiency Services (ACES) New Construction Program	6
Appliance and Plug Load Program	7
Efficient Heating and Cooling Program	7
ENERGY STAR Lighting Program	8
Head Start Program	8
Home Performance with ENERGY STAR Program	9
New Homes Program	9
Residential Renewables Program	10
Targeted Home Performance Program	10
Non-Residential New Construction Program	11
Agricultural Program	12
Commercial Program	13
Industrial Program	13
Schools and Government Program	13
Non-Residential Renewables	14
Summary of Measures by Program	15
Evaluated Measures	17
EVALUATION FINDINGS	21
About Energy Savings Evaluations	21
Summary of Findings	23
Summary of Findings by Program	23
Summary of Findings by Measure Category	27
Residential Portfolio	31
Electronically Commutated Motors Study	31
Non-Residential Markets	40

Process and HVAC Study	40
Benefit Cost Findings.....	48
Recommendations.....	52
APPENDIX A. KEY ACHIEVEMENTS AND FIGURES FOR STATE OF WISCONSIN AND FOCUS ON ENERGY.....	54
APPENDIX B. GLOSSARY OF TERMS.....	55
APPENDIX C. NET-TO-GROSS RATIOS USED IN ANALYSIS	58
APPENDIX D. COST EFFECTIVENESS ANALYSIS DETAILS	61
APPENDIX E. COST EFFECTIVENESS SCENARIOS	64
APPENDIX F. DETAILED FINDINGS	67
Overview of Savings	67
Summary of Savings by Residential Program.....	69
Summary of Savings by Residential Measure	71
Summary of Savings by Non-Residential Program	73
Summary of Savings by Non-Residential Measure.....	75
APPENDIX G. CALENDAR YEAR 2011 EVALUATION DATABASE DEVELOPMENT PLAN	80
APPENDIX H. CALENDAR YEAR 2011 EVALUATION PLAN	86
Evaluation Priorities	87
Identifying High-Priority Measures.....	89
Evaluation Activities	90
Task 1. Compile and Summarize CY 2011 Data	90
Task 2. Finalize the Selection of High-Priority Measures	92
Task 3. Evaluate the High-Priority Measures	93
Task 4. Compile CY 2011 Savings.....	106
Task 5. Report on CY 2011 Program Evaluation Findings	106
Task 6. Perform <i>Ad Hoc</i> Tasks.....	107
APPENDIX I. SUMMARY OF FINDINGS BY COUNTY	108
Savings by Sector, by County	108
Residential.....	109
Industrial.....	112
Commercial	115
APPENDIX J. SUMMARY OF FINDINGS BY POLITICAL DISTRICT.....	124

Savings by Sector, by Assembly District.....	124
Residential.....	125
Industrial.....	128
Commercial	131
Savings by Sector, by Senate District.....	142
Residential.....	142
Industrial.....	145
Commercial	148
APPENDIX K. SUMMARY OF FINDINGS BY UTILITY TERRITORY.....	154
Savings by Sector, by Electric Utility Territory	154
Residential.....	155
Industrial.....	158
Commercial	161
Savings by Sector, by Gas Utility Territory.....	164
Residential.....	164
Industrial.....	167
Commercial	170

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Executive Summary

Focus on Energy is Wisconsin utilities' statewide energy-efficiency and renewable resource program funded by the state's investor-owned energy utilities—as required under Wisconsin Statute §196.374(2)(a)—and participating municipal and electric cooperative utilities. Focus on Energy has been in existence since 2001. The Public Service Commission of Wisconsin (the PSC) provides oversight of the Focus on Energy programs.

The 2005 Wisconsin Act 141 requires the PSC to conduct a review of energy-efficiency and renewable resource programs at least once every four years. The PSC is required to determine each program's appropriate goals, priorities, and measurable targets. In November 2011, the PSC contracted with a team of energy consulting and market research firms to evaluate the Focus programs during the current (2011-2014) quadrennial cycle. These firms, collectively referred to as the Evaluation Team (or the Team), are The Cadmus Group, Inc.; Nexant, Inc.; TecMarket Works; and St. Norbert College Strategic Research Institute.

This document provides an overview of the energy impacts achieved by Focus on Energy for calendar year 2011 (CY 2011).

Overview of the Evaluation

The evaluation findings presented in this report are based upon a database review of the Focus on Energy CY 2011 programs (listed in Table 1) and the on-site measurement

and verification activities for one residential measure and two non-residential measures. The Evaluation Team used stipulated net-to-gross (NTG) ratios, based on the results of the Focus on Energy 2010 evaluation to estimate net savings.

Table 1. Residential and Non-Residential Programs

Residential Sector	Non-Residential Sector
ACES-New Home Construction	Agricultural Program
ACES-Whole Building Existing	Commercial Program
Appliance and Plug Load	Industrial Program
Efficient Heating and Cooling	Non-Residential New Construction Program
ENERGY STAR® Lighting	Schools and Government Program
Head Start	
Home Performance with ENERGY STAR	
New Homes	
Residential Renewables	
Targeted Home Performance	

Table 2. First-Year Annual Savings by Sector

		Non-Residential	Residential	Total
Gross	kWh	360,406,747	92,332,997	452,739,744
	kW	52,443	16,716	69,158
	Therms	16,054,969	2,790,230	18,845,198
Verified Gross	kWh	346,712,215	93,887,306	440,599,521
	kW	57,747	19,327	77,074
	Therms	13,831,960	2,875,242	16,707,202
Verified Net	kWh	207,596,331	61,368,714	268,965,045
	kW	34,558	12,763	47,320
	Therms	9,163,081	2,088,348	11,251,429

Summary of Findings

Table 2 lists first-year annual savings: gross claimed, gross verified, and verified net. In CY 2011, on an annual unverified gross basis, Focus on Energy achieved a total of 452,739,744 kWh savings and 18,845,198 therm savings.

Table 3 summarizes the first-year annual savings for CY 2010 and CY 2009. The gross electric, peak demand, and natural gas savings have decreased from CY 2009 to CY 2011. 2011 was a transition year from the old programs and management to the new programs. Due to varying funding levels a comparison of

savings values to previous years is difficult.

Table 4 presents the life cycle savings achieved by Focus in CY 2011. Life cycle savings represent the savings that will be achieved by the measures installed during CY 2011 over their useful lifetimes. Effective useful lifetimes (EULs) were carried forward from the 2010 evaluation and were verified in program tracking records.

Table 5 summarizes the life cycle savings by sector in CY 2010. As with the program year savings, the life cycle savings from CY 2010 were greater than the life cycle savings from CY 2011.

Table 6 summarizes the findings of a benefit cost analysis for Focus on Energy's 2011 program year by sector with renewable measures incorporated into each sector. Table 7 summarizes the same benefit cost analysis but provides independent resolution of the renewable measures outside of their respective sectors. The benefit cost test is based upon the Total Resource Cost (TRC) test; a commonly administered test that counts the avoided cost of supplying the displaced energy against the program and participant costs.

The TRC ratio was 2.71 for the non-residential sector and 1.84 for the residential sector, resulting in an overall TRC ratio of 2.46.

Table 3. First-Year Annual Verified Gross Savings by Sector, CY 2010 and CY 2009

		Non-Residential	Residential	Renewables	Total
CY 2010	kWh	470,987,177	119,653,022	N/A*	590,640,200
	kW	90,344	16,312	N/A*	106,657
	Therms	20,041,916	3,598,320	N/A*	23,640,237
CY 2009	kWh	500,793,181	116,893,752	16,933,010	634,619,944
	kW	110,411	14,506	2,722	127,641
	Therms	20,712,687	3,591,004	5,357,821	29,661,514

* Renewables were offered in 2010; however renewables savings results were not broken out in 2010

Table 4. Life Cycle Savings by Sector

		Non-Residential	Residential	Total
Gross	kWh	4,564,679,749	874,766,059	5,439,445,808
	kW	52,443	16,716	69,158
	Therms	217,085,610	58,918,852	276,004,462
Verified Gross	kWh	4,374,342,776	885,561,963	5,259,904,739
	kW	57,747	19,327	77,074
	Therms	185,735,647	60,435,758	246,171,405
Verified Net	kWh	2,598,969,053	590,179,180	3,189,148,232
	kW	34,558	12,763	47,320
	Therms	120,185,801	49,963,308	170,149,109

Table 5. Life Cycle Savings by Sector, CY 2010

		Non-Residential	Residential	Total
Verified Gross	kWh	5,350,241,669	1,228,350,997	6,578,592,665
	Therms	236,967,513	59,944,987	296,912,500
Verified Net	kWh	3,127,718,325	817,430,868	3,945,149,194
	Therms	110,151,807	46,162,350	156,314,157

Table 6. Costs, Benefits, and TRC Ratio by Sector (with renewables incorporated)

	Non-Residential	Residential	Total
Incentive Costs*	\$32,490,795	\$14,252,876	\$46,743,671
Admin Costs	\$3,760,910	\$2,622,411	\$6,383,320
Delivery Costs	\$15,357,361	\$5,980,265	\$21,337,627
Incremental Measure Costs	\$104,914,159	\$41,291,783	\$146,205,942
Total Non-Incentive Costs	\$124,032,430	\$49,894,459	\$173,926,889
Electric Benefits	\$151,687,233	\$30,255,311	\$181,942,543
Gas Benefits	\$100,954,913	\$41,750,795	\$142,705,708
Emission Benefits	\$84,075,436	\$19,667,147	\$103,742,582
Total TRC Benefits	\$336,717,581	\$91,673,252	\$428,390,833
TRC Net Benefits	\$212,685,151	\$41,778,793	\$254,463,944
TRC Ratio	2.71	1.84	2.46

* Incentive costs are not included in TRC calculation

Table 7. Costs, Benefits, and TRC Ratio by Sector (with renewables independent)

	Non-Residential	Residential	Renewables	Total
Incentive Costs*	\$24,723,728	\$11,740,466	\$10,279,477	\$46,743,671
Admin Costs	\$3,684,792	\$2,583,174	\$115,354	\$6,383,320
Delivery Costs	\$14,817,455	\$5,743,852	\$776,320	\$21,337,627
Net Incremental Measure Costs	\$74,792,951	\$30,910,460	\$40,502,531	\$146,205,942
Total Non-Incentive Costs	\$93,295,197	\$39,237,486	\$41,394,205	\$173,926,889
Electric Benefits	\$141,632,390	\$27,957,129	\$12,353,024	\$181,942,543
Gas Benefits	\$97,459,575	\$41,611,524	\$3,634,609	\$142,705,708
Emission Benefits	\$79,303,530	\$18,925,085	\$5,513,968	\$103,742,582
Total TRC Benefits	\$318,395,495	\$88,493,737	\$21,501,601	\$428,390,833
TRC Net Benefits	\$225,100,298	\$49,256,251	(\$19,892,605)	\$254,463,944
TRC Ratio	3.41	2.26	0.52	2.46

* Incentive costs are not included in TRC calculation

Recommendations

This evaluation presents three key recommendations, supported by additional findings and detailed in the Recommendations section of the report:

- Creating an archive system that meets Federal Energy Regulatory Commission (FERC) and State privacy and security requirements for the protection of personally identifiable information, and

implementing a state-wide rule for utilities participating in the Focus on Energy programs to archive customer billing data with the PSC in a standard format. This process should be consistent with the approach that is being used for collecting and archiving billing data for the federal weatherization programs supported by the utilities.

- Creating and transitioning to a single central tracking database for all programs; (Sready gnderway).

- Maintaining an archive of savings algorithms, deemed savings values and associated supporting information and data sources for each program year in order to support the retroactive verification of savings estimates and increase the transparency of evaluation efforts.

For additional context on 2011 key achievements and figures for State of Wisconsin and Focus on Energy please see Appendix A.

INTRODUCTION

Focus on Energy is Wisconsin utilities' statewide energy-efficiency and renewable resource program funded by the state's investor-owned energy utilities—as required under Wis. Stat. § 196.374(2)(a)—and participating municipal and electric cooperative utilities. Focus on Energy has been in existence since 2001.

Focus on Energy works with eligible Wisconsin residents and businesses to install cost-effective energy-efficiency and renewable energy projects. The information, resources, and financial incentives of Focus are used to: implement energy projects that otherwise would not be completed, or complete projects sooner than scheduled. Its efforts help Wisconsin residents and businesses manage rising energy costs, promote in-state economic development, protect our environment, and control Wisconsin's growing demand for electricity and natural gas.

In 2011, Focus on Energy provided various energy-efficiency and renewable resource options and incentives to customers via three portfolios:

- Residential Portfolio servicing the residential, including single-family and multi-family housing, sector;
- Non-residential Portfolio servicing the commercial, industrial, schools, government and agricultural sector; and
- Research Portfolio providing grants to eligible entities to study the environmental and economic impacts of energy use in Wisconsin.

CY 2011 is considered a transitional year for the Focus on Energy programs because of numerous and significant changes in program administration, program implementation, and program design. For example, the role of Program Administrator, a firm contracted to oversee all of the programs, transitioned to a new company through a competitive Request for Proposals (RFP) process. Since the inception of the Focus programs in 2001—and from January 1, 2011, through April 30, 2011—the Program Administrator was Wisconsin Energy Conservation Corporation (WECC). In May 2011, Shaw Environmental & Infrastructure, Inc., (Shaw) began administering the programs.

In addition, each of the implementation contracts—the contracts to manage the day-to-day operations and delivery of programs—were put out to bid. This has resulted in a number of new implementation firms taking charge of programs in 2011 (and beyond). In 2011, the Program Administrator began making changes to existing programs to improve the efficiency of program processes.

The 2011 Evaluation

The 2005 Wisconsin Act 141 requires the PSC to conduct a review of energy-efficiency and renewable resource programs at least once every four years. The PSC is required to determine each program's appropriate goals, priorities, and measurable targets.

In November 2011, the PSC contracted with a team of energy consulting and market research firms to evaluate the Focus programs during the current (2011-2014) quadrennial cycle. These

firms, collectively referred to as the Evaluation Team (or the Team) are The Cadmus Group, Inc.; Nexant, Inc.; TecMarket Works; and St. Norbert College Strategic Research Institute.

This report presents the CY 2011 impact evaluation results for Focus. For this assessment, the Evaluation Team conducted field studies on these high-priority measures:

- Residential electronically commutated motors (ECMs) on furnaces and central air conditioners;
- Non-residential process efficiency; and
- Non-residential HVAC.

Overview of Evaluation Activities

The Team's activities for the CY 2011 evaluation are listed in Table 8.

- For high-priority measures, the activities consisted of: (1) a database review, (2) phone verifications of measure installation, (3) verification of the proper application of deemed savings values, and (4) site visits to verify proper installation and operation of measures, and to document the hours of operation and energy consumption of installed measures.
- For all other measures, the activities consisted of: (1) a database review to ensure that details confirming eligibility were collected and properly documented and (2) the proper application of deemed savings from the 2010 Focus on Energy evaluation.

Table 8. Evaluation Activities

	Database Review	Phone Verification	Deemed Savings Verification	Site Visits	Application of 2010 Deemed Savings
Residential Portfolio: Specific Measures					
ECMs	✓	✓	✓	✓	
Other Residential Measures	✓				✓
Non-Residential Portfolio: Specific Measures					
HVAC	✓	✓	✓	✓	
Process	✓	✓	✓	✓	
Other Non-Residential Measures	✓				✓

Descriptions of Programs

The Team assessed 16 programs during the CY 2011 evaluation, which are described here.

Apartment and Condo Efficiency Services (ACES) Whole-Building Existing Program

Program Dates: Calendar year 2011

Program Purpose: Applying a holistic approach to building energy efficiency, the program designers focused on the common areas and individual living units, with the goals of lowering operating costs and energy bills. To qualify, buildings must have a minimum of four living units within the structure and be served by a utility participating in Focus on Energy.

Target Audience: The target audiences were building owners, managers, and condominium and apartment associations.

Program Implementer: Before May 2011, the Program Implementers were the Wisconsin Energy Conservation Corporation (WECC) for prescriptive projects and Franklin Energy Services (Franklin) for custom projects. As of May 2011, when restructuring of the portfolios began due to a change in Program Administration, Franklin was designated as the exclusive Program Implementer. The main purposes of the change were to streamline the process for customers and to reduce non-incentive costs.

Process and Associated Measures: The ACES Whole Building Existing Program was communicated and delivered to eligible participants through a Program Implementer and trade allies. The process for customer participation included eligibility verification, a free energy assessment of the building, and the direct installation of energy savings devices in individual living units.

The energy assessment contained a financial analysis of recommended energy-efficiency measures for the building. This assessment provided the building owner with annual energy savings information for each recommended measure and a simple payback, which factors contractor costs for each measure.

The associated measures were: Building envelope improvements, HVAC tune-ups and upgrades, appliances, boilers, water heaters, upgraded common-area lighting, and direct-install measures for individual units. The latter measures included free installation of high-efficiency showerheads, faucet aerators, and compact fluorescent lamps (CFLs).

Apartment and Condo Efficiency Services (ACES) New Construction Program

Program Dates: Calendar year 2011

Program Purpose: This program was developed to facilitate the implementation of energy-efficiency and renewable energy technologies into the design and construction of residential buildings having four or more units of residences.

Target Audience: The target audiences were architects, developers, contractors, and condo and apartment associations.

Program Implementer: Before May 2011, the Program Implementers were WECC for prescriptive projects and Franklin for custom projects. As of May 2011, when restructuring of the portfolios began due to a change in Program Administration, Franklin was designated as the exclusive Program Implementer. The main purposes of the change were to streamline the process for customers and to reduce non-incentive costs.

Process and Associated Measures: By providing incentives for measures similar to those offered in the ACES Whole Building Existing Program, the Program Implementer assisted the target audience in identifying and using energy-efficiency and renewable energy measures. Among

several outreach approaches, the Program Implementer attended conferences and trade shows in an effort to develop relationships with trade allies and demonstrate the value of the Program.

Appliance and Plug Load Program

Program Dates: Calendar year 2011. This program ended December 31, 2011.

Program Purpose: This program was developed to encourage the installation of energy-efficient, power-vented natural gas and electric water heaters in residences. The program provided financial incentives for qualifying water heaters.

Target Audience: The target audiences were homeowners and wholesale and retail distribution channels: contractors, distributors, and retailers.

Program Implementer: The Program Implementer was WECC.

Process and Associated Measures: The program provided cash-back incentives to customers of participating gas and electric utilities who purchased and installed new energy efficient equipment. The Program Implementer promoted the program to contractors and customers through cooperative advertising with wholesalers and retail distributors.

Through this program, participants received rebates for Consortium for Energy Efficiency (CEE) Tier 2 and Tier 3 and eligible water heaters.¹ The criteria for energy-efficient water heaters are presented in Table 9.

Table 9. Water Heater Eligibility Requirements

Unit Type	Criterion
Natural Gas	
Power-vented	≥0.64 energy factor
Condensing	≥90% thermal efficiency
Indirect	Installed with a natural gas modulating boiler ≥90% AFUE
Electric	
Electric Water Heater	Eligible only in areas where natural gas is not available—the unit must have an energy factor rating of 0.93 or greater

Customers were also eligible to participate in the program if they converted from an electric to a gas water heater fueled by a participating natural gas utility provider.

Efficient Heating and Cooling Program

Program Dates: Calendar year 2011. This program ended December 31, 2011. However, while the program officially ended December 31, 2011, applications were accepted through January 30, 2012, for products installed on or before December 31, 2011.

¹ The CEE Tiers are categories in an appliance rating system developed by the Consortium for Energy Efficiency, a nonprofit public benefits corporation, to identify the relative energy efficiency of different appliance models.

Program Purpose: This program was developed to provide prescriptive incentives for the purchase of high-efficiency home heating and cooling equipment to replace older and failed units. Incentives were only available for installed equipment noted on a pre-qualified list available from the Focus on Energy Website (focusonenergy.com), which was updated as needed to include new technologies and equipment.

Target Audience: The target audiences were the owners of existing residential buildings with one to three dwelling units. Additionally, the program targeted HVAC contractors.

Program Implementer: The Program Implementer was WECC.

Process and Associated Measures: The program provided cash incentives to customers of participating gas and electric utilities who purchased and installed new energy efficient heating and cooling equipment. The program promoted the purchase of high-efficiency furnaces with electronically commutated motors (ECMs) and central air conditioners and air source heat pumps with high Seasonal Energy Efficiency Ratio (SEER) ratings. Incentives were also provided for ground-source heat pumps that utilized an ECM and did not have an electric back-up heat source. In the pursuit of gas savings, the program provided incentives for high-efficiency gas boilers.

ENERGY STAR Lighting Program

Program Dates: Calendar year 2011.

Program Purpose: Through the use of upstream incentives, markdowns, and coupon promotions for LEDs, this program promoted the purchase and use of ENERGY STAR-qualified lighting technologies and the proper recycling of compact fluorescent lights (CFLs) through a program with participating retailers. The program engaged all levels of the market so as to influence upstream and downstream market players to increase consumer demand and availability of qualifying products.

Target Audience: The target audience was residential customers. As this was an upstream program, it was not possible to limit participation to any single sector or population. Therefore, there was no requirement that participants be residential customers or customers of utilities participating in Focus on Energy.

Program Implementer: The Program Implementer was WECC.

Process and Associated Measures: Customers were targeted through retail sales channels such as home improvement, hardware, discount, and grocery stores. The energy-saving measures promoted were CFLs and fixtures and certain light-emitting diodes (LED).

Head Start Program

Program Dates: The program concluded in the summer of 2011, as participation numbers were much lower than expected and the program's cost-effectiveness was not sufficient to support the continuation of the Program.

Program Purpose: This program was developed to provide residents who have limited incomes and resources with an opportunity to reduce electric use and utility costs.

Target Audience: The target audience was the parents of children enrolled at participating Head Start Child and Family Development Centers, Inc.

Program Implementer: The Program Implementer was WECC.

Process and Associated Measures: Focus on Energy representatives were expected to select qualified homes based on a home lighting assessment and help participants select the appropriate replacement bulbs at no cost. Participating families were offered six CFL options. Through this program, energy-efficient lighting products and energy education were provided at no cost to the target audience.

Home Performance with ENERGY STAR Program

Program Dates: Calendar year 2011

Program Purpose: The program offered incentives to customers installing specific energy-efficient shell and mechanical measures. The 2011 model of Home Performance with ENERGY STAR (HPwES) was consultant-based, using an independent third party (Home Performance Consultant) to deliver the home energy assessment and a post-test of installed measures.

Target Audience: The target audience was homeowners in one to three unit buildings

Program Implementer: The Program Implementer was WECC.

Process and Associated Measures: The customer was responsible for: (1) contacting a Home Performance Consultant to perform an energy assessment, (2) contacting a contractor to install the recommended measures, and (3) upon completion, contacting the Home Performance Consultant to conduct a post-assessment.

In 2011, this was a consultant-based program that provided incentives for energy-efficient improvements to a home's shell and mechanical measures. Measures installed through the HPwES program in CY 2011 included boilers, building shell measures, domestic hot water measures, and HVAC measures.

New Homes Program

Program Dates: Calendar year 2011

Program Purpose: The transition from ENERGY STAR 2.5 guidelines to ENERGY STAR 3.0 guidelines for single-family new construction created additional costs to construction and, in turn, barriers to participation. In response, Focus on Energy included a new construction program in CY 2011 that was based on the previous Wisconsin ENERGY STAR Homes (WESH) Program. The New Home Program offered incentives for homes successfully built to be at least 10% more energy efficient than the Uniform Wisconsin Dwelling Code.

Target Audience: The target audience was builders of single-family homes.

Program Implementer: The Program Implementer was WECC.

Process and Associated Measures: Various incentives were offered for homes that were 10%-19.99%, 20%-29.99%, 30%-39.99%, and above 40% more efficient than uniform dwelling code. In addition, higher tiers of efficiency also require technology packages, which are home efficiency measures that are not covered in the building codes. These technology packages are:

- ENERGY STAR-Qualified Light Bulbs
- ENERGY STAR-Qualified Light Fixtures
- Energy Efficient Windows
- R5 Exterior Insulation
- R10 Exterior Insulation
- Rim and Band Joist Insulation
- Residential Water Heaters
- Residential HVAC
- Renewable Energy Systems (Solar PV, Solar Thermal, or Wind)

Residential Renewables Program

Program Dates: Calendar year 2011

Program Purpose: The program was developed to offer performance-based, prescriptive incentives of up to 30% of the cost of a project or qualifying renewable energy installations.

Target Audience: The target audiences were residential customers of a participating electric or gas utility and renewable energy installers.

Program Implementer: The Program Implementer was WECC.

Process and Associated Measures: Customers were eligible for additional incentives by following an enhanced efficiency incentive track, which outlined several options for decreasing a home's overall electric consumption.

To participate, customers were required to submit an application form to the Program Implementer (WECC). The completed and signed application and a copy of the invoice were required to be postmarked within 45 days of installation. If the incentive application was approved, Program Implementer staff entered the project into the WECC database, check for customer duplicates in the database, and verify that the enhanced efficiency criterion is met.

The associated measures were: small wind systems of up to 20kW, solar electric photovoltaic (PV) systems of between 0.5 kWDC and 6 kWDC, and solar thermal systems having from one to eight collectors.

Targeted Home Performance Program

Program Dates: January through May 2011. In June, the program was suspended for purposes of restructuring. The Current Administrator suggests it was determined the program was not cost-effective, served few customers, and had a long waitlist. No new applications were accepted after May 2011, and applications were approved only for projects that were started before May 2, 2011, and would be completed by December 31, 2011. All other applicants that were already

waitlisted or submitted applications after the program was suspended were sent notification of program closure.

Program Purpose: The program provided income eligible residents with the opportunity to increase the energy efficiency, durability, and comfort of their homes.

Target Audience: The target audience was income-eligible homeowners. Income eligibility was defined by a household's gross income falling between 60% and 80% percent of the State Median Income (SMI).

Program Implementer: The Program Implementer was WECC.

Process and Associated Measures: Home-energy assessments were provided to identify energy-efficiency opportunities, and homeowners could receive incentives that cover up to 90% of the cost of the improvement measures.

To be eligible to participate in the program, homeowners must meet requirements regarding income, utility provider, and dwelling eligibility. Income eligibility was defined by a household's gross income falling between 60% and 80% percent of the State Median Income (SMI). Income guidelines are updated annually in conjunction with the Wisconsin Home Energy Assistance Program (WHEAP) annual income guidelines update. Gross household income for the previous three full months was used to determine eligibility.

Households must receive both their natural gas and electricity from participating utilities to satisfy the utility provider eligibility requirement. Bulk fuel customers were not eligible for services.

The Program Administrator focused on cultivating strong participation from state weatherization agencies, Wisconsin Home Energy Assistance Program (WHEAP) providers, and nonprofits within the Targeted Home Performance Program. To increase program participation, the Program Administrator worked closely with county-level energy assistance providers, as well as other community service agencies that served eligible households. These networks helped the Program Administrator identify potential participants for the program.

The associated measures were these: insulation, sealing air leaks, heating system replacement, central air conditioner replacement, water heater replacement, refrigerator/freezer replacement, compact fluorescent bulbs, and water-saving measures.

Non-Residential New Construction Program

Program Dates: January 2011 through September 2011. When Shaw became Program Administrator in May 2011, they dissolved the Non-Residential New Construction Program, along with all channel programs. The channel programs were then reassigned to the four business sector program implementers beginning on May, 2011.

Program Purpose: The program was designed to provide incentives to builders and building owners of non-residential new construction projects.

Target Audience: The target audience was builders and building owners of non-residential new construction projects.

Program Implementer: WECC operated as the Program Implementer until May 1 2011, at which time the program was transitioned to the agricultural, commercial, industrial, and schools and government sector Program Implementers. The four business sector program implementers (GDS, Franklin, SAIC, and CESA 10) absorbed the Non-Residential New Construction Program projects and worked with customers to provide incentives and complete projects. After the program was dissolved, the Program Administrator ceased actively marketing and promoting new construction programs in the non-residential sector and stopped accepting new applications.

Agricultural Program

Program Dates: Calendar year 2011

Program Purpose: The program provided support and services to help agricultural and agribusiness customers identify cost-effective energy-efficiency and renewable energy measures. Incentives assisted these customers to install measures.

Target Audience: The target audiences were owners and operators of large farms and rural businesses, especially dairy, livestock, grain drying, and greenhouse facilities, and other agribusinesses.

Program Implementer: The Program Implementer was GDS Associates, Inc.

Process and Associated Measures: The Program Implementer staff reached out to eligible customers to identify energy-saving opportunities and lead the customer through the incentive application process.

The program offered prescriptive and custom incentives to eligible customers including, but not limited to, the following measures:

- Low-energy livestock waterers
- Lighting
- Fans
- Milk pre-coolers (plate coolers)
- Heat recovery tanks
- Scroll compressor replacements
- Commercial water heaters
- Variable speed controllers for vacuum pumps
- Agricultural irrigation systems
- Fans and unit heaters for greenhouses
- Greenhouse climate controls, thermal curtains, and glazing

Commercial Program

Program Dates: Calendar year 2011

Program Purpose: The Commercial program provided support and services to help commercial and rural business customers identify cost-effective, energy-efficiency and renewable energy measures. Incentives assisted these customers to install measures.

Target Audience: The program targeted businesses in the sectors of hospitality (restaurants and lodging), healthcare, grocery, and office buildings. Although large commercial facilities were the primary target audience for the Program, all commercial customers were eligible to participate.

Program Implementer: The Program Implementer was Franklin Energy Services.

Process and Associated Measures: The Program Implementer worked with eligible building owners, managers, tenants, and other parties to identify energy-saving opportunities, and lead the customer through the incentive application process.

The associated measures were all non-residential systems offering opportunities for energy efficiency such as HVAC, lighting, commercial refrigeration, and information systems.

Industrial Program

Program Dates: Calendar year 2011.

Program Purpose: The Industrial program provided support and services to help industrial and rural business customers identify cost-effective, energy-efficiency and renewable energy measures. Incentives assisted these customers to install measures.

Target Audience: The target audiences were all industrial facilities that received electricity and/or natural gas from a participating utility. Special efforts were made to target the following facilities: pulp and paper; food processing, metal casting; plastics; and water/wastewater.

Program Implementer: The Program Implementer was SAIC Energy, Environmental & Infrastructure.

Process and Associated Measures: The Program Implementer worked with building owners, managers, and other staff to identify opportunities for savings at the facilities, and lead the customers through the incentive application process.

Incentives were offered for prescriptive and custom energy-efficiency projects such as HVAC, lighting, motors and drives, and compressed air.

Schools and Government Program

Program Dates: Calendar year 2011

Program Purpose: The Schools and Government Sector program provided support and services to help school and government and rural business customers identify cost-effective, energy-efficiency and renewable energy measures. Incentives assisted these customers to install measures.

Target Audience: The target audiences were schools and government-sector entities, specifically: K-12 public and private schools, private colleges, universities and technical schools, and all government buildings.

Program Implementer: The Program Implementer was CESA 10 (Cooperative Educational Service Agency 10).

Process and Associated Measures: Program staff worked with the decision making bodies (boards and committees) to encourage efficiency upgrades at these facilities and lead them through the incentive application process.

Incentives were offered for prescriptive and custom energy-efficiency projects such as, HVAC, lighting, information systems, and food service systems.

Non-Residential Renewables

Program Dates: Calendar year 2011. However, Focus on Energy temporarily suspended incentives for business renewable energy projects beginning July 1, 2011. The Current Administrator suggests this suspension was necessary to allow Focus on Energy the opportunity to re-evaluate the program framework to ensure the long term sustainability of the program. Prescriptive incentives were honored for all projects completed by June 30, 2011. Custom incentives were honored for all projects approved by June 30, 2011.

Program Purpose: The program offered prescriptive and custom incentives for renewable energy projects. Incentives were tiered for certain projects, with the higher tier offered to customers who met a defined level of efficiency before installing the renewable project. This efficiency could be achieved through participation in another Focus program or by achieving a prescribed benchmark.

Target Audience: The target audience was all non-residential customers.

Program Implementer: Because this is not a stand-alone program, it was implemented by multiple firms within each sector.

Process and Associated Measures: The program offered prescriptive and custom incentives to all non-residential customers. Targeted measure categories were these:

- Photovoltaic (PV)
- Solar hot water
- Wind
- Biomass
- Biogas

Summary of Measures by Program

The Focus on Energy programs contain a variety of initiatives and incentives designed to promote lasting changes in Wisconsin's energy-efficiency markets. The Evaluation Team assessed the electric and gas savings based on both first-year data and the documented impacts occurring over the lifetime of the measures installed through the program in 2011. Reporting on both first-year annual and life cycle savings ensures that the most accurate representation of the program's accomplishments is presented.

Table 10 lists the residential and non-residential programs offered in CY 2011.

Table 10. Residential and Non-Residential Programs

Non-Residential Sector ²	Residential Sector
Agricultural Program	ACES-New Home Construction
Commercial Program	ACES-Whole Building Existing
Industrial Program	Appliance and Plug Load
Non-Residential New Construction Program	Efficient Heating and Cooling
Schools and Government Program	ENERGY STAR® Lighting
	Head Start
	Home Performance with ENERGY STAR
	New Homes
	Residential Renewables
	Targeted Home Performance

² In CY2011 there was no stand-alone renewables program offered for the non-residential sector, as there was for the residential sector. Therefore, incentives for non-residential renewables were offered for the agricultural, commercial, industrial, and schools and government programs.

Table 11 lists all measures as included in the residential and non-residential programs.

Table 11. Residential and Non-Residential Program Measures

Non-Residential Only	Residential & Non-Residential Sectors	Residential Only
Aeration System	Boiler Equipment	Ceiling Fan
Biogas	Boiler Service	Controls
Biomass	Building Shell	Dehumidifier
Boiler Controls	CFL	Design
Dishwasher	Conversion	Compressor Equipment
Farm Equipment	Energy Recovery	Compressor Service
Food Service	High Intensity Discharge (HID)	Energy Savings
Greenhouse	Hot Water	Fixtures
IT	HVAC	Furnace
Pools	HVAC Controls	HVAC Service
Process	Laundry	LED Holiday Light
Refrigeration Controls	LED Lighting	
Scheduling	Lighting	
Vending, Plug Loads	Lighting Controls	
Waste Water Treatment	Motors & Drives	
	Non Energy ³	
	Refrigeration	
	Solar Electric	
	Solar Thermal	
	T8/T5 Fluorescent Lighting	
	Water Heat	
	Whole Building	
	Wind	

³ Non-energy activities are categorized by tracked data that contained no energy savings. A sample of some of these records include: certifications for home status, vouchers, contributions, audit fees, design and grants.

Evaluated Measures

As noted in the Introduction, each of the program designs, implementation contracts, and the overall Focus on Energy Program Administration contract were revisited and/or rebid in 2011. Because of these changes, 2011 was considered a transition year from the old programs and management to the new programs. While it is important to understand the savings being achieved during CY 2011, the opportunity to leverage evaluation findings from 2011 to support the refinement of programs that are changed in 2012 is limited. As a result, the primary evaluation activities for CY 2011 consisted of carrying forward previous evaluation findings.

The Evaluation Team reviewed the savings being achieved by each program and measure in 2011. The Team identified high-priority measures by comparing the relative electricity, peak demand, and gas savings, as well as the percentage of total reward dollars across all measures (as shown in Table 12).

The Team identified process efficiency and HVAC controls as non-residential high-priority measures and residential furnaces, (specifically electronically commutated motors (ECM)), as residential high-priority measures. Each of these measure groups represented a significant share of the electric or gas savings relative to the overall program savings in CY 2011. Furthermore, from CY 2010 to 2011, there was significant growth in the relative contribution to savings for each of these measures. This growth in savings was an indicator that the population of participants receiving these measures had changed and, consequently, that the savings attribution used in the 2010 evaluation may not have been representative of the savings that should be attributed to the 2011 program. Further evaluation activities for these measure groups included metering of equipment and telephone interviews with program staff, participants, installers, and other relevant market actors, as discussed further in the sections titled “Electronically Commutated Motors Study” and “Process and HVAC Study.”

Table 12 lists the relative contribution of Targeted Markets measures or measure categories to the overall program savings in CY 2011.

Table 12. Non-Residential * Focus on Energy Perspective Summary, CY 2011

Efficiency Measure**	Incentive Dollars %	kW %	kWh %	Therms %
Air Conditioning	0%***	1%	0%***	0%***
Agriculture	1%	1%	1%	4%
Appliances	1%	1%	1%	1%
Boilers & Burners	2%	0%***	0%***	12%
Compressed Air, Vacuum Pumps	2%	4%	5%	0%***
Compressed Air, Vacuum Pumps - Commissioning	0%***	N/A	0%***	N/A
Heating	0%***	0%***	0%***	1%
HVAC - Chiller	4%	6%	3%	N/A
HVAC - Commissioning	1%	0%***	1%	1%
HVAC - Controls	2%	1%	4%	5%
HVAC - Energy Recovery	1%	1%	0%***	4%
HVAC - Fan	1%	2%	1%	N/A
HVAC - Filtration	2%	0%***	0%***	5%
HVAC - Other	3%	2%	3%	13%
HVAC - Variable Air Volume	1%	1%	1%	2%
Industrial Ovens and Furnaces	1%	0%***	1%	3%
Information Technology	1%	1%	2%	N/A
Insulation	1%	0%***	0%***	4%
Lighting	16%	43%	38%	N/A
Motors & Drives	4%	7%	8%	0%***
New Construction	3%	5%	2%	6%
Other - Training and Special	2%	N/A	N/A	N/A
Process	12%	8%	10%	30%
Refrigeration	4%	8%	10%	0%***
Renewables	30%	6%	6%	4%
Wastewater Treatment	1%	2%	2%	N/A
Water Heater	1%	1%	1%	3%
Non-Residential Totals	100%	100%	100%	100%

* The Non-residential Portfolio includes the Agricultural, Commercial, Industrial, and Schools & Government programs.

** Measure category names may differ in this table from the claimed, verified, and net savings tables because the values in this table were derived from the raw 2011 data before the Evaluation Team applied its measure category standardization methods.

***The values that are represented in this table as 0% result from rounding to the nearest percentage and comprise less than 0.5% of the total incentive/kW/kWh/therms.

These values are derived from three files provided to the Evaluation Team by the Program Administrator in January 2012. The files were exports from databases used by both the current and the previous Program Administrator (Shaw and WECC respectively) to track participation from January 1, 2011, until the new SPECTRUM online tracking system was activated in December 2011. Participation and savings tracked in the SPECTRUM system were not included in the CY 2011 evaluation plan and are not represented in Table 12 through Table 16.

As the contents of SPECTRUM are believed to pertain to less than 5% of overall CY 2011 program accomplishments, the Evaluation Team believes the percentages are representative of the overall program activities.

Table 13 lists the equivalent contribution from residential measures to the overall savings.

Table 13. Residential Focus on Energy Perspective Summary, CY 2011

Efficiency Measure	Incentive Dollars %	kW %	kWh %	Therms %
Air Conditioning	2%	7%	1%	N/A
Assessment	3%	N/A	N/A	0%*
Boilers & Burners	2%	N/A	N/A	23%
Heating - Furnace	10%	19%	13%	27%
Heating - Other	2%	N/A	0%*	0%*
HVAC - Fan	1%	N/A	0%*	0%*
Insulation	4%	3%	1%	49%
Lighting	74%	71%	85%	N/A
Water Heater	2%	0%*	0%*	2%
Residential Totals	100%	100%	100%	100%

*The values that are represented in this table as 0% result from rounding to the nearest percentage and comprise less than 0.5% of the total incentive/kW/kWh/therms.

The growing importance of several significant measures is demonstrated by comparing the changes in the contribution of savings in CY 2010 to CY 2011. As shown in Table 14, process efficiency and HVAC controls are highlighted as high-priority measures, because of their contributions to CY 2011 electricity savings as compared to CY 2010.

Table 14. High-Priority Electric Measures for Non-Residential Sector

Efficiency Measure	CY 2010 kWh %	CY 2011 kWh %
HVAC	2%	13%
Process	3%	10%

Table 15 highlights HVAC and process efficiency measures as also being high-priority measures because of their relative contribution and growth in their contribution to gas savings compared to CY 2010.

Table 15. High-Priority Gas Measures for Non-Residential Sector

Efficiency Measure	CY 2010 Therms %	CY 2011 Therms %
HVAC	13%	30%
Process	10%	30%

Similarly, Table 16 presents the electric savings for residential furnaces, the majority of which are associated with electronically commutated motors.

Table 16. High-Priority Electric Measures for Residential Sector

Efficiency Measure	CY 2010 kWh %	CY 2011 kWh %
Heating – Furnace (primarily ECMs)	14%	13%

EVALUATION FINDINGS

Calendar year 2011 was a transitional year for the Focus on Energy programs because of changes to key components, such as the Program Administrator and the design of certain programs. As noted in the Introduction, each of the program designs, implementation contracts, and the overall Focus on Energy Program Administration contract were revisited and/or rebid in 2011. Because of these changes, 2011 was considered a transition year from the old programs and management, to the new programs. While it is still important to understand the savings being achieved during CY 2011, the opportunity to leverage evaluation findings from 2011 to support the refinement of programs that are changed in 2012 is limited. As a result, the primary evaluation activities for CY 2011 consisted of carrying forward previous evaluation findings.

The Evaluation Team's efforts for CY 2011 were focused on measurement and verification of gross savings. The critical activities supporting these efforts were these:

- A study of electronically commutated motors (ECM)
- A database review
- An evaluation of custom process measures and custom HVAC measures

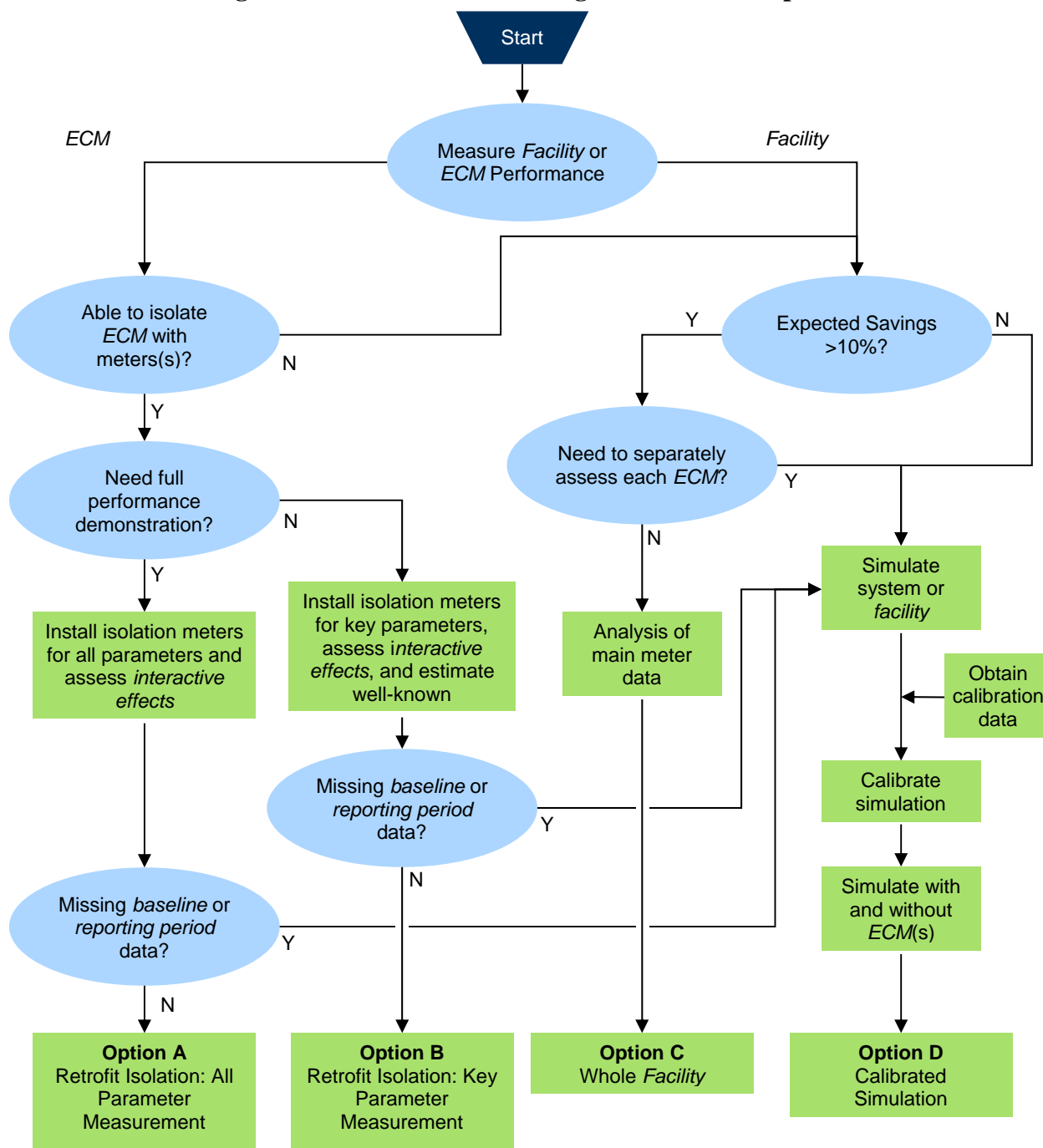
To estimate net savings, the Team used stipulated net-to-gross (NTG) ratios that were based on the results of the CY 2010 evaluation (see Appendix C).

About Energy Savings Evaluations

Evaluating energy savings is challenging as it requires an estimation of “what did not happen,” (that is, a baseline). The International Performance Measurement and Verification Protocol (IPMVP) is considered the gold standard of evaluation protocols, and its options regarding methodologies are these.

- **Option A, Retrofit Isolation: Key Parameter Measurement.** This method uses engineering calculations with partial site measurements to verify the savings resulting from specific measures.
- **Option B, Retrofit Isolation: All Parameter Measurement.** This method uses engineering calculations with on-going site measurements to verify the savings resulting from specific measures.
- **Option C, Whole Facility.** This method utilizes whole-facility energy usage information—typically focusing on a utility bill analysis—to evaluate savings.
- **Option D, Calibrated Simulation.** This method uses computer energy models to calculate savings as a function of the important independent variables. The models must contain verified inputs that accurately characterize the project and must be calibrated to match actual energy usage.

The flowchart shown in Figure 1 illustrates the Team's process for selecting the IPMVP option most appropriate to this evaluation. The Team selected Option B, Post-Measure Metering, as the methodology for estimating the savings of the Energy Conservation Measure.

Figure 1. Flowchart for Selecting IPMVP M&V Option⁴

⁴ In this figure only, ECM is an acronym for Energy Conservation Measure.

Summary of Findings

The Evaluation Team conducted a tracking database review and applied the deemed savings values used in the CY 2010 evaluation report to determine savings across all CY 2011 Focus on Energy programs.

Summary of Findings by Program

Table 17 summarizes the total participation, measured as number of customers participating in each Focus on Energy program in CY 2011. The ENERGY STAR Lighting program experienced the most participation of any Focus on Energy program, followed by the Efficient Heating and Cooling program. The high participation for these two programs is expected given that they rely on upstream and midstream market actors and distribution channels to reach customers. Furthermore, the structure of these two programs provided simple prescriptive rebates to customers, which ensures ease of program access and therefore high participation.

Table 17. CY 2011 Total Participation by Program

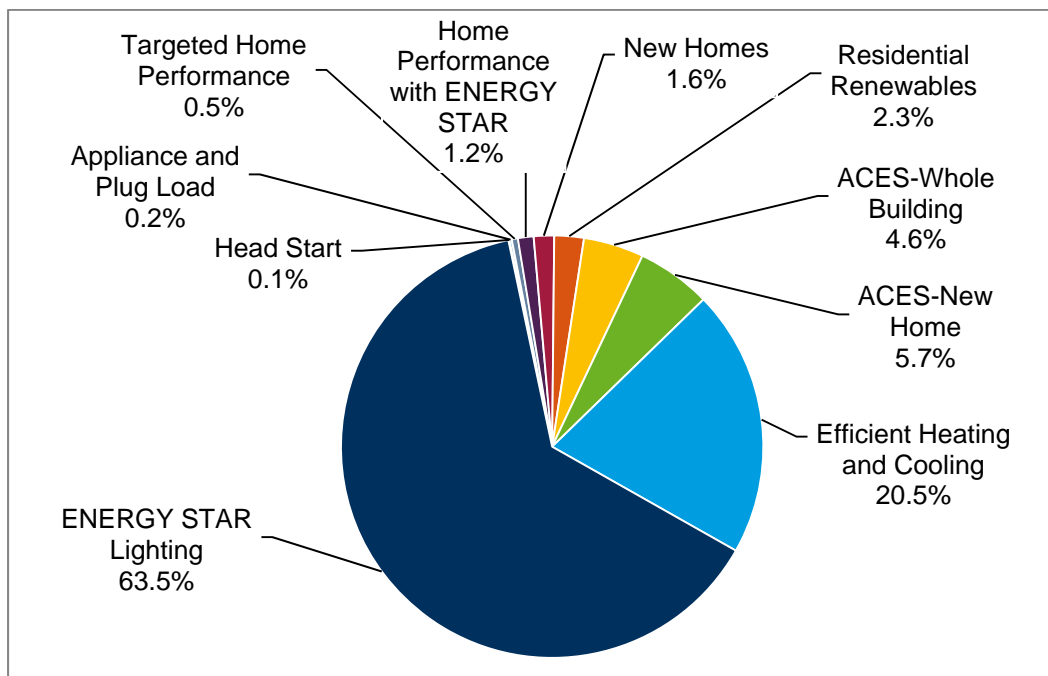
Sector	Program	Participation
Residential	ACES-New Home Construction	87
Non-Residential	Agricultural Program	957
Non-Residential	ENERGY STAR Lighting	7,681
Non-Residential	Commercial Program	2,255
Non-Residential	Non-Residential New Construction Program	45
Non-Residential	Industrial Program	952
Non-Residential	Schools and Government Program	1,148
Non-Residential Subtotal		13,033
Residential	ACES-Whole Building Existing	603
Residential	Appliance and Plug Load	850
Residential	Efficient Heating and Cooling	23,640
Residential	ENERGY STAR Lighting	149,646
Residential	Head Start	423
Residential	Home Performance with ENERGY STAR	4,944
Residential	New Homes	1,745
Residential	Residential Renewables	402
Residential	Targeted Home Performance	275
Residential Subtotal		182,615

Figure 2 through Figure 5 summarize the verified gross electric and gross gas energy impacts by program for residential and non-residential programs. The highlights of the results are these:

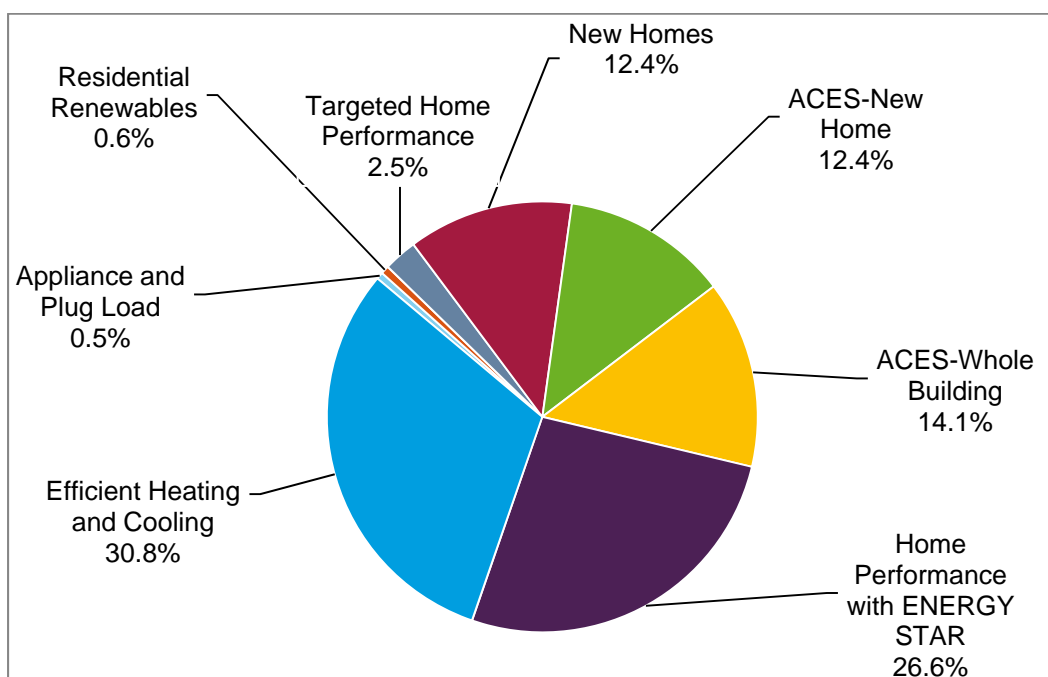
- The ENERGY STAR Lighting program provided the greatest amount of electric savings for the residential sector.
- The Efficient Heating and Cooling program provided the greatest amount of gas savings for the residential sector.

- The Industrial Program provided the greatest amount of both electric and gas savings for the non-residential sector.

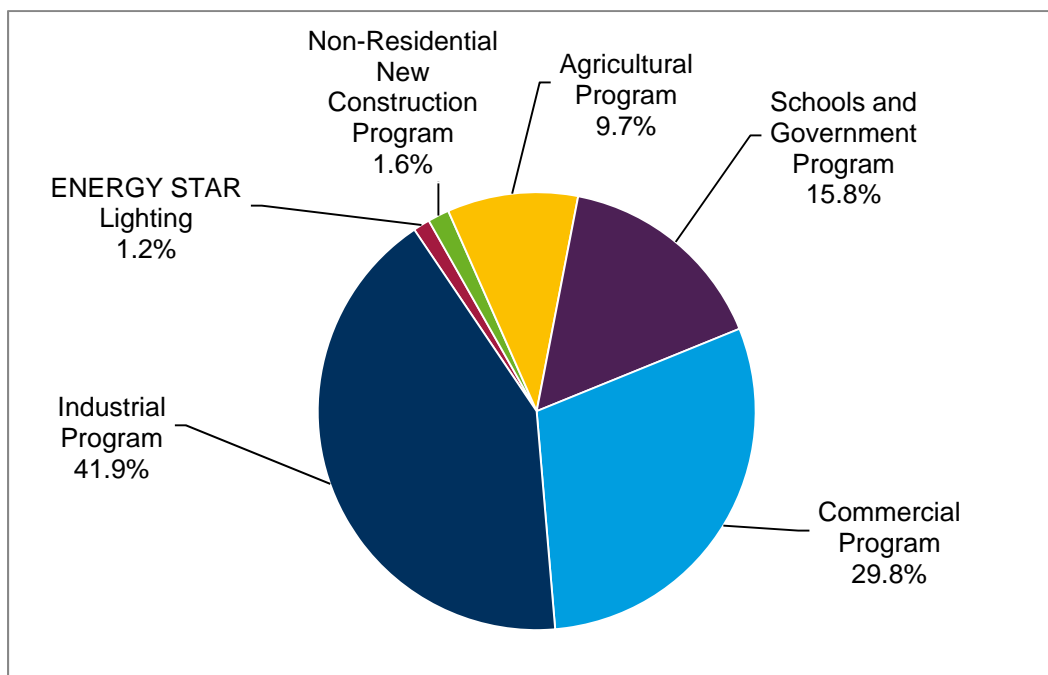
**Figure 2. Verified Gross Electric Energy Impacts by Program,
Residential Sector CY 2011**



**Figure 3. Verified Gross Gas Energy Impacts by Program,
Residential Sector CY 2011**



**Figure 4. Verified Gross Electric Energy Impacts by Program,
Non-Residential Sector CY 2011**



**Figure 5. Verified Gross Gas Energy Impacts by Program,
Non-Residential Sector CY 2011**

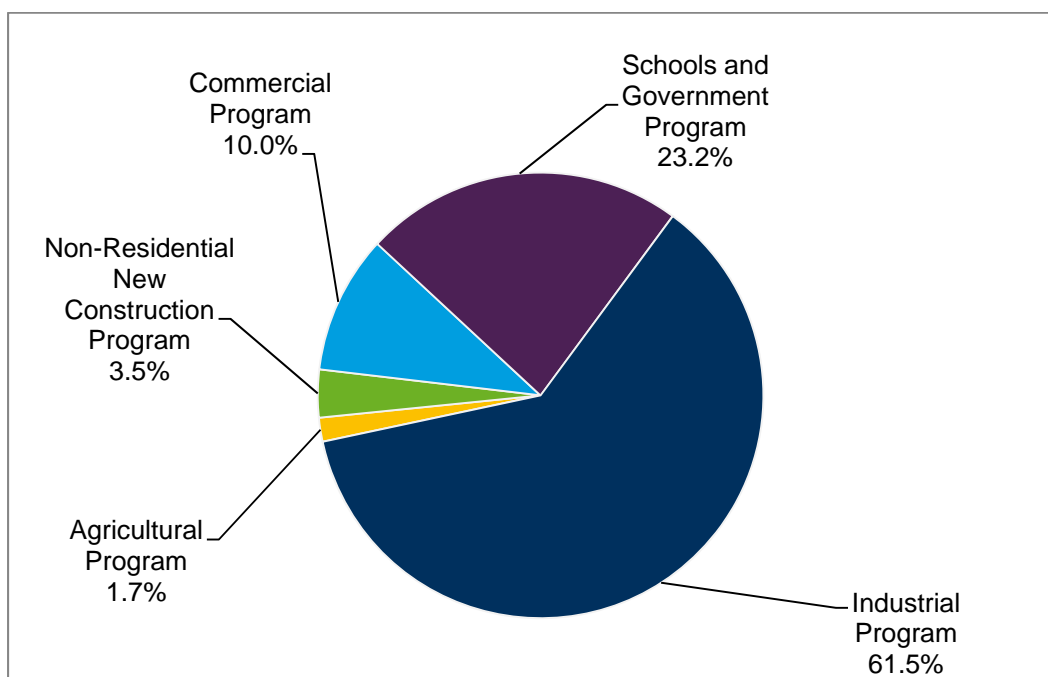


Table 18 summarizes by program the first-year annual gross, verified gross, and net electric, peak demand, and gas savings, with residential and non-residential subtotals.

Table 18. Summary of First-Year Annual Savings by Program

	Gross kWh	Gross kW	Gross Therms	Verified Gross kWh	Verified Gross kW	Verified Gross Therms	Verified Net kWh	Verified Net kW	Verified Net Therms
Residential Sector									
ACES-New Home Construction	4,609,110	979	278,317	5,151,028	970	282,467	3,199,570	618	146,387
ACES-Whole Building Existing	4,156,797	421	413,663	4,238,931	422	416,567	2,723,889	258	225,167
Appliance and Plug Load	167,132	16	15,576	167,003	16	15,653	167,003	16	15,653
Efficient Heating and Cooling	19,345,656	5,741	871,670	19,345,656	5,741	912,821	7,963,820	3,114	615,797
ENERGY STAR Lighting	58,730,713	7,815	N/A	59,712,617	10,442	N/A	42,900,604	7,376	N/A
Head Start	87,831	4	N/A	87,831	4	N/A	87,831	4	N/A
Home Performance with ENERGY STAR	1,132,907	594	748,973	1,131,392	592	786,932	824,380	408	638,287
New Homes	1,470,784	258	367,644	1,470,784	258	367,806	1,383,816	245	366,379
Residential Renewables	2,190,348	807	19,866	2,140,344	802	18,476	1,676,083	644	6,159
Targeted Home Performance	441,720	81	74,520	441,720	81	74,520	441,720	81	74,520
Residential Subtotals	92,332,997	16,716	2,790,230	93,887,306	19,327	2,875,242	61,368,714	12,763	2,088,348
Non-Residential Sector									
Agricultural Program	35,139,980	5,974	371,496	33,474,631	8,217	239,672	18,898,063	4,643	130,455
Commercial Program	102,590,182	13,420	1,730,519	103,214,965	15,303	1,387,876	59,835,574	9,091	721,850
ENERGY STAR Lighting	4,503,209	679	N/A	4,569,915	865	N/A	3,285,245	627	N/A
Industrial Program	154,070,397	21,023	9,285,131	145,180,531	19,642	8,513,558	86,219,043	11,793	6,395,324
Non-Residential New Construction Program	5,468,849	2,255	766,100	5,468,849	2,125	480,344	3,655,144	1,660	248,982
Schools and Government Program	58,634,130	9,091	3,901,722	54,803,325	11,596	3,210,509	35,703,263	6,745	1,666,470
Non-Residential Subtotals	360,406,748	52,440	16,054,967	346,712,216	57,746	13,831,959	207,596,335	34,555	9,163,082
GRAND TOTALS	452,739,745	69,156	18,845,197	440,599,522	77,073	16,707,201	268,965,049	47,318	11,251,430

Summary of Findings by Measure Category

Table 19 summarizes CY 2011 residential savings by measure category. Lighting measures comprise the majority of electricity savings and building shell measures comprise the majority of gas savings.

Table 19. Summary of Savings by Measure Category, Residential Sector

Measure Category	Gross kWh	Gross kW	Gross Therms	Verified Gross kWh	Verified Gross kW	Verified Gross Therms	Verified Net kWh	Verified Net kW	Verified Net Therms
Residential Sector									
Appliances	120,785	3	6,871	120,785	3	6,871	120,760	3	6,871
Boiler	-20,149	-6	692,875	-20,149	-6	692,875	-15,233	-5	548,103
Building Shell	1,118,828	687	852,414	1,118,828	687	888,716	824,268	486	710,568
Controls	621,789	13	49,264	621,789	13	49,264	449,206	13	49,264
Conversion	344,296	40	-12,912	340,360	39	-12,751	307,230	35	-11,128
Energy Recovery	214,102	N/A	17,028	214,102	N/A	17,028	214,102	N/A	17,028
Furnace	18,643,771	4,300	443,820	18,673,760	4,304	484,834	7,106,965	1,642	184,258
Hot Water	831,818	28	221,792	831,697	28	225,292	583,835	21	147,663
HVAC	1,401,237	1,782	135,346	1,358,360	1,742	140,273	1,208,409	1,683	70,072
Laundry	92,413	N/A	6,042	92,645	N/A	6,541	68,459	N/A	2,988
Lighting	65,004,037	8,501	N/A	66,622,011	11,148	N/A	47,159,677	7,798	N/A
Motors & Drives	144,924	175	N/A	144,924	175	N/A	84,709	94	N/A
Non Energy ⁵	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Refrigeration	52,690	98	4,046	52,690	98	4,046	39,698	74	4,046
Renewables	96,808	60	N/A	99,859	65	N/A	65,244	45	N/A
Service	2,221,128	821	21,006	2,171,124	815	19,616	1,706,863	658	7,299
Whole Building	N/A	N/A	2,133	N/A	N/A	2,133	N/A	N/A	813
Other	1,444,520	215	350,504	1,444,520	215	350,504	1,444,520	215	350,504
Residential Subtotals	92,332,997	16,716	2,790,230	93,887,306	19,327	2,875,242	61,368,714	12,763	2,088,348

⁵ Non-energy activities are categorized by tracked data that contained no energy savings. A sample of some of these records include: certifications for home status, vouchers, contributions, audit fees, design and grants.

Table 20 lists CY 2011 non-residential savings by measure category. As in the residential sector, the lighting measures comprise the majority of electricity savings. However, HVAC measures comprise the majority of gas savings.

Table 20. Summary of Savings by Measure Category, Non-Residential Sector

Measure Category	Gross kWh	Gross kW	Gross Therms	Verified Gross kWh	Verified Gross kW	Verified Gross Therms	Verified Net kWh	Verified Net kW	Verified Net Therms
Non-Residential Sector									
Appliances	682,473	46	13,510	682,473	44	8,471	456,136	34	4,391
Biogas	13,700,849	1,576	320,116	11,847,460	1,576	320,116	4,037,977	510	320,116
Biomass	-9,578	-6	27,222	-9,578	-6	25,861	-9,578	-6	10,208
Boiler	29,942	N/A	1,569,874	28,954	N/A	1,648,157	28,984	N/A	458,253
Building Shell	284,249	12	943,064	283,939	12	592,847	189,163	12	307,315
Compressor	18,026,681	2,188	N/A	15,613,562	1,726	N/A	9,214,369	952	N/A
Controls	19,942,587	1,130	441,643	20,932,923	1,098	463,001	11,714,370	812	129,072
Conversion	31,782	60	-1,192	31,782	60	-1,192	31,782	60	-1,192
Energy Recovery	4,541,100	639	2,294,536	4,940,441	661	2,290,817	2,440,185	327	2,262,643
Farm Equipment	1,490,126	324	286,222	1,490,126	305	179,461	1,001,408	238	93,022
Food Service	1,630,007	196	117,565	1,630,007	184	73,713	1,089,427	144	38,208
Greenhouse	N/A	N/A	65,859	N/A	N/A	41,294	N/A	N/A	21,404
Hot Water	1,376,400	337	374,085	1,376,400	318	235,011	947,639	251	122,411
HVAC	45,010,151	6,282	5,042,684	33,961,628	13,718	4,103,827	16,192,549	6,230	2,912,513
Industrial	6,240,600	677	N/A	5,385,638	529	N/A	3,163,984	284	N/A
IT	3,712,923	321	N/A	3,712,923	302	N/A	2,481,558	236	N/A
Laundry	389,580	103	100,052	389,580	97	63,053	260,379	76	32,567
Lighting	131,804,896	22,296	N/A	131,880,982	20,882	N/A	81,215,194	13,245	N/A
Motors & Drives*	44,035,595	4,881	-91	46,074,305	4,995	-57	29,718,632	3,521	-30
Non Energy**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Measure Category	Gross kWh	Gross kW	Gross Therms	Verified Gross kWh	Verified Gross kW	Verified Gross Therms	Verified Net kWh	Verified Net kW	Verified Net Therms
Pools	3,493,961	645	6,668	3,493,961	645	6,668	3,493,961	645	6,668
Process	21,467	N/A	78,147	21,467	N/A	48,998	14,348	N/A	25,398
Refrigeration	34,894,152	3,970	3,344,839	32,286,234	3,806	2,984,423	21,152,735	2,327	1,958,147
Renewables	13,058,490	1,500	N/A	15,192,072	1,822	N/A	7,745,032	844	N/A
Scheduling	4,678,614	1,471	78,908	4,335,706	1,432	81,044	3,553,984	1,150	41,248
Service	52,834	4	N/A	48,520	4	N/A	22,481	2	N/A
Whole Building	1,681,931	221	18,900	1,451,506	173	19,845	852,739	93	5,481
Other	9,604,936	3,567	932,356	9,629,205	3,363	646,601	6,586,897	2,568	415,239
Non-Residential Subtotals	360,406,748	52,440	16,054,967	346,712,216	57,746	13,831,959	207,596,335	34,555	9,163,082
Grand Totals	452,739,745	69,156	18,845,197	440,599,522	77,073	16,707,201	268,965,049	47,318	11,251,430

*Heat provided by motors and drives provide ambient heat, more-efficient equipment may provide less ambient heat resulting in an increase in heating load.

**Non-energy activities are categorized by tracked data that contained no energy savings. A sample of some of these records include: certifications for home status, vouchers, contributions, audit fees, design and grants.

Residential Portfolio

The Residential Portfolio encompasses single-family and multi-family housing. This section of the report focuses on the savings of residential electronically commutated motors (ECMs). Based on the findings of the 2011 tracked savings, this measure was considered to be a high priority and was recommended for more rigorous measurement and verification (M&V) activities.

Electronically Commutated Motors Study

To assess the energy and demand savings impacts of the ECM measure, the Evaluation Team installed 30 meters in the homes of participating customers during CY 2011. This evaluation report includes only partial data because meters were installed February and March of 2012.

As of the date of this report, the Evaluation Team has successfully collected data from 20 of the installed meters. Because the data from the remaining participants cannot be collected remotely, the Team will collect it in March 2013. By leaving the metering equipment in place for a total of 12 months and supplementing the CY 2011 evaluation sample with additional homes as part of the CY 2012 evaluation, the Team will be able to provide findings that have greater levels of confidence and precision in the CY 2012 evaluation report.

Methodology and Approach

Energy savings and demand reduction are achieved through replacing existing permanent split-capacitor indoor blower motors with high-efficiency indoor blower motors. ECM furnace blowers have much higher efficiencies than permanent split-capacitor motors, and some manufacturers claim that ECMs may use 80% less energy.

To measure the energy use and savings associated with ECM furnace fans, the Evaluation Team performed these tasks (detailed in the next section) to obtain program-specific and site-specific measurements and verifications:

- Obtained and reviewed program data records and selected a sample.
- Conducted telephone interviews with program staff, participants, installers, and other relevant market actors.
- Performed site visits to verify the installation and effective operation of the installed measures.
- Interviewed participants during the site visits to ascertain the behavioral changes and motivations associated with installing the ECMs and assess the baseline condition.
- Performed spot metering and installation of long-term metering equipment (using cellular data loggers where possible).
- Performed a preliminary analysis of the meter data.
- Adjusted for weather.

ECM Evaluation Tasks

Details of the Evaluation Team's efforts regarding these seven tasks are provided below.

Task 1. Obtain Program Data Records and Select a Site Visit Sample

The Team obtained and reviewed all available documents associated with three types of data records for ECMs:

- Program tracking database;
- Program project files; and
- Project documents from external sources, such as documents from customers, M&V evaluators, or implementation contractors.

The purpose was to obtain data that supported an estimation of the savings; however, this effort was impeded by a lack of information regarding the existing systems. (That is, there was insufficient information about the fan motor and furnace of the system that was replaced by of the new measure, because it is difficult and time-consuming for HVAC contractors to verify the details of an old furnace fan they are replacing.) Anticipating this situation, the Team developed interview questions for collecting relevant information during site visits, which is discussed in the subsequent section.

The Evaluation Team selected a sample of participants to receive the full documentation review and metering. Table 21 presents the derivation of the sample size for this M&V effort.

Table 21. Residential ECM Assumed Sample Sizes

Activity	Population	Confidence & Precision	Sample Size
On-Site Inspections	15,796	90% \pm 13%	30*

* With a coefficient of variance (CV) of 0.2105 on the savings in the population, a sample size of 27 is needed for 90% confidence level and a 13% precision level. Because this measure is recommended for expedited fieldwork, a larger sample was proposed to mitigate risks on achieving reliable data at 90% and \pm 13% confidence and precision levels.

The Team analyzed the meter data collected through June 10, 2012, to estimate the savings being achieved from installation of ECMs in homes throughout Wisconsin. A conservative savings estimate is reported because of both the limited data collection period and the sample attribution (resulting from the inability to collect data remotely for some participants).⁶

Task 2. Conduct Telephone Interviews

To schedule site visits with participants for Task 3, the Evaluation Team reached out to participants. While the primary purpose of the calls was to schedule times when the Team's technicians could go on site to install metering equipment, these calls also provided an opportunity to confirm that customers had indeed participated in the program.

⁶ Some homes did not have sufficient cellular service meaning remote loggers were installed and that data will not be available until meters are retrieved.

Task 3. Perform Site Visits and Collect Data

The Evaluation Team conducted on-site inspections via these activities: (1) interviewing homeowners; (2) performing a visual inspection of the installed equipment; (3) performing spot measurements; and (4) verifying that the equipment was performing as designed.

The key data collected during on-site inspection were these:

- Verification that the installed equipment matched reported equipment;
- Operational parameters (such as ECM settings, thermostat settings, and participant-reported operation);
- Airflow measurement to verify correct installation and control; and
- Duct pressure measurements to verify correct duct sizing.

While on site, the Team also collected nameplate information, such as:

- AC nameplate info
- Furnace nameplate info
- Evaporator coil nameplate info
- ECM model and serial number (if visible)
- Filter condition (dirty or clogged, clean, etc.)

Task 4. Conduct Interviews On Site

Because the amount of savings depends on the baseline conditions, the Team developed a survey to determine the baseline equipment. Using interviews with data from previous meter studies enabled the Team to identify a baseline energy consumption pattern.

Additionally, the survey was designed to reveal the behavioral changes and motivations underlying the decision to install the ECM measure. Thus, the key questions were these:

- Is the home occupied year-round?
- Have you changed your thermostat program since installing the ECM?
- How often do you change the filter?
- What type of fan was it and how did you operate your old furnace fan?
- Are there other heat sources in the home?

Task 5. Perform Metering

Energy and demand impacts are verified using IPMVP Option B, Retrofit Isolation: All Parameter Measurement. This method uses engineering calculations and on-going site measurements to verify the savings resulting from specific measures.

While the variables measured at each site by the Evaluation Team were generally the same, the method for obtaining the metered data varied. The most significant difference was the use of cellular data loggers for sites with cell phone reception and remote loggers for sites without reception.

- For the sites metered with remote loggers, the data will be available for the next program year evaluation (CY 2012).
- For the sites metered with cellular data loggers, the types of metering equipment used are listed in Table 22.

Table 22. Residential ECM Metering Equipment

Parameter	Data Source	Logging Device*	Interval	Data Source Details	Purpose
Airflow spot measurement	DG-700 and TrueFlow plates	N/A	N/A	±9% accuracy	Develop fan curve and verify proper airflow and control settings
Static pressure	Onset T-VER-PXU-X or similar	U30-GSM Cellular	1 minute	Ranges: 0.1, 0.25, 0.5, 1.0, 2.5, 5, and 10 W.C. and ±1% accuracy for full scale of selected range	Develop fan curve and verify blower efficiency and proper control
Supply and Return temperature	S-THB-M00X	U30-GSM Cellular	1 minute	Range / Accuracy: -40° to 167° ; ±0.36° from 32° to 122°	Heating and cooling runtime estimate, temp split
Fan current/ power	a) Wattnode WNB-3D-240-P with b) MagneLab MAG-SCT-20 current transformer(s)	U30-GSM Cellular with: SUCC-M006 pulse adaptor S-FS-RMSA	1 minute	a) ±0.45% of reading and 0.05% FS through 25th harmonic b) ±0.5% of reading from 5% to 100% of rated current	ECM current and true power where possible
Thermostat temperature	Hobo-U12	Hobo-U12	5 minute	±0.63°F from 32° to 122°F	Verify temperature program settings

* Onset Energy Logger Pro (H-22) was used if cellular service was not available

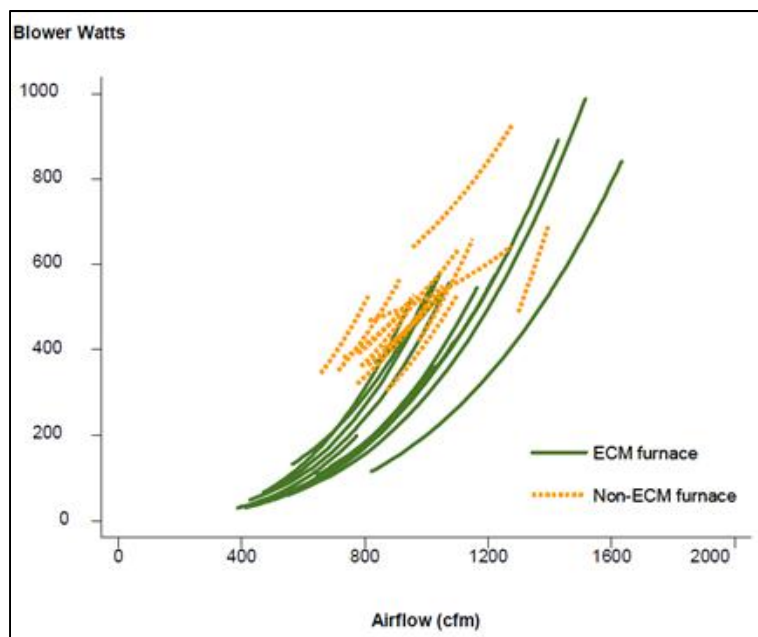
Task 6. Perform a Preliminary Analysis to Estimate Savings

To establish the baseline condition, the Evaluation Team interviewed each homeowner and used the responses to: (1) estimate the power draw of the original motor, (2) learn how this equipment operated, and (3) determine whether the blower operation changed after the installation of a more efficient system.⁷ The Team also performed duct pressure tests and airflow spot measurements.

The baseline energy consumption pattern is more predictable than the ECM energy consumption pattern. Previous studies—and the Evaluation Team’s experience—indicate that the fan power draw of permanent split-capacitor motors has very low variability between the three modes (heating, cooling, and on). In contrast ECM motors are capable of delivering a much wider range of airflow (as illustrated in Figure 6). The consequence of improved capability in airflow delivery is a change in operating condition, which makes savings difficult to assess.

⁷ Some homeowners reported using their ECM fan for more hours (i.e., leaving it on longer) because it is more efficient.

**Figure 6. Sample Chart of Blower Power
Versus Airflow⁸**



For estimating savings, the Evaluation Team considered these methodologies:

- **Option 1.** Meter the total kWh of ECM furnaces and compare to meter data from similar studies of non-ECM furnaces.
- **Option 2.** Assume no savings when the system is in heating or cooling mode. Savings are realized during system shut-down and in circulation (on) mode.
- **Option 3.** Assume ECM is always more efficient and savings are realized for all modes of operation by using a synthetic fan power curve for the baseline condition and actual airflow delivered by the new system.

Each of these savings estimation methods takes into consideration the interactive effects of: (1) potential improvement in air conditioner operating efficiency from better airflow control; (2) reduced waste heat for summer cooling; and (3) increased heat capacity due to reduced waste heat from the ECM fan motor.

For the 2011 evaluation report, the reported ECM savings are based on the most conservative approach, Option 2. While the Team anticipates using Option 3 to report ECM savings in the 2012 report, it is not used in this report for the following reasons:

- **Limited Data.** ECM motors are controlled to supply the same amount of airflow even as static pressure changes. This study monitors static pressure, which changes as the air filter gets dirty (clogged). Since a standard, permanent, split-capacitor fan motor does not provide constant airflow—as the filter gets dirty, the cooling and heating capacity may

⁸ “Electricity Use by New Furnaces” Scott Pigg. October 2003

decrease— the system will run for longer periods in heating and cooling mode. To estimate the baseline energy consumption accurately based on post-measure data, it is necessary to have data from a full year of operation, which encompasses the effects of filter change-outs and variable static pressure drop.

- ***Follow-up survey is necessary.*** Survey data often show that the information reported by participants is not always aligned with reality. For example, a thorough review of the meter data showed that some participants reported keeping their fan on in circulation mode all the time, but the meter data indicated this is not accurate. Before retrieving the meters from the participants, the Team will summarize the site-specific operational characteristics and discuss them with the homeowner. With this information, the Team will revisit and assess the validity of the responses used to estimate baseline operation.
- ***Sample Attrition.*** Thirty-three percent of the metered participants required installation of remote data loggers. Data processing is costly, especially because there are various types of relevant data collected at each site, which results in the data from many sites being relatively unique. The Team will complete the comprehensive analysis of the data at the completion of the study.

Task 7. Make Weather Adjustments

By multiplying realized savings by a ratio of cooling degree days (CDD) or heating degree days (HDD) during the metering period, the Team will adjust for weather difference from year to year to the TMY-3 normal CDD and HDD. These adjustments will be made to cooling and heating mode operation.

If the system operates in circulation mode (the fan runs when heating or cooling is not required), the Team will adjust to a weather-normalized run time in heating or cooling mode. For example, if a fan runs every hour of the year and the meter study was conducted in a particularly hot summer that required 100 more cooling hours than normal, the time in continuous mode would be adjusted accordingly; thus, effectively increasing the amount of continuous run time by 100 hours.

Preliminary Results of ECM Evaluation

The preliminary results of the Evaluation Team's efforts are provided here.

Verification of Data Records

Through telephone calls to recruit participants for the meter study, the Team verified that both customer contact information was accurate and the ECM measures were installed and operating.

Site Visit Verifications

The Team's on-site inspection activities entailed: interviews with homeowners, a visual inspection of the installed equipment, spot measurements, and verification that the equipment was performing as designed.

The key data collected by the Team during on-site inspection were these:

- ***Verification that installed equipment matched reported equipment.*** In each case, the ECM measure was installed and the furnace efficiency matched the reported efficiency tier.

- **Operational parameters (such as ECM settings, thermostat settings, and participant-reported operation).** The Team did not identify any issues with ECM installation. However, meter data will be reviewed in detail to ascertain whether the ECM is functioning properly.
- **Airflow measurement to verify proper installation and control.** Although airflow was not tested in cooling mode, it was tested in both heating mode and circulation mode, and no issues were identified. The Team will use meter data to ascertain whether the ECM is functioning properly in cooling mode.
- **Duct pressure measurements to verify proper duct sizing.** The Team did not identify any major issues with duct sizing. However, several participants mentioned they are able to maintain temperature better throughout the home and that the air does not “blow as loud as it used to.” This is an indication that the previous blower may have been oversized for the ducts and that airflow may have been too high.

On-Site Data Collection and Interview

While on site, the Team collected all available nameplate information. Further, because the amount of savings depends on the baseline conditions, the Team developed a survey to collect information about the baseline equipment. The intention was to determine a baseline energy consumption pattern through the use of participant interviews and data from previous meter studies.

The goal for the survey was to reveal behavioral changes and motivation regarding the installation of the energy-efficient measure. The key questions asked by the Team were these:

- **Is the home occupied year-round?** All participants noted they stay in their homes year-round, many leaving for only a short period of time (from one to two weeks).
- **Have you changed your thermostat program since installing the ECM?** Some 66% of participants reported not changing the control strategy of their thermostat.
- **What type of fan was it and how did you operate your old furnace fan?** There were no instances where an ECM motor was replaced. One furnace was described as relatively new (a standard permanent split-capacitor type), but the motor did not function well, so it was replaced.
- **Are there other heat sources in the home?** While homes had fireplaces or other heat sources, the primary heat source for all homes—with one exception—was the furnace with ECM fan. The exception was a participant who uses a wood furnace and constant-speed fan to provide the home’s primary heat. The ECM is installed and used when the heat pump operates, and it is also used to circulate air when the wood furnace is not running. The participant’s data will not be available until the study is complete.

Energy Use and Savings Estimate

For the reasons previously mentioned, the Team used the most conservative approach when reporting the estimated savings. These interim results are used to advise Wisconsin of a conservative savings estimate. Consequently, the energy savings will likely increase, when full data sets are available and all information is collected.

Table 23. Interim Meter Data Results

Averages	Metering Duration (hrs)	Metered Run time (Circulation Mode hrs)	Extrapolated kWh "On" Mode	Metered Heating Run Time	Extrapolated kWh "Heat" Mode	Metered Cooling Run Time	Extrapolated kWh "Cooling" Mode	HDD Metered Period	HDD 12-Month Total	CDD Metered Period	CDD 12-Month Ttotal	Savings kWh
	2,842	2,549	915	309	172	0	0	1,554	5,687	264	1,016	331
	2,195	1,375	190	335	104	64	26	1,061	6,376	206	852	175
	2,609	2	1	437	135	33	41	1,390	5,943	251	1,089	-1
	2,633	1,928	331	184	149	91	159	1,664	6,010	254	1,105	1,773
	2,035	116	46	263	364	94	90	1,115	6,593	143	746	87
	2,032	924	348	155	300	156	254	786	5,598	267	1,204	1,177
	2,609	3	2	252	119	106	105	1,359	5,943	250	1,089	0
	2,271	677	237	305	360	197	126	1,079	6,359	225	805	351
	2,099	2	1	276	546	95	188	1,118	6,588	174	779	3
	2,848	76	42	200	119	11	7	1,368	5,943	359	1,152	-12
	2,272	248	102	111	226	53	95	1,022	6,473	237	841	342
	2,593	954	332	512	163	0	0	1,623	5,879	145	819	-53
	2,880	2,447	271	182	78	223	113	1,685	5,853	213	819	825
	2,900	93	5	387	135	0	0	1,554	5,687	264	1,016	26
	2,822	1,398	547	418	575	62	179	1,554	5,687	264	1,016	1,548
	2,439	104	11	282	132	29	15	1,139	5,853	213	819	33
	2,271	258	53	156	163	44	29	1,029	6,914	214	800	164
	2,252	1,227	189	350	151	66	14	1,022	6,473	237	841	199
	2,868	1	0	362	68	157	85	1,554	5,687	264	1,016	0
	2,149	1	0	183	50	75	28	1,064	6,489	175	771	0
	2,481	719	181	283	205	78	78	1,287	6,102	231	930	348

The 20 sites for which interim data were available averaged 464 kWh consumed⁹ and 348 kWh saved. Deemed savings for ECM furnace measures in the 2011 population was an average of 732 kWh.¹⁰ Because only a portion of the 12 months has been metered thus far, the Evaluation Team adjusted energy consumption and savings by a ratio of CDD and HDD. The Team selected the closest weather station for each site and used the previous 12 months of weather data to extrapolate the meter data to a full year. These interim metering results are not reflected in this report's portfolio-wide verified gross savings.

Reasons for Lower-Than-Expected Savings

The Evaluation Team identified the following reasons for the lower-than-expected savings.

Abnormally mild winter. Thus far, the analysis shows that ECM furnace motors use 464 kWh/year. A similar study, "Electricity Use by New Furnaces," (which was fielded in 2001-2002) estimated ECM furnaces use 645 kWh on an annual basis. However, the period metered in 2012 included a much milder than usual winter¹¹. As a result, the equipment run time and energy consumption of ECM fans were lower than typical. When Option 3 (described under Task 6) is used to estimate savings for the CY 2013 evaluation report, the savings during heating periods will be increased by ~20%, which is the 12-month deviation from the TYM3 weather normal.

Conservative baseline assumption. As described above, savings were not included in the analysis when the system operates in heating or cooling mode, but savings will be included when complete information is available at the completion of the study.

The participants who experienced little or no savings in the preliminary analysis operated their systems in a similar manner: the ECM power draw was very steady, and fans were not used in circulation mode. The assumption is that the permanent split-capacitor motor efficiency would have been similar, so savings are realized only when the ECM motor operates at low speeds.

This methodology can even result in negative savings. For example, the data indicate one participant used more power when the fan was in circulation mode than in heat mode, which resulted in negative savings at this site (-53 kWh).

Airflow variability not yet accounted for. ECM motors are set to maintain constant airflow, so when a filter gets dirty, the ECM motor power increases to deliver the heating and cooling capacity at the same rate through the restricted filter. A non-ECM motor does not have this capability, so airflow is reduced. As a consequence, the non-ECM system must run for longer

⁹ Energy consumption noted applies to ECM motors only. The standby power and furnace induction motor were not metered

¹⁰ Average of 12,639 participants, ECM motor savings only. Some participants also had savings from high-efficiency air conditioner measures, but these savings are not included here, for the purpose of making a similar comparison.

¹¹ Wisconsin State Climatology Office. Wisconsin Statewide Monthly Temperature Departures (from 1981-2010 Normals) for last 12 months (September 2011- August 2012). <http://www.aos.wisc.edu/>. Accessed September 20, 2012.

cycles to satisfy the heating or cooling need. This leads to both higher variability in temperature throughout the home and an overall decrease in heating and cooling efficiency. The Team will research this issue throughout the evaluation, applying secondary data to estimate the savings from system efficiency improvement.

Interactive effects not accounted for. The Team anticipates additional savings from decreased motor waste heat in the summer and a slight increase in gas use in the winter. The electric savings are expected to be in the range of from 20 to 30 kWh.

Normalizing furnace size. The Team did not attempt to normalize the size of the meter study furnace to match the population. When all data sets are analyzed and all program tracking data are reviewed, the Team will adjust the metering participant sample to match the population by furnace BTUs and average cooling capacity of AC systems. (Note that homes without AC are also included in the analysis). The interim review shows the sample is similar to the population. The average furnace size of the 20 meter participants is 75,238 BTUs, while the average furnace size of the population is 72,344 BTUs.

Non-Residential Markets

The Non-Residential Portfolio services these sectors: (1) commercial, (2) industrial, (3) schools and government, and (4) agriculture. This section of the evaluation report focuses on the Process and Custom HVAC measure groups which, based on the Evaluation Team's review of the 2011 reported savings were recommended for more rigorous measurement and verification (M&V) activities.

Process and HVAC Study

Each of these measure groups represented a significant share of the electric or gas savings relative to the overall program savings in CY 2011. Furthermore, from CY 2010 to 2011, there was significant growth in the relative contribution to savings for each of these measures. This growth in savings was an indicator that the population of participants receiving these measures had changed and, consequently, that the savings attribution used in the 2010 evaluation may not have been representative of the savings that should be attributed to the 2011 program.

Sampling Approach

A stratified random sample of the population was selected for site visits, based on combined kWh and Therm savings (ex ante) estimated by the Program Administrator, prioritizing measures with higher savings and higher risk. The Evaluation Team designed the nested sampling metric to achieve levels of 90% confidence and 12% precision or better at the measure group level, assuming a coefficient of variance of 0.5, using on-site inspections. Table 24 presents Process and HVAC measure group sample sizes.

Table 24. Process & HVAC Measure Group Sample Sizes

Activity	Population	Confidence and Precision	Sample Size
Process On-site Inspection	53	90% ± 12%	28
HVAC On-site Inspection	530	90% ± 12%	25

Sample size was calculated based on the following formula:

$$n = \frac{C_v^2 Z^2}{P^2}$$

where:

- C = Coefficient of variation = 0.5 (assumed)
- P = Precision = as applicable, criteria described above
- Z = Z-Statistic based on 90% confidence = 1.645

The participant population was stratified by combined gas and electric savings (MMBTU savings).

The sample size for each stratum was calculated using a ratio estimation approach based on savings weights. A savings-weighted approach ensured that the high-impact projects were selected for review.

Process Measures Evaluation

Under this measure group, a variety of process upgrades were installed in industrial facilities. The process measures affected electricity or natural gas consumption, or both. The measures—which were selected to increase the overall process efficiency and reduce the overall electrical load on the utility—consisted of the following:

- Replacing process equipment;
- Adding control capabilities;
- Optimizing systems; and
- Recovering waste heat.

Table 25 lists the measures in the process efficiency category and the relative savings contributions in terms of kW, kWh, and therms, as reported by the Program Administrator.

Table 25. Process Subcategories and Relative Contributions

Sub-Category	Number of Projects in Sample	% of Sub-Category kW Savings in Sample	% of Sub-Category kWh Savings in Sample	% of Sub-Category therm Savings in Sample
Energy Recovery	8	33.2%	35.1%	55.2%
Process Cooling	1	10.9%	10.8%	23.1%
Process Heat	4	0.0%	0.7%	0.0%
Specialty Pulp & Paper	4	0.1%	1.3%	0.7%
Variable Speed Drive	1	51.6%	51.3%	21.0%
Other	10	4.1%	0.8%	0.0%
Total	28	100%	100%	100%

HVAC Measures Evaluation

Under this measure group, a variety of HVAC upgrades were installed in non-residential buildings including chillers, added control capabilities, system optimization, and waste heat recovery. The HVAC measures affected electricity or natural gas consumption, or both.

Table 26 lists the measures in the HVAC category and the relative savings contributions in terms of kW, kWh, and therm savings, as reported by the Program Administrator.

Table 26. HVAC Subcategories and Relative Contributions

Sub-category	Number of Projects in Sample	% of Sub-Category kW Savings in Sample	% of Sub-Category kWh Savings in Sample	% of Sub-Category therm Savings in Sample
Chiller	3	90.3%	15.5%	0.0%
Controls	5	0.0%	59.0%	25.8%
Custom HVAC (Heat Pumps)	1	5.2%	0.5%	0.0%
Energy Management System	1	0.0%	0.9%	0.0%
Energy Recovery	2	0.7%	-1.2%	6.1%
Fans	7	42.9%	9.0%	49.4%
Filtration	1	0.4%	1.2%	11.3%
Other	5	-39.6%*	4.9%	7.4%
Total	25	100%	100%	100%

* Negative value caused by one large project with large negative kW savings selected as part of the sample. This large project was not followed through to completion resulting in negative kW savings. The Administrator was able to anticipate this discrepancy and adjust kW savings accordingly.

Methodology and Approach

The Evaluation Team's assessment of the energy use and savings for the Process and HVAC measure groups required program-specific and site-specific M&V. The general evaluation tasks for both were these:

1. Obtaining and reviewing program data records and selecting a sample.

2. Conducting telephone interviews with program staff, participants, installers, and other relevant market actors.
3. Performing site visits to verify the installation and effective operation of implemented measures.
4. Performing short-term or spot metering and equipment measurements.
5. Collecting pertinent documentation and trending data (if available) while on site.

Non-Residential Evaluation Tasks

Task 1. Obtain Program Data Records and Select a Sample

The Evaluation Team obtained and reviewed comprehensive program records for each of the sampled measure groups. Specifically, the Team reviewed all available documents associated with these types of data records:

- Program tracking databases. These contained a comprehensive list of program participants and specific project data for each participant, including: customer name, site address, savings reported (energy and demand, as applicable), project schedule, and incentives paid. These databases enabled the Team to: (1) Determine aggregate reported program savings impacts, and (2) develop and execute a program sampling strategy.
- Program project files
- Project documents from external sources, such as documents from customers, M&V evaluators, or implementation contractors

After selecting participant projects from the sample populations, the Team obtained project-specific files from the WIserts program tracking database. (For details, see the section titled “Sampling Approach” Section earlier in this chapter.) These project files typically consisted of program documents maintained for each project, including the participant’s application, calculations of savings, and supporting documentation on the history of the project.

Depending on the project, the Evaluation Team requested additional supporting information from third-party M&V consultants, customers, and implementation contractors. The requested data included post-retrofit M&V reports, trend data, possible revisions to projects, equipment inventories, and equipment specifications. The information provided by these other sources was useful because it provided a more accurate and comprehensive understanding of the retrofit that occurred.

The Evaluation Team then developed an M&V plan specific to each site. The plans were developed using the most appropriate methodology for the project, considering both the availability of trend data and the opportunities for taking independent measurements at the facility. The uncertainty associated with the measure was also taken into account when ascertaining the level of rigor needed to verify a sample point.

Where M&V had already been conducted by the customer, the customer's contractor, or the utility, the Team determined if existing data could be leveraged. Table 27 summarizes the general M&V methodologies used by the Team.

Table 27. Process Efficiency M&V Methodology

Preference	Method	Description
1	IPMVP Option B	This method used if the facility was collecting trends of the energy consumption of the affected equipment.
2	IPMVP Option A	In the absence of trend data, spot measurements and/or short-term data collection was performed to capture the affected system's performance.
3	IPMVP Option C	If measurements could not be taken but the energy savings were expected to be significant, as compared to the facility's total utility bill, then the impact of program participation would be quantified using utility bill analysis.
4	Calculated Approach	In the absence of other appropriate options, engineering calculations were used to estimate savings based on operational parameters collected during the site visit.

For many sites, there was a limited opportunity (or no opportunity) to measure key parameters. Spot and short-term measurements were restricted or not possible at a portion of the sites. Most sites were sufficiently sophisticated that the Team was able to collect site-specific energy consumption data through building management systems, which can in turn be fed into an Option C approach.

Task 2. Conduct Telephone Interviews

In order to schedule site visits with participants as part of Task 3, the Evaluation Team needed to reach out to participants. While the primary objective of the call was to schedule times when the Evaluation Team's technicians could go on-site for inspections and/or to install metering equipment, these calls also provided an opportunity to confirm that the customer had indeed participated in the program.

Task 3. Perform On-Site Inspections

After selecting the metering equipment appropriate to the M&V plan, the Evaluation Team conducted on-site inspections via interviews with facility personnel, visual inspection of the installed equipment, spot measurements, and/or installation of data loggers. Data collected during on-site inspections included:

- Operational parameters, such as hours of operation and operating loads.
- Annual variation of operational parameters.
- Pre-retrofit conditions, such as age and condition of replaced equipment.
- Recent equipment or operational changes to the facility in addition to those associated with the installed measure.

Due to the timeframe of the 2011 evaluation, the Evaluation Team was unable to provide metering results to capture operating characteristics in the winter and summer months. The Team adjusted metering results to normalize for weather variations for each site as necessary.

Task 4. Verify the Sample

The Evaluation Team verified the gross impacts of the sample projects, which were the energy and demand savings directly resulting from the project found at a customer site. The impact evaluation activities resulted in adjustment factors (realization rates) that the Team applied to the reported savings documented in the program tracking records.

- The project realization rate is the ratio of the savings determined from the site inspections, M&V activities, or engineering calculations to the program-reported savings.
- The program realization rate is the weighted average for all projects in the sample.

The gross savings is obtained from multiplying the program realization rates by the program-reported savings, and they reflect the direct energy and demand impact of the program's operations. (These savings do not account for customer or market behavior that may have resulted in greater or lesser savings.)

Total program verified gross savings are adjusted using the following equation:

$$\text{kWh}_{\text{ver}} = \text{kWh}_{\text{rep}} * \text{Realization Rate}$$

where:

- kWh_{ver} = kWh verified by the Evaluator, the gross impact
- kWh_{rep} = kWh reported for the program
- Realization rate = $\text{kWh}_{\text{rep}}/\text{kWh}_{\text{rep}}$ for the research sample

Demand (kW) savings and natural gas savings (therms) were treated in a similar manner.

Findings and Recommendations

In general, project realization rates for kWh and kW savings had variability and were generally low for the sampled HVAC projects. Realization rates for the sampled Process projects had low variability and were consistently high.

The overall realization rates for each program by fuel type are listed in Table 28.

Table 28. Realization Rates for Custom HVAC and Process Programs

Program	Number of Projects in Sample	Realization Rate for kWh	Realization Rate for kW	Realization Rate for Therms
Custom HVAC Program	25	68.1%	52.8%	103.7%
Custom Process Program	28	93.9%	100.7%	100.6%

The lower realization rates for electric HVAC projects were largely attributed to inaccurate assumptions in customer *ex ante* calculations compared to actual conditions on-site. Specific examples include modifications to the system schedules and operating hours, differences in

measure parameters such as motor sizes and VFD speeds. The Evaluation Team also encountered manual control systems at many of the project sites, which can affect energy savings.

Additional findings from the evaluation of the Process and HVAC measure groups are as follows.

Program M&V Requirements

Finding: The Evaluation Team found that customers (and their contractors) were not required to conduct M&V to measure important parameters that influence *ex ante* savings estimates. In several instances, changes to a key parameter compromised other data provided by manufacturers' representatives or by contractors who had assumed a different fixed value. Also, baseline conditions were not adequately established for some projects.

Recommendation: To confirm key parameter assumptions and document any project scope changes, implement a framework of M&V activities and check the key parameters used in submitted energy savings calculations. If discrepancies are noted between the approved scope of work and the actual installed equipment, then adjust the energy savings attributed to the project.

Project Documentation Requirements

Finding: The comprehensiveness of the documentation varied from project to project, and there did not appear to be a direct correlation between the size of the project and the quality of the information. The Evaluation Team encountered several large projects with limited documentation and several smaller projects with extensive documentation. Often, equipment specification data and commissioning documents listing system set points were not available.

Recommendation: Standardize program documentation requirements. At a minimum, the documentation should include: information on project savings; baseline and post-retrofit conditions and deemed energy savings estimates that are supported with transparent calculation spreadsheets or notes. It is further recommended that sources be specified for stipulated or assumed parameters used in customer calculations.

Feasibility Study Incentives

Finding: The Evaluation Team encountered several projects where a customer received an incentive payment for completing a feasibility study and later applied for additional incentives after the implementation of energy conservation measures. It is unclear whether this is part of the program design.

Due to program constraints, it is challenging for the Evaluator to determine whether a measure has been appropriately implemented relative to recommendations from the feasibility study. For the projects included in the sample, the energy efficiency opportunities were commonly implemented internally by facility management personnel. This is one of the primary objectives of feasibility study incentive programs; however, this model can introduce error and higher levels of uncertainty, especially when implementation documentation is limited.

Recommendation: If the program is designed to provide incentives for both a feasibility study and measure implementation, the Team recommends modifying the program. Specifically,

institute more rigorous documentation requirements for the implementation of Feasibility Study Energy Conservation Opportunities or consider removing the Post-Implementation offering from the incentive package.

Load Shape Analyses

Finding: The design of the program placed limited emphasis on load shape analyses for this evaluation. However, load shapes can provide insight on savings achieved during the summer-peak, off-peak, and shoulder-peak periods. They can also provide value when calculating system on-peak demand savings for measures subject to daily and seasonal variations in the operating schedule. Examples in which load shapes can be useful are: HVAC systems where cooling load varies significantly on an hourly basis (e.g., commercial buildings and industrial facilities), and process efficiency projects at a facility with dynamic production cycles.

Recommendation: To calculate more accurately the electric energy and demand benefits resulting from implemented measures, the Evaluation Team recommends generating either 864 or 8,760 load shapes.

Optimize Energy Savings

Finding: The Evaluation Team encountered two or three projects for which installed measures had not been commissioned or optimum savings were not achieved due to pre-defined factory defaults, manual controls, or manually overridden control set-points. A representative example was a high-volume, low-speed (HVLS) fan installation where variable frequency drives (VFDs) were installed at default factory settings, which restricted the lower load limit of the VFD to 50% instead of the designed value of 30%.

Recommendation: To ensure designed set-points have been appropriately implemented, institute post-installation commissioning requirements.

Database Improvements

Finding: In several instances, the customer MMBtu savings listed in the WIserts database was a representation of the combined savings for multiple projects with multiple unique project ID numbers. This required several projects to be re-stratified late in the evaluation process. To compute realization rates accurately, the deemed MMBtu savings for the sampled projects had to be extracted from the aggregate savings. This re-stratification resulted in lower sample populations in Stratum 3 for the Custom Process projects and Stratum 4 for the Custom HVAC projects.

Recommendation: Modify the project tracking database to allow users to see individual project savings by customer ID. This would provide more transparency on individual project savings and aid in future sample stratification efforts.

Positive Findings, General Observations, & Additional Recommendations

Fuel Penalties: Several projects in the sample involved alternative fuel penalties (typically electric) in exchange for larger electric or natural gas savings. The realization rates were calculated for both the energy savings and the energy penalties associated with each project. The average realization rate was approximately 90% for energy demand (kW) penalties and

approximately 70% for electric energy (kWh) penalties. These figures indicate that the energy penalties were based on adequately conservative assumptions.

Minimal Measure Drop-outs: The Evaluation Team encountered few instances in which energy efficiency measures had been dropped from the project scope.

Spillover: Most participants said their participation in the program influenced them to install—or plan to install—additional energy-efficient equipment. While it is not possible to quantify the additional savings that occurred from such spillover activity, this does suggest a program benefit.

Trending Data: The Evaluation Team encountered several projects where trending-capable building automation systems (BAS) systems were installed but under-utilized. Trending data can be a valuable tool in evaluating energy performance improvement projects, especially on weather-dependent measures or process measures with varying production cycles. Customers should be encouraged to take advantage of trending capabilities.

Benefit Cost Findings

As part of the 2011 evaluation activities, the Evaluation Team has reviewed the cost effectiveness of the programs. This section of the annual report presents the findings of a benefit cost analysis for Focus on Energy's 2011 program year. The 2011 benefit cost analysis used a new approach as compared to previous years. The new approach uses many of the previously applied input assumptions. In the current quadrennial cycle the Program Administrator has, with PSC approval, elected to use a cost-effectiveness calculator for program planning purposes. Consistency between planning and evaluation approaches is critical for an effective understanding of program performance relative to expectations. As a result, the same calculator is being used for evaluation.

The benefit cost (B/C) test, also known as a cost-effectiveness test, is used to compare the benefits of a demand side management program with the costs of the program. There are several tests used for evaluating energy efficiency cost-effectiveness. The benefit cost test is based upon the total resource cost (TRC) test; a commonly administered test in the energy industry that counts the avoided cost of supplying the displaced energy against the program and participant costs. The TRC test used in this evaluation is typically applied to define what is cost-effective from a regulatory perspective. The goal of a TRC test is to help answer whether energy efficiency is cost-effective overall. The TRC test measures the net costs of an energy efficiency program as a resource option based on the total program costs, both to the participants and Focus on Energy. The TRC test provides a measure of the net direct economic impact on a population—i.e. a utility service territory, county, or political districts.

The TRC is essentially the ratio of program benefits to program costs. A value greater than one translates into a program or portfolio of programs that is cost effective (net benefits are positive), whereas a value less than one is not cost effective (net benefits are negative). From a TRC perspective, a conservation measure or practice “fails” if net benefits are negative, meaning the costs of achieving the savings outweigh the value of the savings achieved. The equation used for the TRC is as follows:

$$\begin{aligned}
 TRC = & [Value\ of\ Net\ Saved\ Energy\ (Avoided\ costs) \\
 & + Value\ of\ Avoided\ Emissions] \\
 & / [Program\ Costs\ (exclusive\ of\ incentives) \\
 & + (Incremental\ Measure\ Cost * Net - to - Gross\ Ratio))]
 \end{aligned}$$

A more detailed discussion of the inputs to the TRC ratio is presented below and in Appendix D.

Value of Net Saved Energy: The value of energy saved, or displaced, can be defined as the net energy saved multiplied by the utility avoided cost of the saved energy. In the case of energy efficiency and renewable resource programs, avoided cost is the incremental (or marginal) cost to an electric or gas utility for additional energy and capacity required if the utility would generate or purchase from another source rather than pay for the efficient measure that offsets this demand.

The source for avoided costs included in the 2011 evaluation comes from generation level costs on the Midwest Independent Transmission System Operator (MISO) forward-looking capacity market Locational Marginal Prices (LMP). The value was inflated from average 2009 dollars to 2011 dollars based on a 2.5 percent inflation rate. The avoided costs are held constant over the forecasted time period and the present value of the stream of benefits are discounted back to the base year (2011) at a rate of two percent. The energy savings are decreased by the conventional attribution factor of net-to-gross to derive net savings. Net savings are then increased by the line loss factor of eight percent to account for distribution losses. Table 29 shows the 2011 and 2010 avoided cost assumptions used for the cost effectiveness tests.

Table 29. Avoided Cost Comparison between 2010 and 2011 Evaluation Reports

	2011 Report	2010 Report
Electric Energy (\$/kWh)	0.04127	0.0411-0.0556
Electric Capacity (\$/kW)	114.3	127
Gas (\$/therms)	1.0005	1.0005
Avoided Cost Inflation	0%	1%
Real Discount Rate	2%	5%
Line Loss	8%	8%

A discussion and various scenario analyses that compares the default 2011 PSC approved avoided costs (based on three-year historic MISO LMP pricing) against newly developed avoided costs (based on forecasted MISO LMP pricing) are included in Appendix E.

Emissions Benefits: Emissions benefits are the only other benefit included in the TRC calculation. The emissions benefits require three key parameters: net energy savings, emissions factors, and the value of the reduced emissions. Emissions factors are simply the rate the criteria pollutants are emitted per unit of energy and are most often expressed in tons of pollutant per energy unit (for electric it is tons/MWH and for gas it is tons/MThm). The product of the emissions factor and the net energy savings is the total weight of air pollutant offset or avoided

by the program. The product of the total tonnage of pollutant saved and the dollar value of the reduced emissions per ton is therefore the avoided emissions benefit.

The gas and electric emission factors were derived from the 2010 evaluation report and were originally detailed in the report *Focus on Energy Evaluation Emission Factors Update*.¹² The emissions factors and allowance prices are shown in Table 30 below.

Table 30. Emission Factors and Allowance Price

Service Fuel Type	CO2	NOX	SO2
Electric Emissions Factor (Tons/ MWh)	0.9005	0.0013	0.0019
Gas Emission Factor (Tons / MThm)	5.85		
Allowance Price (\$/ton)	\$30.00	\$15.89	\$2.12

The 2011 nitrogen oxides (NOx) and sulfur dioxides (SO2) emission allowance prices were collected from the Energy Information Administration (EIA)¹³. Due to the continued decline in and uncertainty surrounding forecasted NOx and SO2 allowance prices the forecasted values remained constant at 2011 values. The CO2 emission price was derived from the the PSC's order in docket 5-GF-191, Electronic Regulatory Filing System reference number 137513 that states “A levelized carbon value of \$30 per ton shall be used in the benefit/cost modeling of energy efficiency programs.”

Table 31 shows total program level emission benefits. The considerable difference between the emissions benefits for program year 2010 and 2011 can be fully attributed to the application of a \$30/ton carbon benefit.

Table 31. Program Emission Benefits

	Non-Residential	Residential	Total
2011 Emissions Benefits	\$84,075,436	\$19,667,147	\$103,742,582
2010 Emissions Benefits	\$13,573,000	\$4,030,000	\$17,603,000

Program Costs: The program costs represent all costs associated with running the efficiency and renewables programs (including administration and delivery costs). Incentive costs are not included as program costs as they are deemed transfer payments. The 2011 program costs were provided to Cadmus from the fiscal agent Wipfli.

¹² PA Consulting Group, December 22, 2009

¹³ <http://www.eia.gov/todayinenergy/detail.cfm?id=4830>

Table 32 shows the 2011 and 2010 program and incentive cost values used for the cost effectiveness tests.

Table 32. Program Cost Comparison between 2010 and 2011 Evaluation Reports

	Non-Residential		Residential	
	2011 Report	2010 Report	2011 Report	2010 Report
Incentive Costs	\$32,491	\$39,661	\$14,253	\$18,930
Admin Costs	\$3,761	N/A	\$2,622	N/A
Delivery Costs	\$15,357	N/A	\$5,980	N/A
Total Non-Incentive Program Costs	\$19,118	\$19,862	\$8,602	\$8,524

Incremental Costs: The gross incremental costs are the additional costs incurred by participants as a result of purchasing efficient equipment over and above a baseline non-qualified product. Gross incremental cost values used in this evaluation were derived from the Focus on Energy Benefit-Cost Analysis CY09 Evaluation Report with the notable exception of renewable-based measures. Similar to the 2010 evaluation effort, the renewable energy projects received actual project cost values from the program tracking databases. The gross incremental costs, similar to the energy savings values used in the cost effectiveness tests, required the application of attribution factors to account for free-ridership. The values for attribution factors, namely the net to gross ratios, were derived from the 2010 evaluation and carried forward to the 2011 evaluation on a measure by measure basis.

Table 33 shows the 2011 and 2010 total measure gross incremental costs used for the cost effectiveness tests.

Table 33. Gross Incremental Measure Cost Comparison between 2010 and 2011 Evaluation Reports

	Non-Residential		Residential	
	2011 Report	2010 Report	2011 Report	2010 Report
Incremental Costs (in thousand \$'s)	\$164,935	\$104,694	\$64,837	\$52,778

In 2012, the Evaluation Team will be conducting an analysis of the relative impacts of using the cost effectiveness calculator procured by the Program Administrator and used to determine program design as well as current approaches to working with the tool, to assess whether there are any systematic differences when compared to other commonly used approaches.

Table 34, shows the 2011 cost-effectiveness results along with the previously reported program year 2010 and program inception through December 31, 2010 cost effectiveness results.

Table 34. Cost-Effectiveness Results

	2011 w/ Renewables	2011 w/out Renewables	2010*	July 1, 2001 – December 31, 2010
Non-Residential	2.71	3.41	2.7	2.6
Residential	1.84	2.26	1.5	1.4
Renewables	N/A	0.52		0.9
Total	2.46	2.46	2.3	2.0

*In 2010, both non-residential and residential cost-effectiveness calculations are inclusive of renewables

For additional details on the processes used for calculating the cost effectiveness of the Focus on Energy portfolio, please refer to the **Benefit-cost Analysis: CY09** report available on the focusonenergy.com Website,¹⁴ as well as Appendix D and Appendix E.

Recommendations

During the review of program materials and on-site work evaluating the high-priority measures, the Evaluation Team noted a number of activities that should be addressed or considered for the optimization of the current program portfolio and to support future evaluation activities. These recommendations include:

- Reviewing the assumptions behind the savings being claimed for ECMs on residential furnaces. (Although the unusually warm 2011-2012 heating season combined with a short metering timeframe does not provide for enough confidence and precision to develop a new savings value at this time, there is sufficient evidence to suggest that the current savings assumptions are a likely source of risk, and future verified gross savings may be lower.)
- Instituting a process for storing and associating information collected during program site visits to individual records in SPECTRUM.
- Including an assessment of job impacts as a regular component of program design and evaluation processes.
- Creating an archive system that meets Federal Energy Regulatory Commission (FERC) and State privacy and security requirements for the protection of personally identifiable

¹⁴ Focus on Energy Benefit-Cost Analysis CY09 Evaluation Report. Submitted by PA Consulting Group and KEMA, Inc. Submitted to Public Service Commission of Wisconsin. Final: November 24, 2009. http://www.focusonenergy.com/files/Document_Management_System/Evaluation/bcanalysiscy09_evaluationreport.pdf

information, and implementing a state-wide rule for utilities participating in the Focus on Energy programs to archive customer billing data with the PSC in a standard format.

This process should be consistent with the approach that is being used for collecting and archiving billing data for the federal weatherization programs supported by the utilities.

- Implementing a framework of M&V activities and check the key parameters used in submitted energy savings calculations to confirm key parameter assumptions and document any project scope changes. If discrepancies are noted between the approved scope of work and the actual installed equipment, then adjust the energy savings attributed to the project.
- Standardizing program documentation requirements. At a minimum, the documentation should include: information on project savings; baseline and post-retrofit conditions and deemed energy savings estimates that are supported with transparent calculation spreadsheets or notes. It is further recommended that sources be specified for stipulated or assumed parameters used in customer calculations.
- Generating either 864 or 8,760 load shapes to calculate more accurately the electric energy and demand benefits resulting from implemented measures.
- Instituting post-installation commissioning requirements to ensure designed set-points have been appropriately implemented.

In addition to the recommendations noted above, the Evaluation Team noted several other items that would have also constituted recommendations, however; these activities had been previously noted and are already approved or underway at the time this report is being issued. These activities include:

- Creating and transitioning to a single central tracking database for all programs
- Solidifying the key savings assumptions behind lighting savings by conducting a state-wide lighting hours of use study.
- Maintaining an archive of savings algorithms, deemed savings values and associated supporting information and data sources for each program year in order to support the retroactive verification of savings estimates and increase the transparency of evaluation efforts.
- Conducting training with residential furnace dealers so that they are less likely to recommend that customers change their behavior to begin leaving furnace fans running continuously – an action that eliminates the savings for which the program is providing an incentive.

Appendix A.

Key Achievements and Figures for State of Wisconsin and Focus On Energy

Program Participants	Total Gross Verified Life Cycle Savings	Population Numbers
Residential: 182,615	Energy Savings (MWh): 5,259,905	State-Wide Census Population: 5,711,767
Non-Residential: 13,033	Demand Reduction (MW): 77.1	Eligible Residential Electric Accounts: 2,561,588
Total: 195,648	Natural Gas Savings (Therms): 246,171,405	Eligible Residential Gas Accounts: 1,666,480
Total Electric and Natural Gas Energy Use	Total Net Verified Annual Savings	Eligible Non-Residential Electric Accounts: 337,965
Electric Sales to WI Retail Customers (MWh): 68,752,000	Energy Savings (kWh): 268,965,000	Eligible Non-Residential Gas Accounts: 167,531
WI Aggregated Electric Utilities Non-coincident Peak Demand (MW): 14,577	Demand Reduction (kW): 47,300	
Natural Gas Consumption (Therms): 3,336,000,000	Natural Gas Savings (Therms): 11,251,429	

	Non-Residential	Residential	Total
Incentive Costs*	\$32,490,795	\$14,252,876	\$46,743,671
Admin Costs	\$3,760,910	\$2,622,411	\$6,383,320
Delivery Costs	\$15,357,361	\$5,980,265	\$21,337,627
Incremental Measure Costs	\$104,914,159	\$41,291,783	\$146,205,942
Total Non-Incentive Costs	\$124,032,430	\$49,894,459	\$173,926,889
Electric Benefits	\$151,687,233	\$30,255,311	\$181,942,543
Gas Benefits	\$100,954,913	\$41,750,795	\$142,705,708
Emissions Benefits	\$84,075,436	\$19,667,147	\$103,742,582
Total TRC Benefits	\$336,717,581	\$91,673,252	\$428,390,833
TRC Net Benefits	\$212,685,151	\$41,778,793	\$254,463,944
TRC Ratio	2.71	1.84	2.46

* Incentive costs are not included in TRC calculation

APPENDIX B. GLOSSARY OF TERMS

Term	Definition
Attribution	The establishment of a causal relationship between action(s) taken by a group and an outcome.
Avoided Costs	Costs avoided by the implementation of an energy-efficiency measure, program, or practice. These costs generally include generation or distribution costs.
Baseline	Conditions (including energy consumption) that would have occurred without implementation of the subject measure or project.
Benefit-Cost Ratio	Mathematical relationship between the benefits and costs associated with the implementation of energy-efficiency measures, programs, practices, or emissions reductions.
Claimed Savings	Energy savings reported by the administrator or implementer, before being verified by the evaluation team. (These are also called “reported savings” or “tracked savings.”)
Coefficient of Variance (CV)	The mean of a sample (average) divided by its standard error.
Cost-Effectiveness	Indicator of relative performance or economic attractiveness associated with the implementation of energy-efficiency measures, programs, practices, or emissions reductions.
Custom Savings	Savings for non-prescriptive measures that are calculated by a program implementer or administrator at the time of project completion. The result reflects the savings for the specific project based on pre-installation and post-installation energy use.
Deemed Savings	An estimate of energy, demand, or gas savings for a single unit of an installed energy-efficient measure. Savings are developed from data sources and analytical methods that are: (1) widely considered acceptable for the measure and purpose, and (2) applicable to the situation being evaluated.
<i>Ex Ante</i> Savings Estimate	Forecasted savings used for program and portfolio planning purposes.
<i>Ex Post</i> Evaluation	An assessment of the impact(s) of an activity after completion.
Estimated Saving	Savings estimates reported by an evaluator after the energy impact evaluation has been completed.
Freeridership	Participants who would have adopted the energy-efficient measure in the program’s absence.
Gross Savings	Change in energy consumption and/or demand that directly results from program related actions taken by participants in an efficiency program, regardless of whether they participated and unadjusted by any factors.

Interactive Effects	The influence in energy use between one technology application and the energy required to operate another application.
Locational Marginal Prices (LMP)	The value of energy at a specific location at the time that it is delivered
Life cycle Savings	Energy savings—expressed either as verified gross or verified net—that are generated in the current program cycle. Savings incorporate annual savings and each measure’s estimated useful life.
Lifetime Savings	Energy savings—expressed as either verified gross or verified net—that are produced as a result of measures installed in the current program cycle and in the previous program cycle(s), provided the reporting period is within the measure’s useful life. Savings incorporate annual savings and each measure’s estimated useful life.
Market Effects	Changes in marketplace practices, services, and promotional efforts that induce businesses and consumers to buy energy-saving products and services without direct program assistance. In evaluation, these effects are generally considered as a result of program impacts on the market.
Measure Life	The life of an energy consuming measure, including its equipment life and measure persistence.
Net Savings	Savings “net” of what would have occurred in the program’s absence. (These are the observed impacts attributable to the program.) The savings are typically calculated by applying the net-to-gross ratio to the gross verified savings.
Net-to-Gross (NTG)	The ratio of the verified net to the verified gross savings.
Non-Energy Benefits (NEBs)	An array of valued attributes derived from energy-efficient measures in addition to energy savings, such as increased property value or reduced water usage.
Participant Spillover	Participants who, after an initial program experience, go on to adopt more energy saving products or practices without program assistance.
Persistent Savings	Energy savings (expressed as verified net) that are life cycle impacts and include an exponential decay rate, such that half the savings remain after the measure life.
Precision	The degree to which repeated measurements under unchanged conditions produce the same results.
Realization Rate	Ratio of gross savings to verified gross savings.
Reported Savings	Energy savings as reported by the administrator or implementer, before being verified by the evaluation team. Also referred to as tracked savings or claimed savings.
Standard Error	A measure of the variability in a data sample, how far a “typical” data point is from the mean of a sample.

Tracked Savings	Energy savings as reported by the administrator or implementer, before being verified by the evaluation team. (These are also called “reported savings” or “claimed savings.”)
Unclaimed Rewards	Customers who fail to submit the paperwork to claim program incentives.
Verified Gross Savings	Energy savings verified by an independent evaluation team based on reviews of the number and types of implemented improvements and the engineering calculations used to estimate the energy saved. Verified gross savings reflect the total calculated savings, without considering the influence of freeriders or spillover.
Verified Net Savings	Energy savings that can confidently be attributed to program efforts. For verified net savings, the evaluation team makes adjustments for outside influences, such as freeridership and spillover.

APPENDIX C. NET-TO-GROSS RATIOS USED IN ANALYSIS

The Evaluation Team used stipulated net-to-gross (NTG) ratios, based on the results of the Focus on Energy 2010 evaluation to estimate net savings. Table 35 shows the net-to-gross (NTG) ratios the Evaluation Team used to calculate net savings for every measure category included in Focus on Energy programs. The measure categories with particularly low NTG values are marked with an asterisk.

Table 35. Net-to-Gross Ratios for CY 2011 Evaluation

Sector	Measure Category Name	NTG
Commercial	Solar Electric	79%
Commercial	HVAC	66%
Commercial	Process	66%
Commercial	T8/T5 Fluorescent Lighting	60%
Commercial	Biogas	63%
Commercial	Wind	93%
Commercial	Motors & Drives	65%
Commercial	Whole Building	66%
Commercial	Energy Recovery	95%
Commercial	Solar Thermal	51%
Commercial	Lighting	60%
Commercial	Compressor Equipment	59%
Commercial	Refrigeration	51%
Commercial	Boiler Equipment	28%*
Commercial	Other	100%
Commercial	LED Lighting	60%
Commercial	Bonus	100%
Commercial	Aeration System	59%
Commercial	Lighting Controls	60%
Commercial	Building Shell	52%
Commercial	Refrigeration Controls	51%
Commercial	Biomass	39%*
Commercial	Hot Water	55%
Commercial	Agriculture	55%
Commercial	IT	67%
Commercial	Boiler Controls	28%*

Sector	Measure Category Name	NTG
Commercial	CFL	82%
Commercial	Food Service	58%
Commercial	High Intensity Discharge (HID)	86%
Commercial	Compressor Service	59%
Commercial	Laundry	54%
Commercial	HVAC Controls	42%*
Commercial	Waste Water Treatment	59%
Commercial	Pools	52%
Commercial	Non Energy	100%
Commercial	Design	100%
Commercial	Dishwasher	61%
Commercial	Boiler Service	28%*
Commercial	Vending, Plug Loads	67%
Commercial	Greenhouse	52%
Commercial	Conversion	100%
Commercial	Scheduling	46%*
Commercial	Fixtures	60%
Commercial	Water Heat	100%
Commercial	LED Holiday Light	60%
Residential	Furnace	38%*
Residential	Solar Electric	82%
Residential	Building Shell	79%
Residential	Other	86%
Residential	HVAC	57%
Residential	CFL	66%
Residential	Boiler Equipment	79%
Residential	Whole Building	100%
Residential	Solar Thermal	40%*
Residential	Non Energy	100%
Residential	Hot Water	65%
Residential	Wind	51%
Residential	Bonus	100%
Residential	Fixtures	79%
Residential	Refrigeration	65%
Residential	Conversion	71%
Residential	Lighting	70%

Sector	Measure Category Name	NTG
Residential	LED Holiday Light	95%
Residential	Dishwasher	100%
Residential	Motors & Drives	58%
Residential	T8/T5 Fluorescent Lighting	54%
Residential	Controls	100%
Residential	LED Lighting	99%
Residential	Energy Recovery	100%
Residential	Laundry	55%
Residential	Lighting Controls	59%
Residential	HVAC Service	100%
Residential	HVAC Controls	100%
Residential	Conversion - Other	100%
Residential	Boiler Service	38%*
Residential	Dehumidifier	72%
Residential	Water Heat	100%
Residential	High Intensity Discharge (HID)	100%
Residential	Ceiling Fan	100%
Residential	Energy Savings	100%

APPENDIX D. COST EFFECTIVENESS ANALYSIS DETAILS

In the current quadrennial cycle the Program Administrator has, with PSC approval, elected to use a cost-effectiveness calculator for program planning purposes. Consistency between planning and evaluation approaches is critical for an effective understanding of program performance relative to expectations. As a result, the same calculator was used for evaluation.

The Benefit Cost (B/C) test, also known as a Cost-Effectiveness Test, is used to compare the benefits of a demand side management program, and/or investments, with the costs of the program and/or investments. Cost-effectiveness analysis measures the relative performance or economic attractiveness of an energy- efficiency investment compared to a baseline. Strategies that improve energy efficiency are always beneficial, as long as their costs are justified by their economic worth. Avoided cost analysis has been widely used in the energy sector to assess the cost-effectiveness (or net benefits) of energy efficiency management relative to conventional supply alternatives. When calculating the benefits of such programs, analysis begins with avoided costs assumptions and makes adjustments for administrative or programmatic costs as well as other costs associated with participating in energy efficiency programs. Depending on the perspective taken in the analysis, competing views about benefits can emerge. Five basic tests are generally used for comparing demand and supply management alternatives, each representing a measure of cost-effectiveness from various unique perspectives.

For this evaluation the Total Resource Costs (TRC) test was applied. The TRC test is a commonly administered test that counts the avoided cost of supplying the displaced energy against the program and participant costs. The total resource cost (TRC) test, used in this evaluation, is typically used to define what is cost-effective from a regulatory perspective. From a TRC perspective, a conservation measure or practice “fails” if net benefits are negative, meaning the costs of achieving the savings outweigh the value of the savings achieved.

The TRC is calculated based on the following formula:

$$TRC = \frac{[Value\ of\ Net\ Saved\ Energy\ (Avoided\ costs) + Value\ of\ Avoided\ Emissions]}{[Program\ Costs\ (exclusive\ of\ incentives) + (Incremental\ Measure\ Cost * Net - to - Gross\ Ratio)]}$$

Where:

Value of Energy Saved:

$$Value\ of\ Energy\ Saved = Net\ Energy\ Savings \times Utility\ Avoided\ Cost$$

The source for Utility Avoided Cost of the saved energy included in the 2011 evaluation comes from generation level costs on the MISO forward-looking capacity market Locational Marginal Prices (LMP). The value was inflated from average 2009 dollars to 2011 dollars based on a 2.5 percent inflation rate. The avoided costs are held constant over the forecasted time period and the present value of the stream of benefits are discounted back to the base year (2011) at a rate of 2 percent. The energy savings are decreased by the conventional attribution factor of net-to-gross to derive net savings. Net savings are then increased by the line loss factor of eight percent to account for distribution losses.

Emissions benefits are the only other benefit included in the TRC calculation. The emissions benefits require three key parameters: net energy savings, emissions factors, and the value of the reduced emissions. Emissions factors are simply the rate the criteria pollutants are emitted per unit of energy and are most often expressed in tons of pollutant per energy unit (for electric it is tons/MWH and for gas it is tons/MThm). The product of the emissions factor and the net energy savings is the total weight of air pollutant offset or avoided by the program. The product of the total tonnage of pollutant saved and the dollar value of the reduced emissions per ton is therefore the avoided emissions benefit.

Value of Avoided Emissions

$$= [\text{Net Saved Energy} \times \text{Emissions Factor} \times \text{Value of Emissions Allowance}]$$

The gas and electric emission factors were derived from the 2010 evaluation report and were originally detailed in the report *Focus on Energy Evaluation Emission Factors Update*.¹⁵ The 2011 NO_x and SO₂ emission allowance prices were collected from the EIA¹⁶. In 2011 the price of one NO_x allowance was \$15.89 per ton while the price of an SO₂ allowance was \$2.12 per ton. Due to the continued decline in and uncertainty surrounding forecasted NO_x and SO₂ allowance prices the forecasted values remained constant at 2011 values. The CO₂ emission price was derived from the PSC November 10, 2010 Order in docket 5-GF-191 (PSC reference number 141173) that states “A levelized carbon value of \$30 per ton shall be used in the benefit/cost modeling of energy efficiency programs.”

Program Costs:

The 2011 program costs were provided to Cadmus from the accounting firm Wipfli. The program costs represent all costs associated with running the efficiency programs (including administration and delivery costs). Incentive costs are not included as program costs as they are deemed transfer payments.

Incremental Costs:

The gross incremental costs are the additional costs incurred by participants as a result of purchasing efficient equipment over and above a baseline non-qualified product. Gross

¹⁵ PA Consulting Group, December 22, 2009

¹⁶ <http://www.eia.gov/todayinenergy/detail.cfm?id=4830>

incremental cost values used in this evaluation were derived from the Focus on Energy Benefit-Cost Analysis CY09 Evaluation Report with the notable exception of renewable-based measures. Similar to the 2010 evaluation effort, the renewable energy projects received actual installed cost values from the program tracking databases. The gross incremental costs, similar to the energy savings values used in the cost effectiveness tests, required the application of attribution factors to account for free-ridership. The values for attribution factors, namely the net to gross ratios, were derived from the 2010 evaluation and carried forward to the 2011 evaluation on a measure by measure basis.

In 2012, the Evaluation Team will be conducting an analysis of the relative impacts of using the Program Administrator's calculator, and current approaches to working with the tool, to assess whether there are any systematic differences when compared to other commonly used approaches.

APPENDIX E. COST EFFECTIVENESS SCENARIOS

The PSC staff were interested in a dual perspective of simple B/C ratios for 2011, based on 1) the Commission's original order to base avoided energy costs on the most recent 3-year historical LMP data with a 2% discount rate applied to future savings, and then 2) the revised Commission decision on avoided energy cost methodology that uses MISO transmission expansion planning (MTEP) LMP forecasting.

The Commissions' original decision resulted in \$36.37 per MWh for avoided energy costs based on the historical 3-year average MISO LMP price, and \$685 per kW as the avoided capacity cost based on a natural gas fired combustion turbine peaker plant (the type of quick start electric generating unit that is most often dispatched to meet peak demand). These assumptions were given to Shaw as a basis for 2011 program year assumptions and therefore also used in the cost effectiveness model for this 2011 evaluation effort. The original \$36.37/MWh avoided energy cost was inflated by 2.5% per year from the 2009 basis value and adjusted based on an eight percent line loss factor.

The revised Commission decision on avoided energy cost methodology that uses MISO MTEP LMP forecast pricing has a basis year of 2011 and only required an adjustment to factor in line loss, which is eight percent. According to documentation for the MISO forecast pricing included in the document "20110622 PAC Item 05 MTEP11 Future Weights.pdf" the single stream of forecasted values were based on these weights across the four forecast scenarios and then adjusted to account for an eight percent line loss factor. The values listed in Table 36 below show the annual forecasted stream compared with the constant historic LMP pricing used in the model. Only the historic LMP-based avoided costs receive the inflation rate in the model of two percent.

Table 36. Forecasted and Historic based Avoided Cost Streams

Year	Forecast LMP \$/MWH	Historic LMP \$/MWH
2011	0.03426	0.04127
2012	0.03770	0.04127
2013	0.04110	0.04127
2014	0.04453	0.04127
2015	0.04795	0.04127
2016	0.05136	0.04127
2017	0.05162	0.04127
2018	0.05190	0.04127
2019	0.05217	0.04127
2020	0.05244	0.04127
2021	0.05277	0.04127
2022	0.05348	0.04127
2023	0.05423	0.04127
2024	0.05496	0.04127
2025	0.05572	0.04127
2026	0.05653	0.04127

On average, the forecast avoided energy cost is higher than the value currently in the cost-effectiveness model (flat \$0.0413/kWh). Assuming a 15 year measure lifetime and a 2% real discount rate (RDR), the lifetime NPV per kWh saved using the forecasted avoided energy cost is \$0.63. Using the same 15 year measure lifetime and 2% RDR, the lifetime NPV per kWh saved is \$0.53 under the avoided energy cost assumptions currently in the cost-effectiveness model.

Cadmus developed several scenarios to test the sensitivity of the cost effectiveness (the TRC ratio) to the avoided cost inputs. Because the primary objective was to test the sensitivity of the TRC to changes in the avoided electric energy cost, the avoided gas cost was held constant for all three scenarios. For the third scenario, “Forecast LMP Q”, the 2010 evaluation report served as the source of the avoided capacity cost. The scenarios are listed below in Table 37.

Table 37. Assumptions Used in Cost Effectiveness Scenarios

Scenario	15 Year Lifetime NPV Avoided Energy (\$/kWh)	15 Year Lifetime NPV Avoided Capacity (\$/kW)	15 Year Lifetime NPV Avoided Gas (\$/therm)
Historic LMP	\$0.53	\$1,469	\$12.86
Forecast LMP	\$0.63	\$1,469	\$12.86
Forecast LMP Q	\$0.63	\$1,632	\$12.86

There is only a slight change in the cost effectiveness based on adjusting the avoided electric energy costs as can be seen in the relative TRC results listed in Table 38. Using the forecasted

LMP price stream results in a slightly higher (approximately four percent) TRC ratio. The higher TRC is due to the higher avoided cost values that occur in the mid-to outer years of the forecast. The lower early period avoided cost does not have as significant an impact on the ultimate TRC because they are offset by the higher outer year forecasted values.

The scenario “Forecast LMP Q” was used to test the impact of increased avoided capacity costs on the TRC. Though the increased capacity cost resulted in a larger change in the overall TRC ratio, this is due to the larger change in input value relative to the avoided energy cost scenario (“Forecast LMP”). To put the relative impact of avoided costs on the TRC in perspective, an adjustment of 10 percent in either direction (higher or lower avoided electric energy cost) to the base year cost correlates with a four percent change in cost effectiveness TRC ratio, whereas a 10 percent change in avoided electric capacity costs translates into a two percent change in the TRC ratio.

Table 38. Results of Cost Effectiveness Scenarios

Scenario	Non-Residential TRC	Residential TRC
Historic LMP	2.71	1.84
Forecast LMP	2.84	1.89
Forecast LMP Q	2.90	1.93

APPENDIX F. DETAILED FINDINGS

This section contains detailed first-year annual gross savings and life cycle savings for the Non-Residential and Residential Sectors, as well as savings organized by program and measure category.

Overview of Savings

Table 39 lists first-year annual savings: gross claimed, gross verified, and verified net. In CY 2011, on an annual unverified gross basis, Focus on Energy achieved a total of 452,739,744 kWh savings and 18,845,198 therm savings.

Table 39. First-Year Annual Savings by Sector

		Non-Residential	Residential	Total
Gross	kWh	360,406,747	92,332,997	452,739,744
	kW	52,443	16,716	69,158
	Therms	16,054,969	2,790,230	18,845,198
Verified Gross	kWh	346,712,215	93,887,306	440,599,521
	kW	57,747	19,327	77,074
	Therms	13,831,960	2,875,242	16,707,202
Verified Net	kWh	207,596,331	61,368,714	268,965,045
	kW	34,558	12,763	47,320
	Therms	9,163,081	2,088,348	11,251,429

Table 40 summarizes the first-year annual savings for CY 2010 and CY 2009. The gross electric, peak demand, and natural gas savings have decreased from CY 2009 to CY 2011.

Table 40. First-Year Annual Verified Gross Savings by Sector, CY 2010 and CY 2009

		Non-Residential	Residential	Renewables	Total
CY 2010	kWh	470,987,177	119,653,022	N/A	590,640,200
	kW	90,344	16,312	N/A	106,657
	Therms	20,041,916	3,598,320	N/A	23,640,237
CY 2009	kWh	500,793,181	116,893,752	16,933,010	634,619,944
	kW	110,411	14,506	2,722	127,641
	Therms	20,712,687	3,591,004	5,357,821	29,661,514

Table 41 presents the life cycle savings achieved by Focus in CY 2011. Life cycle savings represent the savings that will be achieved by the measures installed during CY 2011 over their useful lifetimes. Effective useful lifetimes (EULs) were carried forward from the 2010 evaluation and were verified in program tracking records.

Table 41. Life Cycle Savings by Sector

		Non-Residential	Residential	Total
Gross	kWh	4,564,679,749	874,766,059	5,439,445,808
	kW	52,443	16,716	69,158
	Therms	217,085,610	58,918,852	276,004,462
Verified Gross	kWh	4,374,342,776	885,561,963	5,259,904,739
	kW	57,747	19,327	77,074
	Therms	185,735,647	60,435,758	246,171,405
Verified Net	kWh	2,598,969,053	590,179,180	3,189,148,232
	kW	34,558	12,763	47,320
	Therms	120,185,801	49,963,308	170,149,109

Table 42 summarizes the life cycle savings by sector in CY 2010. As with the program year savings, the life cycle savings from CY 2010 were greater than the life cycle savings from CY 2011.

Table 42. Life Cycle Savings by Sector, CY 2010

		Non-Residential	Residential	Total
Verified Gross	kWh	5,350,241,669	1,228,350,997	6,578,592,665
	Therms	236,967,513	59,944,987	296,912,500
Verified Net	kWh	3,127,718,325	817,430,868	3,945,149,194
	Therms	110,151,807	46,162,350	156,314,157

Summary of Savings by Residential Program

Table 43 summarizes the first year annual savings by residential program. The ENERGY STAR Lighting Program resulted in the greatest gross and net electric energy and peak demand savings in CY 2011. The Efficient Heating and Cooling Program resulted in the greatest amount of gross natural gas savings and the Home Performance with ENERGY STAR Program resulted in the greatest net natural gas savings.

Table 43. Summary of First Year Annual Savings by Residential Program, CY 2011

Program	First Year Annual Savings								
	Gross			Verified Gross			Verified Net		
	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
ACES-New Home Construction	4,609,110	979	278,317	5,151,028	970	282,467	3,199,570	618	146,387
ACES-Whole Building Existing	4,156,797	421	413,663	4,238,931	422	416,567	2,723,889	258	225,167
Appliance and Plug Load	167,132	16	15,576	167,003	16	15,653	167,003	16	15,653
Efficient Heating and Cooling	19,345,656	5,741	871,670	19,345,656	5,741	912,821	7,963,820	3,114	615,797
ENERGY STAR Lighting	58,730,713	7,815	N/A	59,712,617	10,442	N/A	42,900,604	7,376	N/A
Head Start	87,831	4	N/A	87,831	4	N/A	87,831	4	N/A
Home Performance with ENERGY STAR	1,132,907	594	748,973	1,131,392	592	786,932	824,380	408	638,287
New Homes	1,470,784	258	367,644	1,470,784	258	367,806	1,383,816	245	366,379
Residential Renewables	2,190,348	807	19,866	2,140,344	802	18,476	1,676,083	644	6,159
Targeted Home Performance	441,720	81	74,520	441,720	81.0729	74,520	441,720	81	74,520
Total	92,332,997	16,716	2,790,230	93,887,306	19,327	2,875,242	61,368,714	12,763	2,088,348

Table 44 summarizes the life cycle savings by residential program. The ENERGY STAR Lighting Program resulted in the greatest gross and net electric energy and peak demand life cycle savings. The Home Performance with ENERGY STAR Program resulted in the greatest gross natural gas life cycle savings and the New Homes Program resulted in the greatest net natural gas life cycle savings.

Table 44. Summary of Life Cycle Savings by Residential Program

Program	Life Cycle Savings								
	Gross			Verified Gross			Verified Net		
	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
ACES-New Home Construction	36,999,928	979	2,239,437	41,335,266	970	2,272,639	25,723,604	618	1,184,000
ACES-Whole Building Existing	33,496,691	421	3,310,086	34,153,764	422	3,333,315	22,033,424	258	1,802,113
Appliance and Plug Load	2,005,584	16	186,912	2,004,031	16	187,832	2,004,031	16	187,832
Efficient Heating and Cooling	258,408,520	5,741	14,367,960	258,408,520	5,741	14,902,929	110,444,652	3,114	11,041,613
ENERGY STAR Lighting	403,279,072	7,815	N/A	410,126,866	10,442	N/A	309,254,785	7,376	N/A
Head Start	526,983	4	N/A	526,983	4	N/A	526,983	4	N/A
Home Performance with ENERGY STAR	28,092,074	594	18,718,165	28,049,390	592	19,666,828	20,520,036	408	15,954,709
New Homes	57,107,253	258	17,835,967	57,107,253	258	17,839,702	55,107,003	245	17,806,870
Residential Renewables	43,806,954	807	397,325	42,806,889	802	369,512	33,521,661	644	123,171
Targeted Home Performance	11,043,000	81	1,863,000	11,043,000	81.0729	1,863,000	11,043,000	81	1,863,000
Total	874,766,059	16,716	58,918,852	885,561,963	19,327	60,435,758	590,179,180	12,763	49,963,308

Summary of Savings by Residential Measure Category

Table 45 summarizes the first year annual savings by residential program measure category. Lighting measures resulted in the greatest gross and net electric energy and peak demand savings in 2011. Building shell measures resulted in the greatest gross and net natural gas savings.

Table 45. Summary of First Year Annual Savings by Residential Measure Category, CY 2011

Measure Category	First Year Annual Savings								
	Gross			Verified Gross			Verified Net		
	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
Appliances	120,785	3	6,871	120,785	3	6,871	120,760	3	6,871
Boiler	-20,149	-6	692,875	-20,149	-6	692,875	-15,233	-5	548,103
Building Shell	1,118,828	687	852,414	1,118,828	687	888,716	824,268	486	710,568
Controls	621,789	13	49,264	621,789	13	49,264	449,206	13	49,264
Conversion	344,296	40	-12,912	340,360	39	-12,751	307,230	35	-11,128
Energy Recovery	214,102	N/A	17,028	214,102	N/A	17,028	214,102	N/A	17,028
Furnace	18,643,771	4,300	443,820	18,673,760	4,304	484,834	7,106,965	1,642	184,258
Hot Water	831,818	28	221,792	831,697	28	225,292	583,835	21	147,663
HVAC	1,401,237	1,782	135,346	1,358,360	1,742	140,273	1,208,409	1,683	70,072
Laundry	92,413	N/A	6,042	92,645	N/A	6,541	68,459	N/A	2,988
Lighting	65,004,037	8,501	N/A	66,622,011	11,148	N/A	47,159,677	7,798	N/A
Motors & Drives	144,924	175	N/A	144,924	175	N/A	84,709	94	N/A
Non Energy	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other	52,690	98	4,046	52,690	98	4,046	39,698	74	4,046
Refrigeration	96,808	60	N/A	99,859	65	N/A	65,244	45	N/A
Renewables	2,221,128	821	21,006	2,171,124	815	19,616	1,706,863	658	7,299
Service	N/A	N/A	2,133	N/A	N/A	2,133	N/A	N/A	813
Whole Building	1,444,520	215	350,504	1,444,520	215	350,504	1,444,520	215	350,504
Totals	92,332,997	16,716	2,790,230	93,887,306	19,327	2,875,242	61,368,714	12,763	2,088,348

Table 46 summarizes the life cycle savings by residential program measure category. Lighting measures resulted in the greatest gross and net electric energy and peak demand life cycle savings. Building shell measures resulted in the greatest gross and net natural gas life cycle savings.

Table 46. Summary of Life Cycle Savings by Residential Measure Category

Measure Category	Life Cycle Savings								
	Gross			Verified Gross			Verified Net		
	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
Appliances	981,157	3	54,967	981,157	3	54,967	980,956	3	54,967
Boiler	-161,192	-6	10,989,840	-161,192	-6	10,989,840	-121,861	-5	9,831,662
Building Shell	24,495,743	687	22,064,600	24,495,743	687	22,972,150	18,202,311	486	19,080,784
Controls	4,974,312	13	394,112	4,974,312	13	394,112	3,593,645	13	394,112
Conversion	5,073,984	40	-193,596	4,975,584	39	-189,575	4,710,547	35	-176,591
Energy Recovery	1,712,816	N/A	136,224	1,712,816	N/A	136,224	1,712,816	N/A	136,224
Furnace	244,772,673	4,300	5,818,460	245,048,774	4,304	6,357,042	93,206,024	1,642	2,415,844
Hot Water	6,460,576	28	2,034,751	6,459,255	28	2,108,361	4,480,594	21	1,485,208
HVAC	23,139,716	1,782	1,384,649	22,796,696	1,742	1,401,610	21,597,091	1,683	815,398
Laundry	739,306	N/A	48,334	741,160	N/A	52,327	547,673	N/A	23,905
Lighting	454,738,093	8,501	N/A	466,674,442	11,148	N/A	344,553,962	7,798	N/A
Motors & Drives	1,159,392	175	N/A	1,159,392	175	N/A	677,674	94	N/A
Non Energy	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other	508,900	98	101,150	508,900	98	101,150	404,967	74	101,150
Refrigeration	776,708	60	N/A	801,115	65	N/A	524,198	45	N/A
Renewables	44,422,554	821	420,125	43,422,489	815	392,312	34,137,261	658	145,971
Service	N/A	N/A	17,064	N/A	N/A	17,064	N/A	N/A	6,501
Whole Building	60,971,320	215	15,648,172	60,971,320	215	15,648,172	60,971,320	215	15,648,172
Totals	874,766,059	16,716	58,918,852	885,561,963	19,327	60,435,758	590,179,180	12,763	49,963,308

Summary of Savings by Non-Residential Program

Table 47 summarizes the first year annual savings by non-residential program. The Industrial Program resulted in the most first year annual gross and net electric and natural gas savings.

Table 47. Summary of First Year Annual Savings by Non-Residential Program, CY 2011

Program	First Year Annual Savings								
	Gross			Verified Gross			Verified Net		
	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
Agricultural Program	35,139,980	5,974	371,496	33,474,631	8,217	239,672	18,898,063	4,643	130,455
Commercial Program	102,590,182	13,420	1,730,519	103,214,965	15,303	1,387,876	59,835,574	9,091	721,850
ENERGY STAR Lighting	4,503,209	679	N/A	4,569,915	865	N/A	3,285,245	627	N/A
Industrial Program	154,070,397	21,023	9,285,131	145,180,531	19,642	8,513,558	86,219,043	11,793	6,395,324
Non-Residential New Construction Program	5,468,849	2,255	766,100	5,468,849	2,125	480,344	3,655,144	1,660	248,982
Schools and Government Program	58,634,130	9,091	3,901,722	54,803,325	11,596	3,210,509	35,703,263	6,745	1,666,470
Totals	360,406,747	52,443	16,054,969	346,712,215	57,747	13,831,960	207,596,331	34,558	9,163,081

Table 48 summarizes the life cycle savings by non-residential program. The Industrial Program resulted in the most life cycle gross and net electric and natural gas savings.

Table 48. Summary of Life Cycle Savings by Non-Residential Program

Program	Life Cycle Savings								
	Gross			Verified Gross			Verified Net		
	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
Agricultural Program	486,271,781	5,974	4,712,919	460,511,369	8,217	3,062,819	255,013,335	4,643	1,689,521
Commercial Program	1,324,747,608	13,420	25,171,408	1,328,640,517	15,303	20,139,358	759,029,667	9,091	10,242,494
ENERGY STAR Lighting	28,320,521	679	N/A	28,730,442	865	N/A	20,674,154	627	N/A
Industrial Program	1,887,607,733	21,023	118,528,087	1,776,730,157	19,642	107,887,054	1,058,058,259	11,793	79,952,296
Non-Residential New Construction Program	65,626,190	2,255	9,193,194	65,626,190	2,125	5,764,133	43,861,723	1,660	2,987,788
Schools and Government Program	772,105,915	9,091	59,480,002	714,104,102	11,596	48,882,283	462,331,914	6,745	25,313,702
Totals	4,564,679,749	52,443	217,085,610	4,374,342,776	57,747	185,735,647	2,598,969,053	34,558	120,185,801

Summary of Savings by Non-Residential Measure Category

Table 49 summarizes the first year annual savings by non-residential program measure category. Lighting measures resulted in the greatest gross and net electric energy and peak demand savings in 2011. HVAC measures resulted in the greatest gross and net natural gas savings.

Table 49. Summary of First Year Annual Savings by Non-Residential Measure Category, CY 2011

Measure Category	First Year Annual Savings								
	Gross			Verified Gross			Verified Net		
	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
Appliance ¹⁷	682,473	46	13,510	682,473	44	8,471	456,136	34	4,391
Biogas	13,700,849	1,576	320,116	11,847,460	1,576	320,116	4,037,977	510	320,116
Biomass	-9,578	-6	27,222	-9,578	-6	25,861	-9,578	-6	10,208
Boiler	29,942	N/A	1,569,874	28,954	N/A	1,648,157	28,984	N/A	458,253
Building Shell	284,249	12	943,064	283,939	12	592,847	189,163	12	307,315
Compressor	18,026,681	2,188	N/A	15,613,562	1,726	N/A	9,214,369	952	N/A
Controls ¹⁸	19,942,587	1,130	441,643	20,932,923	1,098	463,001	11,714,370	812	129,072
Conversion	31,782	60	-1,192	31,782	60	-1,192	31,782	60	-1,192
Energy Recovery	4,541,100	639	2,294,536	4,940,441	661	2,290,817	2,440,185	327	2,262,643
Farm Equipment	1,490,126	324	286,222	1,490,126	305	179,461	1,001,408	238	93,022
Food Service	1,630,007	196	117,565	1,630,007	184	73,713	1,089,427	144	38,208
Greenhouse	N/A	N/A	65,859	N/A	N/A	41,294	N/A	N/A	21,404
Hot Water	1,376,400	337	374,085	1,376,400	318	235,011	947,639	251	122,411
HVAC	45,010,151	6,282	5,042,684	33,961,628	13,718	4,103,827	16,192,549	6,230	2,912,513
Industrial ¹⁹	6,240,600	677	N/A	5,385,638	529	N/A	3,163,984	284	N/A
IT	3,712,923	321	N/A	3,712,923	302	N/A	2,481,558	236	N/A

¹⁷ The Appliances measure category includes dishwashers and vending machines.

¹⁸ The Controls measure category includes boiler controls, HVAC controls, lighting controls, and refrigeration controls.

¹⁹ The Industrial measure category includes aeration systems and waste water treatment equipment.

Measure Category	First Year Annual Savings								
	Gross			Verified Gross			Verified Net		
	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
Laundry	389,580	103	100,052	389,580	97	63,053	260,379	76	32,567
Lighting ²⁰	131,804,896	22,296	N/A	131,880,982	20,882	N/A	81,215,194	13,245	N/A
Motors & Drives	44,035,595	4,881	-91	46,074,305	4,995	-57	29,718,632	3,521	-30
Non-Energy ²¹	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pools	3,493,961	645	6,668	3,493,961	645	6,668	3,493,961	645	6,668
Process	21,467	N/A	78,147	21,467	N/A	48,998	14,348	N/A	25,398
Refrigeration	34,894,152	3,970	3,344,839	32,286,234	3,806	2,984,423	21,152,735	2,327	1,958,147
Renewables ²²	13,058,490	1,500	N/A	15,192,072	1,822	N/A	7,745,032	844	N/A
Scheduling	4,678,614	1,471	78,908	4,335,706	1,432	81,044	3,553,984	1,150	41,248
Service ²³	52,834	4	N/A	48,520	4	N/A	22,481	2	N/A
Whole Building	1,681,931	221	18,900	1,451,506	173	19,845	852,739	93	5,481
Other ²⁴	9,604,936	3,567	932,356	9,629,205	3,363	646,601	6,586,897	2,568	415,239
Totals	360,406,747	52,443	16,054,969	346,712,215	57,747	13,831,960	207,596,331	34,558	9,163,081

²⁰ The Lighting measure category includes CFLs, High Intensity Discharge (HID) lighting, LED lighting, and T8/T5 fluorescent lighting.

²¹ Non--energy activities are categorized by tracked data that contained no energy savings. A sample of some of these records include: certifications for home status, vouchers, contributions, audit fees, design and grants.

²² The Renewables measure category includes solar electric, solar thermal, and wind.

²³ The Service measure category includes boiler service and compressor service.

²⁴ Other was included as a measure category in the tracking database from Shaw and the Evaluation Team does not have further information on what measures comprise this category.

Table 50 summarizes the life cycle savings by non-residential program measure type. Lighting measures resulted in the greatest gross and net electric energy and peak demand life cycle savings. HVAC measures resulted in the greatest gross and net natural gas life cycle savings.

Table 50. Summary of Life Cycle Savings by Non-Residential Measure Category

Measure Category	Life Cycle Savings								
	Gross			Verified Gross			Verified Net		
	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
Appliance	8,189,676	46	162,120	8,189,676	44	101,649	5,473,627	34	52,689
Biogas	205,512,735	1,576	4,801,740	177,711,907	1,576	4,801,740	60,569,648	510	4,801,740
Biomass	-191,560	-6	544,440	-191,560	-6	517,217	-191,560	-6	204,150
Boiler	449,130	N/A	23,548,114	434,309	N/A	24,722,362	434,758	N/A	6,873,798
Building Shell	5,400,724	12	17,918,216	5,394,837	12	11,264,102	3,594,092	12	5,838,981
Compressor	198,293,491	2,188	N/A	171,749,179	1,726	N/A	101,358,060	952	N/A
Controls	242,083,692	1,130	6,624,642	253,635,005	1,098	6,945,015	141,548,410	812	1,936,078
Conversion	381,384	60	-14,304	381,384	60	-14,304	381,384	60	-14,304
Energy Recovery	52,881,870	639	25,694,082	57,673,255	661	25,648,175	28,280,417	327	25,299,077
Farm Equipment	16,391,387	324	3,148,445	16,391,387	305	1,974,075	11,015,491	238	1,023,245
Food Service	19,560,084	196	1,410,774	19,560,084	184	884,555	13,073,119	144	458,502
Greenhouse	N/A	N/A	1,246,937	N/A	N/A	781,829	N/A	N/A	405,255
Hot Water	16,516,800	337	4,489,018	16,516,800	318	2,820,137	11,371,664	251	1,468,926
HVAC	675,152,260	6,282	75,640,266	509,424,413	13,718	61,557,412	242,888,238	6,230	43,687,690
Industrial	69,332,037	677	N/A	59,833,548	529	N/A	35,151,343	284	N/A
IT	44,555,076	321	N/A	44,555,076	302	N/A	29,778,697	236	N/A
Laundry	4,674,960	103	1,200,626	4,674,960	97	756,635	3,124,542	76	390,805
Lighting	1,505,374,414	22,296	N/A	1,505,831,238	20,882	N/A	915,801,163	13,245	N/A
Motors & Drives	704,569,516	4,881	-1,456	737,188,873	4,995	-913	475,498,108	3,521	-473

	Life Cycle Savings								
	Gross			Verified Gross			Verified Net		
Measure Category	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
Non-Energy	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pools	41,927,537	645	80,014	41,927,537	645	80,014	41,927,537	645	80,014
Process	257,604	N/A	937,769	257,604	N/A	587,981	172,171	N/A	304,775
Refrigeration	383,835,674	3,970	36,793,229	355,148,576	3,806	32,828,651	232,680,081	2,327	21,539,615
Renewables	156,701,874	1,500	N/A	182,304,864	1,822	N/A	92,940,384	844	N/A
Scheduling	93,572,280	1,471	1,578,161	86,714,116	1,432	1,620,874	71,079,671	1,150	824,966
Service	634,008	4	N/A	582,236	4	N/A	269,770	2	N/A
Whole Building	3,363,862	221	94,502	2,903,013	173	99,227	1,705,478	93	27,406
Other	115,259,234	3,567	11,188,275	115,550,458	3,363	7,759,213	79,042,759	2,568	4,982,869
Totals	4,564,679,749	52,443	217,085,610	4,374,342,776	57,747	185,735,647	2,598,969,053	34,558	120,185,801

APPENDIX G. CALENDAR YEAR 2011 EVALUATION DATABASE DEVELOPMENT PLAN

This appendix contains the Focus on Energy CY 2011 Evaluation Database Development Plan.

Introduction

This section summarizes processes that enabled the Evaluation Team to assess accurately the program-level and measure-level savings for Focus on Energy's 2011 Programs.

- Processing the data: Merging and cleaning the data records
- Standardizing Data: Data manipulation, standardizing, identifying and filling gaps, locating the appropriate deemed savings, allocating buy-down lighting, and geo-coding.

Data Processes

These processes encompass data collection, review, cleaning, and merging.

Data Collection

The Evaluation Team received the following files from Shaw Environmental & Infrastructure, Inc. (Shaw), the Focus on Energy Program Administrator:

- FocusPrescriptive_20120102.xlsx. Contains residential information that was housed in the previous program administrator's MS Access database
- 2011 Spectrum extract.xlsx (Cadmus extracted from SPECTRUM). Contains all 2011 targeted market information and some of the residential multifamily data
- 2011 Data_ES Lighting.xlsx. Contains all residential and commercial lighting data
- Appliance 2011 Data.xlsx. Contains participation data on water heater measures from the Efficiency and Cooling Program
- HeadStart 2011 Data.xlsx. Contains participant information pertaining to the Head Start Program

File Merging

The Team merged the five files by mapping column headings to a master list of column names and creating a master dataset of all 2011 data.²⁵

Table 51 and Table 52 show how program names and sectors were mapped and standardized for both Mass Markets and Targeted Markets.

²⁵ Several columns (such as program name and sector) needed standardization.

Table 51. Mapping of Mass Market Program Names and Sectors

Filename	Sector	Original Measure Program	Standardized Measure Program	Rules Applied
2011 Data_ES Lighting.xlsx	Agricultural	BP-Agriculture	ENERGY STAR Lighting	
2011 Data_ES Lighting.xlsx	Commercial	BP-Commercial	ENERGY STAR Lighting	
2011 Data_ES Lighting.xlsx	Residential	Res-ACES - Lighting	ENERGY STAR Lighting	
2011 Data_ES Lighting.xlsx	Residential	Residential - Lighting	ENERGY STAR Lighting	
Appliance 2011 Data.xlsx	Residential	Residential - Appliances	Appliance and Plug Load	
FocusPrescriptive_20120102.xlsx	Residential	ACES	ACES-Whole Building Existing	MeasureType = 'Whole Building Existing' or 'Whole Building Existing-DI'
FocusPrescriptive_20120102.xlsx	Residential	ACES	ACES-New Home Construction	MeasureType = 'New Construction'
FocusPrescriptive_20120102.xlsx	Residential	EHCI	Efficient Heating and Cooling	BillMeasureto <> 'FOE-Appliances'
FocusPrescriptive_20120102.xlsx	Residential	EHCI	Appliance and Plug Load	BillMeasureto = 'FOE-Appliances'
FocusPrescriptive_20120102.xlsx	Residential	HPES	Home Performance with ENERGY STAR	
FocusPrescriptive_20120102.xlsx	Residential	New Homes Program	New Homes	
FocusPrescriptive_20120102.xlsx	Residential	Renewables	Residential Renewables	
FocusPrescriptive_20120102.xlsx	Residential	THPES	Targeted Home Performance	
FocusPrescriptive_20120102.xlsx	Residential	WESH	New Homes	
HeadStart 2011 Data.xlsx	Residential	Head Start	Head Start	
2011 Spectrum extract.xlsx	Residential	Multifamily - New Construction	ACES-New Home Construction	
2011 Spectrum extract.xlsx	Residential	Multifamily - Whole Building	ACES-Whole Building Existing	

Table 52. Mapping of Targeted Market Program Names and Sectors

Filename	Sector	Original Measure Program	Standardized Measure Program	Rules Applied
2011 Spectrum extract.xlsx	Agricultural	Agriculture Custom Energy Program	Agricultural Program	MeasureCategory <> 'New Construction' or (MeasureCategory = 'New Construction' and dateentered >30SEP2011)
2011 Spectrum extract.xlsx	Agricultural	Agriculture Custom Energy Program	Non-Residential New Construction Program	MeasureCategory = 'New Construction' and dateentered <01OCT2011
2011 Spectrum extract.xlsx	Commercial	Commercial Custom Energy Program	Commercial Program	MeasureCategory <> 'New Construction' or (MeasureCategory = 'New Construction' and dateentered >30SEP2011)
2011 Spectrum extract.xlsx	Commercial	Commercial Custom Energy Program	Non-Residential New Construction Program	MeasureCategory = 'New Construction' and dateentered <01OCT2011
2011 Spectrum extract.xlsx	Industrial	Industrial Custom Energy Program	Industrial Program	MeasureCategory <> 'New Construction' or (MeasureCategory = 'New Construction' and dateentered >30SEP2011)
2011 Spectrum extract.xlsx	Industrial	Industrial Custom Energy Program	Non-Residential New Construction Program	MeasureCategory = 'New Construction' and dateentered <01OCT2011
2011 Spectrum extract.xlsx	Schools and Government	Local Government Custom Energy Program	Schools and Government Program	MeasureCategory <> 'New Construction' or (MeasureCategory = 'New Construction' and dateentered >30SEP2011)
2011 Spectrum extract.xlsx	Schools and Government	Local Government Custom Energy Program	Non-Residential New Construction Program	MeasureCategory = 'New Construction' and dateentered <01OCT2011
2011 Spectrum extract.xlsx	Schools and Government	Non-Local Government Custom Energy Program	Schools and Government Program	MeasureCategory <> 'New Construction' or (MeasureCategory = 'New Construction' and dateentered >30SEP2011)
2011 Spectrum extract.xlsx	Schools and Government	Non-Local Government Custom Energy Program	Non-Residential New Construction Program	MeasureCategory = 'New Construction' and dateentered <01OCT2011

As instructed by Shaw Group for this evaluation effort, the Team excluded from the final rollup of program savings several programs that were tracked in some of the files. Table 53 lists the programs that we removed from the master database.

Table 53. Programs Removed From the Master Database

Filename	Sector	Original Program Name	Reason for Removal
FocusPrescriptive_20120102.xlsx	Residential	WPSAllouez	Programs are funded through a separate program that is not part of the Focus on Energy evaluation efforts
FocusPrescriptive_20120102.xlsx	Residential	WPSBrillion	
FocusPrescriptive_20120102.xlsx	Residential	WPSPlover	

Data Manipulation

The Team was required to perform some data manipulation to create a dataset containing only the information applicable to the 2011 evaluation. Thus, the Team imposed the rule that all data must be relevant exclusively to the 2011 program year. Table 54 lists the date fields in the original databases used to discern the 2011 program year.

Table 54. Filenames and Date Fields

Filename	Date Field Used
FocusPrescriptive_20120102.xlsx	DateEntered
2011 Spectrum extract.xlsx	Payment Approved Date
2011 Data_ES Lighting.xlsx	Month
Appliance 2011 Data.xlsx	Month
HeadStart 2011 Data.xlsx	Month

Another rule the Team imposed involved removing any row that contains an invalid status. Table 55 illustrates the accepted and rejected statuses from the original datasets.

Table 55. Filenames and Statuses

Filename	Listed Status	Action
2011 Data_ES Lighting.xlsx	[No Status]	Accepted
Appliance 2011 Data.xlsx	[No Status]	Accepted
HeadStart 2011 Data.xlsx	[No Status]	Accepted
FocusPrescriptive_20120102.xlsx	Completed	Accepted
FocusPrescriptive_20120102.xlsx	Implemented	Accepted
FocusPrescriptive_20120102.xlsx	Installed	Accepted
2011 Spectrum extract.xlsx	Paid	Accepted
2011 Spectrum extract.xlsx	Pre-Approved	Rejected
2011 Spectrum extract.xlsx	Void	Rejected
FocusPrescriptive_20120102.xlsx	Rejected	Rejected

Data Standardization

After the five data sources were integrated into a common database, the Team further standardized various parameters and classifications to ensure the accurate reporting of the summary results. For example, some of the input datasets (or programs within the same dataset) used a three- or four-letter abbreviation for the utility name, while other sources used the full utility name. Table 56 is a list of the variables that required standardization.

Table 56. List of standardized variables

Variable	Standardization Method
Electric Utility Name	Renamed to established utility name
Gas Utility Name	Renamed to established utility name
Program Name	Renamed to list in Table 53
Sector	Agricultural, Commercial, Industrial, Residential, Schools & Government
County	Renamed to established 72 county names

For those measure groups that did not receive a comprehensive evaluation analysis, the Team standardized measure categories to enable the application of verified and net savings values, non-energy benefits, and incremental costs from the 2010 evaluation results.

The Evaluation Team used a three-tiered categorization system to link the 2010 program year results and the 2011 program measures: sector, program name, and measure category. All of the 1,537 sector, program, measures in 2010 and 2,568 in 2011 programs were mapped to 52 available measure categories, which were further aggregated into 29 measure groups.

The Team's data standardization effort included assigning a benefit/cost ID to each of the 2,568 measure combinations. This ID allowed the linkage between the standardized database with the benefit cost parameters (measure life, net incremental cost, and non-energy benefits).

Gap Fill

Over 4% of the gas therm savings did not include the gas utility assigned or had an invalid company assigned to the record. The Team populated these records based on the geographic location of other records with gas savings. This dropped the percentage of unallocated gas utility therm savings to zero.

The 2010 Census Website served as the source for county-level residential household population to normalize the residential county-level gas and electric bill savings maps.

The EIA Website served as the source for calendar year 2011 monthly gas and electric retail rates. These rates were multiplied by the electric kWh and gas therm savings to generate the gas and electric bill savings.

The sector-based eligible population used to normalize the utility territory maps was collected from the "file 2" spreadsheet associated with the EIA form 861 for the 2010 calendar year (the most currently available source of this information).

Deemed Savings Lookup

To carry forward the verified and net savings values for 2011 program measures that were not considered high-impact measures, the Evaluation Team used the 2010 verified and net savings rates and linked them using the standardized measure categories discussed above. This entailed following these rules:

- If the verified ratio (verified savings divided by gross claimed savings) was between 98% and 102% percent, then the Team let these measure categories pass through without receiving the verification ratio. (This assumed the verification rate can be attributed to the data factor and not based on actual verification/evaluation analysis.)
- If the verified ratio fell outside of this range, then this ratio was used and applied to the 2011 savings assumptions

Buydown Lighting Allocation

The Evaluation Team received invoice data (including purchase store location, bulb quantity, rebate, and savings) for the “buydown” measures within the ENERGY STAR Lighting program. Unfortunately, due to the nature of the buydown program and the information collected by the Implementer, this dataset did not provide the end-use location of where the bulbs were installed. To approximate the ultimate location of where the bulbs were installed, the Team created an allocation lookup table based on historical coupon statistics.

To allocate the historical records, the Team collected 2002-2007 historical coupon data. These data showed the purchase location (store, address, city, state) and the installation location (home/business address, city, county, state). Due to the transient nature of commerce (stores close, open, rename, relocate), the Team used the store’s city as the basis purchase location and then allocated the end-use locations based on county, assembly district, senate district, and electric service territory. For those 2011 records with an unidentifiable purchase location (city/state), the records were distributed according to the overall distribution of bulbs across the Wisconsin counties, senate and assembly districts, and electric service territories.

To estimate the participation in the ENERGY STAR buydown program, the Team used the total quantity of bulbs incented through the buydown program divided by the average quantity calculated for ENERGY STAR instant rebate program participants.

GeoCoding the Data

The senate and assembly district shape files were downloaded from the following link: <http://legis.wisconsin.gov/ltsb/redistricting/districts.htm>. Each participant was assigned a latitude and longitude (that is, each participant was geo-coded) using Microsoft MSDN’s GeoCode service based on their physical address. The senate and assembly districts were assigned based on each participant’s geocoded location, using the shape files in the link previously indicated.

APPENDIX H. CALENDAR YEAR 2011 EVALUATION PLAN

This document presents a plan for evaluating the impact of Focus on Energy programs during calendar year 2011 (CY 2011). The scope of work in the evaluation contract between the Cadmus Group and the Public Service Commission of Wisconsin (the PSC) states that:

Calendar year 2011 is a transition year for the Focus on Energy programs. Therefore, evaluation of the CY 2011 programs primarily consists of measuring and verifying gross savings. For CY 2011, stipulated net-to-gross (NTG) ratios, based on Focus on Energy 2010 program evaluation, are used to estimate net savings.

Subsequent to the writing of this scope of work, the Evaluation Team (composed of The Cadmus Group, Inc., Nexant, Inc., St. Norbert College, and TecMarket Works) met with representatives of the PSC, the Program Administrator (Shaw Environmental & Infrastructure, Inc.), the Statewide Energy Efficiency and Renewable Administration (SEERA) and the Evaluation Work Group (EWG) to discuss the CY 2011 evaluation plan in greater detail.

The outcome of these meetings was a general confirmation of the evaluation rigor expressed in the scope of work, with interest in pursuing more a rigorous evaluation for a limited set of key measures or program components. These additional evaluation activities would be limited to measures or program components for which: (1) the previous evaluation findings may not accurately represent current program accomplishments, and (2) having timely additional detail would assist planning efforts for the current Mass Markets or Targeted Markets portfolio. Therefore, this CY 2011 evaluation plan primarily adheres to the high-level CY 2011 strategies outlined in the scope of work while also recommending expanded evaluation efforts for several select measures.

The first step of this proposed plan entails combining the data from multiple CY 2011 tracking databases into a single evaluation database in which:

- The deemed savings values can be confirmed,
- The NTG numbers from the 2010 evaluation can be applied, and
- The summaries of program accomplishments can be generated in the required report formats.

In addition, this CY 2011 plan recommends these three measures or measure categories for more rigorous measurement and verification (M&V) activities:

- Non-residential HVAC.
- Non-residential process efficiency.
- Residential Electronically Commutated Motors (ECMs) on furnaces and central air conditioners.

These measures contribute significant electric or gas savings relative to the overall program accomplishments in CY 2011. Furthermore, for each of these measures, there was significant

growth in their relative contribution to savings from CY 2010 to 2011. This growth in savings is an indicator that the population of participants receiving these measures may have changed and, consequently, that the savings attribution used in the 2010 evaluation may not be representative of the savings attributable to the 2011 program.

The savings that are being claimed from the installation of these measures is a source of risk to meeting program savings goals in the event that the results of M&V efforts not support the currently assumed savings levels. As a result of the growing importance of these measures to the overall program, it is critical to evaluate these measures as early as possible in the current program cycle in order to maximize the certainty around the savings being achieved.

The following sections present a summary of the CY 2010 program accomplishments, demonstrate the relative and growing importance of the few measures discussed above, and present a proposal for the evaluation activities for the CY 2011 program. Note that all of savings values and accomplishments presented in this plan are preliminary, as they are based upon an initial analysis of partial program records for CY 2011.

While the Evaluation Team anticipates that the data reviewed to date account for a vast majority of the CY 2011 accomplishments (greater than 95%) and, therefore, that the savings contributions presented here should be a reasonable representation of the overall program accomplishments, all values in this plan are subject to change.

The total budget for the activities described in this evaluation plan is not to exceed \$960,000.

Evaluation Priorities

Table 57, on the following page, presents the relative contribution of non-residential measures or measure categories to the overall program savings in CY 2011. These values are derived from three files that were provided to the Evaluation Team by the program administrator in January 2012. These files are exports from databases used by both the current and the previous Program Administrators to track program participation from January 1, 2011, until the new SPECTRUM tracking system was activated in December 2011.

The participation and savings tracked in the SPECTRUM system are not included in the tables or in any part of the current CY 2011 evaluation plan. As the Evaluation Team believes the data in SPECTRUM represents less than 5% of the CY 2011 program accomplishments, the percentages presented in these tables are assumed to be representative of the accomplishments overall for 2011.

Table 57. Non-Residential* Focus on Energy Perspective Summary, CY 2011

Efficiency Measure**	Incentive Dollars %	kW %	kWh %	Therms %
Air Conditioning	0%***	1%	0%***	0%***
Agriculture	1%	1%	1%	4%
Appliances	1%	1%	1%	1%
Boilers & Burners	2%	0%***	0%***	12%
Compressed Air, Vacuum Pumps	2%	4%	5%	0%***
Compressed Air, Vacuum Pumps - Commissioning	0%***	N/A	0%***	N/A
Heating	0%***	0%***	0%***	1%
HVAC - Chiller	4%	6%	3%	N/A
HVAC - Commissioning	1%	0%***	1%	1%
HVAC - Controls	2%	1%	4%	5%
HVAC - Energy Recovery	1%	1%	0%***	4%
HVAC - Fan	1%	2%	1%	N/A
HVAC - Filtration	2%	0%***	0%***	5%
HVAC - Other	3%	2%	3%	13%
HVAC - Variable Air Volume	1%	1%	1%	2%
Industrial Ovens and Furnaces	1%	0%***	1%	3%
Information Technology	1%	1%	2%	N/A
Insulation	1%	0%***	0%***	4%
Lighting	16%	43%	38%	N/A
Motors & Drives	4%	7%	8%	0%***
New Construction	3%	5%	2%	6%
Other - Training and Special	2%	N/A	N/A	N/A
Process	12%	8%	10%	30%
Refrigeration	4%	8%	10%	0%***
Renewables	30%	6%	6%	4%
Wastewater Treatment	1%	2%	2%	N/A
Water Heater	1%	1%	1%	3%
Non-Residential Totals	100%	100%	100%	100%

* The Non-residential Portfolio includes the Agricultural, Commercial, Industrial, and Schools & Government programs.

** Measure category names may differ in this table from the claimed, verified, and net savings tables because the values in this table were derived from the raw 2011 data before the Evaluation Team applied its measure category standardization methods.

***The values that are represented in this table as 0% result from rounding to the nearest percentage and comprise less than 0.5% of the total incentive/kW/kWh/therms.

Table 58 presents the equivalent contribution to overall savings for residential measures.

Table 58. Residential Focus on Energy Perspective Summary, CY 2011

Efficiency Measure	Incentive Dollars %	kW %	kWh %	Therms %
Air Conditioning	2%	7%	1%	N/A
Assessment	3%	N/A	N/A	0%*
Boilers & Burners	2%	N/A	N/A	23%
Heating - Furnace	10%	19%	13%	27%
Heating - Other	2%	N/A	0%*	0%*
HVAC - Fan	1%	N/A	0%*	0%*
Insulation	4%	3%	1%	49%
Lighting	74%	71%	85%	N/A
Water Heater	2%	0%*	0%*	2%
Residential Totals	100%	100%	100%	100%

*The values that are represented in this table as 0% result from rounding to the nearest percentage and comprise less than 0.5% of the total incentive/kW/kWh/therms.

Identifying High-Priority Measures

The growing importance of several significant measures is demonstrated by comparing the contribution to savings in CY 2010 to that of CY 2011. As shown in Table 59, process efficiency and HVAC controls are identified as high-priority measures because of their contributions to CY 2011 electricity savings as compared to CY 2010.

Table 59. Non-Residential High-Priority Electric Measures

Efficiency Measure	CY 2010 kWh %	CY 2011 kWh %
HVAC	2%	13%
Process	3%	10%

Table 60 also presents HVAC and process efficiency measures as being high priority because of their relative contribution to and growth in gas savings, as compared to CY 2010.

Table 60. Non-Residential High-Priority Gas Measures

Efficiency Measure	CY 2010 Therm %	CY 2011 Therm %
HVAC	13%	30%
Process	10%	30%

Similarly, Table 61 presents the electric savings for residential furnaces, the majority of which are associated with electronically commutated motors (ECMs).

Table 61. Residential High-Priority Electric Measures

Efficiency Measure	CY 2010 kWh %	CY 2011 kWh %
Heating – Furnace (primarily ECMs)	14%	13%

Evaluation Activities

The Evaluation Team proposes six tasks for assessing the achievements of CY 2011:

- Task 1. Compile and summarize data.
- Task 2. Finalize the selection of high-priority measures.
- Task 3. Evaluate the high-priority measures.
 - Task 3a. Evaluate Process Efficiency Savings
 - Task 3b. Evaluate Non-Residential HVAC
 - Task 3c. Evaluate Residential ECMs
- Task 4. Compile CY 2011 savings
 - Task 4a. Apply realization rates and NTG ratios from previous evaluations to non-high-priority measures.
 - Task 4b. Apply the updated realization rates and NTG ratios to high-priority measures.
- Task 5. Report on CY 2011 program evaluation findings
- Task 6. Perform *ad hoc* tasks, as requested.

Table 62 presents an overview of the proposed CY 2011 evaluation activities for each program.

Table 62. Proposed Evaluation Activities

	Phone Verification	Deemed Savings Verification	Site Visits
Mass Markets: Specific Measures			
Efficient Heating and Cooling (primarily ECMs)	✓	✓	✓
Other Mass Market Programs		✓	
Targeted Markets: Specific Measures			
HVAC	✓	✓	✓
Process	✓	✓	✓
Other Targeted Markets Programs		✓	

Task 1. Compile and Summarize CY 2011 Data

The Evaluation Team will create a master database that is a compilation of the three databases currently containing program data. The Team's main purposes for creating this master are these: (1) To facilitate the creation of replicable reports, and (2) to have a well-documented process for summarizing programs' achievements. Note that the summaries of the 2011 Focus on Energy programs' accomplishments presented in this CY 2011 evaluation plan are only intended to guide the evaluation planning efforts, and are not sufficient for the CY 2011 evaluation.

At the beginning of 2011, the programs records were contained in one of three databases, each with unique naming conventions and fields. As a result, it has not been possible to merge the results efficiently from the various databases. In addition, the fourth and newest database,

SPECTRUM, is currently under development, so the data in this system cannot be exported or reported upon yet.

The summaries in this preliminary plan are based on the Team's analysis of the three databases, which (as was mentioned earlier) should account for over 95% of CY 2011 program performance. Thus, the information is sufficient to guide the development of priorities for the CY 2011 evaluation plan, but it is not sufficient for the needs of the final CY 2011 evaluation report.

Task 1 requires compiling and reporting upon significantly more of the data contained in each of the unique databases than has been summarized in this plan. To accomplish this, the Evaluation Team will develop a database populated only with the fields from the programs records databases that are essential to the evaluation. The Team will classify measures into the same categories used in the most recent evaluations and will track the following key fields for each record:

- Unique Key ID
- Application Number
- Application Date
- Application Approved Date
- Measure Name
- Measure Group
- Measure Installation Date
- Measure Model
- Measure Installed kWh Savings
- Measure Installed kW Savings
- Measure Installed Therm Savings
- Measure Assumed NTG
- Measure Effective Useful Life
- Incentive Paid Date
- Incentive Paid Amount
- Incentive Recipient Name
- Incentive Recipient Telephone Number
- Incentive Recipient E-Mail
- Incentive Recipient Company (if applicable)
- Incentive Recipient Address
- Site Contact Name
- Site Company Name (if applicable)
- Site Contact Telephone Number
- Site Contact E-mail
- Site Address
- Site Assembly District
- Site Senate District
- Site Electric Utility
- Site Gas Utility
- Installer Company Name
- Installer Contact Name
- Installer Address
- Installer Telephone Number
- Installer E-Mail
- Retailer Company Name
- Retailer Contact Name
- Retailer Address
- Retailer Telephone Number
- Retailer E-mail
- Customer Sector
- Source File (originating database filename)
- Source Key (To Relate To Original Record)

An essential step in populating the master database is including savings estimates from the original data files. Thus, the Evaluation Team proposes to verify the deemed savings values to ensure that the correct final savings estimates are associated with each record.

While not a requirement for the CY 2011 evaluation effort, having this database would also facilitate populating SPECTRUM with project files from the beginning of the current quadrennial program cycle.

Task 2. Finalize the Selection of High-Priority Measures

The Evaluation Team proposes that these measures/measure groups be considered high priority and receive a more rigorous assessment than other measures/measure groups in the CY 2011 evaluation:

- HVAC (non-residential)
- Process Efficiency (non-residential)
- ECMs in furnace and central air conditioning systems (residential)

Each has had significant growth in their savings contribution from 2010 to 2011.

- Together, the two non-residential measures represented 5% of CY 2010 non-residential electric savings and 23% of CY 2011 non-residential electric savings.
- Regarding gas savings, the growth in savings is even greater, increasing from 23% of CY 2010 therm savings to 60% of therm savings in CY 2011.

Additionally, the attribution factor from the 2010 evaluation for both of these measures is less than 55%.

About Measure Selection

While this plan includes a proposal to conduct additional research on several high-priority measures, the final selection of these measures will require dialogue between the Evaluation Team, the EWG, the Program Administrator, and the PSC. This dialogue will happen in parallel with Task 1, and the Evaluation Team proposes completing this effort in February 2012.

In recommending the non-residential measures, the Team assumes that their growth in savings reflects an emphasis on these measures during CY 2011. Furthermore, the Team expects that with the increased emphasis, the programs likely reached more participants who had not planned to perform these upgrades on their own. So the attribution factor from the CY 2010 evaluation report likely does not reflect the savings that should be attributed to the CY 2011 program.

The Team also recommends that the residential furnace ECMs be evaluated as a high-priority measure for CY 2011. This measure provides a significant share of the residential electric savings, and the Team expects that the emphasis on this measure will continue going forward.

In conducting a review of the draft work papers for CY 2012, the Evaluation Team examined the assumptions behind the savings claimed for this measure. The Team concluded it was appropriate to begin the process of evaluating this measure soon, because of the current savings,

the expected continued emphasis on this measure, and some uncertainty surrounding baselines for residential furnaces that has been expressed by several key Focus stakeholders.

Task 3. Evaluate the High-Priority Measures

In program-specific and site-specific measurement and verification (M&V) plans, the Evaluation Team will define further the measurement of energy use and savings for the high-priority measures. In general, the assessment will rely on these key activities:

- Telephone interviews with program staff, participants, installers, and other relevant market actors.
- Site visits to verify the installation and effective operation of measures.
- Short-term or spot metering and equipment measurements.

The data needed to evaluate HVAC equipment are well understood, as these measures have been the focus of numerous evaluations in Wisconsin and around the country. The process efficiency savings come from custom, site-specific studies, and the measures that are implemented vary significantly. Consequently, evaluating the process efficiency savings requires a variety of techniques, which the Evaluation Team determines after gathering information about the measures in each project.

While EMCs have not been the focus as quite as many evaluations as the non-residential HVACs, the data needed to evaluate ECM measures are also well understood. The ability to measure savings from ECMs is highly dependent upon weather, so it is particularly desirable to begin fieldwork on this measure during the current heating season. Consequently, the schedule included installing metering equipment on ECMs in February of 2012.

Task 3a. Evaluate Process Efficiency Savings

The Team's evaluation approach entails a review of program records, telephone surveys, and site visits. Under this program, a wide variety of process upgrades were installed in industrial facilities, with a goal of increasing the overall process efficiency and reducing the electrical load on the utility. The installed measures (which affect electricity consumption, natural gas consumption, or both) encompassed equipment replacements, added control capabilities, system optimization, and waste heat recovery. Table 63 shows the breakdown of measures in the refrigeration measure category, including relative contributions based on kW, kWh, and therm savings reported by the Program Administrators.

Table 63. Process Efficiency Subcategories and Relative Contributions²⁶

Sub-Category	% of Category kW	% of Category kWh	% of Category Therms
Energy Recovery	-3.2%	-1.1%	38.7%
Furnace	0.0%	0.0%	0.0%
Other	88.8%	80.7%	58.5%
Process Cooling	0.3%	1.2%	0.1%
Process Heat	3.1%	2.7%	2.7%
Pump	6.3%	11.9%	0.0%
Specialty Pulp & Paper	0.1%	0.1%	0.0%
Tune-up / Repair / Commissioning	4.4%	3.9%	0.0%
Variable Speed Drive	0.0%	0.4%	0.0%
Welder	0.2%	0.1%	0.0%
Totals	100.0%	100.0%	100.0%

About the Sample Plan

The sample plan—which uses an assumption of a coefficient of variance of 0.5²⁷—is designed to achieve 90% confidence and 18% precision levels (or better) at the program level. A stratified random sample of the population will be selected for site visits, based on Program Administrator-estimated savings (*ex ante* savings) and prioritizing measures with higher savings and higher risk. The current population database indicates that the large majority of savings are allocated to the “other” sub-category. As more detailed information about each individual project is determined, the Evaluation Team may modify measure groupings to create better efficiencies in the sample design.

For planning purposes, the Team has developed sample sizes (shown in Table 64) based on currently available program participation data. Although the sample size is not sufficient to achieve statistical validity for each individual sub-category, the CY 2011 evaluation sets the stage for additional M&V efforts in future years.

²⁶ Based on “Wiseerts_TM DATA_01.01.2011-11.21.2011.xlsx”. Subject to change based on updated information received, especially to account for December 2011 participation in the Wiseerts database. Sub-categories are identified using column AP of the database.

²⁷ The Evaluation Team may adjust the coefficient of variance based on identification of the “other” subcategory. If a wide variety of measures are contained within the other subcategory, the coefficient of variance is likely to increase and, therefore, increase the sample size.

Table 64. Process Efficiency Assumed Sample Sizes

Activity	Population	Confidence & Precision	Sample Size
On-site Inspection	138	90% \pm 18%	21

Measurement and Verification

Using on-site inspections to conduct M&V, the Evaluation Team will estimate savings for approximately 20 to 25 process measures installed through the program. These inspections will be supplemented by detailed customer interviews, including third-party contractors, if enlisted by the customer.

Before conducting the on-site inspection, program records for the sample will be reviewed for definition of project scope, installed measures, and any submitted savings calculations. Any missing information about project scope or measure descriptions may be collected via telephone survey with the participant.

Based on the project scopes, the Team will develop site-specific measurement and verification (M&V) plans for each project in the sample. Each M&V plan will be developed using the most appropriate methodology for the project, considering the availability of trend data and the opportunities for taking independent measurements. The Team will also consider the uncertainty associated with the measure when ascertaining the level of rigor needed to verify a sample point. Where M&V has already been conducted by the customer, customer's representative, or the utility, the Team will analyze the data to determine whether it is useful to this evaluation. Table 65 summarizes the general M&V methodologies to be used, in order of preference.

Table 65. Process Efficiency Anticipated M&V Methodology

Preference	Method	Description
1	IPMVP Option B	This method will be used if the facility is collecting trends of the energy consumption of the affected equipment.
2	IPMVP Option A	In the absence of trend data, spot measurements and/or short-term data collection will be performed to capture the affected system's performance.
3	IPMVP Option C	If measurements cannot be taken and the energy savings are significant as compared to the facility's total utility bill, then the impact of program participation will be quantified using utility bill analysis.
4	Calculated Approach	In the absence of other appropriate options, engineering calculations will be used to calculate savings based on operational parameters collected during the site visit.

In addition to interviewing facility personnel during the site visit, the Evaluation Team will conduct a visual inspection of the installed equipment, spot measurement(s), and/or installation of data loggers. The data collected during these on-site inspections includes:

- Operational parameters including hours of operation, loads produced;
- Annual variation of operational parameters;
- Pre-retrofit conditions, such as age and condition of replaced equipment; and
- Recent changes to the facility in addition to the installed measure.

The Team will scale the duration of the monitoring period to reflect the level of impact and uncertainty associated with the sample point. Measures with seasonal variations due to weather may require multiple metering periods because of differences in operating characteristics in the winter and summer months.

The Team will select the appropriate metering equipment to support the M&V plan. Table 66 describes the types of metering equipment that are anticipated to be used in evaluating the Process Efficiency program.

Table 66: Process Efficiency Anticipated Metering Equipment

Measurement	Data Source	Logging Device?	Interval	Purpose
Power, Voltage, Current, Power Factor	Fluke True RMS Multimeter	No	N/A	Spot-measurements of equipment power consumption
Energy	DENT elitePro	Yes	TBD	Collect trends of industrial equipment energy consumption
Current	HOBO U12-006 with CT	Yes	TBD	Collect trends of equipment amperage
Motor Runtime	HOBO U9-004	Yes	TBD	Record motor operating hours
Temperature	Infrared Thermometer	No	N/A	Spot-measurements of process operating temperatures, heat recovery, etc
Temperature	HOBO U12-01 or similar	Yes	TBD	Record temperature trends (limited to a range of -4° to 158°F)

The Evaluation Team will use the following equation, which will be manipulated for each specific measure, as the basis for calculating energy savings:

$$Watt\text{hours saved} = Wh_{baseline} - Wh_{efficient}$$

Examples of Measure-Specific M&V Plans

This section outlines three measure-specific M&V plans to demonstrate the types of data required for calculating the impact of projects in the Process Efficiency program. Because of the varied nature of projects in this program, M&V plans will be developed specifically for each different project in the sample.

Energy Recovery

These projects generally involve capturing energy from various industrial waste streams for reuse in other industrial processes. The typical M&V plan for this type of project is based on IPMVP Option B – Retrofit Isolation: All Parameter Measurement.

To determine the energy savings resulting for implementing energy recovery, the following parameters must be measured:

- Process fluid inlet temperature and exit temperature
- Process fluid flow rate
- kW consumption of any fans or pumps used by the heat recovery device

This data will be collected using the facility's industrial control system or energy management system, if possible. If no trends are available, the Evaluation Team will use an infrared thermometer to take spot measurements of the temperature rise of the working fluid (described in Table 67). The Team will estimate fluid flow rate and variations in fluid temperatures based on information from on-site personnel.

Table 67. Heat Recovery Anticipated Metering Equipment

Parameter	Data Source	Logging Device	Interval	Data Source Details	Purpose
Working fluid inlet temperature, exit temperature	Fluke 62 Thermometer	No	N/A	±1.5% accuracy	Measure the amount of energy added to the working fluid through heat recovery

Tune up / Repair / Commissioning

These projects entail tune-ups to compressed air systems. The typical M&V plan for this type of project is based on IPMVP Option B – Retrofit Isolation: All Parameter Measurement.

The Evaluation Team will collect these electronic trend data from the compressed air system's central control device for both the pre-retrofit and post-retrofit scenarios:

- System pressure
- CFM produced
- kW consumption
- VFD speed (if applicable)

If electronic data are not available, the Team will use copies of system printouts. If post-retrofit trends are not available or are deemed unsatisfactory, then independent metering devices will be installed (described in Table 68). Any trends collected should cover a period of at least one week of typical production time.

Table 68. Tune up / Repair / Commissioning Anticipated Metering Equipment

Parameter	Data Source	Logging Device	Interval	Data Source Details	Purpose
Compressor System Energy	DENT elitePro	Yes	15 min	±0.2% accuracy	Develop weekly power consumption profile
Power, Voltage, Current, Power Factor	Fluke 39 Power Meter	No	N/A	Varies by measurement, better than ±1% accuracy	Verify equipment power consumption and power factor

The Team will calculate energy savings by comparing the system's pre- and post-retrofit profile for kW consumed as a function of CFM produced. Annual energy savings will be extrapolated by applying this profile to the facility's estimated annual compressed air CFM requirement.

Other – Fast Closing Doors for Walk-in Cooling

This measure entails the installation of special doors for walk-in refrigerated spaces that automatically open and close. These doors are energy-saving alternatives to strip-curtains or completely open refrigeration. The typical M&V plan for this type of project is based on IPMVP Option A – Retrofit Isolation: Partial Measurement.

The Evaluation Team will collect the following information during the on-site visit through visual inspection, personnel interviews, or spot-measurements:

- Refrigeration system size (tons)
- Refrigeration system kW
- Size of refrigerated space (sq ft)
- Level of insulation of cooler walls, ceiling, floor
- Information about the baseline condition (strip curtain, etc.)

A logging device will be installed for a period of at least one week to measure the amount of time that the door remains closed throughout the week (described in Table 69). This measurement will verify that the fast-closing door is both functional and being used correctly.

Table 69. Tune up / Repair / Commissioning Anticipated Metering Equipment

Parameter	Data Source	Logging Device	Interval	Data Source Details	Purpose
Status of door (open vs closed)	Onset HOBO U9-001	Yes	N/A	N/A	Determine % of time that cooler door remains closed

Table 70 presents a breakdown of this budget by major sub-task.

Table 70. Proposed Budget for Task 3a.

	Task 3a. Process Efficiency
Management	\$10,000
File Reviews	\$25,000
Site M&V Plans	\$20,000
Survey/Scheduling	\$30,000
Fieldwork	\$75,000
Analysis	\$40,000
Total	\$200,000

Task 3b. Evaluate Non-Residential HVAC

The Evaluation Team will obtain data from program records, telephone surveys, and site visits. The Team's preliminary review of the program databases indicates the installation of a broad range of HVAC measures designed to increase the efficiency of HVAC equipment and reduce the overall electric or gas load on the utility. Table 71 contains a list of the most common measures and the IPMVP Options typically used to determine the savings.

Table 71. HVAC Measure Subcategories and Relative Contributions²⁸

HVAC Subcategories	% of Category kWh	% of Category Therms	Possible IPMVP Options
Chiller	25.9%	0.0%	A, B, C
Commissioning	6.4%	6.1%	A, B
Controls	25.0%	15.3%	A, B, C
Energy Recovery	0.7%	12.9%	A, B
Fan	6.8%	0.3%	A, B, C
Filtration	0.5%	15.6%	A, B, C
Other	22.2%	42.6%	A, B, C
Variable Air Volume	8.9%	5.9%	A, B
Totals	100.0%	100.0%	

The Evaluation Team will select a stratified random sample of the population for site visits. The sample plan—which uses an assumption of a coefficient of variance of 0.5²⁹—is designed to achieve 90% confidence and 18% precision levels (or better) at the program level. Although the sample size is not sufficient to achieve statistical validity for each individual sub-category, the CY 2011 evaluation sets the stage for additional M&V efforts in future years.

For planning purposes, sample sizes have been developed based on currently available program participation data and are shown in Table 72.

Table 72. Assumed Sample Sizes for HVAC

Activity	Population	Confidence& Precision	Sample Size
On-site Inspection	1,399	90% ± 18%	24

Measurement and Verification

Through on-site inspections, the Evaluation Team will estimate savings for approximately 20 to 25 HVAC measures installed through the program to conduct M&V. The inspections will be

²⁸ Based on “FocusPrescriptive_20120102.xlsx” and “Wiseerts_TM DATA_01.01.2011-11.21.2011.xlsx”. Subject to change based on updated information received, especially to account for December 2011 participation in the Wiseerts database. Air curtain, air turnover unit, dampers/shutters, dehumidifiers, economizers, food service controls, and fuel switching subcategories were insignificant contributors and were removed.

²⁹ The Evaluation Team may adjust the coefficient of variance based on identification of the “other” subcategory. If a wide variety of measures are contained within the other subcategory, the coefficient of variance is likely to increase and, therefore, increase the sample size.

supplemented by detailed customer interviews, including third-party contractors, if enlisted by the customer.

Before conducting the on-site inspection, the Team will review the program records for the sample to help define project scope, to determine the installed measures, and to assess any submitted savings calculations. Any missing information about project scope or measure descriptions may be collected via a telephone survey with the participant.

Based on the project scopes and measure types, the Team will develop general or custom measurement and verification (M&V) plans for each project in the sample. Each M&V plan will be developed using the most appropriate methodology for the project, considering the availability of trend data and the opportunities for taking independent measurements. The Team will take the following factors into consideration when developing the plans:

- The savings for measures such as rooftop units, split systems, and agricultural fans will likely be determined using IPMVP Option A, involving general M&V plans developed for the measure category.
- For simple HVAC measures, the Team will focus on collecting data to verify deemed savings assumptions, such as hours of operation and operating characteristics of the equipment.
- Projects with greater impacts (large chillers, boilers, or furnaces, for example) will likely require site-specific M&V plans based on IPMVP Option B or Option C with short-term monitoring.
- Because most HVAC measures experience seasonal variations based on weather conditions, each M&V plan will specify the appropriate length of M&V required to determine energy consumption during the winter, summer, and shoulder months.

Since the Focus on Energy program incentives are prescriptive or based on the estimated first-year energy savings, measure data was probably not collected during the project implementation phase, from either the baseline or retrofit equipment. Baseline equipment efficiencies will likely be stipulated based on customer interviews and on historical data for equipment replacements (since no measurement can be done on equipment that is no longer installed). Measurements of new equipment can be collected on site for most types of HVAC equipment, although boiler and furnace measurements may not be possible during the summer months when this equipment is not typically operating. In such cases, IPMVP Option A or Option C may be the best choices.

In addition to interviewing facility personnel during the site visit, the Evaluation Team will conduct a visual inspection of the installed equipment, spot measurement(s), and/or installation of data loggers. The data collected during these on-site inspections includes:

- Operational parameters including hours of operation and loads.
- Annual variation of operational parameters.
- Pre-retrofit conditions, such as the age and condition of replaced equipment.
- Recent changes to the facility in addition to the installed measure.

The Team will select the appropriate metering equipment to support the M&V plan. Table 73 describes the types of metering equipment that are anticipated to be used in evaluating the HVAC program.

Table 73. Non-Residential HVAC Anticipated Metering Equipment

Measurement	Data Source	Logging Device?	Interval	Purpose
Power, Voltage, Current, Power Factor	Fluke True RMS Multimeter	No	N/A	Spot-measurements of equipment power consumption
Energy	DENT elitePro	Yes	TBD	Collect trends of industrial equipment energy consumption
Current	HOBO U12-006 with CT	Yes	TBD	Collect trends of equipment amperage
Motor Runtime	HOBO U9-004	Yes	TBD	Record motor operating hours
Temperature	Infrared Thermometer	No	N/A	Spot-measurements of process operating temperatures, heat recovery, etc
Temperature	HOBO U12-01 or similar	Yes	TBD	Record temperature trends (limited to a range of -4° to 158°F)

The Evaluation Team will use this equation in calculating the energy savings of simple HVAC measures. This equation can be modified to accommodate changes in operating hours, capacities, and different efficiency ratings.

$$\text{Watt hours saved} = \text{BTU/hr} \times \left(\frac{1}{\eta_{\text{baseline}}} - \frac{1}{\eta_{\text{efficient}}} \right) \times \text{Equivalent Full Load Hours}$$

Examples of Measure-Specific M&V Plans

The following sections describe the typical parameters and metering approach for several priority subcategories within the non-residential HVAC measure category. The data points and data collection methodologies will vary based on the measure type.

Chillers

Chiller measures routinely involve the replacement of existing chiller systems with more efficient chiller systems. This may include the installation of a VFD chiller. M&V plans for chiller projects will be customized based on chiller configuration and other cooling-related equipment (e.g., chilled water pumps, condenser water pumps, cooling towers, etc.), load profile of the facility, and controls.

The Evaluation Team will leverage existing historical trend data to confirm baseline data characteristics coupled with in-depth customer interviews. Data anticipated to be collected during on-site inspections are listed in Table 74. Data by customer Energy Management Systems will be leveraged to increase efficiency of evaluation M&V processes.

Table 74. Non-Residential HVAC – Proposed Chiller Metering Equipment

Measurement	Data Source	Logging Device?	Interval	Purpose
Chiller True Power	Fluke True RMS Multimeter	No	N/A	Spot-measurements of chiller power consumption
Chiller Energy	DENT elitePro	Yes	TBD	Collect trends of chiller energy consumption
Chiller Current	HOBO U12-006 with CT	Yes	TBD	Collect trends of chiller amperage
Chilled Water Supply and Return Temperatures	HOBO U12-006 with temperature sensors	Yes	TBD	Develop chiller load profile
Chilled Water Flow	Siemens SITRANS FUP1010 or similar	Yes	TBD	Develop chiller load profile
Condenser Water Supply and Return Temperatures	HOBO U12-006 with temperature sensors	Yes	TBD	Develop chiller load profile
Outside Air Temperature	HOBO U12-01 or similar	Yes	TBD	Record temperature trends (dry bulb and wet bulb)

The Team will use the collected data points to develop the facility cooling load profile in relation to temperature and other key operating conditions ascertained through customer interviews. The Team will calculate the estimated savings by comparing energy used by the baseline chiller plant to the new chiller plant under the same conditions for each hour of the year, using the following equation in which represents a one hour interval:

$$\text{Energy Savings (kWh)} = \sum t(\text{kWh}_{t,\text{baseline}} - \text{kWh}_{t,\text{efficient}})$$

Controls

This sub-category encompasses control technologies that optimize equipment sequencing, determine on/off times, or change set-points based on weather conditions or time of day. The Team will customize the M&V plans for controls projects customized based on the equipment that is being controlled and the existing controls sequence. The affected equipment may include fans, pumps, central cooling equipment, central heating equipment, and heat rejection equipment. Peripheral equipment that is not directly controlled may still warrant M&V if energy use is affected.

The Evaluation Team will leverage existing historical trend data to confirm baseline data characteristics coupled with in-depth customer interviews. Table 75 lists the data likely to be collected during on-site inspections for each unit, based on observed changes in energy consumption due to controls. Data collected by customer EMS will be leveraged to increase efficiency of evaluation M&V processes.

Table 75. Non-Residential HVAC – Proposed Controls Metering Equipment

Measurement	Data Source	Logging Device?	Interval	Purpose
Power, Voltage, Current, Power Factor	Fluke True RMS Multimeter	No	N/A	Spot-measurements of equipment power consumption
Energy	DENT elitePro	Yes	TBD	Collect trends of industrial equipment energy consumption
Current	HOBO U12-006 with CT	Yes	TBD	Collect trends of equipment amperage
Motor Runtime	HOBO U9-004	Yes	TBD	Record motor operating hours
Temperature	Infrared Thermometer	No	N/A	Spot-measurements of process operating temperatures, heat recovery, etc
Temperature	HOBO U12-01 or similar	Yes	TBD	Record temperature trends (limited to a range of -4° to 158°F)
Power, Voltage, Current, Power Factor	Fluke True RMS Multimeter	No	N/A	Spot-measurements of equipment power consumption

Table 76 presents a breakdown of this budget by major sub-task.

Table 76. Proposed Budget for Task 3b.

Category	Task 3b. Non-Residential HVAC
Management	\$10,000
File Reviews	\$15,000
Site M&V Plans	\$15,000
Survey/Scheduling	\$20,000
Fieldwork	\$60,000
Analysis	\$30,000
Total	\$150,000

Task 3c.: Evaluate Residential ECMs

Energy savings and demand reduction are achieved through replacing existing permanent, split-capacitor indoor blower motors with high-efficiency indoor blower motors. ECM furnace blowers have much higher efficiencies than permanent split-capacitor motors, and some manufactures claim that energy savings may be as much as 80%.

The Evaluation Team's approach entails data collection by phone verification, deemed savings verification, and site visits. Table 77 presents the derivation of the sample size proposed for this effort. At this time, the Team anticipates that the CY 2011 evaluation report will only have partial data from this effort, but should have sufficient information to provide a strong indication of the savings being achieved from ECMs in homes throughout Wisconsin. By leaving metering

equipment in place for a total of 12 months and by supplementing the CY 2011 evaluation sample with additional homes as part of the CY 2012 evaluation work, the Evaluation Team anticipates reporting evaluation findings with greater confidence and precision in the CY 2012 evaluation report.

Table 77. Residential ECM Assumed Sample Sizes

Activity	Population	Confidence & Precision	Sample Size
On-Site Inspections	15,796	90% ± 13%	30*

* With a CV of 0.2105 on the savings in the population, a sample size of 27 is needed for 90% confidence and a 13% precision. Because this measure is recommended for expedited fieldwork, additional sample is being recommended to mitigate risks on achieving reliable data at 90%/13% confidence and precision.

The Evaluation Team proposes an M&V approach for residential ECMs consistent with IPMVP Option B – Retrofit Isolation: All Parameter Measurement.

Table 78. Residential ECM Anticipated M&V Methodology

Method	Description
IPMVP Option B	This method will be used for detailed measurements of ECMs. Measurements will consist of both short- and long-term measurements of ECMs in homes.

Measurement and Verification

The Evaluation Team will determine baseline condition and EMC energy consumption. In previous studies—and in the Team’s experience—the fan power draw of permanent split-capacitor motors has very low variability between the three modes: heating, cooling, and on. Also, the baseline energy consumption pattern is more predictable than the ECM energy consumption pattern.

Through the metering of equipment, the Evaluation Team will estimate savings for 30 motors installed through the programs. Also, through this rigorous metering study, the Team will verify and/or record all parameters of interest for all ECMs installed through the programs. The Team will: (1) conduct duct pressure tests and airflow spot measurements to estimate the baseline power draw; and (2) research whether the blower operation has changed due to the installation of a more efficient system.³⁰

The Team will also conduct detailed interviews with homeowners and will supplement the responses with information from the HVAC technician(s) responsible for installation. Since the amount of savings depends on the baseline conditions, the Team will use these detailed interviews—leveraged with data from previous meter studies—to determine a baseline energy consumption pattern. The interview will include questions for determining the power draw of the original motor and how this equipment operated.

³⁰ Some homeowners report using their ECM fan for more hours (i.e., leaving it on longer) because it is more efficient.

The variables measured by the Team at each site will generally be the same, but the method for obtaining the metered data may vary. Table 79 outlines the proposed parameters of interest and planned metering equipment.

Table 79. Residential ECM Metering Equipment

Parameter	Data Source	Logging Device	Interval	Data Source Details	Purpose
Airflow spot measurement	DG-700 and TrueFlow plates	N/A	N/A	±9% accuracy	Develop fan curve and verify proper airflow and control settings
Static pressure	Onset T-VER-PXU-X or similar	U30-GSM Cellular	1 minute	Ranges: 0.1, 0.25, 0.5, 1.0, 2.5, 5, and 10 W.C. and ±1% accuracy for full scale of selected range	Develop fan curve and verify blower efficiency and proper control
Motor operating temperature	Fluke 62 infrared thermometer	N/A	N/A	±2% of temperature reading	Verify minimal heat gain (interactive effects)
Fan current/ power	a) Wattnode WNB-3D-240-P with b) Magnelab MAG-SCT-50 current transformer(s)	U30-GSM Cellular with: SUCC-M006 pulse adaptor S-FS-RMSA	1 minute	a) ±0.45% of reading and 0.05% FS through 25th harmonic b) ±0.5% of reading from 5% to 100% of rated current	ECM current and true power where possible
Thermostat temperature	Hobo-U12	Hobo-U12	5 minute	±0.63°F from 32° to 122°F	Verify temperature program settings

The Evaluation Team will calculate savings for each 1-minute interval ‘i’ using the following equation:

$$\text{Watthours saved} = \sum (W_{\text{baseline}} - W_{\text{ECM}})_i \times \frac{1\text{hr}}{60\text{min}}$$

The Team will also calculate interactive effects. Experience has shown that ECM motor housings are typically close to the ambient temperature (which means that very little or no cooling energy is required to offset the heat gain from the motor). During the heating season, ECMs do not produce as much waste heat as permanent split-capacitor motors. Thus, a home heated with gas will require more gas consumption to account for the reduction in motor heat loss.

The Team will record heating system details to determine interactive effects using the following equation:

$$\text{Additional heat use} = \frac{\text{Watthours saved} \times 3.412 \frac{\text{BTU}}{\text{watthour}}}{\text{heating system efficiency}}$$

Table 80 presents a breakdown of this budget by major sub-task.

Table 80. Proposed Budget for Task 3c.

Category	Task 3c. Residential ECM
Management	\$12,000
File Reviews	\$13,000
Site M&V Plans	\$5,000
Survey/Scheduling	\$25,000
Fieldwork	\$65,000
Analysis	\$30,000
Total	\$150,000

Task 4. Compile CY 2011 Savings

Upon completing the evaluation efforts for the high-priority measures, the Evaluation Team will update the master database (described in Task 1) with the newly evaluated savings and attribution values. The Team will also apply the appropriate realization rates and NTG ratios from the CY 2010 evaluation to the remaining measures. These activities will be conducted, as described in Task 4a and Task 4b.

Task 4a. Apply Realization Rates and NTG Ratios from Previous Evaluations to Non-High-Priority Measures

In accordance with the terms of the evaluation contract, the Team will calculate the savings from non-high-priority measures in CY 2011 based on verified gross savings and attribution savings from previous evaluations. Specifically, the Team will rely on the verified gross and attribution factors contained in the CY 2010 evaluation report for the same measures or measure groups. The Team will include these values with each individual record in the master database, which will facilitate the reporting of savings in each of the required Geographic Information System (GIS)-based formats.

Task 4b. Apply the Updated Realization Rates and NTG Ratios to High-Priority Measures

After completing the evaluation of high-priority measures, the Evaluation Team will incorporate the new verified gross and attribution factors into both the master database and SPECTRUM.

Task 5. Report on CY 2011 Program Evaluation Findings

The Evaluation Team will report the CY 2011 program evaluation findings in accordance with the agreed-upon schedule. The proposed timeline for completing tasks 1 through 5 for the CY 2011 evaluation is presented in Table 81.

Table 81. CY 2011 Program Evaluation Proposed Timeline

	2012							
	January	February	March	April	May	June	July	August
Task 1								
Task 2								
Task 3a								
Task 3b								
Task 3c								
Task 4a								
Task 4b								
Task 5								

Task 6. Perform *Ad Hoc* Tasks

Based upon preliminary discussions between the Evaluation Team, Commission staff and the EWG, a total not to exceed budget target of 10% of the entire evaluation contract has been agreed upon as a reasonable level for the CY 2011 evaluation. At 10% of the total evaluation budget, this establishes the not-to-exceed budget total for the CY 2011 evaluation effort at approximately \$960,000. With the remaining task budgets set forth in this plan totaling \$810,000, there is \$100,000 available to be set aside for *ad hoc* tasks that may be required or requested.

Although it is useful to have extra monies available to accommodate unplanned activities, the Evaluation Team currently anticipates no particular need to expend this budget during the CY 2011 evaluation. Instead, the Team will seek to roll these funds into future evaluation efforts, if possible.

APPENDIX I. SUMMARY OF FINDINGS BY COUNTY

Savings by Sector, by County

The following section includes nine maps based on the results of the 2011 evaluation: three county-level maps (per capita lifetime bill savings, 2011 participation rates, and per capita incentives paid in 2011) for three primary sectors (residential, industrial, and commercial). Commercial maps include commercial, schools, government, and agricultural entities.

Similar to the 2010 evaluation report, the bill savings are defined as evaluated lifecycle verified gross energy savings multiplied by the average retail rate of delivered energy in 2011 and normalized on a per capita basis. The incentive dollars are also reported on a per capita basis.

The per capita numbers for residential are based on the number of households reported in the most current (2010) US Census. The per capita county numbers for commercial and industrial are based on the county-level total number of active businesses in the 2010 evaluation report. The participation rates are the county-level participation normalized by the county-and sector-level populations.

Residential

Figure 7. Residential Per Capita Energy Bill Savings by County

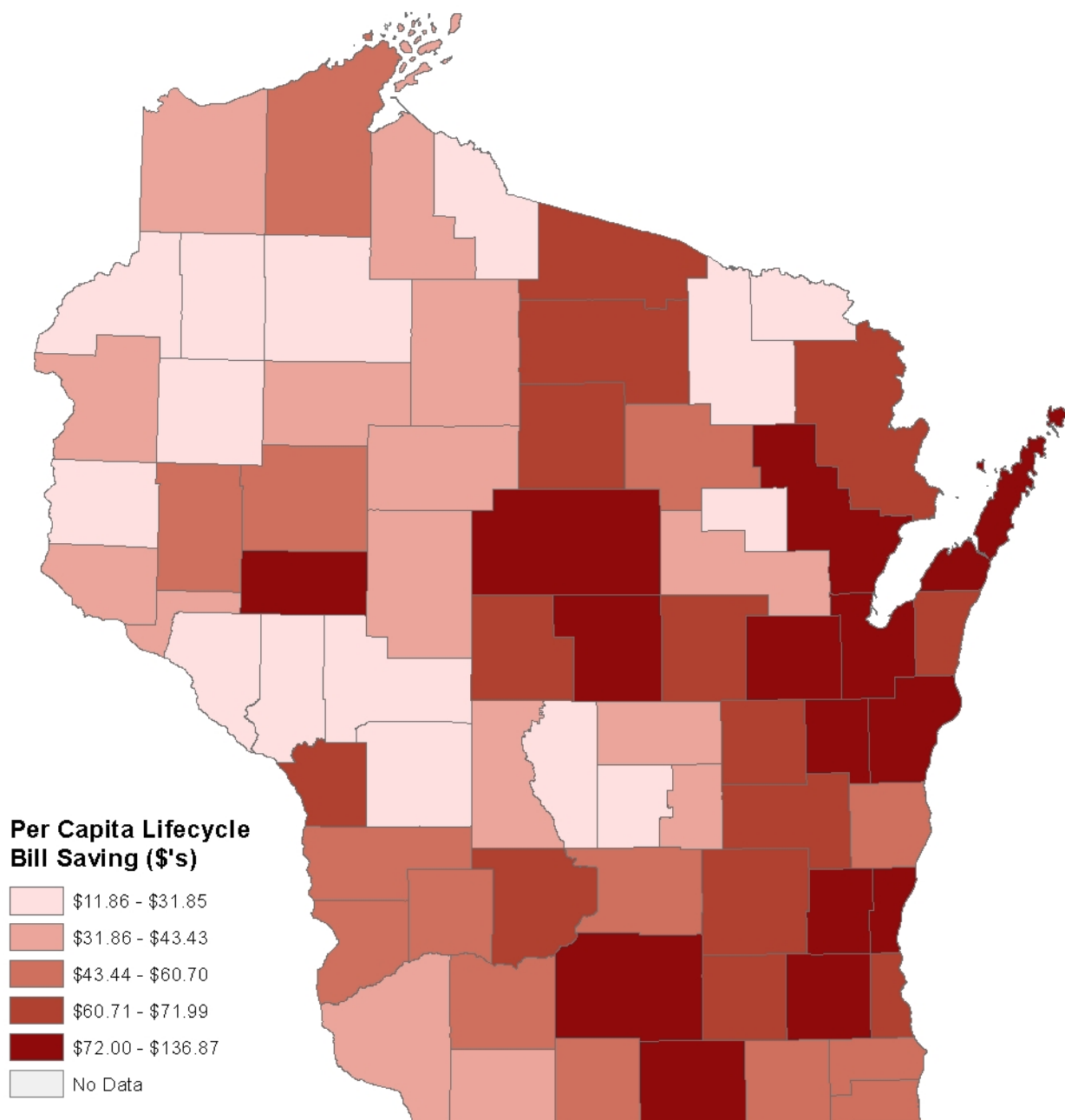


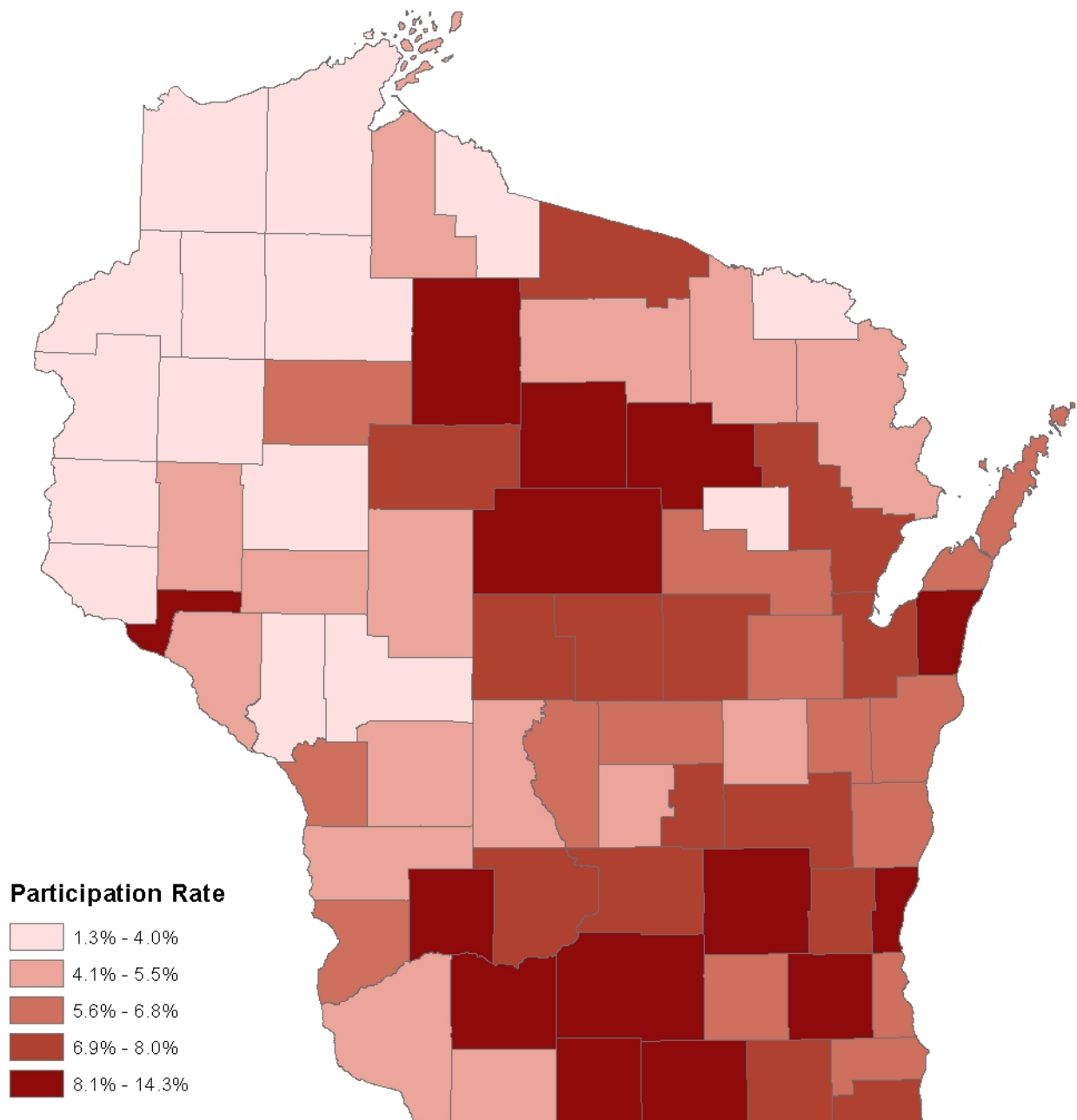
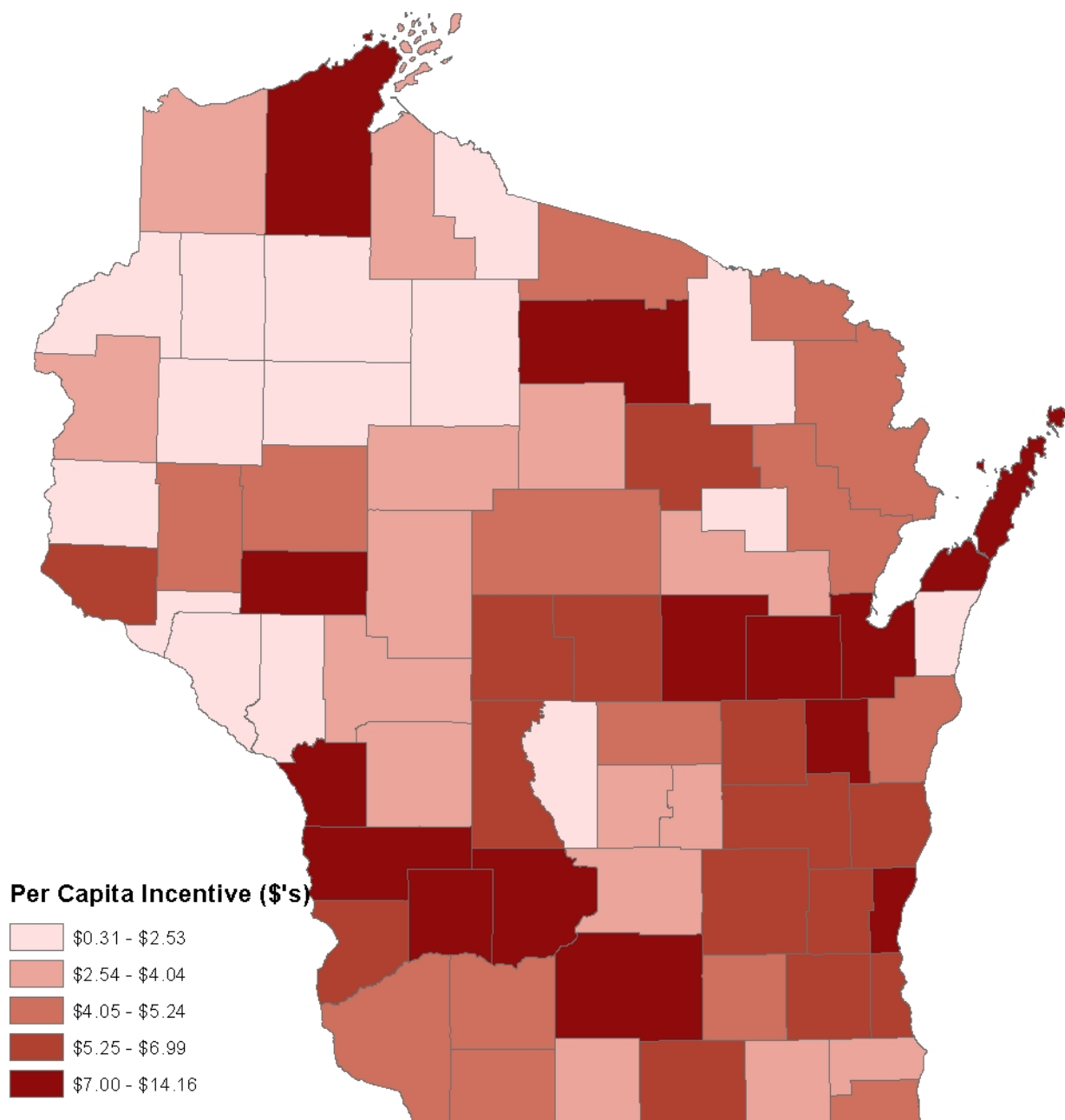
Figure 8. Residential Participation Rate by County

Figure 9. Residential Per Capita Incentive Dollars Awarded by County

Industrial

Figure 10. Industrial Per Capita Energy Bill Savings by County

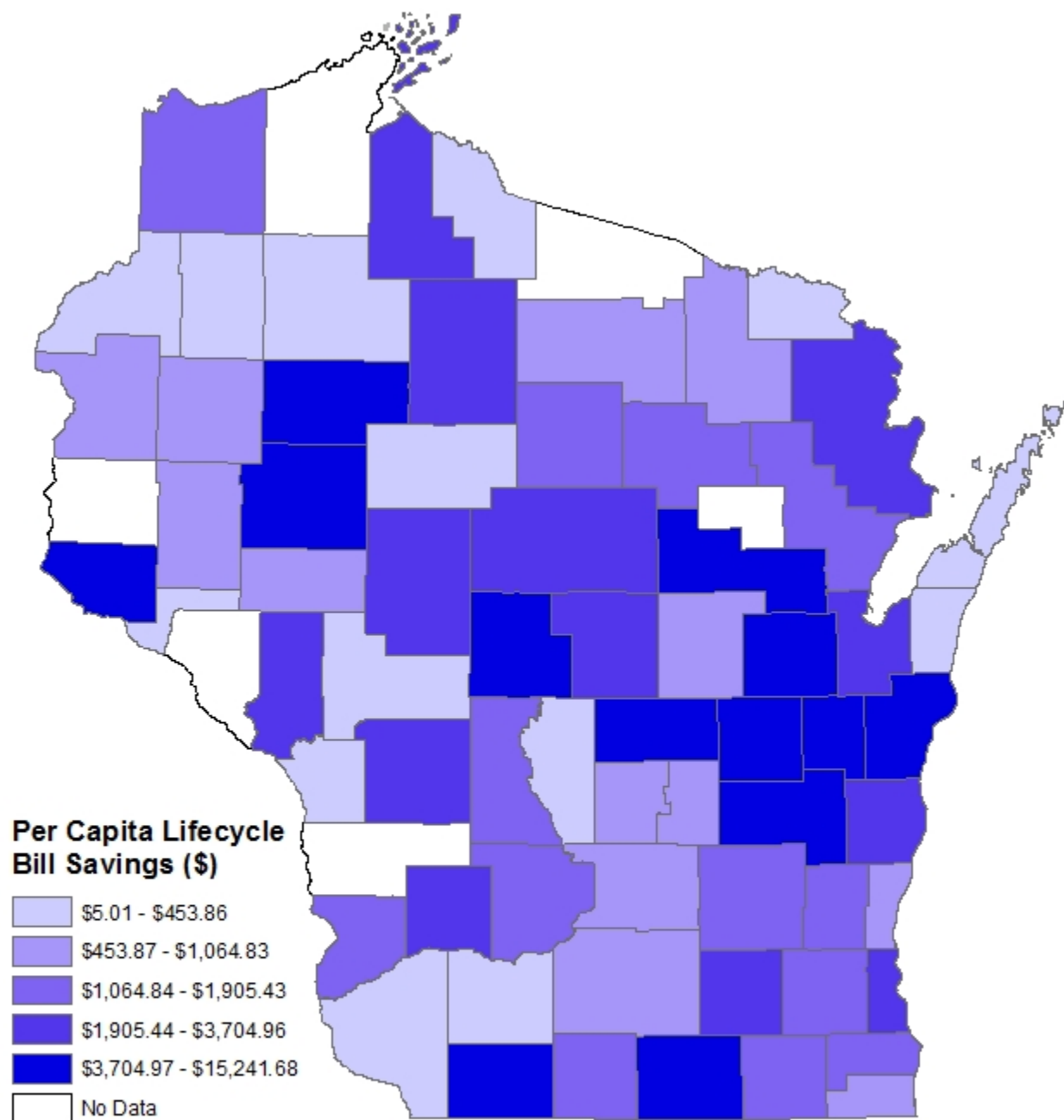


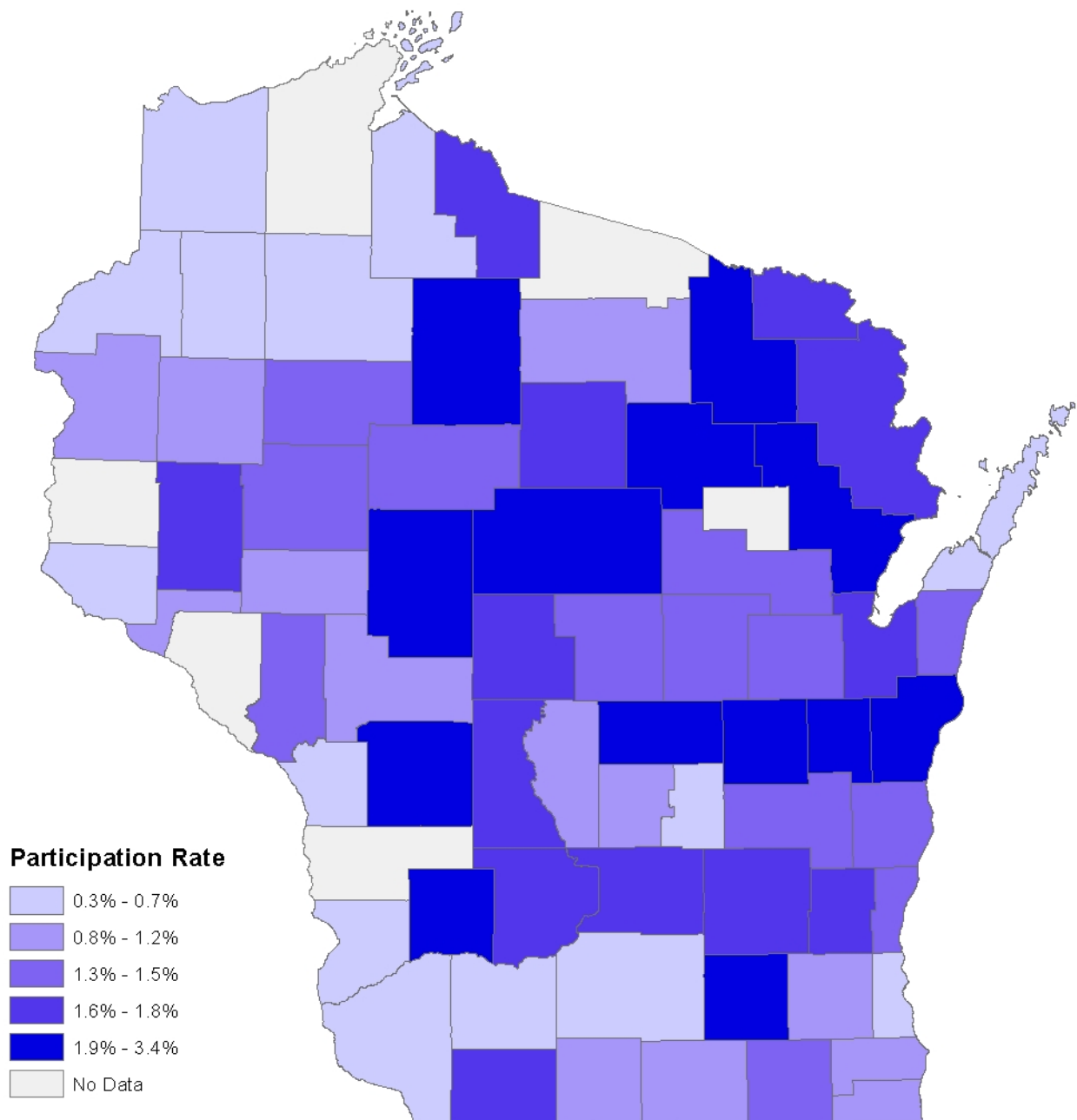
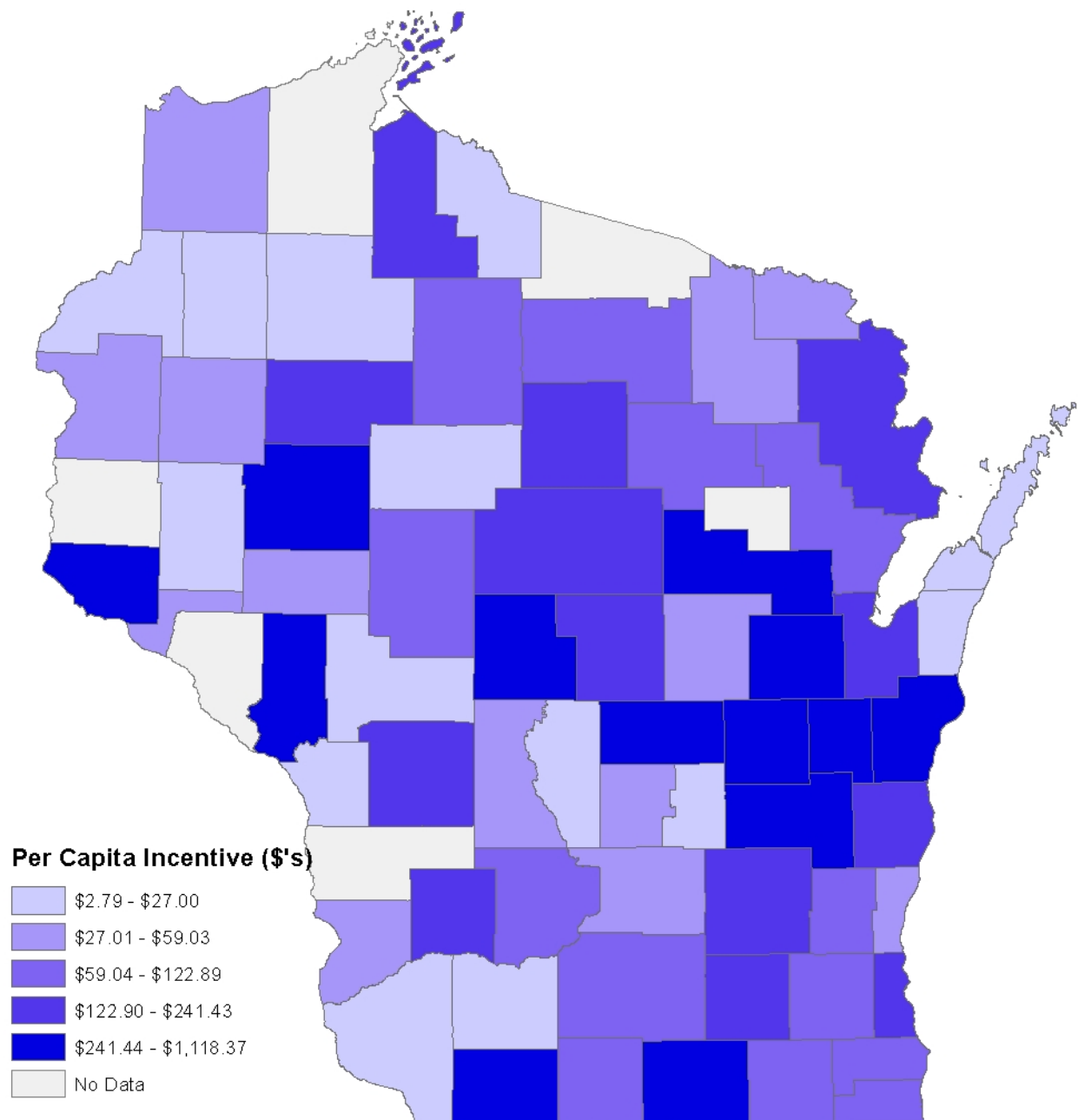
Figure 11. Industrial Participation Rate by County

Figure 12. Industrial Per Capita Incentive Dollars Awarded by County

Commercial

Figure 13. Commercial Per Capita Energy Bill Savings by County

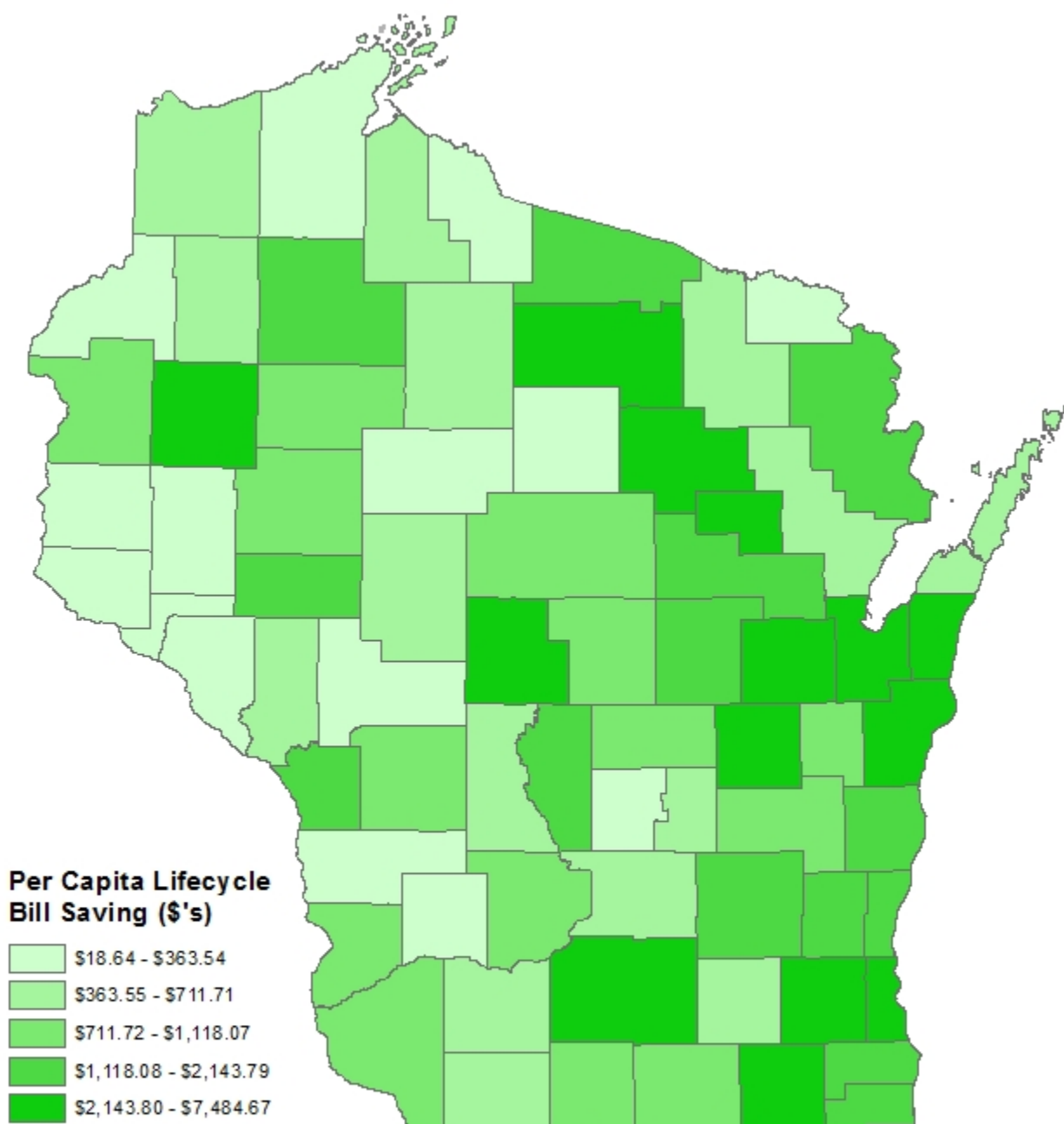


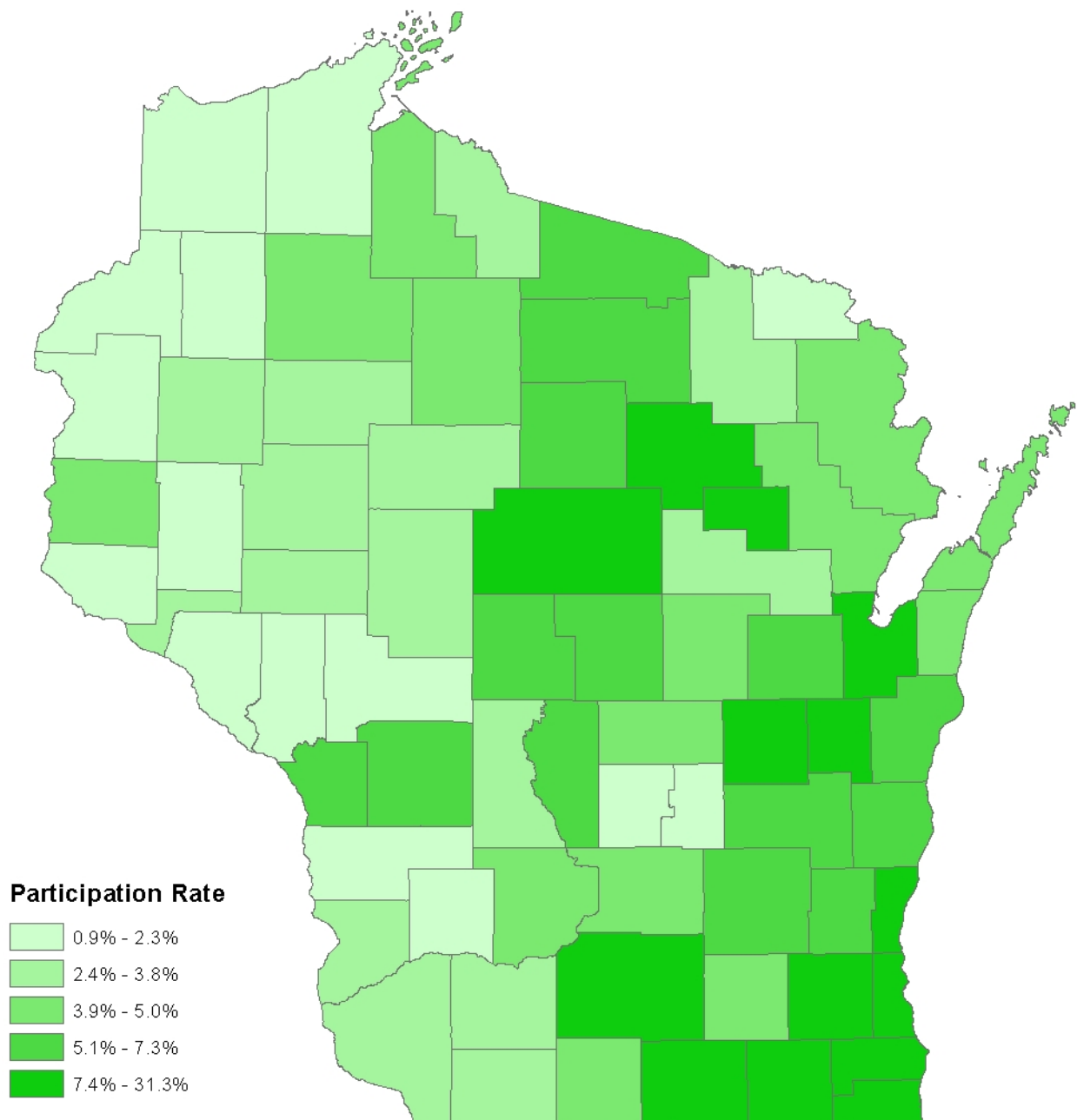
Figure 14. Commercial Participation Rate by County

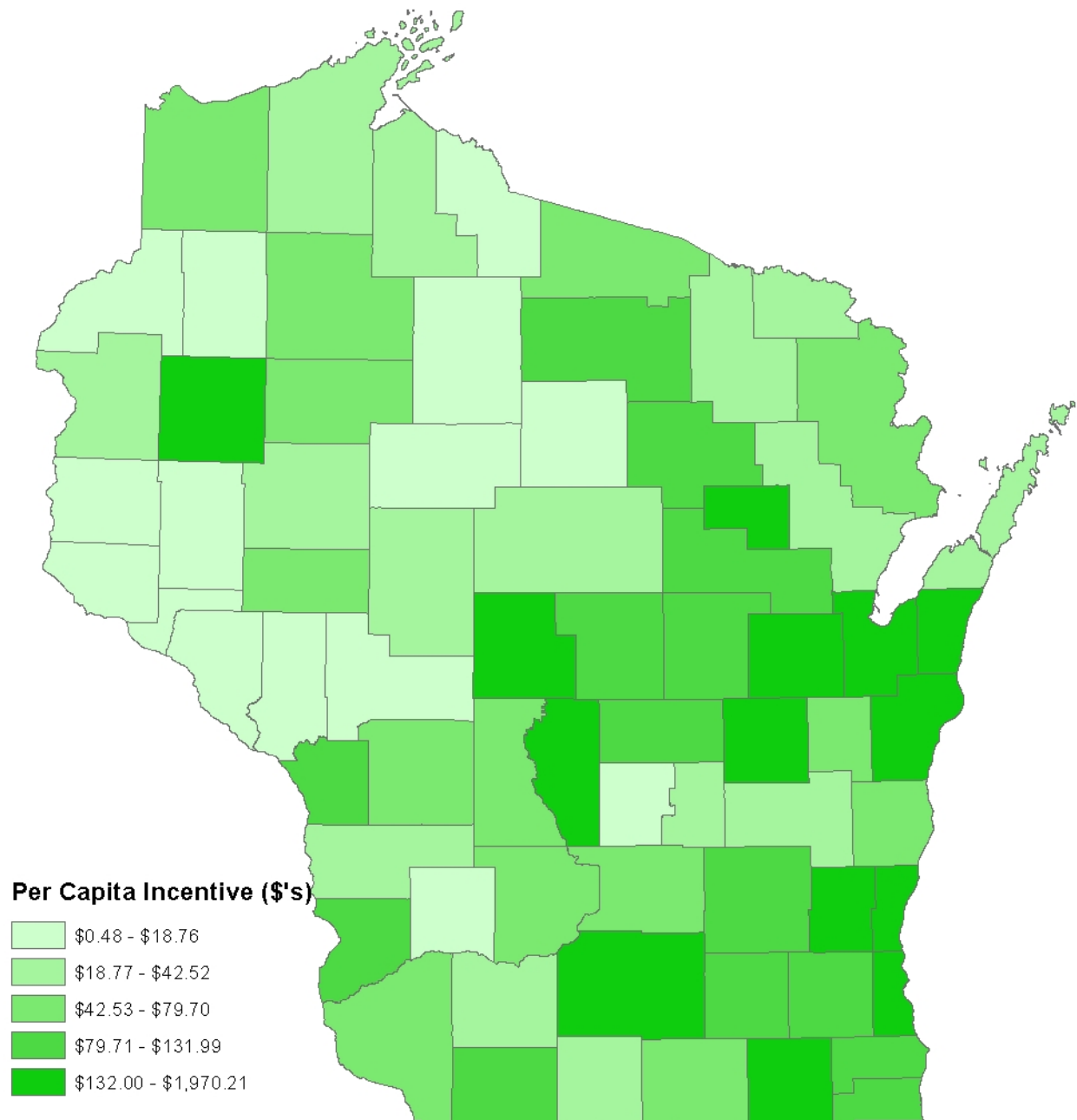
Figure 15. Commercial Per Capita Incentive Dollars Awarded by County

Table 82. Savings and Participation by County and Sector

County	Sector	Per Capita Life Cycle Bill Savings (\$)	Participation Rate (%)	Per Capita Incentive (\$)
ADAMS	Commercial	\$ 1,509.77	6.3%	\$168.35
ASHLAND	Commercial	\$ 416.71	4.1%	\$19.75
BARRON	Commercial	\$ 4,184.91	2.4%	\$273.16
BAYFIELD	Commercial	\$ 363.54	2.3%	\$21.39
BROWN	Commercial	\$ 3,391.52	11.9%	\$231.97
BUFFALO	Commercial	\$ 163.93	0.9%	\$4.46
BURNETT	Commercial	\$ 134.19	1.7%	\$5.86
CALUMET	Commercial	\$ 857.93	7.9%	\$79.70
CHIPPEWA	Commercial	\$ 740.29	2.9%	\$36.98
CLARK	Commercial	\$ 696.18	3.0%	\$28.02
COLUMBIA	Commercial	\$ 599.28	4.2%	\$44.65
CRAWFORD	Commercial	\$ 1,118.07	2.6%	\$83.40
DANE	Commercial	\$ 3,229.53	8.3%	\$172.28
DODGE	Commercial	\$ 1,409.20	5.9%	\$102.35
DOOR	Commercial	\$ 412.51	4.5%	\$25.70
DOUGLAS	Commercial	\$ 537.67	1.8%	\$58.91
DUNN	Commercial	\$ 330.66	2.1%	\$13.92
EAU CLAIRE	Commercial	\$ 1,739.93	3.7%	\$70.79
FLORENCE	Commercial	\$ 122.96	1.3%	\$42.52
FOND DU LAC	Commercial	\$ 777.96	5.7%	\$42.30
FOREST	Commercial	\$ 556.35	3.6%	\$36.61
GRANT	Commercial	\$ 962.39	3.3%	\$45.92
GREEN	Commercial	\$ 763.74	4.4%	\$39.91
GREEN LAKE	Commercial	\$ 427.94	2.0%	\$40.69
IOWA	Commercial	\$ 385.02	3.0%	\$26.97
IRON	Commercial	\$ 225.06	3.6%	\$7.33
JACKSON	Commercial	\$ 48.52	1.3%	\$2.42
JEFFERSON	Commercial	\$ 711.71	4.3%	\$82.57
JUNEAU	Commercial	\$ 651.86	3.7%	\$76.33
KENOSHA	Commercial	\$ 1,490.49	9.9%	\$100.10
KEWAUNEE	Commercial	\$ 7,484.67	4.9%	\$433.81
LA CROSSE	Commercial	\$ 1,518.02	6.6%	\$108.58
LAFAYETTE	Commercial	\$ 671.28	2.5%	\$87.81
LANGLADE	Commercial	\$ 2,505.53	7.4%	\$85.65
LINCOLN	Commercial	\$ 282.62	6.0%	\$15.88
MANITOWOC	Commercial	\$ 4,081.63	6.9%	\$163.52
MARATHON	Commercial	\$ 1,056.43	7.3%	\$41.72
MARINETTE	Commercial	\$ 1,193.50	4.6%	\$43.22
MARQUETTE	Commercial	\$ 231.94	2.0%	\$11.79

County	Sector	Per Capita Life Cycle Bill Savings (\$)	Participation Rate (%)	Per Capita Incentive (\$)
MENOMINEE	Commercial	\$ 4,753.57	31.3%	\$1,970.21
MILWAUKEE	Commercial	\$ 3,066.55	10.0%	\$167.39
MONROE	Commercial	\$ 1,091.65	5.1%	\$64.04
OCONTO	Commercial	\$ 405.64	4.2%	\$38.49
ONEIDA	Commercial	\$ 2,209.68	5.6%	\$104.89
OUTAGAMIE	Commercial	\$ 2,298.65	7.0%	\$160.82
OZAUKEE	Commercial	\$ 1,697.45	11.4%	\$192.45
PEPIN	Commercial	\$ 259.08	2.5%	\$9.09
PIERCE	Commercial	\$ 311.24	1.6%	\$15.11
POLK	Commercial	\$ 872.69	2.0%	\$37.02
PORTAGE	Commercial	\$ 942.22	6.4%	\$117.33
PRICE	Commercial	\$ 704.35	4.0%	\$15.68
RACINE	Commercial	\$ 2,143.79	8.0%	\$121.80
RICHLAND	Commercial	\$ 139.02	2.1%	\$6.52
ROCK	Commercial	\$ 1,050.74	10.5%	\$64.85
RUSK	Commercial	\$ 776.63	2.8%	\$74.43
SAUK	Commercial	\$ 840.96	3.9%	\$51.95
SAWYER	Commercial	\$ 1,614.73	3.8%	\$67.37
SHAWANO	Commercial	\$ 1,140.83	3.8%	\$81.37
SHEBOYGAN	Commercial	\$ 2,067.11	6.9%	\$64.00
ST. CROIX	Commercial	\$ 18.64	4.5%	\$0.48
TAYLOR	Commercial	\$ 293.78	2.7%	\$11.90
TREMPEALEAU	Commercial	\$ 413.58	1.1%	\$18.76
VERNON	Commercial	\$ 356.02	1.5%	\$19.74
VILAS	Commercial	\$ 1,206.89	7.3%	\$44.85
WALWORTH	Commercial	\$ 2,248.68	7.9%	\$352.56
WASHBURN	Commercial	\$ 456.07	1.8%	\$15.46
WASHINGTON	Commercial	\$ 1,637.22	7.2%	\$143.10
WAUKESHA	Commercial	\$ 2,409.94	9.5%	\$131.99
WAUPACA	Commercial	\$ 1,230.63	5.0%	\$112.85
WAUSHARA	Commercial	\$ 857.90	4.7%	\$102.66
WINNEBAGO	Commercial	\$ 3,344.42	7.3%	\$147.86
WOOD	Commercial	\$ 3,700.77	7.2%	\$161.98
ADAMS	Industrial	\$ 5.01	1.0%	\$2.79
ASHLAND	Industrial	\$ 3,375.29	0.7%	\$241.43
BARRON	Industrial	\$ 582.40	0.8%	\$27.96
BROWN	Industrial	\$ 3,565.39	1.7%	\$224.83
BURNETT	Industrial	\$ 331.56	0.4%	\$9.67
CALUMET	Industrial	\$ 4,661.01	2.0%	\$324.11
CHIPPEWA	Industrial	\$ 6,800.64	1.5%	\$519.88

County	Sector	Per Capita Life Cycle Bill Savings (\$)	Participation Rate (%)	Per Capita Incentive (\$)
CLARK	Industrial	\$ 2,530.16	2.2%	\$90.22
COLUMBIA	Industrial	\$ 852.19	1.5%	\$51.34
CRAWFORD	Industrial	\$ 1,769.52	0.5%	\$54.86
DANE	Industrial	\$ 716.27	0.5%	\$59.31
DODGE	Industrial	\$ 1,729.08	1.8%	\$123.02
DOOR	Industrial	\$ 227.15	0.4%	\$11.51
DOUGLAS	Industrial	\$ 1,905.43	0.7%	\$59.03
DUNN	Industrial	\$ 460.86	1.6%	\$27.00
EAU CLAIRE	Industrial	\$ 1,040.47	0.9%	\$53.84
FLORENCE	Industrial	\$ 453.86	1.8%	\$33.54
FOND DU LAC	Industrial	\$ 9,218.21	1.4%	\$523.79
FOREST	Industrial	\$ 808.50	1.9%	\$39.51
GRANT	Industrial	\$ 242.80	0.4%	\$12.49
GREEN	Industrial	\$ 1,664.74	1.1%	\$81.78
GREEN LAKE	Industrial	\$ 566.02	0.6%	\$26.77
IOWA	Industrial	\$ 169.65	0.3%	\$3.57
IRON	Industrial	\$ 74.43	1.7%	\$3.57
JACKSON	Industrial	\$ 450.03	1.0%	\$14.98
JEFFERSON	Industrial	\$ 2,487.95	1.9%	\$190.62
JUNEAU	Industrial	\$ 1,135.68	1.6%	\$56.83
KENOSHA	Industrial	\$ 1,064.83	0.9%	\$60.51
KEWAUNEE	Industrial	\$ 311.49	1.3%	\$14.36
LA CROSSE	Industrial	\$ 404.01	0.6%	\$23.54
LAFAYETTE	Industrial	\$ 4,230.45	1.5%	\$1,118.37
LANGLADE	Industrial	\$ 1,782.51	2.0%	\$104.01
LINCOLN	Industrial	\$ 1,850.82	1.8%	\$144.15
MANITOWOC	Industrial	\$ 3,852.20	3.0%	\$271.27
MARATHON	Industrial	\$ 2,282.00	2.3%	\$139.49
MARINETTE	Industrial	\$ 3,646.51	1.8%	\$162.11
MARQUETTE	Industrial	\$ 570.57	1.0%	\$32.21
MILWAUKEE	Industrial	\$ 2,096.68	0.6%	\$127.71
MONROE	Industrial	\$ 2,945.33	2.4%	\$180.53
OCONTO	Industrial	\$ 1,691.22	2.1%	\$85.52
ONEIDA	Industrial	\$ 879.63	0.8%	\$102.50
OUTAGAMIE	Industrial	\$ 5,849.31	1.4%	\$370.20
OZAUKEE	Industrial	\$ 655.41	1.2%	\$53.83
PEPIN	Industrial	\$ 373.47	0.9%	\$37.77
PIERCE	Industrial	\$ 7,948.70	0.6%	\$453.47
POLK	Industrial	\$ 581.05	0.8%	\$28.85
PORTAGE	Industrial	\$ 2,169.29	1.4%	\$239.22

County	Sector	Per Capita Life Cycle Bill Savings (\$)	Participation Rate (%)	Per Capita Incentive (\$)
PRICE	Industrial	\$ 3,704.96	3.4%	\$93.58
RACINE	Industrial	\$ 1,291.21	1.1%	\$82.99
RICHLAND	Industrial	\$ 2,733.03	1.9%	\$123.44
ROCK	Industrial	\$ 4,574.37	1.2%	\$436.21
RUSK	Industrial	\$ 3,811.57	1.2%	\$161.93
SAUK	Industrial	\$ 1,178.26	1.6%	\$106.71
SAWYER	Industrial	\$ 364.97	0.3%	\$17.19
SHAWANO	Industrial	\$ 7,704.26	1.3%	\$488.70
SHEBOYGAN	Industrial	\$ 2,930.32	1.2%	\$175.59
TAYLOR	Industrial	\$ 377.47	1.2%	\$11.87
TREMPEALEAU	Industrial	\$ 2,989.54	1.3%	\$361.10
WALWORTH	Industrial	\$ 1,901.65	1.3%	\$122.89
WASHBURN	Industrial	\$ 122.88	0.6%	\$6.31
WASHINGTON	Industrial	\$ 1,191.02	1.8%	\$82.47
WAUKESHA	Industrial	\$ 1,791.00	1.0%	\$70.33
WAUPACA	Industrial	\$ 868.78	1.5%	\$39.73
WAUSHARA	Industrial	\$ 5,198.56	1.8%	\$261.90
WINNEBAGO	Industrial	\$ 8,160.59	2.6%	\$418.92
WOOD	Industrial	\$ 15,241.68	1.6%	\$477.49
ADAMS	Residential	\$ 31.85	6.4%	\$1.89
ASHLAND	Residential	\$ 41.78	4.9%	\$2.61
BARRON	Residential	\$ 18.74	2.7%	\$2.45
BAYFIELD	Residential	\$ 49.81	3.0%	\$14.16
BROWN	Residential	\$ 136.87	7.8%	\$7.08
BUFFALO	Residential	\$ 22.73	4.2%	\$1.56
BURNETT	Residential	\$ 14.17	2.8%	\$1.62
CALUMET	Residential	\$ 109.02	6.8%	\$9.58
CHIPPEWA	Residential	\$ 60.00	3.8%	\$5.05
CLARK	Residential	\$ 34.38	5.0%	\$2.70
COLUMBIA	Residential	\$ 47.67	7.2%	\$3.63
CRAWFORD	Residential	\$ 51.78	5.9%	\$6.07
DANE	Residential	\$ 124.00	8.9%	\$9.38
DODGE	Residential	\$ 68.36	8.5%	\$5.46
DOOR	Residential	\$ 76.85	6.8%	\$7.75
DOUGLAS	Residential	\$ 33.76	1.3%	\$3.31
DUNN	Residential	\$ 57.40	4.6%	\$5.02
EAU CLAIRE	Residential	\$ 128.65	4.3%	\$10.60
FLORENCE	Residential	\$ 19.73	1.5%	\$4.37
FOND DU LAC	Residential	\$ 67.91	7.9%	\$5.32
FOREST	Residential	\$ 31.57	5.4%	\$1.50

County	Sector	Per Capita Life Cycle Bill Savings (\$)	Participation Rate (%)	Per Capita Incentive (\$)
GRANT	Residential	\$ 36.13	4.6%	\$5.24
GREEN	Residential	\$ 59.30	10.1%	\$2.98
GREEN LAKE	Residential	\$ 41.26	7.0%	\$2.60
IOWA	Residential	\$ 45.26	8.9%	\$4.73
IRON	Residential	\$ 21.64	3.7%	\$0.96
JACKSON	Residential	\$ 29.23	3.7%	\$3.39
JEFFERSON	Residential	\$ 64.27	5.6%	\$5.06
JUNEAU	Residential	\$ 39.98	5.5%	\$6.49
KENOSHA	Residential	\$ 57.12	7.2%	\$4.95
KEWAUNEE	Residential	\$ 61.60	8.0%	\$2.53
LA CROSSE	Residential	\$ 71.30	6.7%	\$7.20
LAFAYETTE	Residential	\$ 37.09	4.6%	\$4.91
LANGLADE	Residential	\$ 47.11	8.5%	\$6.62
LINCOLN	Residential	\$ 70.65	9.2%	\$3.96
MANITOWOC	Residential	\$ 73.66	6.6%	\$4.58
MARATHON	Residential	\$ 72.79	8.4%	\$5.10
MARINETTE	Residential	\$ 65.66	5.4%	\$4.78
MARQUETTE	Residential	\$ 29.99	4.9%	\$2.62
MENOMINEE	Residential	\$ 18.87	4.0%	\$1.10
MILWAUKEE	Residential	\$ 67.13	6.1%	\$6.61
MONROE	Residential	\$ 31.81	5.0%	\$3.46
OCONTO	Residential	\$ 74.58	6.9%	\$4.06
ONEIDA	Residential	\$ 71.99	5.4%	\$7.26
OUTAGAMIE	Residential	\$ 85.76	6.2%	\$7.03
OZAUKEE	Residential	\$ 123.92	14.3%	\$8.82
PEPIN	Residential	\$ 38.65	8.2%	\$1.70
PIERCE	Residential	\$ 41.44	3.8%	\$6.99
POLK	Residential	\$ 42.51	3.7%	\$3.01
PORTAGE	Residential	\$ 90.33	7.2%	\$6.89
PRICE	Residential	\$ 41.73	9.5%	\$2.06
RACINE	Residential	\$ 51.48	6.6%	\$4.04
RICHLAND	Residential	\$ 59.57	8.3%	\$7.46
ROCK	Residential	\$ 84.01	11.9%	\$6.85
RUSK	Residential	\$ 32.87	5.7%	\$1.90
SAUK	Residential	\$ 63.86	7.1%	\$7.09
SAWYER	Residential	\$ 14.08	2.7%	\$1.27
SHAWANO	Residential	\$ 35.60	5.6%	\$3.33
SHEBOYGAN	Residential	\$ 60.70	6.8%	\$6.18
ST. CROIX	Residential	\$ 11.86	3.7%	\$0.31
TAYLOR	Residential	\$ 38.61	7.5%	\$3.02

County	Sector	Per Capita Life Cycle Bill Savings (\$)	Participation Rate (%)	Per Capita Incentive (\$)
TREMPEALEAU	Residential	\$ 28.24	3.6%	\$2.26
VERNON	Residential	\$ 58.89	4.2%	\$11.58
VILAS	Residential	\$ 60.90	7.5%	\$5.08
WALWORTH	Residential	\$ 47.86	8.0%	\$3.36
WASHBURN	Residential	\$ 19.49	3.5%	\$2.10
WASHINGTON	Residential	\$ 79.71	7.6%	\$6.59
WAUKESHA	Residential	\$ 104.67	10.0%	\$6.72
WAUPACA	Residential	\$ 65.88	7.8%	\$9.82
WAUSHARA	Residential	\$ 43.43	6.5%	\$4.56
WINNEBAGO	Residential	\$ 65.93	4.9%	\$6.31
WOOD	Residential	\$ 64.55	7.7%	\$5.74

APPENDIX J. SUMMARY OF FINDINGS BY POLITICAL DISTRICT

The maps in this appendix summarize the evaluation findings by Assembly District and Senate District in the Residential, Commercial, and Industrial sectors.

Savings by Sector, by Assembly District

The following section includes eighteen maps based on the results of the 2011 evaluation: three Assembly District and three Senate District maps (total lifetime bill savings, total 2011 participation, and total incentive paid in 2011) for three primary sectors (residential, industrial, and commercial). Commercial maps include commercial, schools, government, and agricultural entities.

Due to recent redistricting efforts and time constraints on evaluation activities, the three key parameters for the Assembly and Senate Districts are all defined on a total and not per capita basis. Similar to the 2010 evaluation report, the bill savings are defined as evaluated lifecycle verified gross energy savings multiplied by the retail rate of delivered energy in 2011. The participation is defined as total participation within each Assembly / Senate District. The incentives are defined as total incentives within each Assembly / Senate District.

Residential

Figure 16. Residential Energy Bill Savings by Assembly District

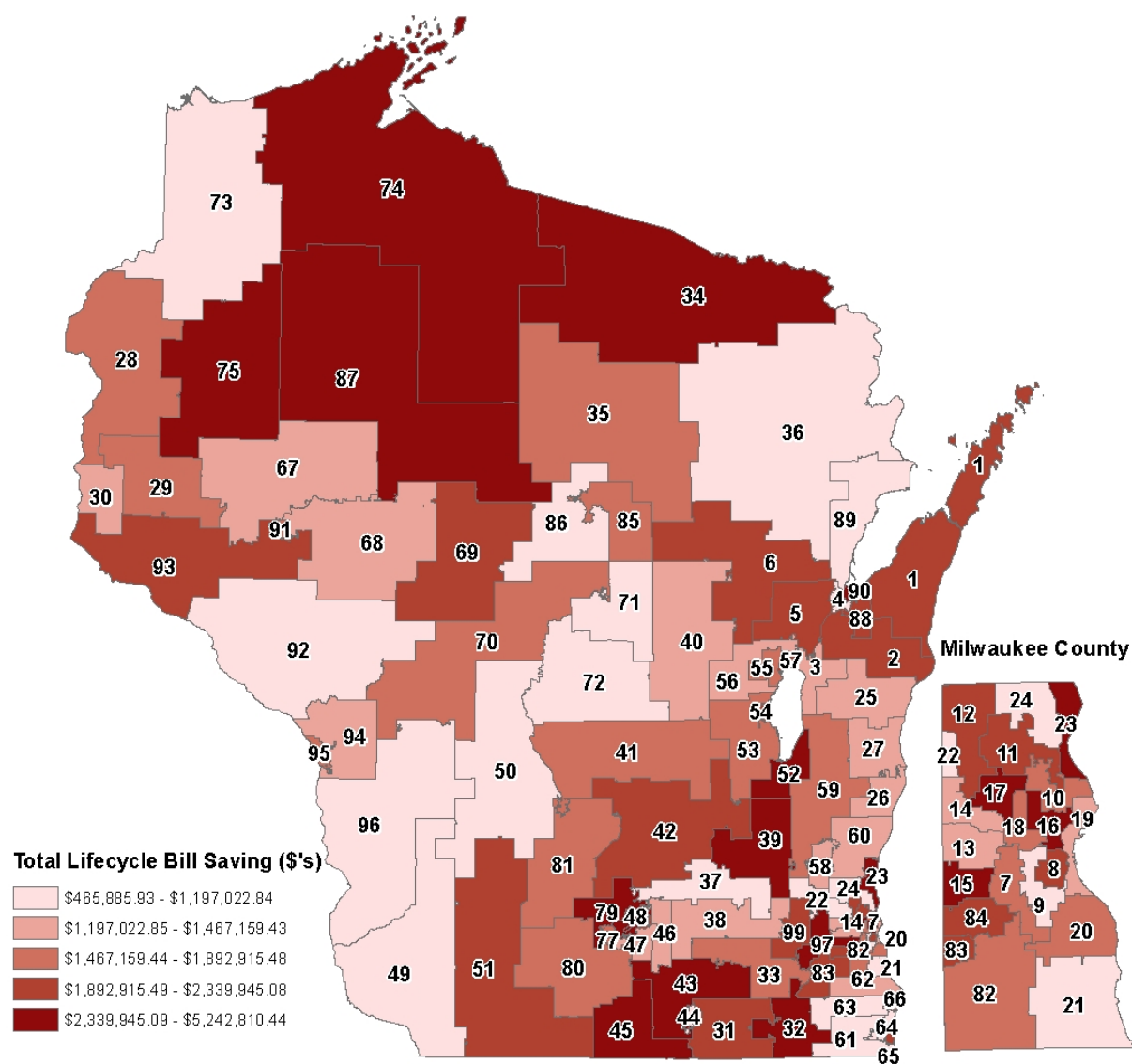


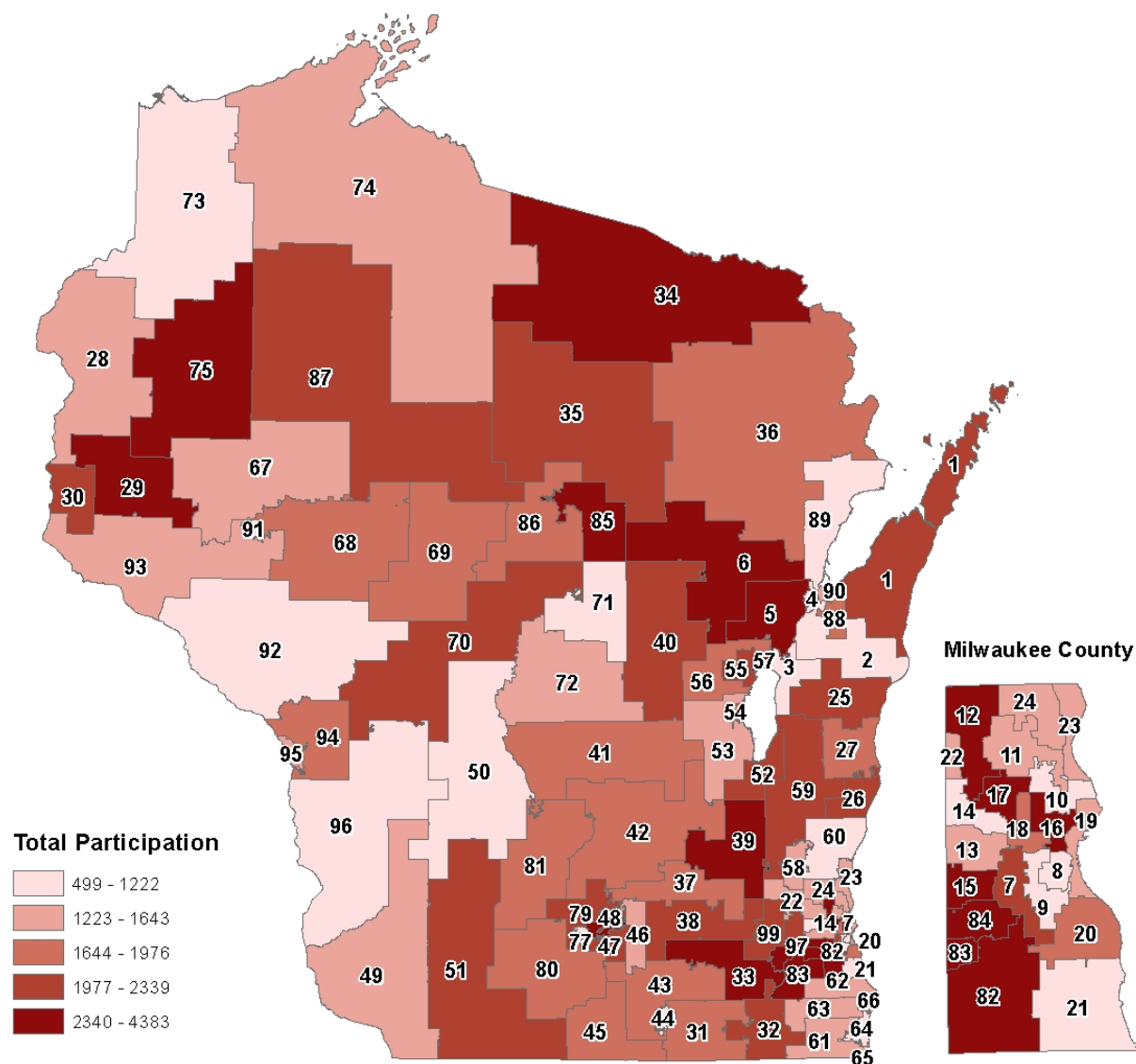
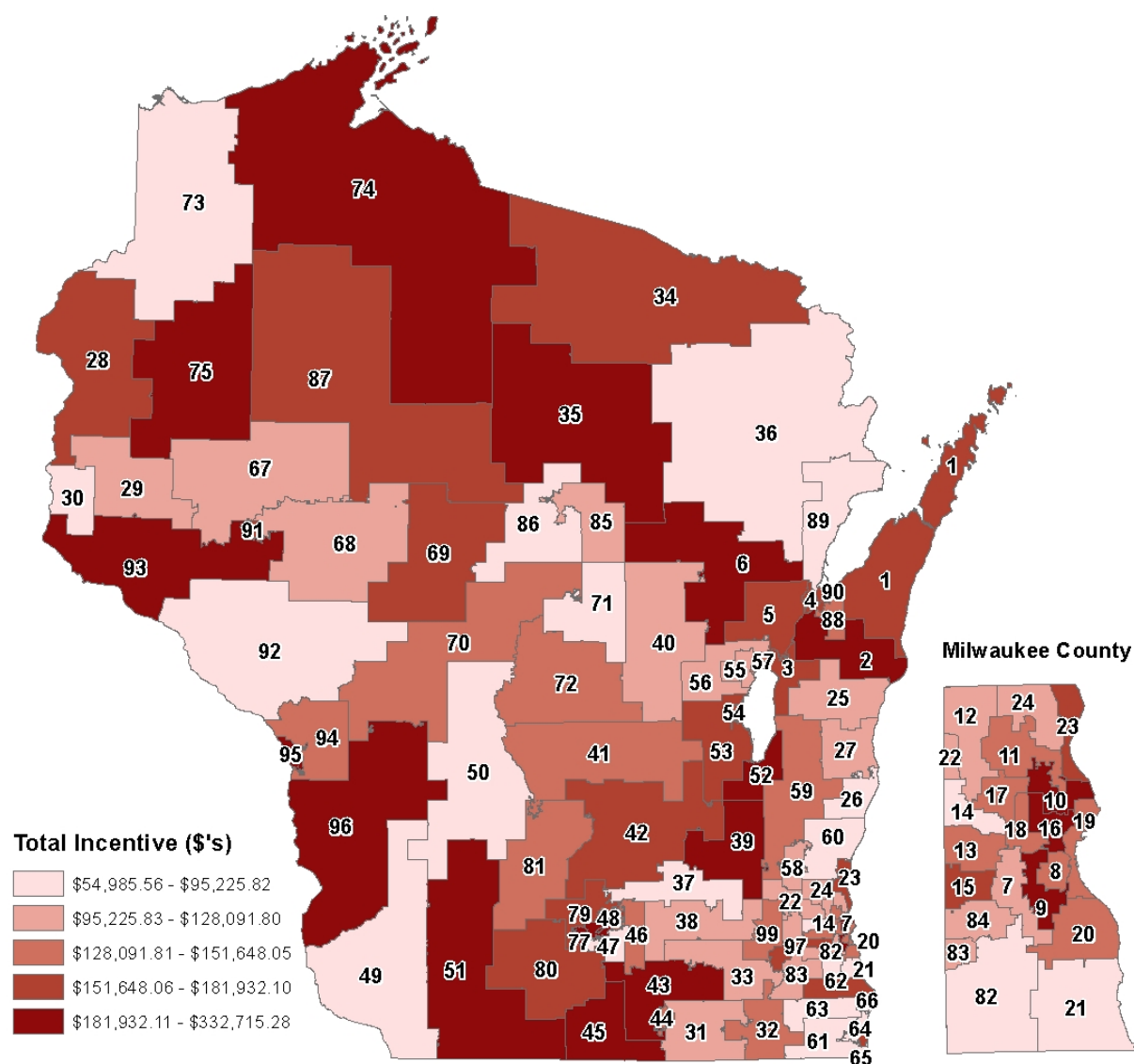
Figure 17. Residential Participation by Assembly District

Figure 18. Residential Incentive Dollars Awarded by Assembly District

Industrial

Figure 19. Industrial Energy Bill Savings by Assembly District

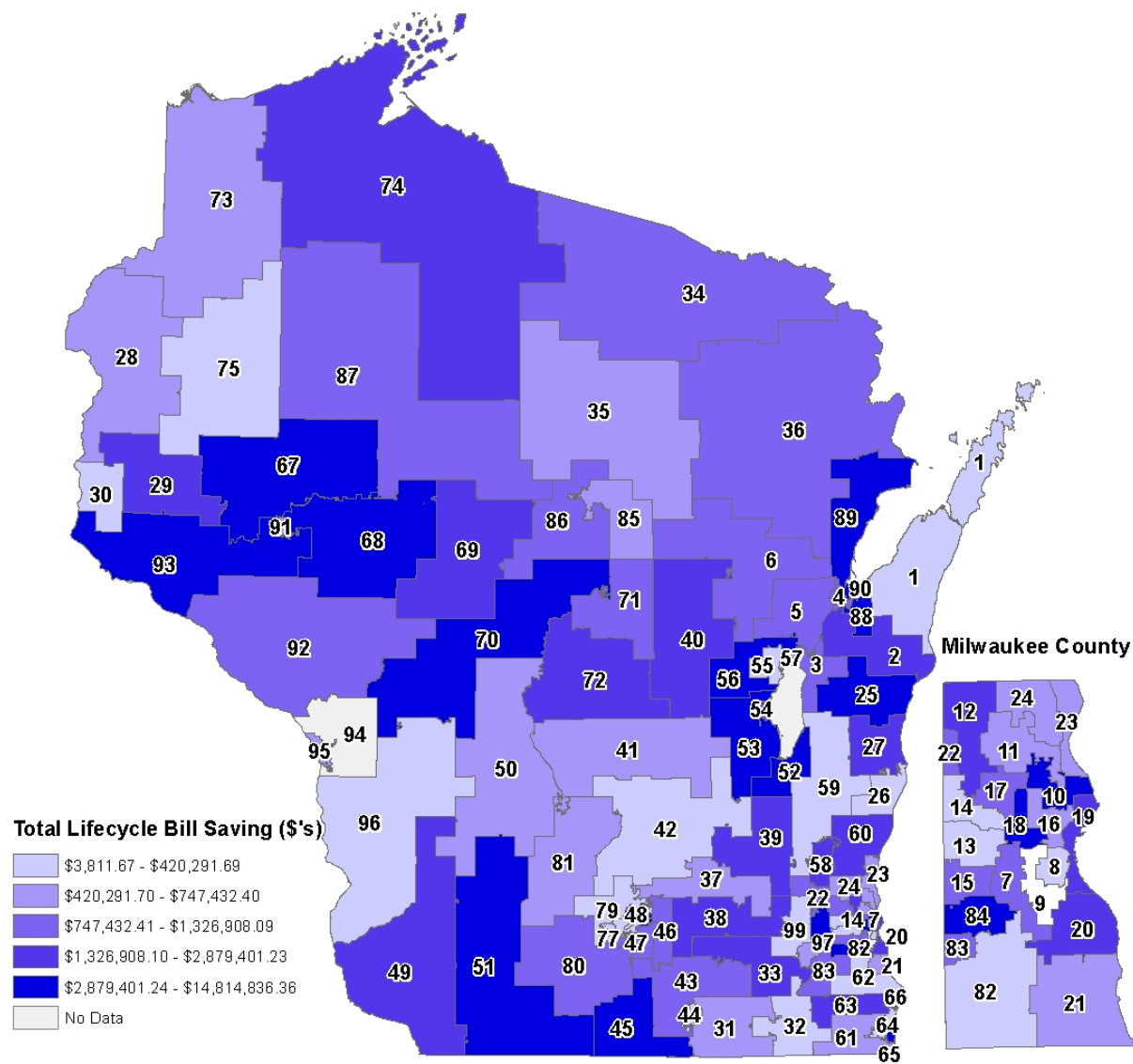


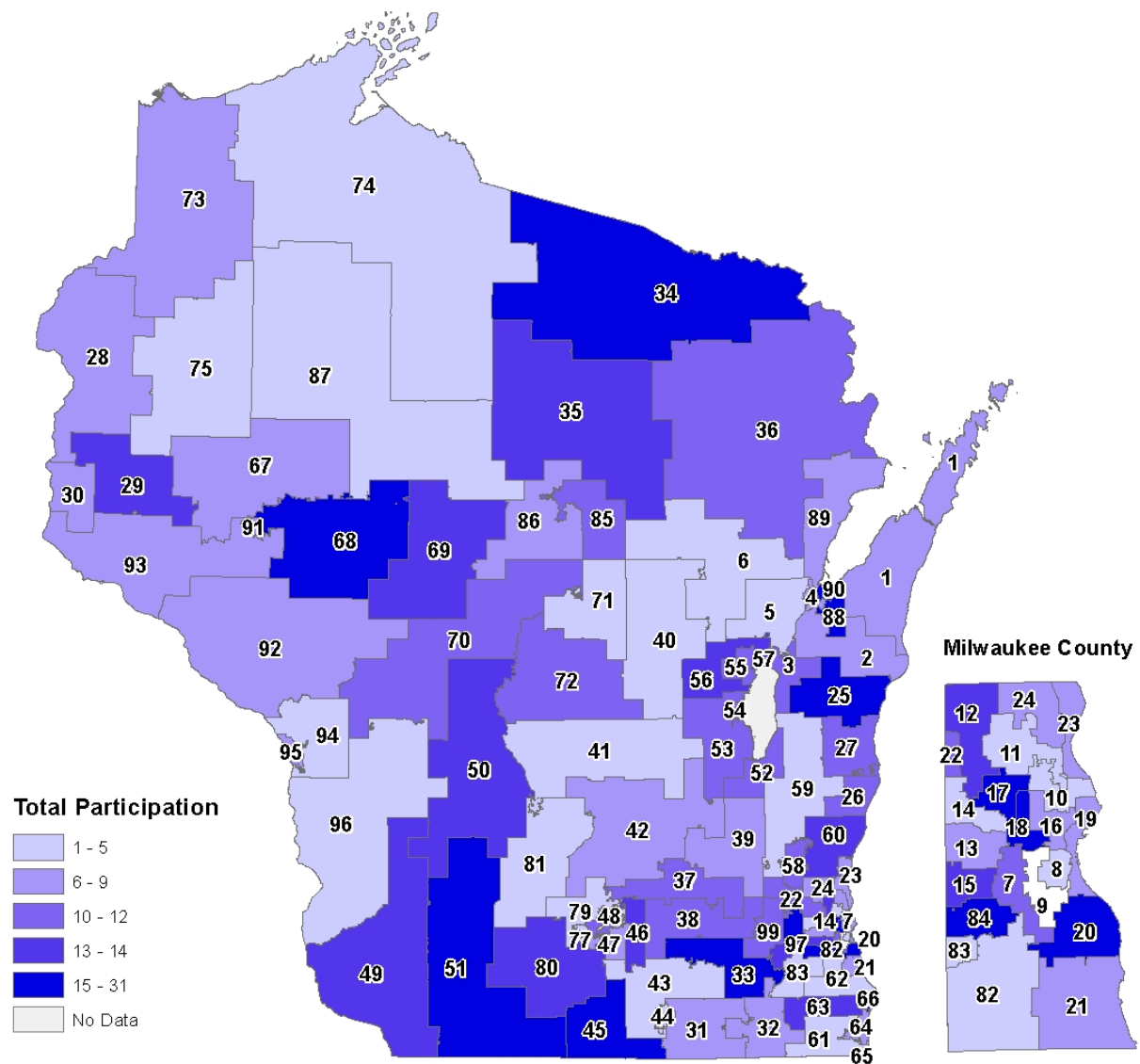
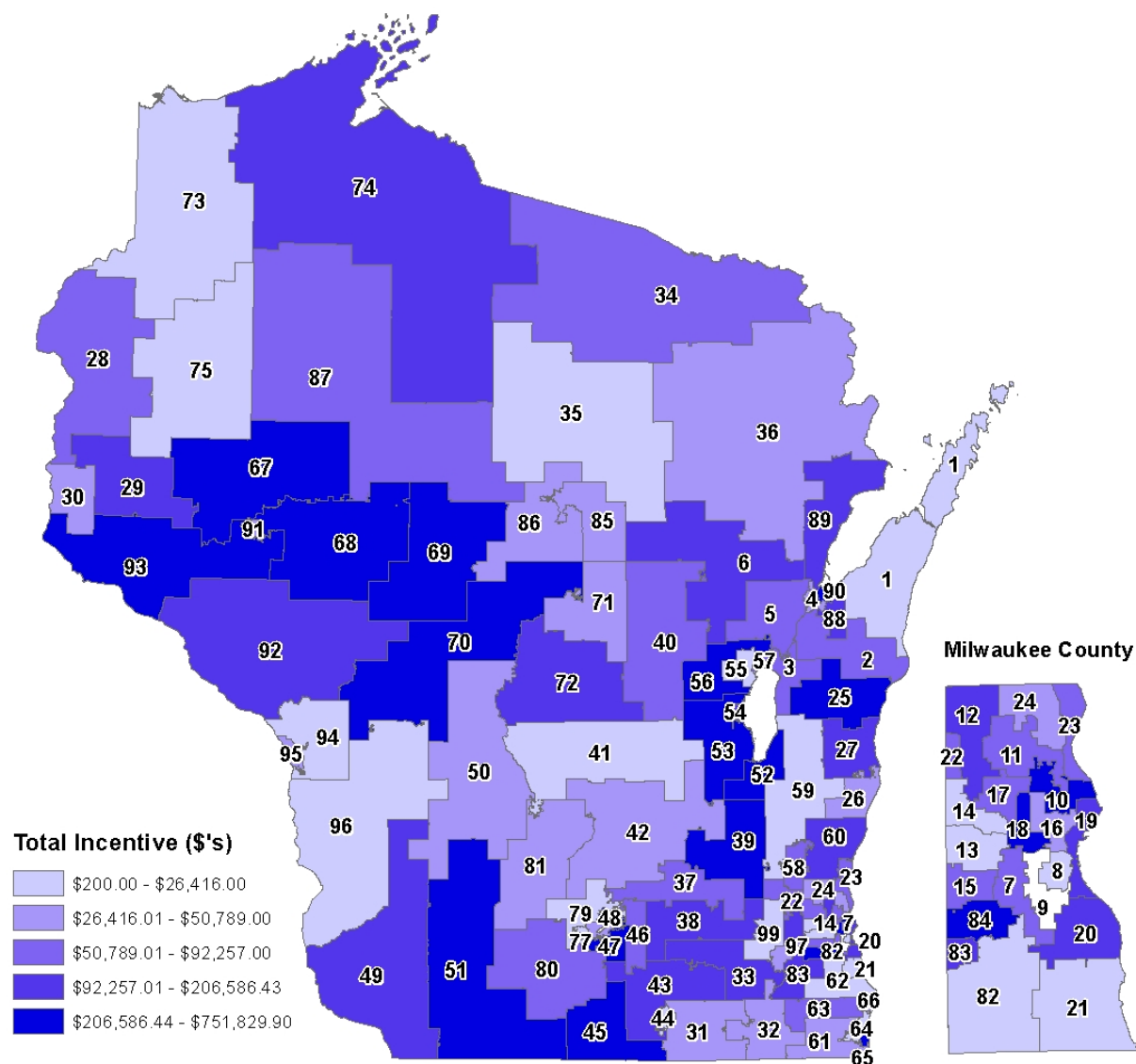
Figure 20. Industrial Participation by Assembly District

Figure 21. Industrial Incentive Dollars Awarded by Assembly District

Commercial

Figure 22. Commercial Energy Bill Savings by Assembly District

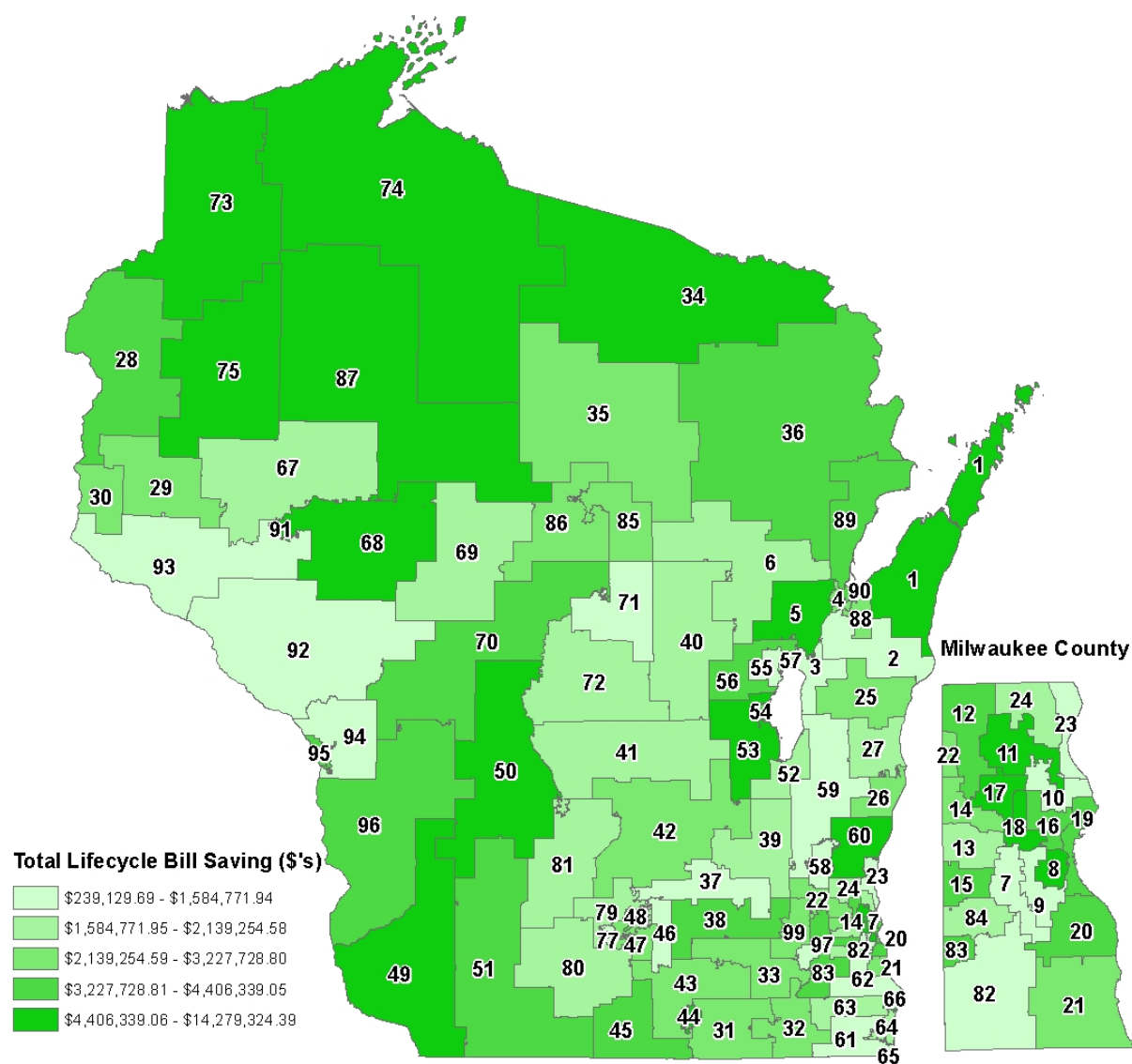


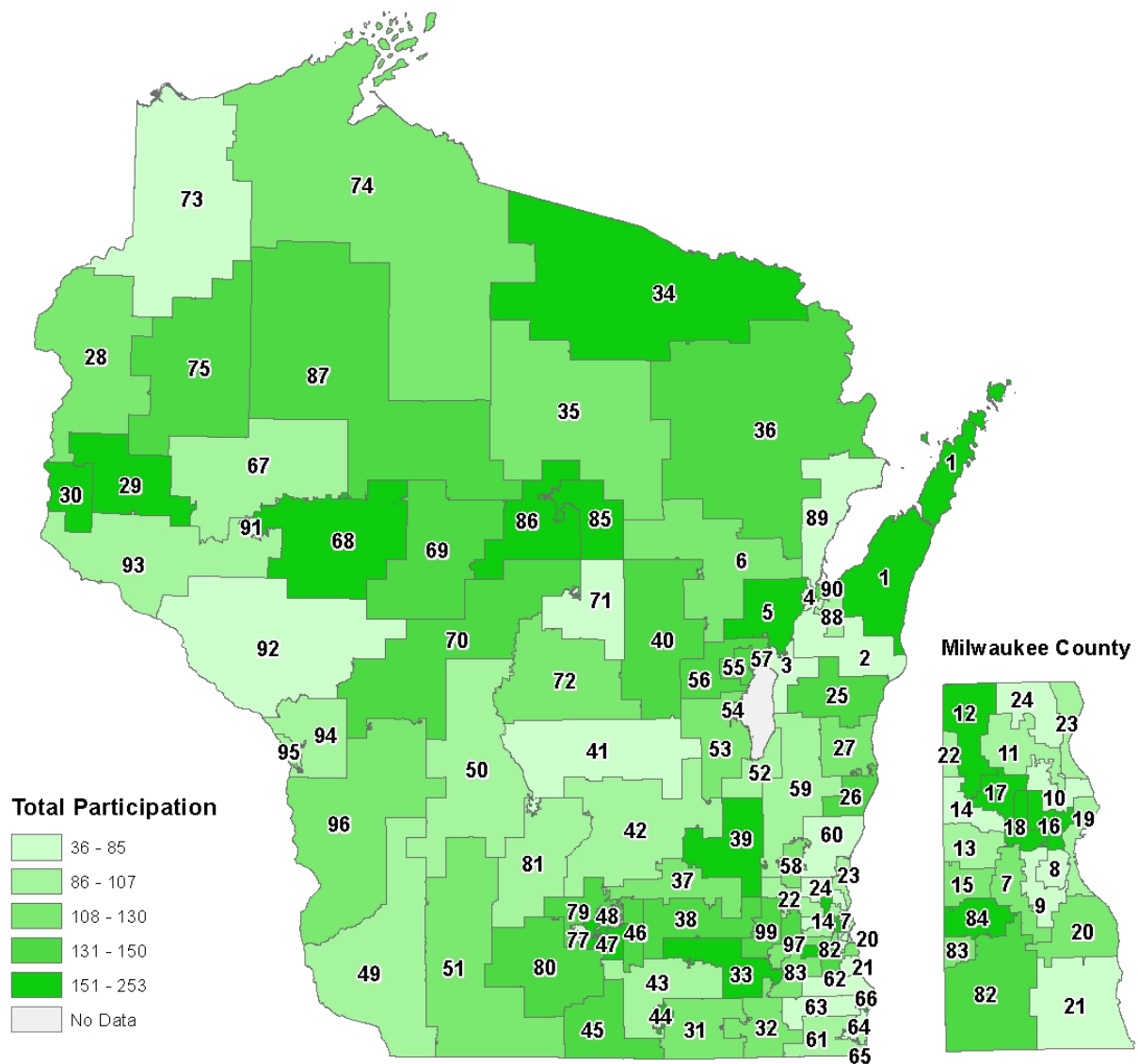
Figure 23. Commercial Participation by Assembly District

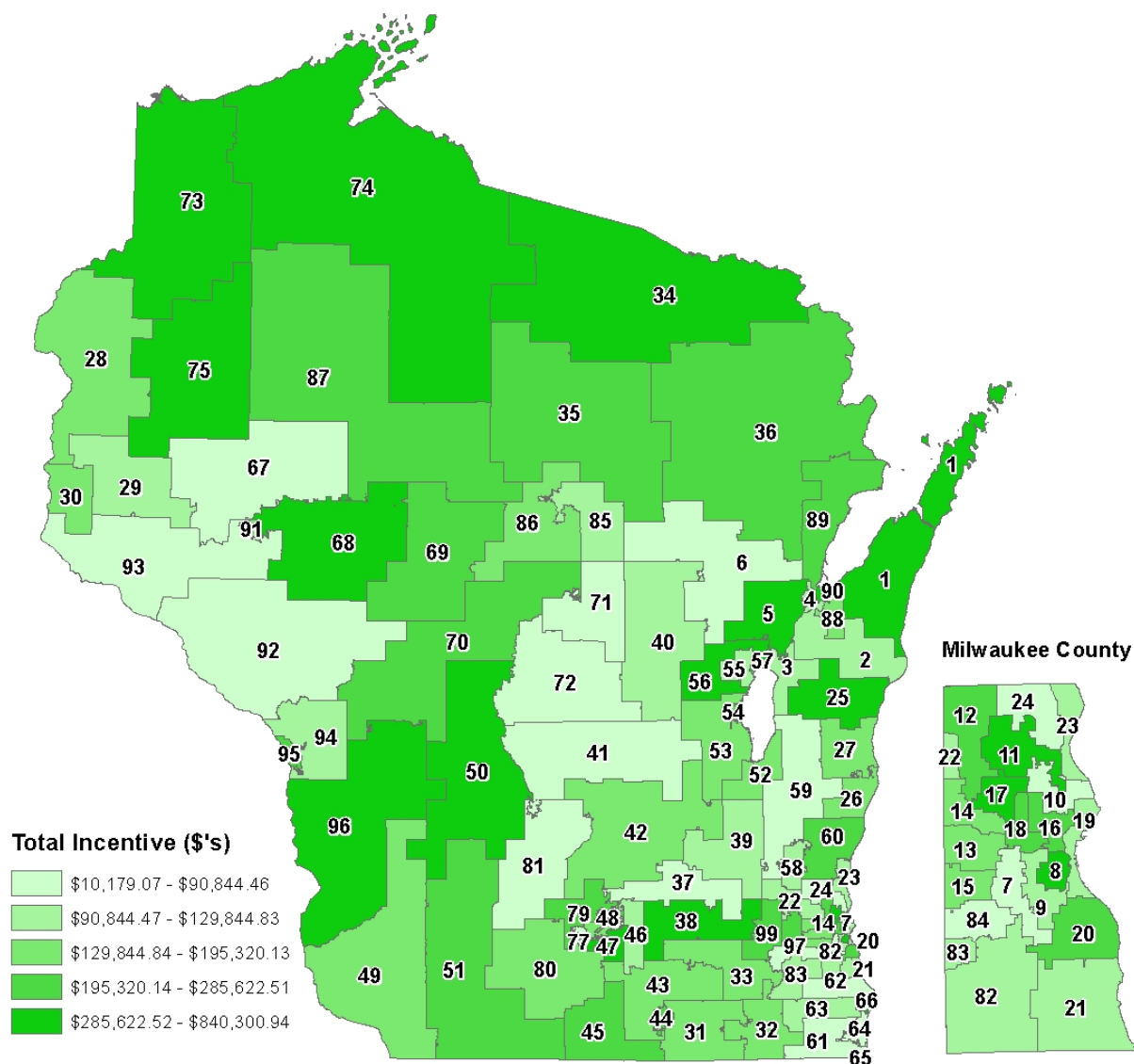
Figure 24. Commercial Incentive Dollars Awarded by Assembly District

Table 83 presents savings and participation by Assembly District and sector.

Table 83. Savings and Participation by Assembly District and Sector

Assembly District	Sector	Life Cycle Bill Savings (\$)	Participation	Incentive (\$)
1	Commercial	\$12,324,519	194	\$715,841
2	Commercial	\$924,437	66	\$120,392
3	Commercial	\$891,916	77	\$91,743
4	Commercial	\$2,749,171	72	\$113,668
5	Commercial	\$5,046,507	168	\$369,962
6	Commercial	\$1,830,266	119	\$85,261
7	Commercial	\$1,523,919	128	\$31,418
8	Commercial	\$5,712,770	72	\$333,398
9	Commercial	\$1,165,798	67	\$129,482
10	Commercial	\$299,606	66	\$13,096
11	Commercial	\$10,689,527	102	\$429,372
12	Commercial	\$4,406,339	165	\$268,959
13	Commercial	\$1,803,450	98	\$141,139
14	Commercial	\$2,903,232	55	\$162,089
15	Commercial	\$3,653,171	115	\$148,958
16	Commercial	\$3,304,434	238	\$255,768
17	Commercial	\$5,609,986	161	\$297,485
18	Commercial	\$10,527,832	150	\$281,847
19	Commercial	\$4,022,266	94	\$109,477
20	Commercial	\$3,707,438	119	\$277,754
21	Commercial	\$2,680,421	72	\$111,469
22	Commercial	\$2,324,891	88	\$109,163
23	Commercial	\$1,580,007	100	\$92,143
24	Commercial	\$1,962,227	76	\$65,117
25	Commercial	\$2,972,896	138	\$779,514
26	Commercial	\$2,778,559	148	\$136,047
27	Commercial	\$1,760,278	116	\$193,383
28	Commercial	\$3,303,813	124	\$160,459
29	Commercial	\$3,073,724	182	\$115,304
30	Commercial	\$2,631,053	160	\$193,382
31	Commercial	\$2,209,914	122	\$177,601
32	Commercial	\$2,561,050	128	\$187,170
33	Commercial	\$2,437,971	161	\$155,584
34	Commercial	\$5,680,818	201	\$355,417
35	Commercial	\$2,747,248	128	\$253,375
36	Commercial	\$3,455,783	143	\$282,892
37	Commercial	\$1,424,257	128	\$90,185
38	Commercial	\$3,367,964	132	\$308,030

Assembly District	Sector	Life Cycle Bill Savings (\$)	Participation	Incentive (\$)
39	Commercial	\$2,091,999	192	\$129,797
40	Commercial	\$2,024,236	145	\$93,098
41	Commercial	\$1,904,057	79	\$72,587
42	Commercial	\$2,272,183	107	\$193,605
43	Commercial	\$2,528,292	93	\$144,492
44	Commercial	\$4,732,092	170	\$225,616
45	Commercial	\$3,777,547	132	\$269,848
46	Commercial	\$1,551,664	134	\$129,845
47	Commercial	\$2,693,310	195	\$309,997
48	Commercial	\$1,704,837	116	\$92,100
49	Commercial	\$4,704,700	91	\$195,320
50	Commercial	\$5,657,869	94	\$308,586
51	Commercial	\$3,948,515	130	\$261,473
52	Commercial	\$1,864,413	94	\$147,478
53	Commercial	\$4,711,443	122	\$192,119
54	Commercial	\$3,959,933	97	\$282,610
55	Commercial	\$1,584,772	138	\$110,750
56	Commercial	\$4,022,093	144	\$331,480
57	Commercial	\$1,600,121	147	\$338,613
58	Commercial	\$1,577,160	107	\$122,926
59	Commercial	\$1,177,950	107	\$90,844
60	Commercial	\$5,132,866	78	\$238,554
61	Commercial	\$1,454,991	94	\$82,431
62	Commercial	\$970,027	82	\$71,344
63	Commercial	\$1,688,695	85	\$126,836
64	Commercial	\$1,657,828	84	\$89,485
65	Commercial	\$1,895,247	87	\$71,258
66	Commercial	\$6,496,604	173	\$298,014
67	Commercial	\$2,099,725	94	\$75,581
68	Commercial	\$7,442,399	233	\$302,973
69	Commercial	\$1,860,998	136	\$270,592
70	Commercial	\$3,249,575	148	\$208,441
71	Commercial	\$1,046,196	42	\$83,023
72	Commercial	\$1,885,000	117	\$68,506
73	Commercial	\$11,597,908	80	\$756,754
74	Commercial	\$13,365,630	120	\$840,301
75	Commercial	\$14,279,324	144	\$488,537
76	Commercial	\$3,371,316	122	\$195,885
77	Commercial	\$3,197,232	253	\$162,535
78	Commercial	\$239,130	36	\$10,179

Assembly District	Sector	Life Cycle Bill Savings (\$)	Participation	Incentive (\$)
79	Commercial	\$1,850,873	150	\$195,772
80	Commercial	\$2,103,808	139	\$139,182
81	Commercial	\$1,977,559	96	\$60,784
82	Commercial	\$1,067,233	132	\$98,438
83	Commercial	\$3,685,853	123	\$128,489
84	Commercial	\$2,139,255	171	\$71,319
85	Commercial	\$3,227,729	170	\$115,625
86	Commercial	\$2,870,110	156	\$161,081
87	Commercial	\$4,723,378	136	\$285,623
88	Commercial	\$2,430,600	102	\$140,574
89	Commercial	\$3,595,553	53	\$241,808
90	Commercial	\$3,271,870	143	\$302,761
91	Commercial	\$4,573,628	78	\$181,230
92	Commercial	\$1,111,768	69	\$56,117
93	Commercial	\$1,414,938	87	\$56,800
94	Commercial	\$1,331,696	103	\$99,424
95	Commercial	\$3,384,330	103	\$237,824
96	Commercial	\$3,538,128	123	\$308,785
97	Commercial	\$1,312,789	125	\$37,424
98	Commercial	\$3,952,006	135	\$218,843
99	Commercial	\$2,249,550	136	\$276,359
1	Industrial	\$261,588	9	\$14,638
2	Industrial	\$1,746,795	6	\$76,574
3	Industrial	\$1,201,596	11	\$77,572
4	Industrial	\$1,095,834	8	\$46,998
5	Industrial	\$958,364	1	\$52,061
6	Industrial	\$1,255,473	5	\$153,558
7	Industrial	\$1,202,211	11	\$90,771
8	Industrial	\$289,448	4	\$13,597
10	Industrial	\$6,547,690	3	\$357,534
11	Industrial	\$599,497	2	\$68,123
12	Industrial	\$2,769,867	14	\$142,013
13	Industrial	\$268,838	7	\$19,089
14	Industrial	\$87,956	2	\$2,440
15	Industrial	\$1,135,622	14	\$61,287
16	Industrial	\$509,395	7	\$28,261
17	Industrial	\$1,012,647	20	\$65,724
18	Industrial	\$4,336,401	25	\$327,706
19	Industrial	\$2,485,618	9	\$98,052
20	Industrial	\$2,498,917	15	\$206,586

Assembly District	Sector	Life Cycle Bill Savings (\$)	Participation	Incentive (\$)
21	Industrial	\$537,146	8	\$26,344
22	Industrial	\$959,855	12	\$52,289
23	Industrial	\$446,892	6	\$61,752
24	Industrial	\$446,929	8	\$28,542
25	Industrial	\$7,162,668	16	\$393,108
26	Industrial	\$396,487	10	\$33,177
27	Industrial	\$2,147,650	10	\$149,458
28	Industrial	\$727,015	9	\$82,027
29	Industrial	\$1,403,712	13	\$98,875
30	Industrial	\$340,740	9	\$29,524
31	Industrial	\$643,423	9	\$32,905
32	Industrial	\$258,486	9	\$50,789
33	Industrial	\$2,275,859	25	\$157,629
34	Industrial	\$1,326,908	17	\$89,450
35	Industrial	\$608,339	13	\$26,416
36	Industrial	\$773,641	10	\$37,245
37	Industrial	\$674,018	11	\$50,976
38	Industrial	\$1,346,927	11	\$118,605
39	Industrial	\$2,048,662	7	\$460,535
40	Industrial	\$1,671,827	5	\$73,774
41	Industrial	\$422,042	4	\$25,829
42	Industrial	\$396,138	8	\$32,756
43	Industrial	\$1,277,890	4	\$159,783
44	Industrial	\$170,206	3	\$8,755
45	Industrial	\$8,396,024	15	\$553,255
46	Industrial	\$1,258,818	13	\$73,356
47	Industrial	\$1,186,961	9	\$246,811
48	Industrial	\$11,675,646	9	\$664,098
49	Industrial	\$2,662,097	14	\$139,324
50	Industrial	\$692,506	13	\$41,788
51	Industrial	\$14,814,836	31	\$751,830
52	Industrial	\$3,795,358	10	\$261,008
53	Industrial	\$4,343,433	11	\$215,328
54	Industrial	\$1,426,397	12	\$101,061
55	Industrial	\$376,909	10	\$22,024
56	Industrial	\$4,159,516	14	\$265,981
57	Industrial	\$506,970	14	\$65,116
58	Industrial	\$1,434,739	11	\$67,979
59	Industrial	\$10,463	1	\$1,300
60	Industrial	\$1,865,886	13	\$125,649

Assembly District	Sector	Life Cycle Bill Savings (\$)	Participation	Incentive (\$)
61	Industrial	\$473,892	5	\$40,498
62	Industrial	\$3,812	1	\$200
63	Industrial	\$1,389,121	13	\$82,940
64	Industrial	\$419,477	8	\$23,643
65	Industrial	\$5,829,632	9	\$442,524
66	Industrial	\$1,432,898	22	\$46,759
67	Industrial	\$8,333,952	6	\$538,360
68	Industrial	\$12,629,189	16	\$327,107
69	Industrial	\$1,997,915	13	\$220,319
70	Industrial	\$6,259,430	11	\$331,996
71	Industrial	\$1,082,285	4	\$33,531
72	Industrial	\$1,875,596	12	\$93,328
73	Industrial	\$491,104	9	\$23,877
74	Industrial	\$2,879,401	4	\$181,740
75	Industrial	\$53,707	2	\$4,980
77	Industrial	\$420,292	11	\$50,071
78	Industrial	\$196,165	4	\$17,345
79	Industrial	\$45,445	2	\$1,966
80	Industrial	\$1,306,754	14	\$91,749
81	Industrial	\$470,906	5	\$26,930
82	Industrial	\$43,457	2	\$4,304
83	Industrial	\$1,216,227	4	\$131,591
84	Industrial	\$3,679,137	23	\$227,664
85	Industrial	\$538,309	11	\$27,445
86	Industrial	\$881,078	7	\$40,358
87	Industrial	\$769,125	5	\$92,257
88	Industrial	\$3,171,028	23	\$137,671
89	Industrial	\$3,091,059	8	\$141,120
90	Industrial	\$9,483,990	17	\$553,122
91	Industrial	\$747,432	7	\$41,966
92	Industrial	\$1,251,300	7	\$143,147
93	Industrial	\$4,016,991	8	\$234,090
94	Industrial	NULL	1	\$480
95	Industrial	\$673,895	9	\$38,786
96	Industrial	\$383,985	1	\$11,904
97	Industrial	\$468,737	13	\$37,824
98	Industrial	\$9,293,595	17	\$172,043
99	Industrial	\$412,397	10	\$24,063
1	Residential	\$2,148,231	2,339	\$153,377
2	Residential	\$1,911,863	1,103	\$220,278

Assembly District	Sector	Life Cycle Bill Savings (\$)	Participation	Incentive (\$)
3	Residential	\$1,328,791	1,130	\$159,465
4	Residential	\$883,433	1,017	\$152,840
5	Residential	\$2,181,461	2,580	\$157,696
6	Residential	\$2,284,158	2,612	\$224,652
7	Residential	\$1,673,256	2,312	\$96,889
8	Residential	\$1,955,953	961	\$146,917
9	Residential	\$1,170,015	1,222	\$257,086
10	Residential	\$1,863,953	1,186	\$217,809
11	Residential	\$1,909,924	1,400	\$140,786
12	Residential	\$2,054,151	2,403	\$119,506
13	Residential	\$1,360,984	1,562	\$133,776
14	Residential	\$1,341,521	894	\$91,296
15	Residential	\$2,894,147	2,531	\$175,538
16	Residential	\$3,497,334	4,383	\$260,147
17	Residential	\$2,373,452	2,730	\$145,135
18	Residential	\$1,790,693	1,760	\$143,926
19	Residential	\$1,331,592	1,569	\$128,250
20	Residential	\$1,671,027	1,958	\$148,197
21	Residential	\$845,481	889	\$62,180
22	Residential	\$1,151,051	1,227	\$109,897
23	Residential	\$1,858,719	1,623	\$161,280
24	Residential	\$969,156	1,274	\$103,544
25	Residential	\$1,306,064	2,008	\$96,207
26	Residential	\$1,257,699	2,058	\$82,902
27	Residential	\$1,337,729	1,716	\$100,388
28	Residential	\$1,781,172	1,643	\$171,229
29	Residential	\$1,591,147	2,553	\$103,361
30	Residential	\$1,291,396	2,072	\$84,053
31	Residential	\$2,176,104	1,721	\$118,933
32	Residential	\$2,577,383	2,197	\$140,491
33	Residential	\$1,750,387	2,446	\$123,606
34	Residential	\$2,702,784	2,764	\$167,761
35	Residential	\$1,545,999	2,154	\$211,623
36	Residential	\$1,075,623	1,942	\$64,995
37	Residential	\$1,054,236	1,786	\$81,917
38	Residential	\$1,391,703	2,017	\$118,241
39	Residential	\$2,538,815	3,383	\$195,461
40	Residential	\$1,306,339	2,308	\$105,016
41	Residential	\$1,849,751	1,730	\$138,873
42	Residential	\$2,321,515	1,655	\$159,831

Assembly District	Sector	Life Cycle Bill Savings (\$)	Participation	Incentive (\$)
43	Residential	\$2,441,208	1,732	\$223,619
44	Residential	\$883,705	1,118	\$132,026
45	Residential	\$3,360,036	1,976	\$226,623
46	Residential	\$1,230,899	1,587	\$151,648
47	Residential	\$1,293,366	2,262	\$90,722
48	Residential	\$1,979,455	2,350	\$141,962
49	Residential	\$1,135,048	1,548	\$55,779
50	Residential	\$1,049,150	998	\$57,449
51	Residential	\$2,228,525	2,273	\$190,288
52	Residential	\$2,733,086	1,990	\$235,122
53	Residential	\$1,892,915	1,576	\$176,963
54	Residential	\$1,957,321	1,760	\$167,579
55	Residential	\$1,520,873	2,218	\$128,092
56	Residential	\$1,235,902	1,902	\$109,938
57	Residential	\$2,208,260	2,432	\$146,129
58	Residential	\$1,467,159	1,617	\$96,684
59	Residential	\$1,538,495	2,004	\$135,023
60	Residential	\$1,248,276	1,172	\$70,644
61	Residential	\$1,072,239	1,622	\$58,226
62	Residential	\$1,268,755	1,474	\$163,845
63	Residential	\$844,547	1,274	\$74,983
64	Residential	\$1,042,251	1,062	\$73,436
65	Residential	\$2,308,475	1,025	\$180,369
66	Residential	\$1,212,516	1,828	\$95,226
67	Residential	\$1,197,770	1,553	\$100,412
68	Residential	\$1,237,448	1,908	\$119,153
69	Residential	\$1,976,195	1,969	\$156,684
70	Residential	\$1,596,590	2,123	\$143,210
71	Residential	\$764,767	558	\$78,405
72	Residential	\$1,046,260	1,510	\$132,925
73	Residential	\$465,886	738	\$55,694
74	Residential	\$2,738,672	1,481	\$282,518
75	Residential	\$4,465,853	2,660	\$332,715
76	Residential	\$2,964,338	2,308	\$263,697
77	Residential	\$5,242,810	4,361	\$253,847
78	Residential	\$1,560,860	499	\$206,084
79	Residential	\$2,374,333	2,188	\$176,626
80	Residential	\$1,508,575	1,855	\$176,022
81	Residential	\$1,766,985	1,861	\$131,504
82	Residential	\$1,719,880	2,394	\$92,635

Assembly District	Sector	Life Cycle Bill Savings (\$)	Participation	Incentive (\$)
83	Residential	\$2,021,845	2,444	\$126,290
84	Residential	\$1,937,872	2,345	\$125,123
85	Residential	\$1,729,416	2,478	\$110,447
86	Residential	\$816,939	1,687	\$54,986
87	Residential	\$3,150,650	2,237	\$166,389
88	Residential	\$2,339,945	1,752	\$142,730
89	Residential	\$784,342	780	\$87,440
90	Residential	\$2,366,277	1,458	\$158,702
91	Residential	\$1,834,421	961	\$181,932
92	Residential	\$589,442	948	\$55,666
93	Residential	\$2,322,287	1,241	\$206,827
94	Residential	\$1,461,705	1,725	\$143,383
95	Residential	\$1,884,936	1,488	\$189,043
96	Residential	\$1,197,023	1,207	\$184,824
97	Residential	\$2,716,383	2,478	\$180,856
98	Residential	\$2,592,984	2,014	\$123,005
99	Residential	\$2,113,186	2,300	\$138,721
Unassigned		\$846,922	1,526	\$46,700
Total Incentive				\$46,743,671

Savings by Sector, by Senate District

Residential

Figure 25. Residential Energy Bill Savings by Senate District

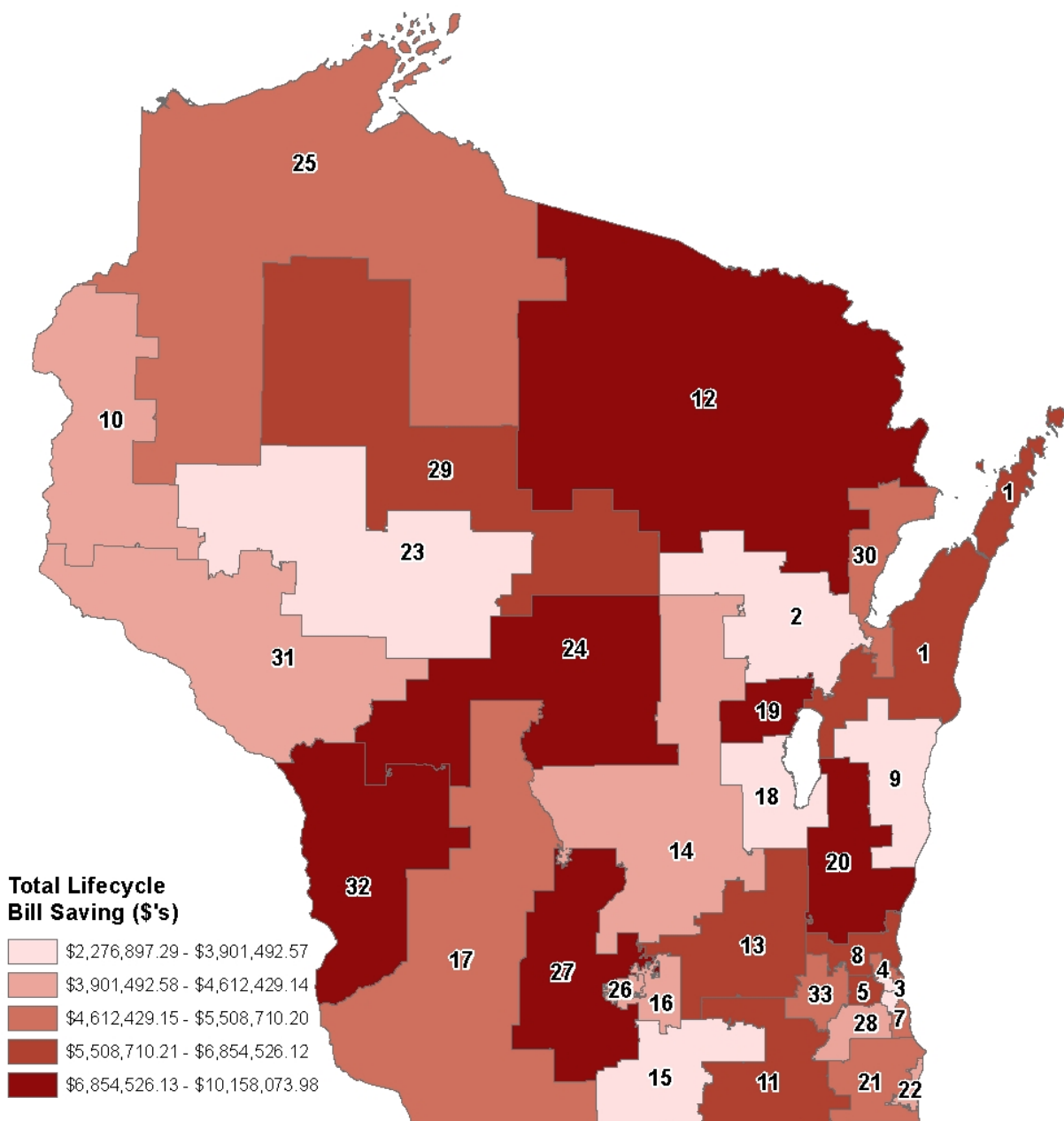


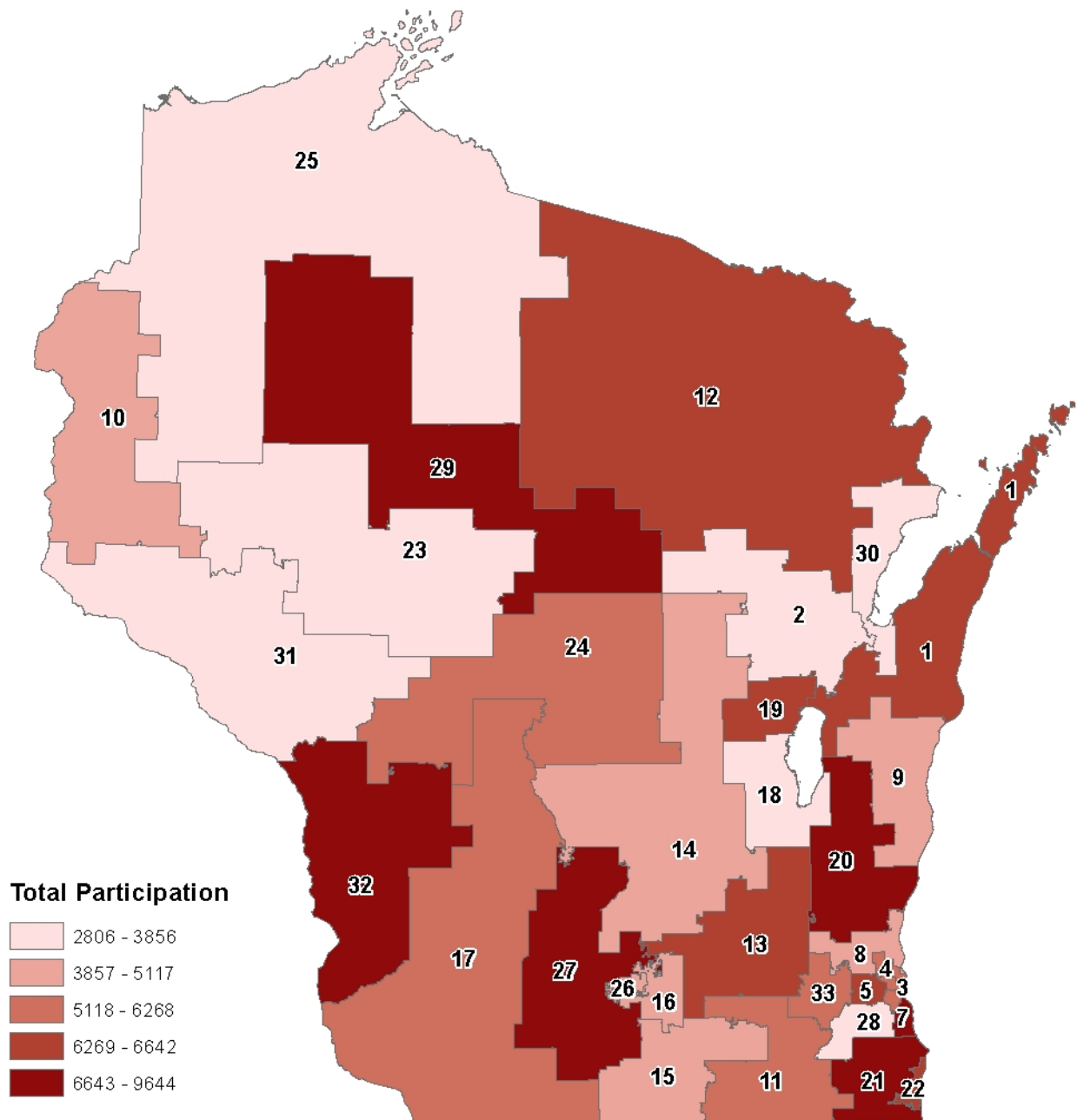
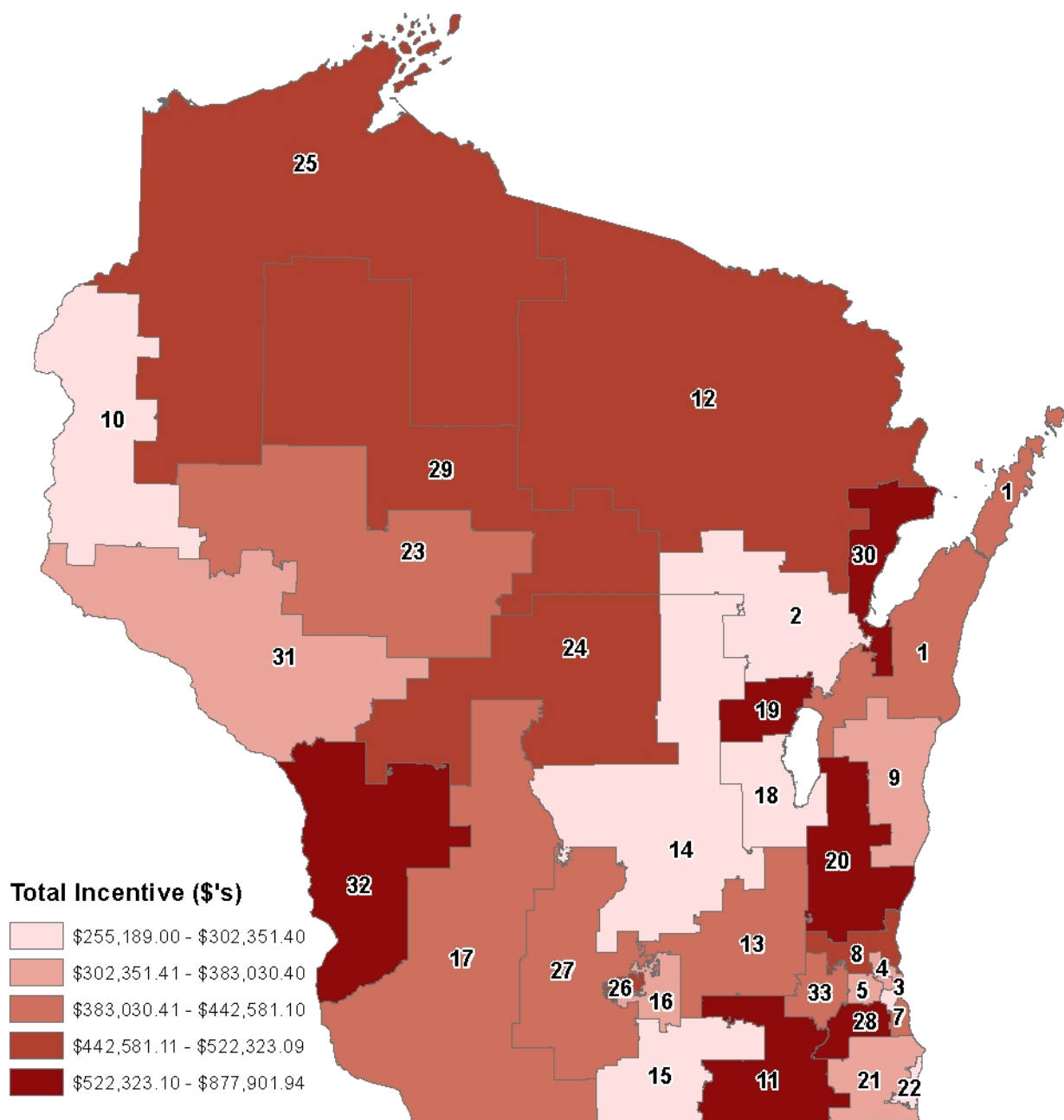
Figure 26. Residential Participation by Senate Districts

Figure 27. Residential Incentive Dollars Awarded by Senate District

Industrial

Figure 28. Industrial Energy Bill Savings by Senate District

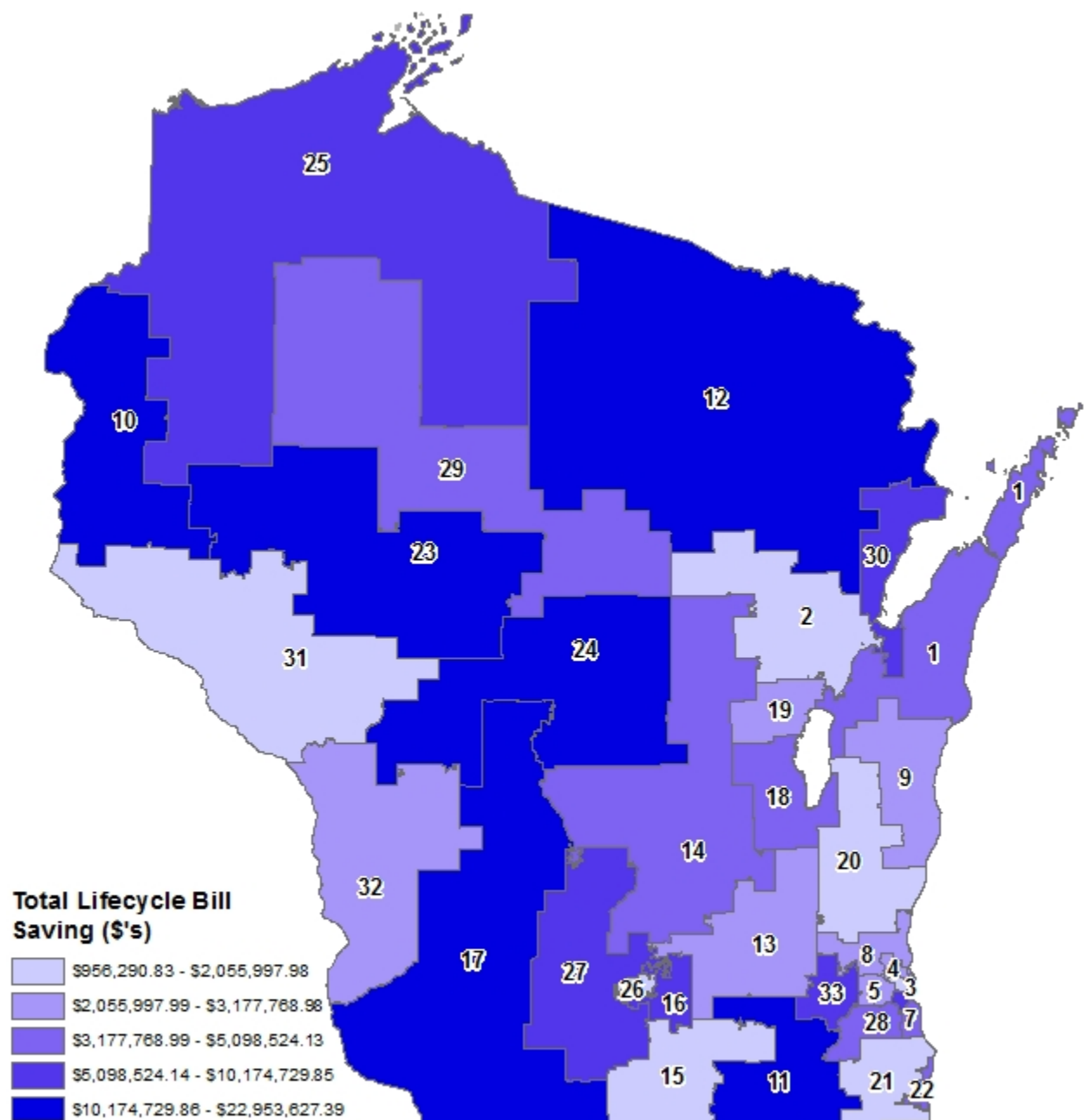


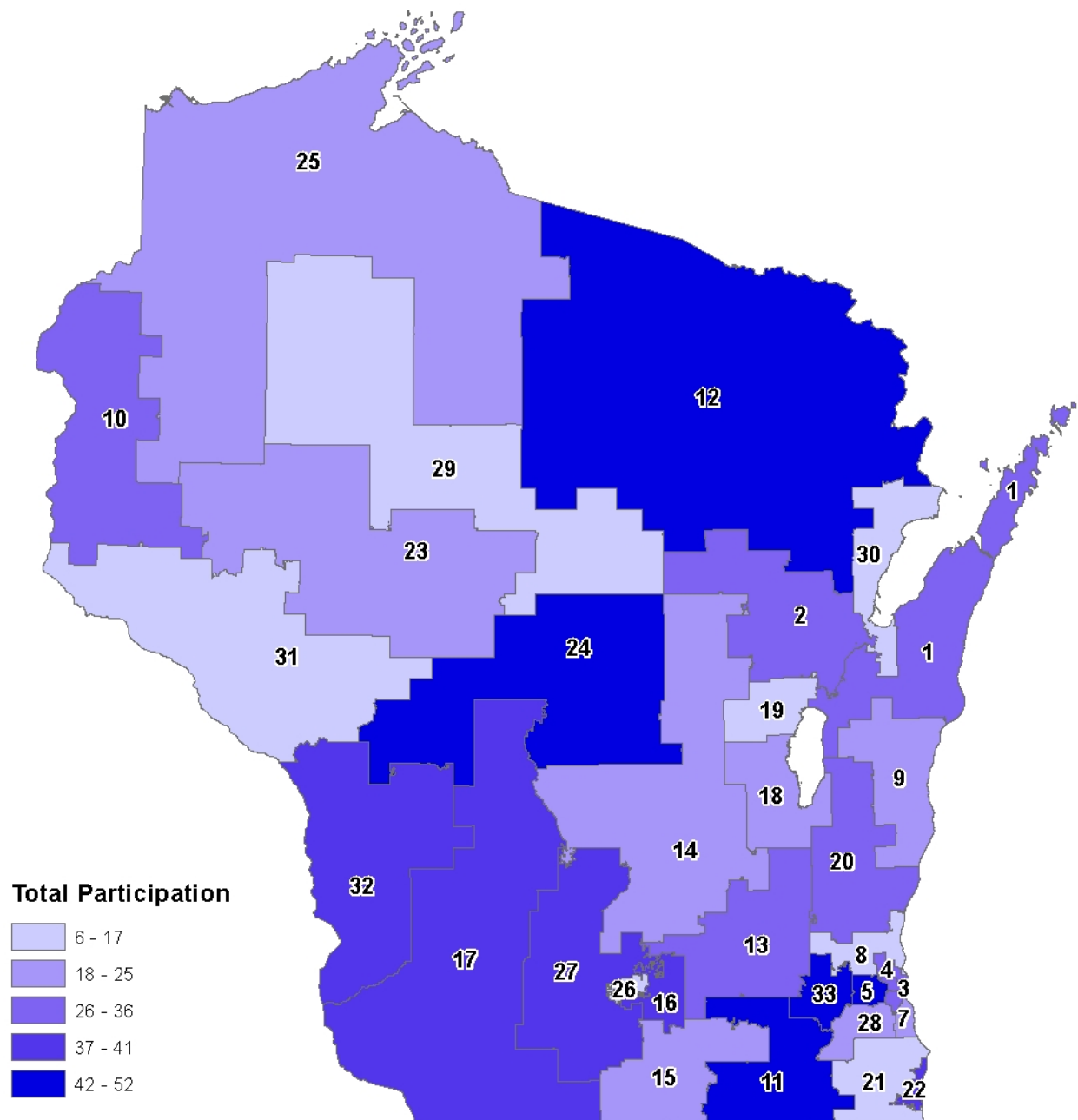
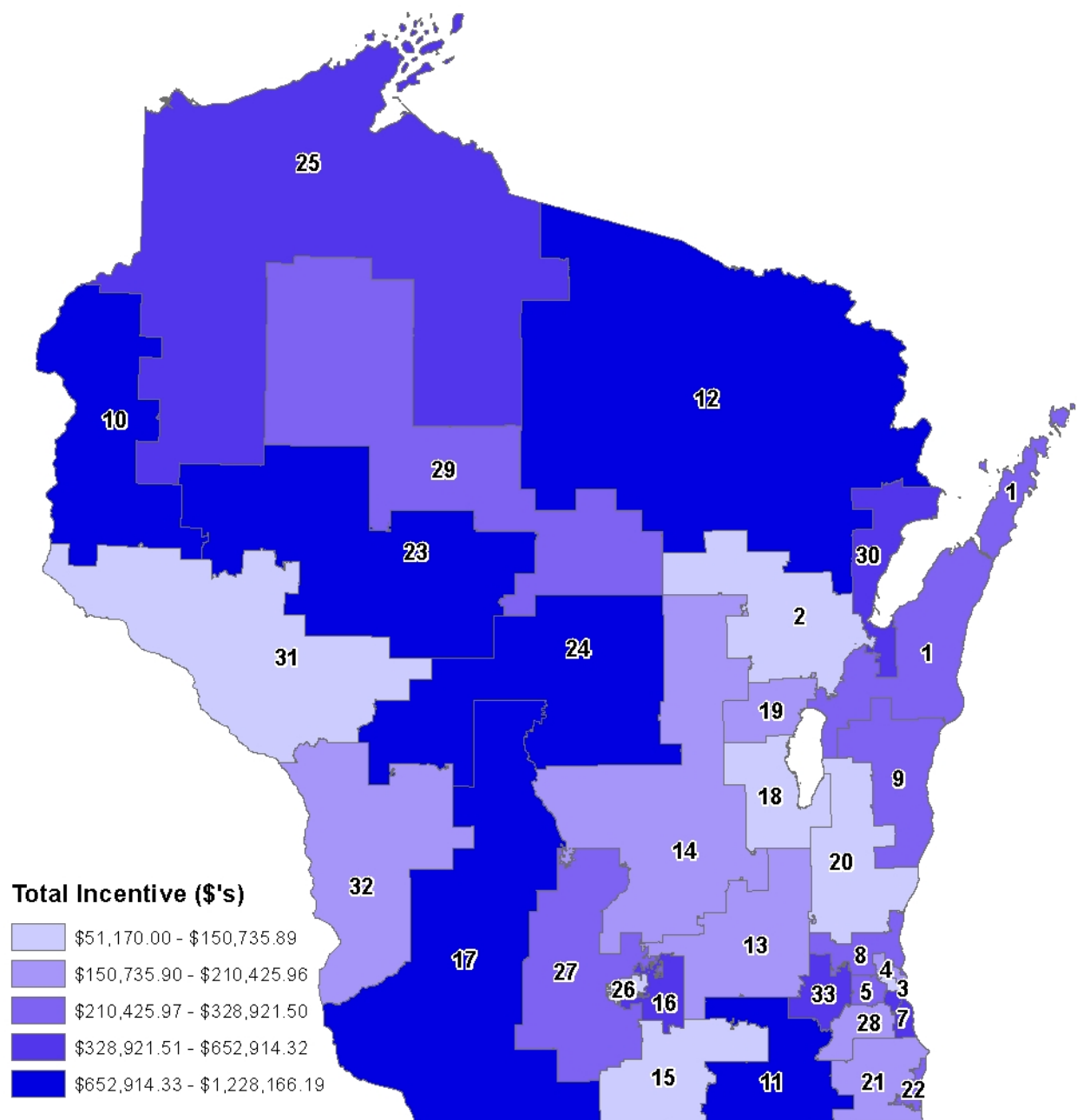
Figure 29. Industrial Participation by Senate District

Figure 30. Industrial Incentive Dollars Awarded by Senate District

Commercial

Figure 31. Commercial Energy Bill Savings by Senate District

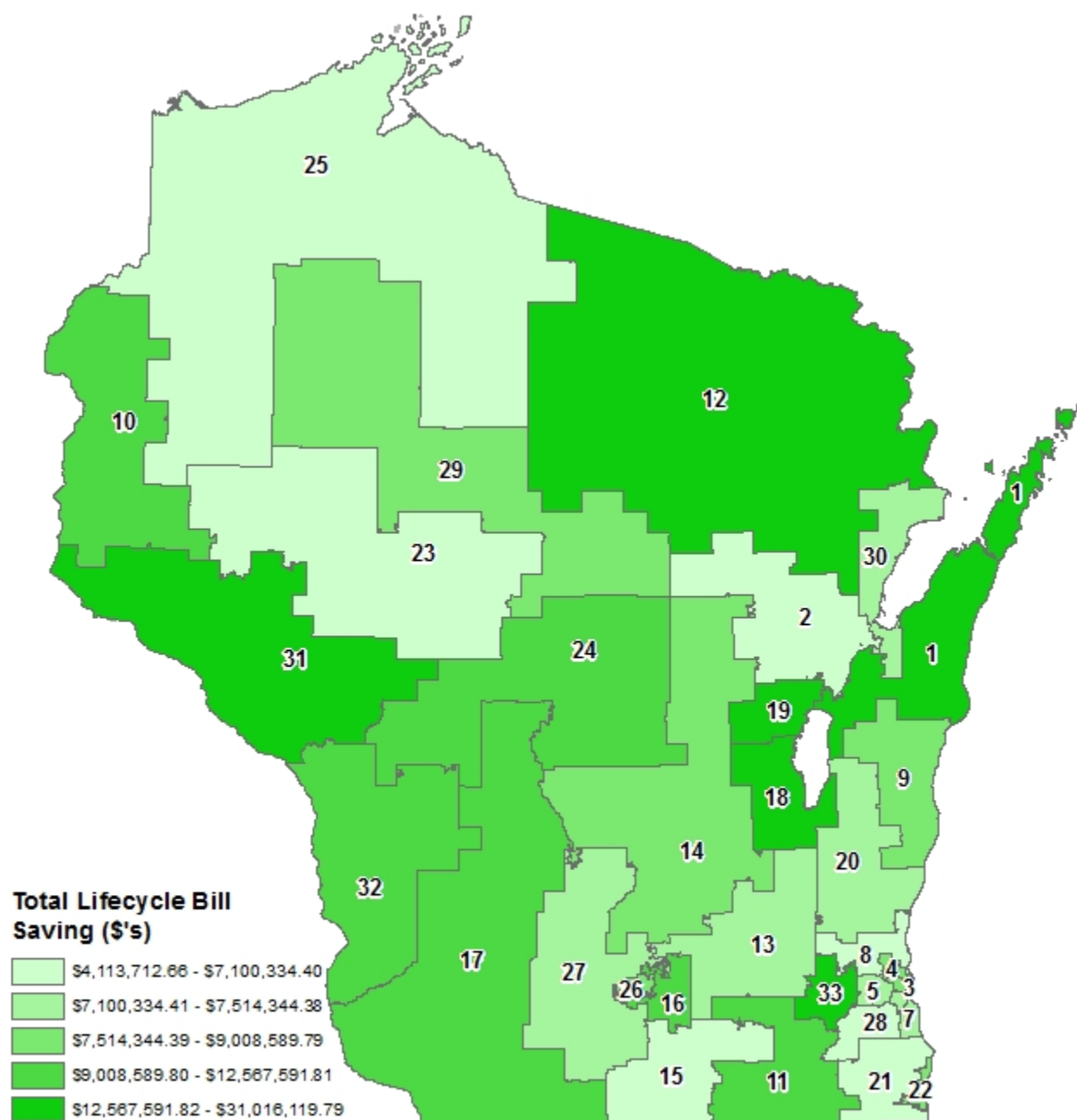


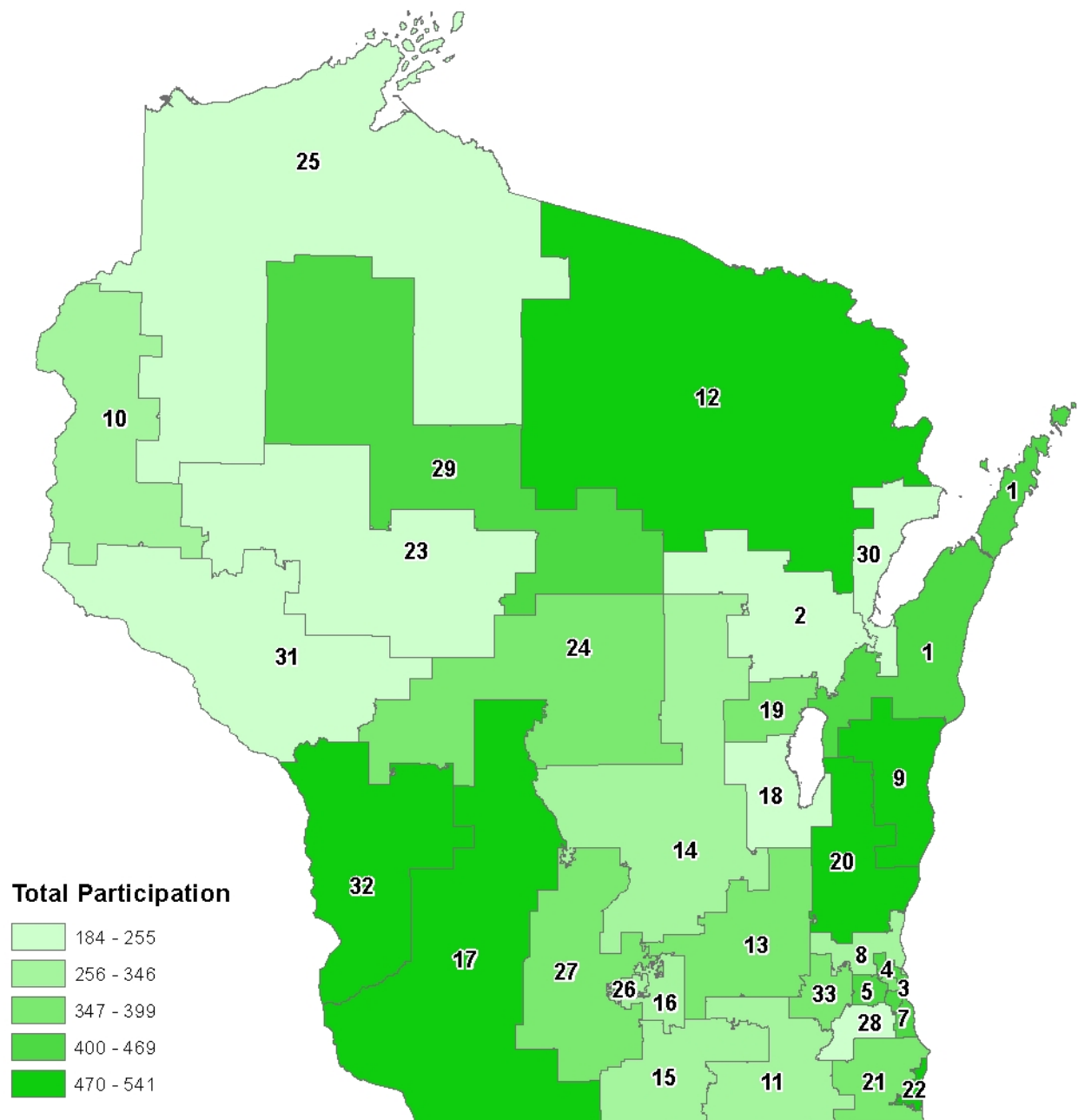
Figure 32. Commercial Participation by Senate District

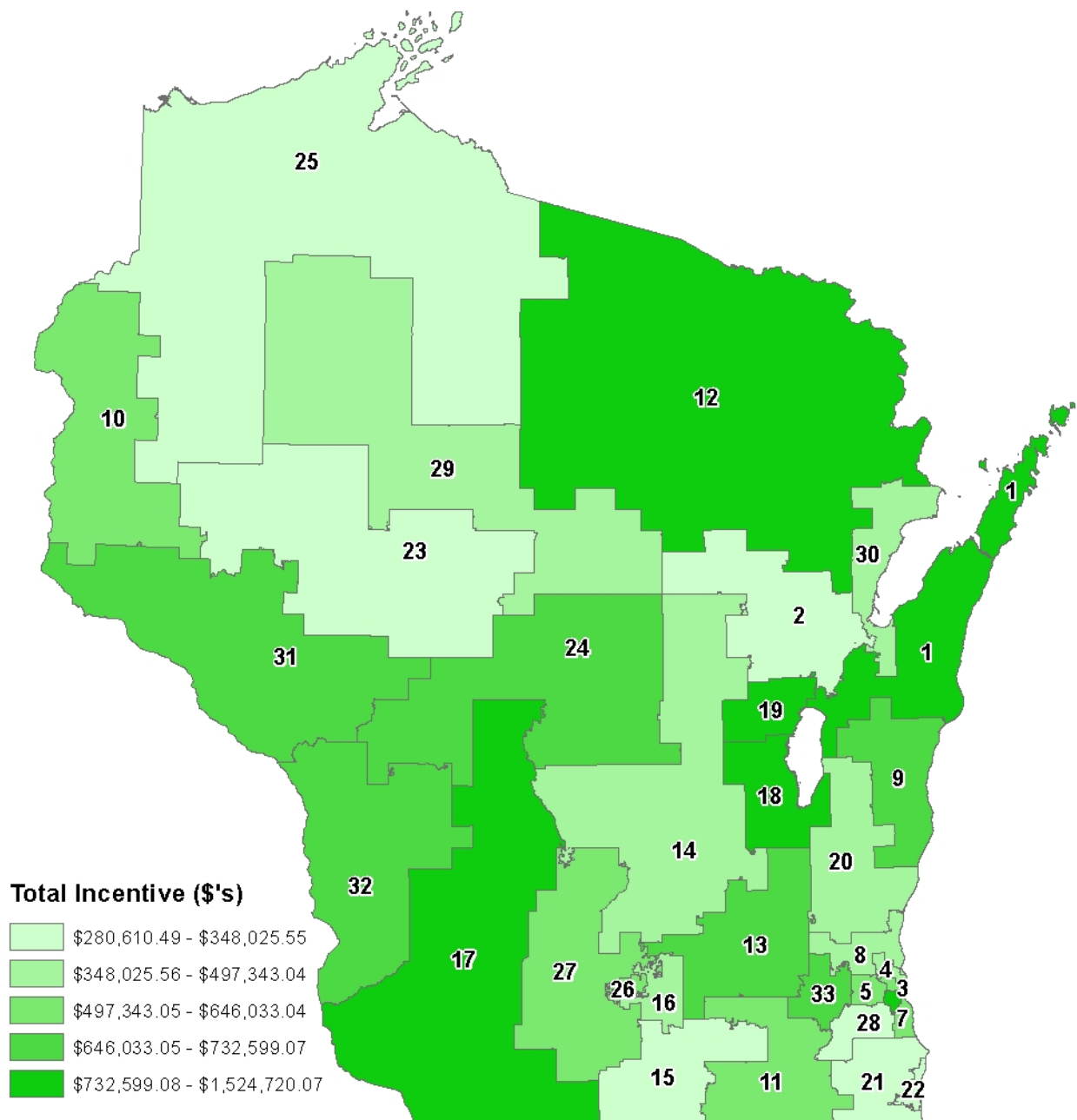
Figure 33. Commercial Incentive Dollars Awarded by Senate District

Table 84. Savings and Participation by Senate District and Sector

Senate District ID	Sector	Life Cycle Bill Savings (\$)	Participation	Total Incentive (\$)
1	Commercial	\$18,310,865	460	\$1,076,943
2	Commercial	\$6,967,540	235	\$285,749
3	Commercial	\$7,511,733	403	\$1,108,945
4	Commercial	\$9,008,590	465	\$469,145
5	Commercial	\$7,208,935	411	\$520,355
6	Commercial	\$7,628,596	399	\$626,603
7	Commercial	\$7,484,199	469	\$530,925
8	Commercial	\$6,704,531	278	\$410,685
9	Commercial	\$8,977,069	498	\$665,457
10	Commercial	\$12,067,407	301	\$596,006
11	Commercial	\$10,524,372	346	\$601,070
12	Commercial	\$13,480,458	477	\$956,745
13	Commercial	\$7,144,827	382	\$731,973
14	Commercial	\$7,887,977	293	\$452,325
15	Commercial	\$4,113,713	262	\$280,610
16	Commercial	\$10,049,679	344	\$458,757
17	Commercial	\$12,552,972	517	\$782,006
18	Commercial	\$14,529,103	239	\$908,283
19	Commercial	\$31,016,120	385	\$1,524,720
20	Commercial	\$7,150,751	541	\$497,343
21	Commercial	\$6,730,645	350	\$287,711
22	Commercial	\$8,237,093	497	\$348,026
23	Commercial	\$5,934,417	184	\$327,568
24	Commercial	\$10,425,848	382	\$728,957
25	Commercial	\$7,100,334	234	\$294,147
26	Commercial	\$8,254,154	330	\$646,033
27	Commercial	\$7,514,344	397	\$532,626
28	Commercial	\$4,565,524	215	\$325,803
29	Commercial	\$8,400,683	414	\$486,640
30	Commercial	\$7,178,173	205	\$475,977
31	Commercial	\$15,396,209	255	\$732,599
32	Commercial	\$12,567,592	514	\$702,212
33	Commercial	\$18,257,535	362	\$669,078
Unassigned	Commercial	\$614,167	36	\$30,046
1	Industrial	\$3,478,347	29	\$218,403
2	Industrial	\$1,943,929	28	\$107,175
3	Industrial	\$9,706,805	36	\$575,744
4	Industrial	\$2,471,467	31	\$210,426
5	Industrial	\$3,177,769	43	\$241,323

Senate District ID	Sector	Life Cycle Bill Savings (\$)	Participation	Total Incentive (\$)
6	Industrial	\$2,055,998	34	\$114,637
7	Industrial	\$5,067,415	23	\$652,914
8	Industrial	\$2,096,069	16	\$218,368
9	Industrial	\$2,615,984	25	\$328,922
10	Industrial	\$15,030,249	36	\$845,210
11	Industrial	\$22,953,627	52	\$1,228,166
12	Industrial	\$13,882,449	46	\$908,685
13	Industrial	\$2,310,276	36	\$188,201
14	Industrial	\$3,311,089	25	\$194,927
15	Industrial	\$1,866,825	19	\$123,638
16	Industrial	\$7,682,007	39	\$512,926
17	Industrial	\$20,886,534	40	\$879,421
18	Industrial	\$3,448,985	25	\$150,736
19	Industrial	\$2,933,108	6	\$186,720
20	Industrial	\$1,772,490	27	\$143,786
21	Industrial	\$1,730,591	11	\$162,825
22	Industrial	\$5,098,524	41	\$295,467
23	Industrial	\$11,621,177	18	\$696,825
24	Industrial	\$13,424,143	45	\$783,050
25	Industrial	\$6,015,723	22	\$419,203
26	Industrial	\$1,057,880	11	\$51,170
27	Industrial	\$10,174,730	40	\$233,930
28	Industrial	\$4,044,226	25	\$201,144
29	Industrial	\$3,416,048	17	\$296,390
30	Industrial	\$6,837,139	7	\$371,131
31	Industrial	\$956,291	11	\$89,652
32	Industrial	\$2,657,665	41	\$155,272
33	Industrial	\$9,320,936	49	\$632,344
1	Residential	\$6,061,098	6,366	\$434,163
2	Residential	\$2,965,704	3,390	\$275,622
3	Residential	\$3,901,493	5,782	\$279,497
4	Residential	\$4,663,716	6,268	\$358,643
5	Residential	\$6,503,874	6,364	\$383,030
6	Residential	\$3,675,809	5,880	\$358,532
7	Residential	\$5,236,857	7,708	\$418,717
8	Residential	\$6,612,475	5,117	\$522,323
9	Residential	\$3,408,002	4,968	\$374,397
10	Residential	\$4,163,654	4,896	\$255,189
11	Residential	\$6,854,526	5,839	\$602,373
12	Residential	\$7,298,770	6,642	\$504,324

Senate District ID	Sector	Life Cycle Bill Savings (\$)	Participation	Total Incentive (\$)
13	Residential	\$5,686,471	6,409	\$441,800
14	Residential	\$4,253,930	4,793	\$302,351
15	Residential	\$3,185,540	4,371	\$297,055
16	Residential	\$4,563,241	3,916	\$349,030
17	Residential	\$4,810,233	6,001	\$419,048
18	Residential	\$2,276,897	2,806	\$267,024
19	Residential	\$10,158,074	6,437	\$877,902
20	Residential	\$9,136,477	8,415	\$607,522
21	Residential	\$5,508,710	6,699	\$350,428
22	Residential	\$4,484,226	6,510	\$290,556
23	Residential	\$3,543,151	2,833	\$393,941
24	Residential	\$7,856,872	5,447	\$467,821
25	Residential	\$4,746,150	3,149	\$444,425
26	Residential	\$4,543,665	4,420	\$517,250
27	Residential	\$7,422,553	6,791	\$442,581
28	Residential	\$4,124,038	3,250	\$532,581
29	Residential	\$6,138,744	7,503	\$479,233
30	Residential	\$4,989,921	3,369	\$621,812
31	Residential	\$4,612,429	3,856	\$365,858
32	Residential	\$8,764,933	9,644	\$580,820
33	Residential	\$4,793,298	5,288	\$420,372
Unassigned	Residential	\$232,755	1,488	\$16,654
Total Incentives				\$ 46,743,671

APPENDIX K. SUMMARY OF FINDINGS BY UTILITY TERRITORY

Savings by Sector, by Electric Utility Territory

The following section includes eighteen maps based on the results of the 2011 evaluation: three electric utility and three gas utility maps (per capita lifetime bill savings, total 2011 participation, and per capita incentive paid in 2011) for three primary sectors (residential, industrial, and commercial). Commercial maps include commercial, schools, government, and agricultural entities.

Similar to the 2010 evaluation report, the bill savings are defined as evaluated lifecycle verified gross energy savings multiplied by the retail rate of delivered energy in 2011 and normalized on a per capita basis. The incentive dollars and participation rates are also reported on a per capita basis.

The counts of eligible customers by sector from different sources are inconsistent due to varying definitions of those sectors. The electric utility maps use counts of customers by sector from the EIA861 report, which is based upon data provided by utilities. The differences between utility and Focus on Energy definitions for each sector results in noticeably high participation rates for some categories in the following section; the high participation rate due to this disconnect is prevalent in the industrial sector only.

Please note that due to the large number of electric cooperatives (Coops) and municipal utilities (Munis) we chose to include only larger utility level labels for the preceding group of maps.

Residential

Figure 34. Residential Per Capita Energy Bill Savings by Electric Territory

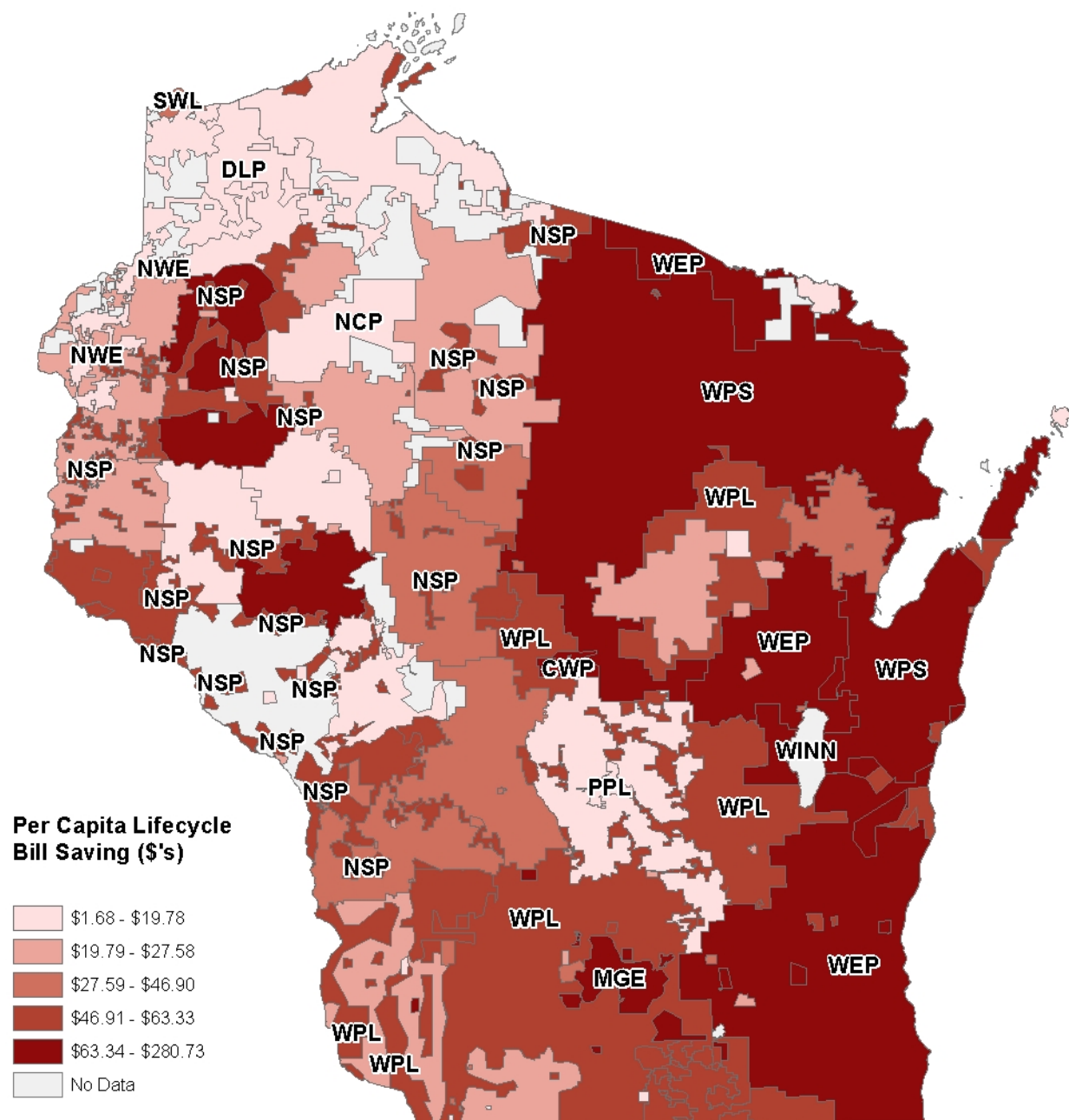


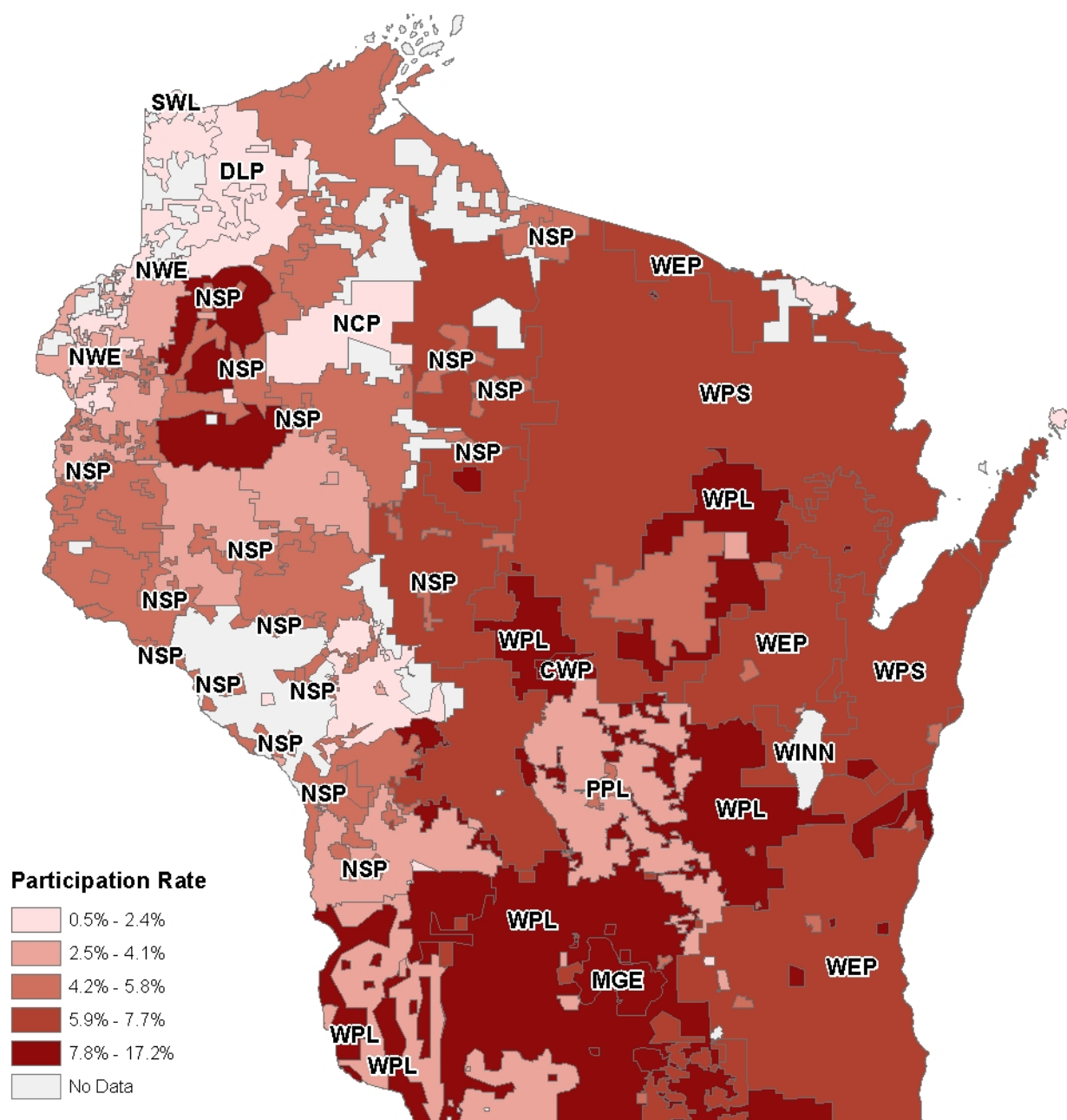
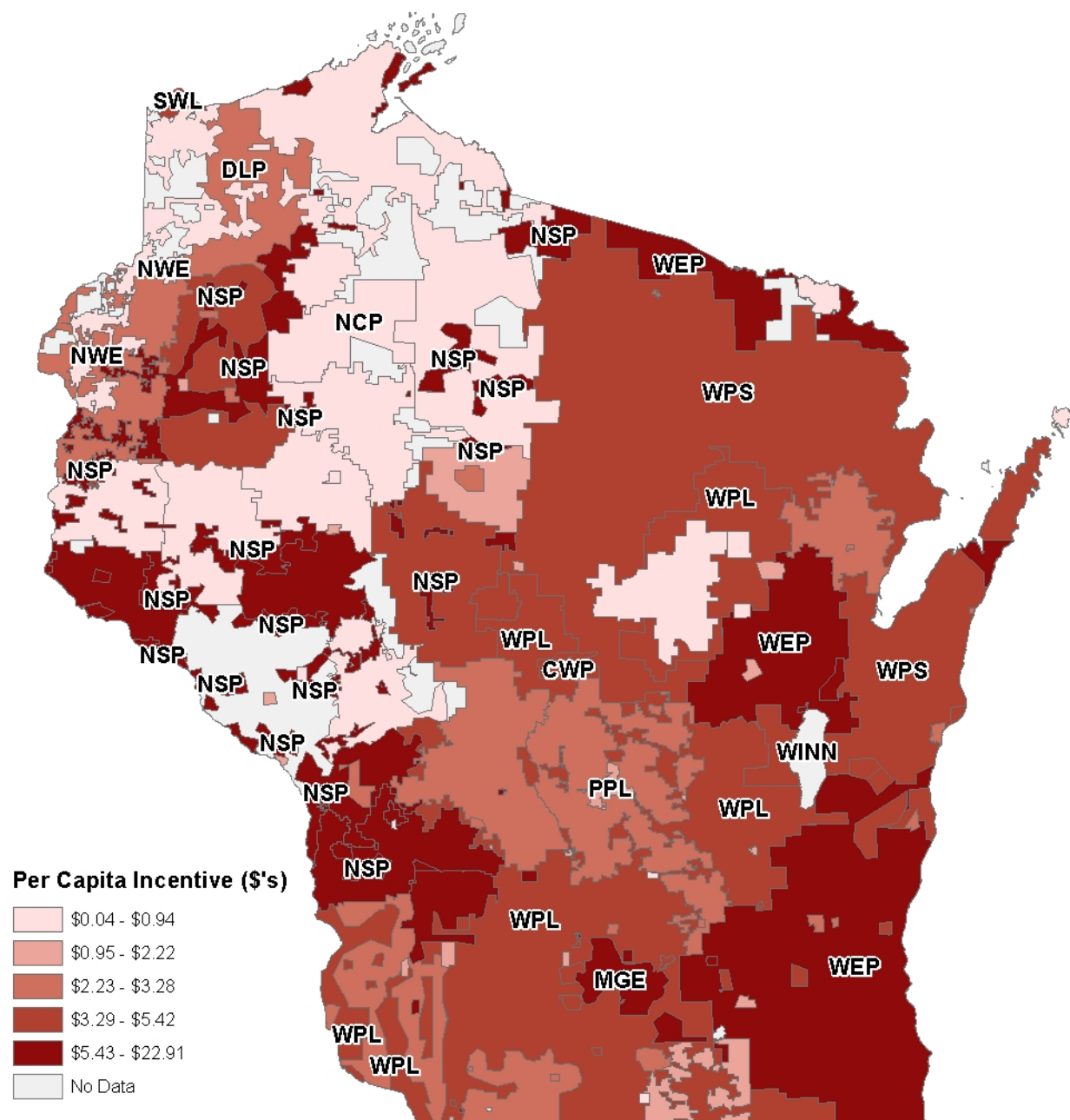
Figure 35. Residential Participation Rate by Electric Territory

Figure 36. Residential Per Capita Incentive Dollars Awarded by Electric Territory



Industrial

Figure 37. Industrial Per Capita Energy Bill Savings by Territory

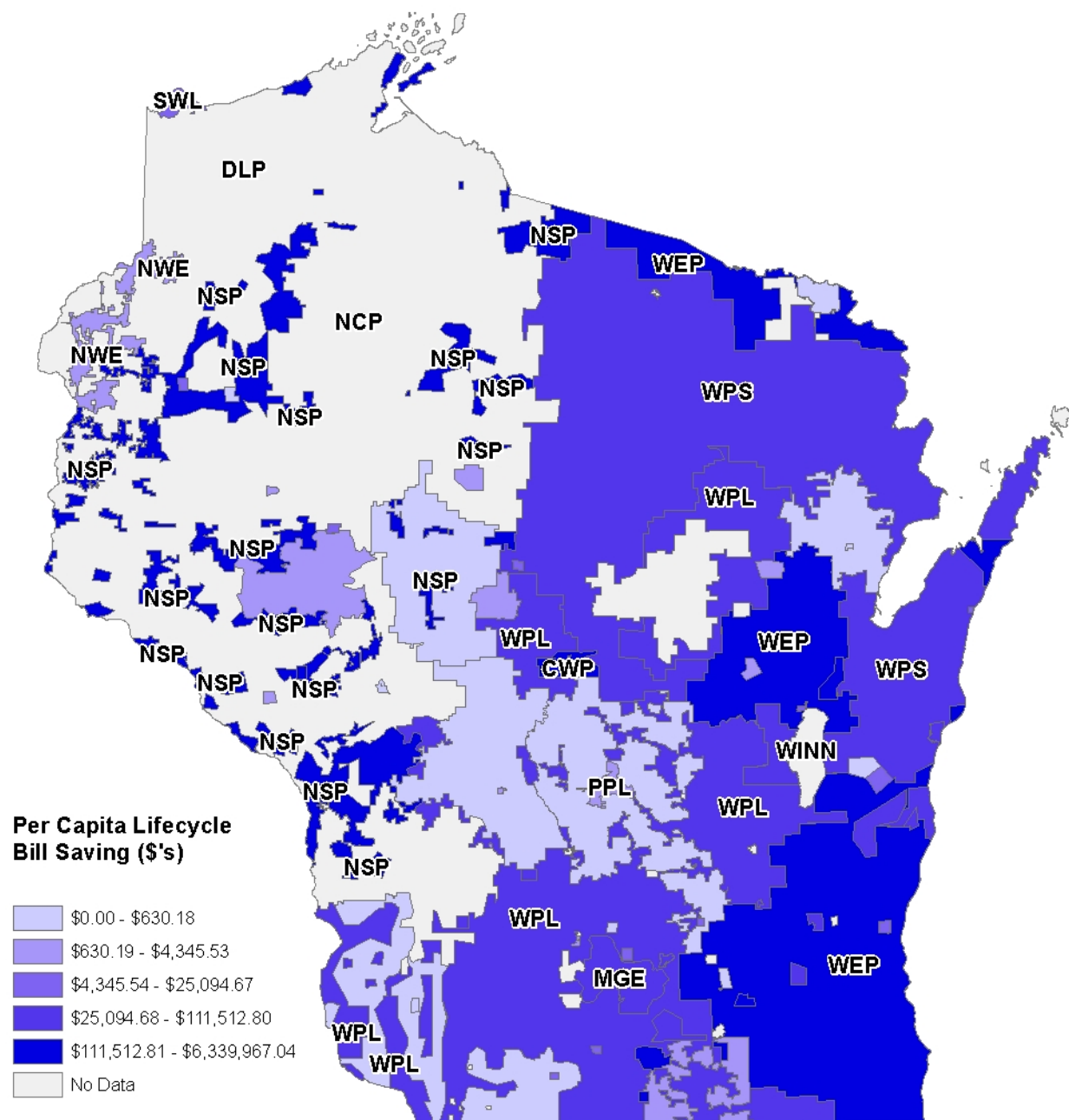


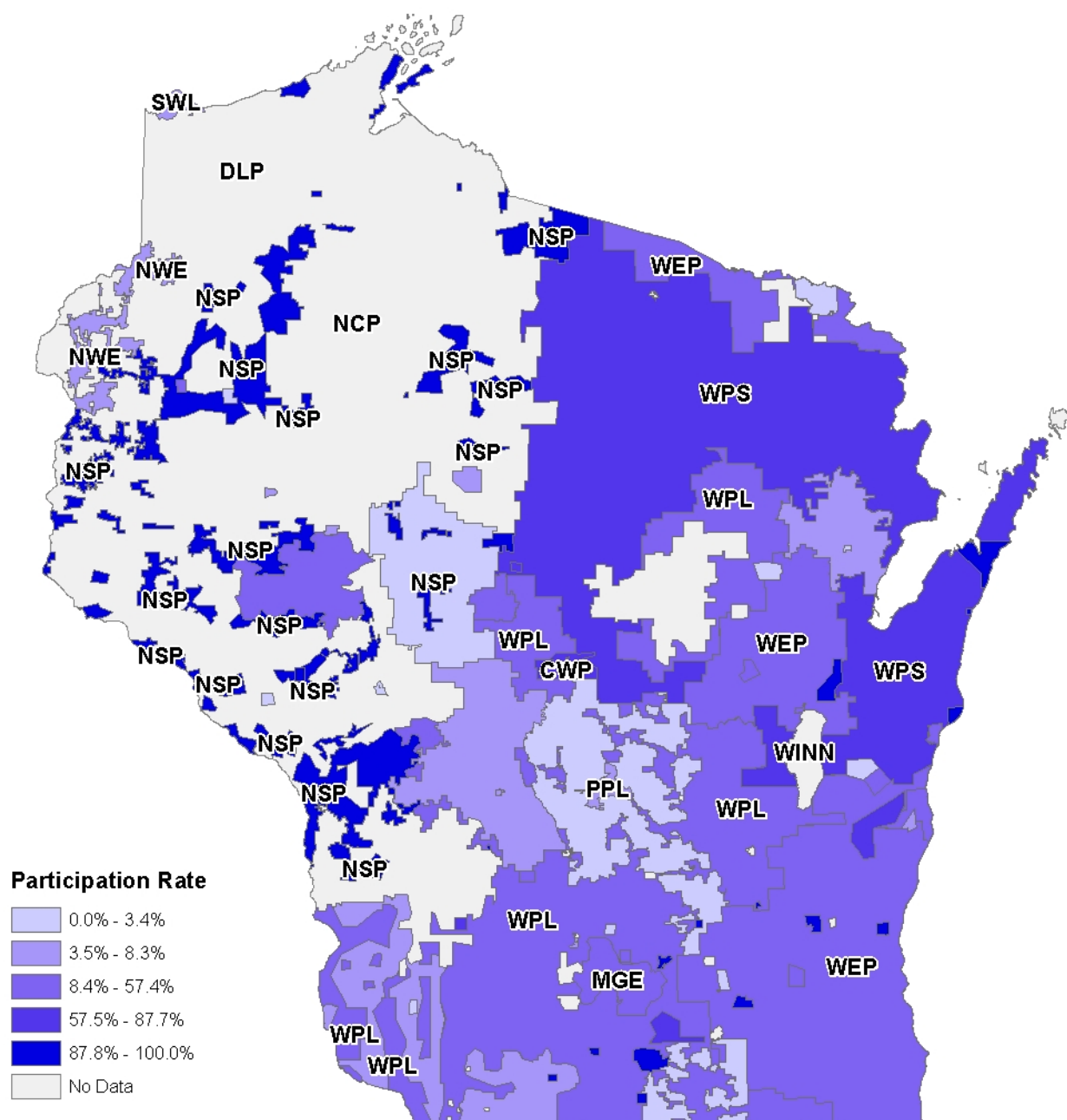
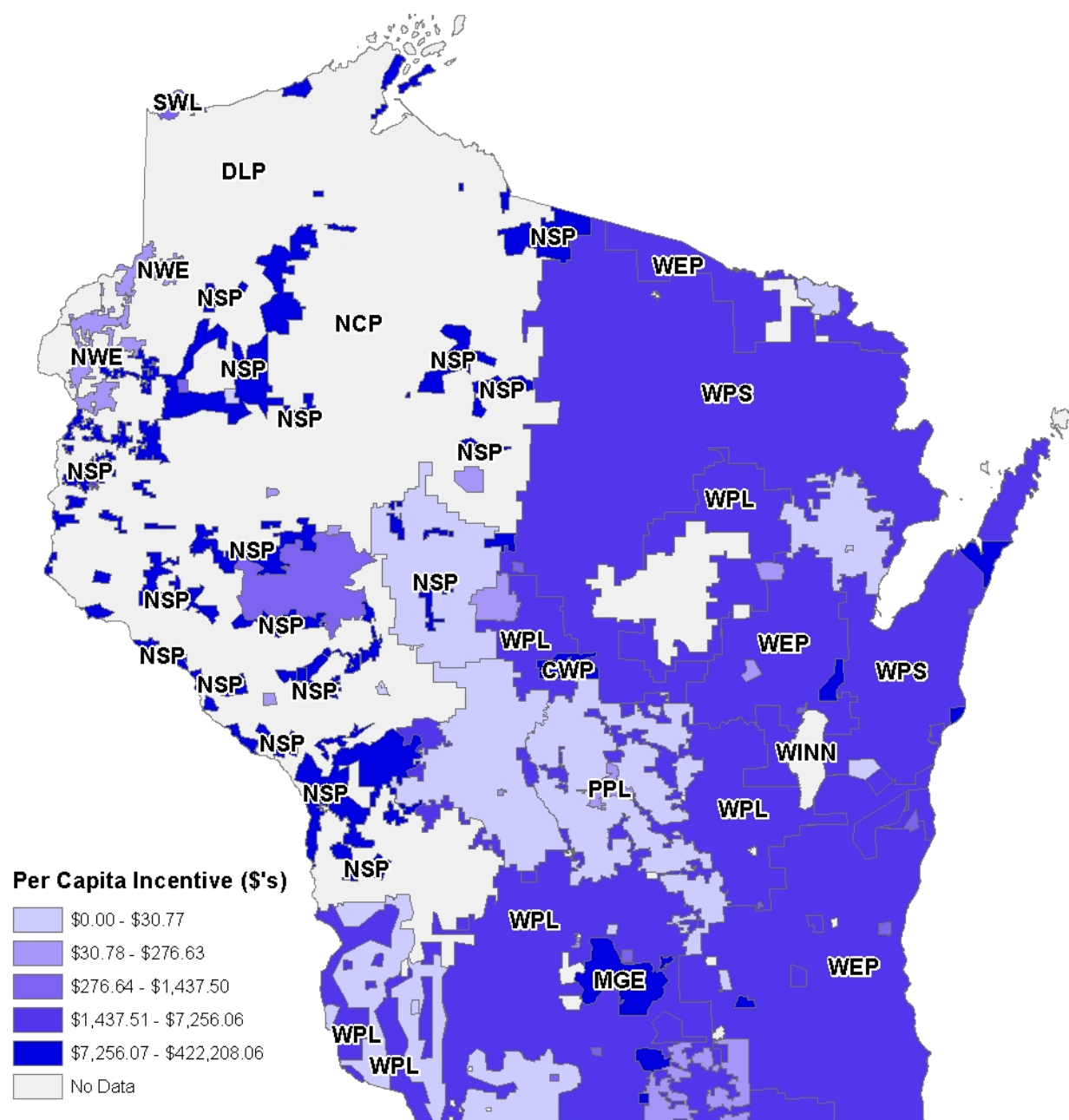
Figure 38. Industrial Participation Rate by Electric Territory

Figure 39. Industrial Per Capita Incentive Dollars Awarded by Electric Territory

Commercial

Figure 40. Commercial Per Capita Energy Bill Savings by Electric Territory

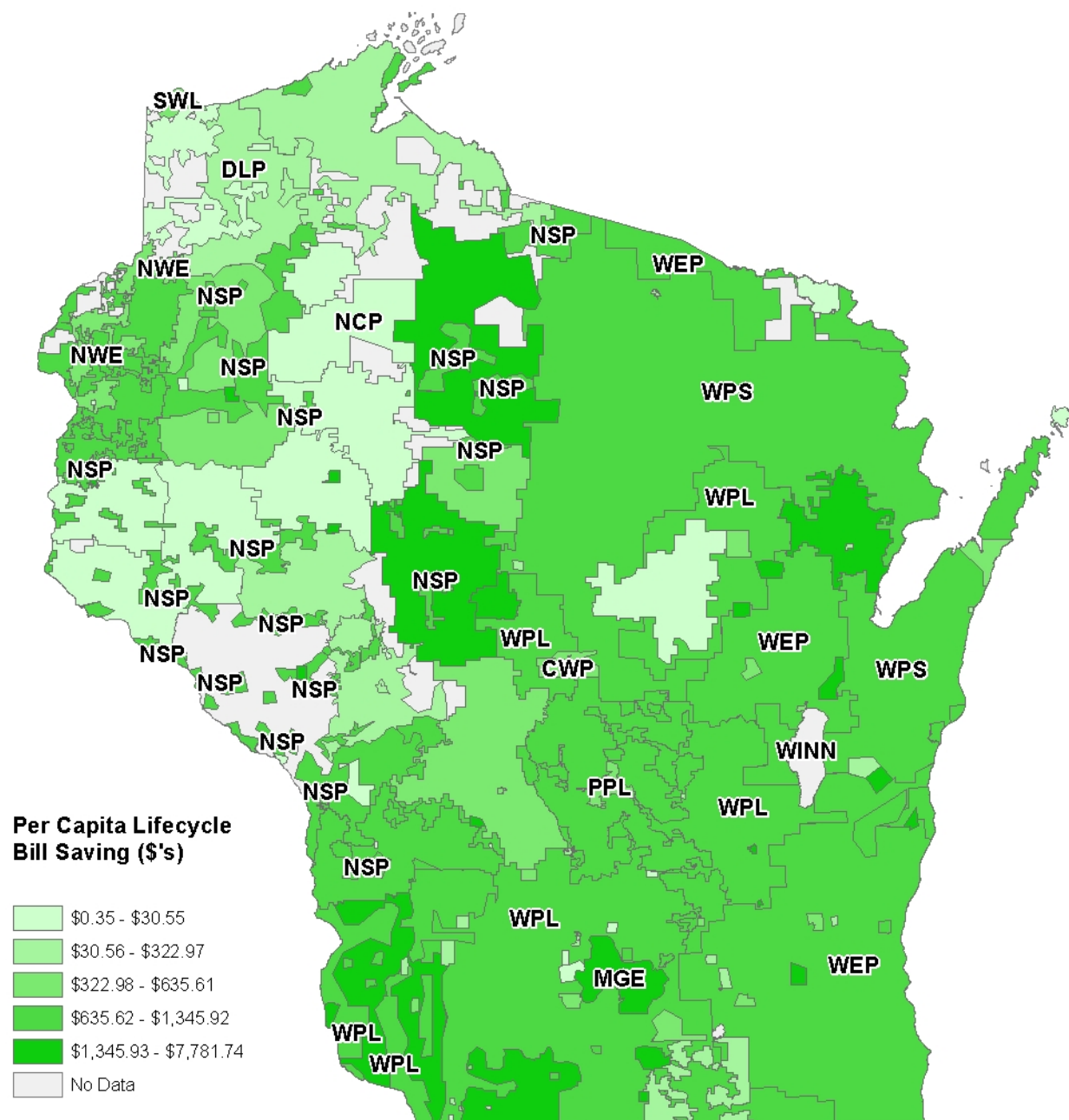


Figure 41. Commercial Participation Rate by Electric Territory

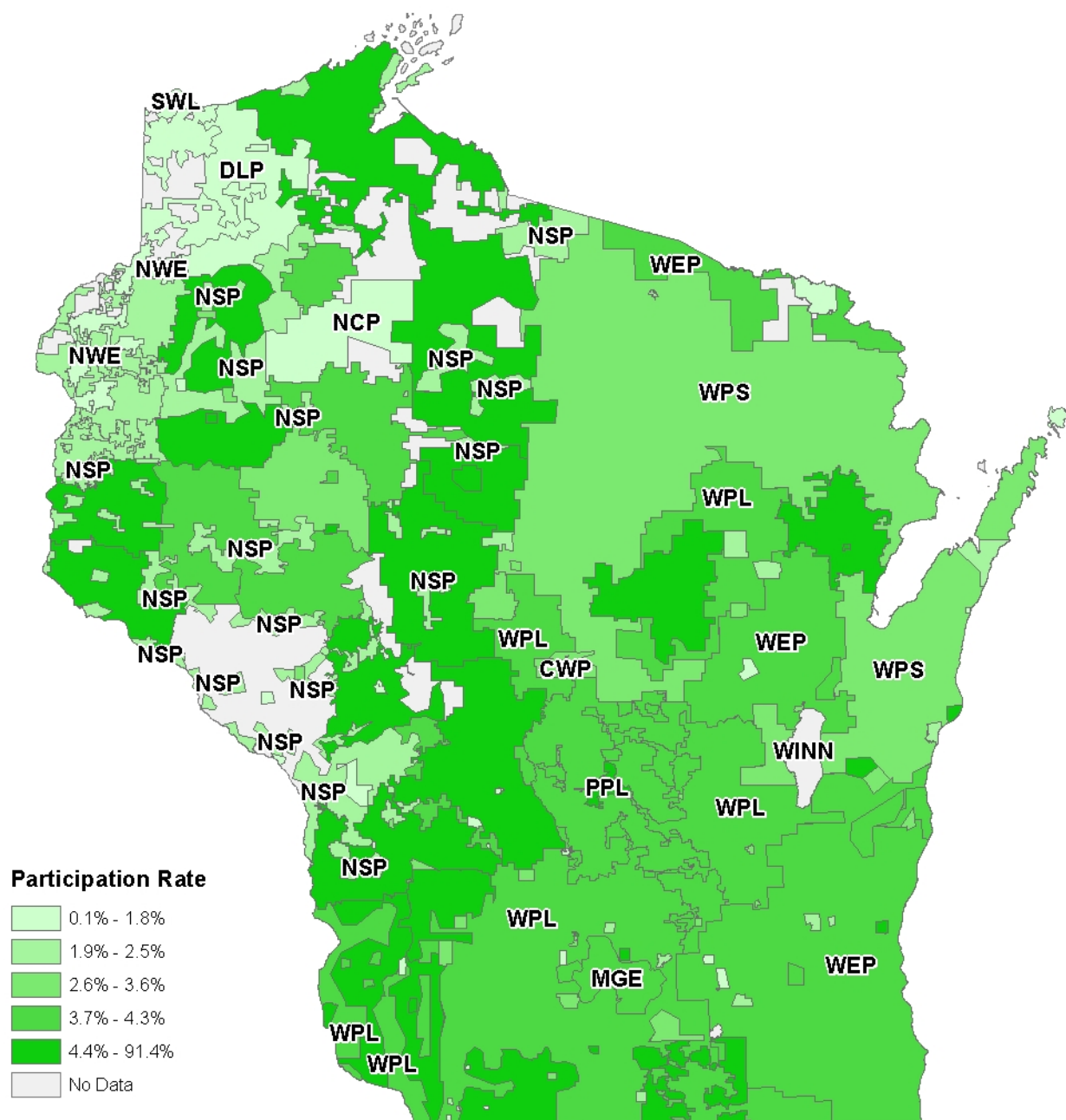
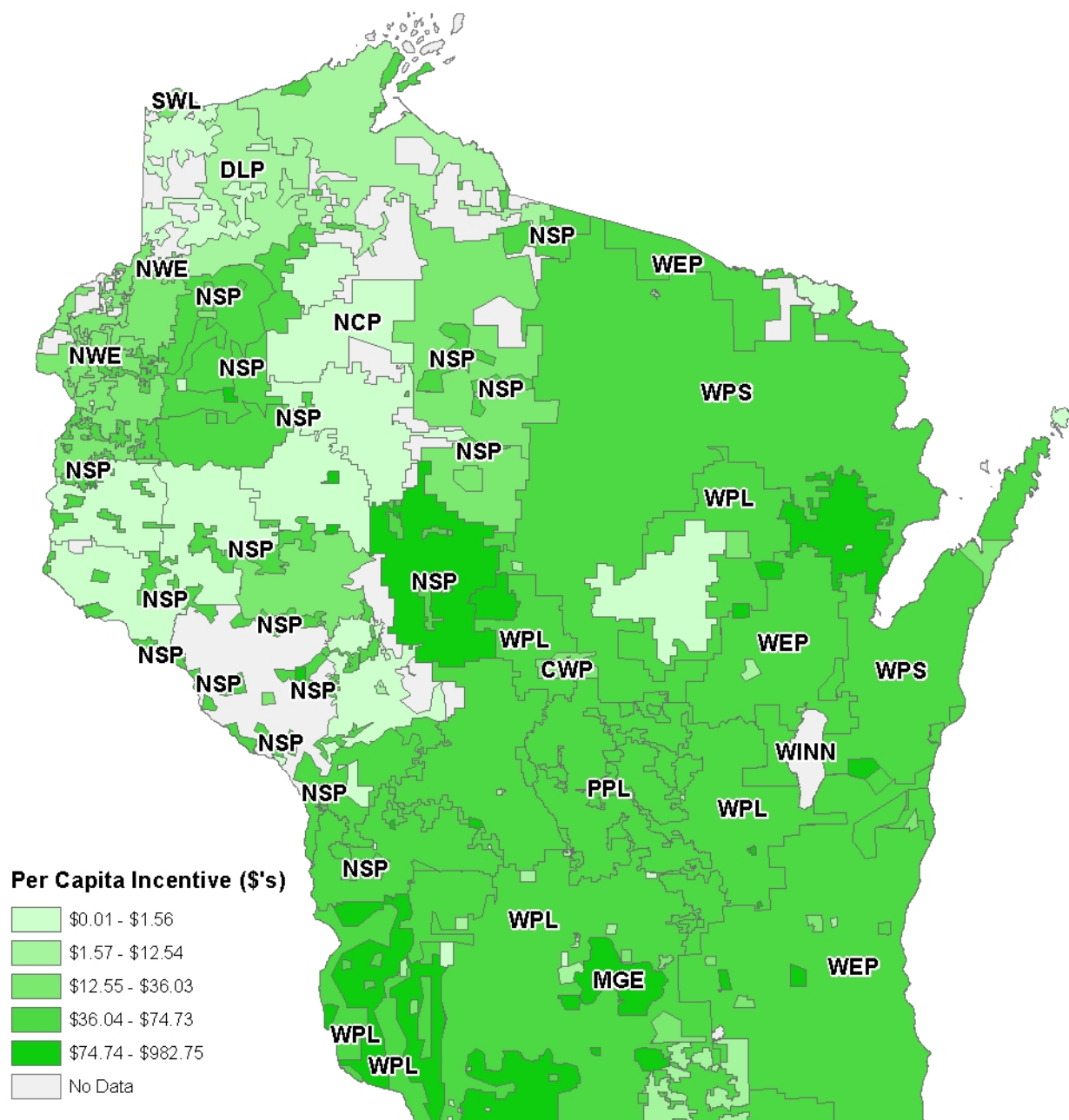


Figure 42. Commercial Per Capita Incentive Dollars Awarded by Electric Territory



Savings by Sector, by Gas Utility Territory

Residential

Figure 43. Residential Per Capita Energy Bill Savings by Gas Territory

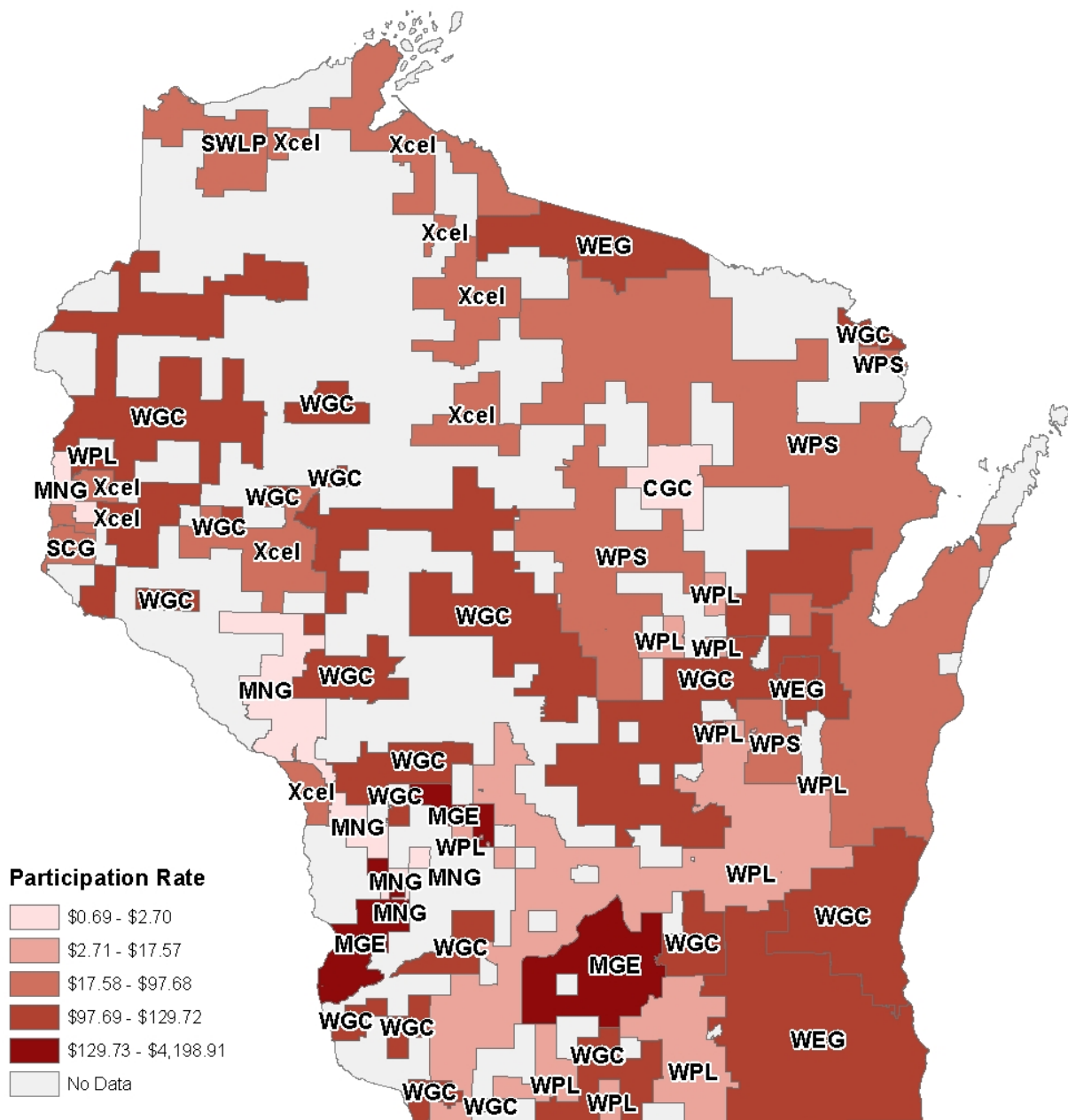
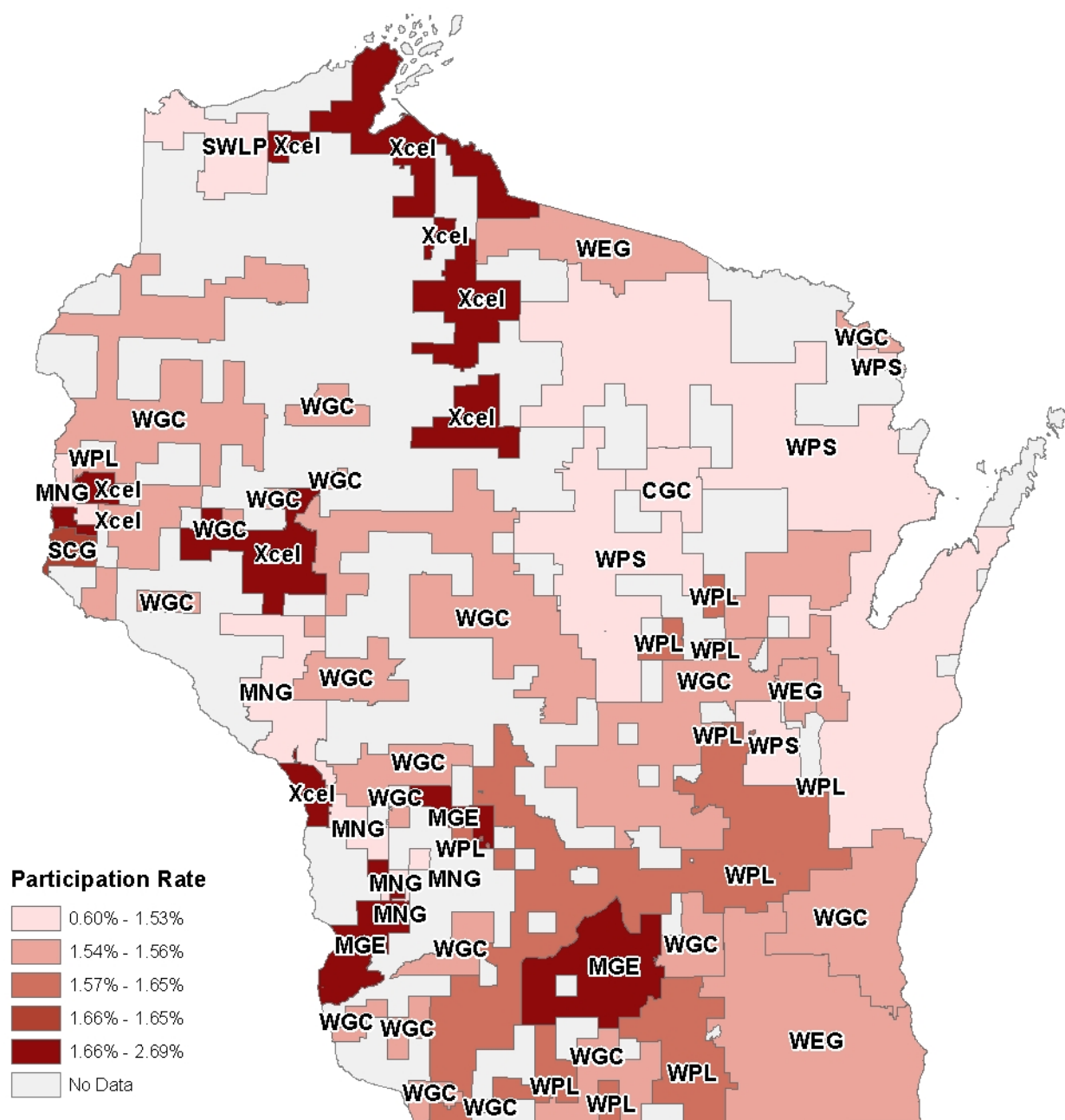
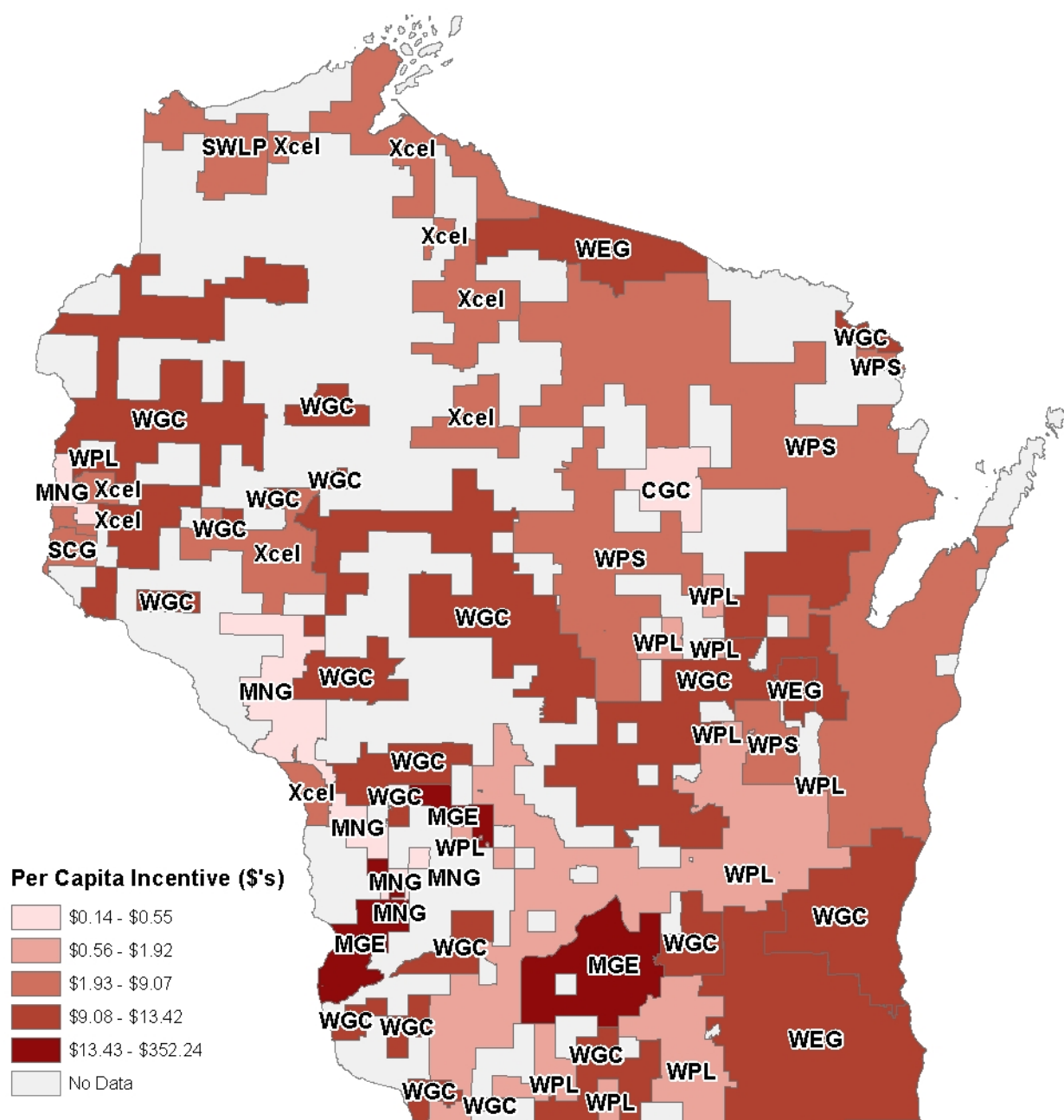


Figure 44. Residential Participation Rate by Gas Territory**Figure 45. Residential Per Capita Incentive Dollars Awarded by Gas Territory**



Industrial

Figure 46. Industrial Per Capita Energy Bill Savings by Gas Territory

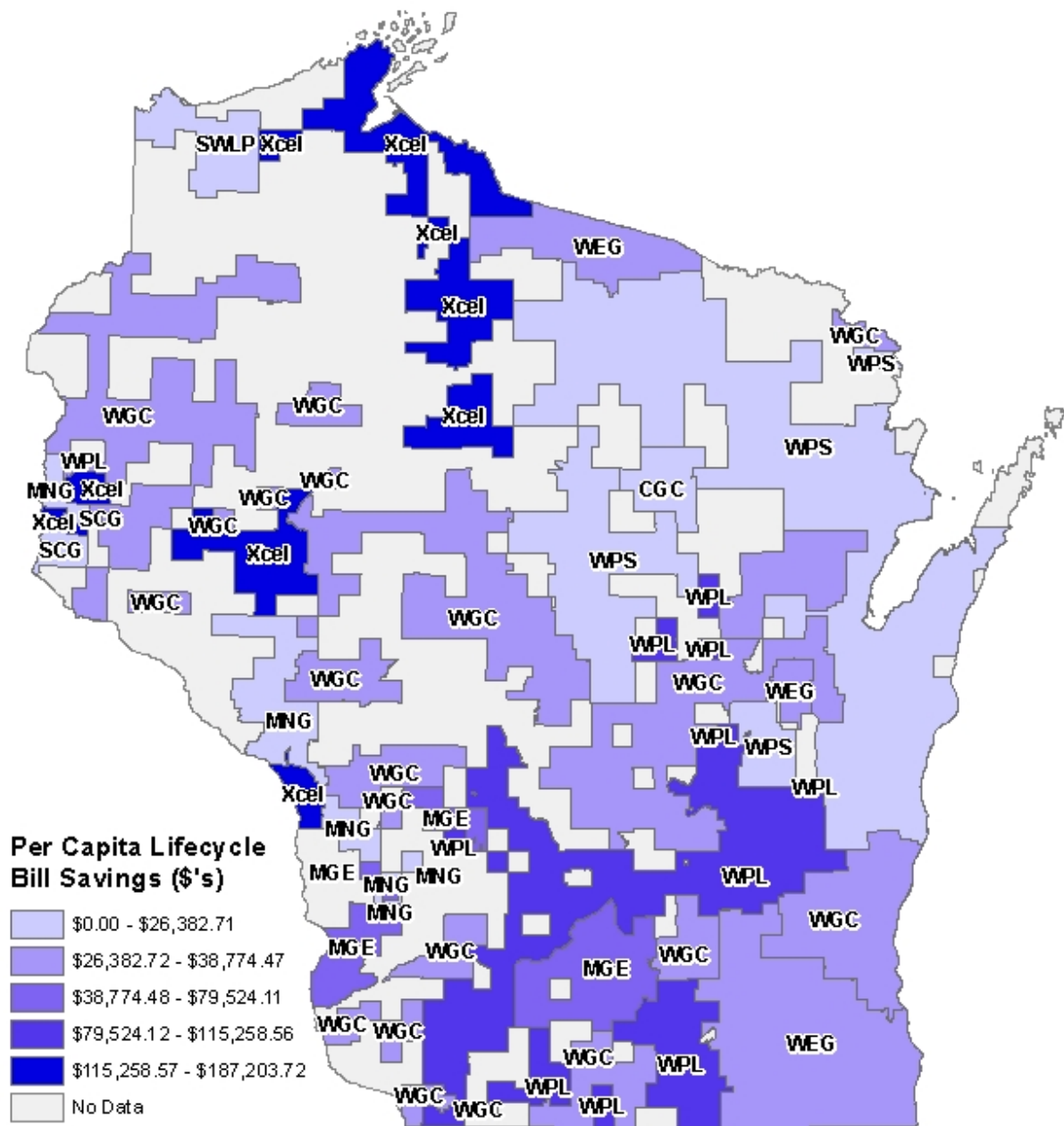


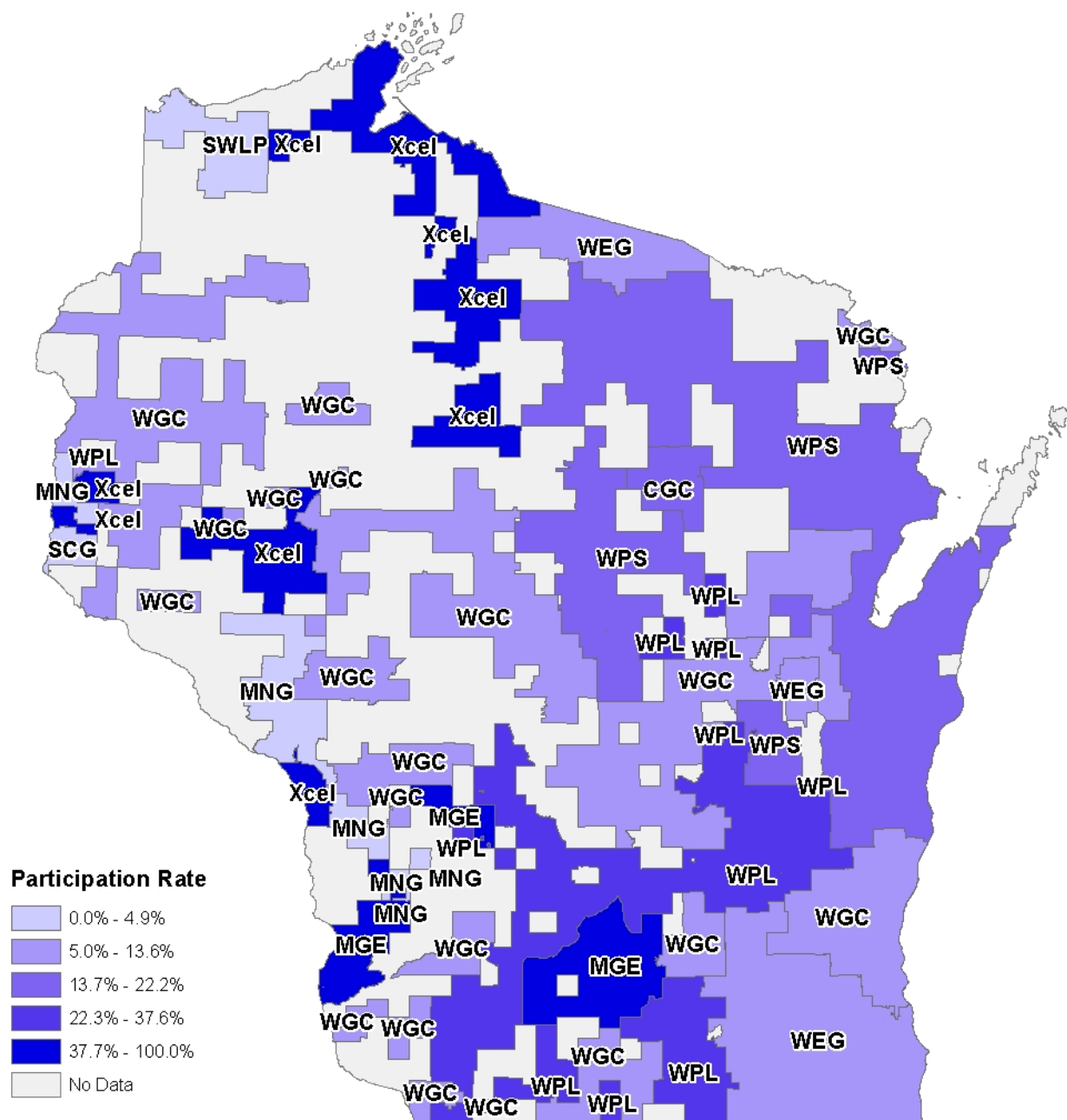
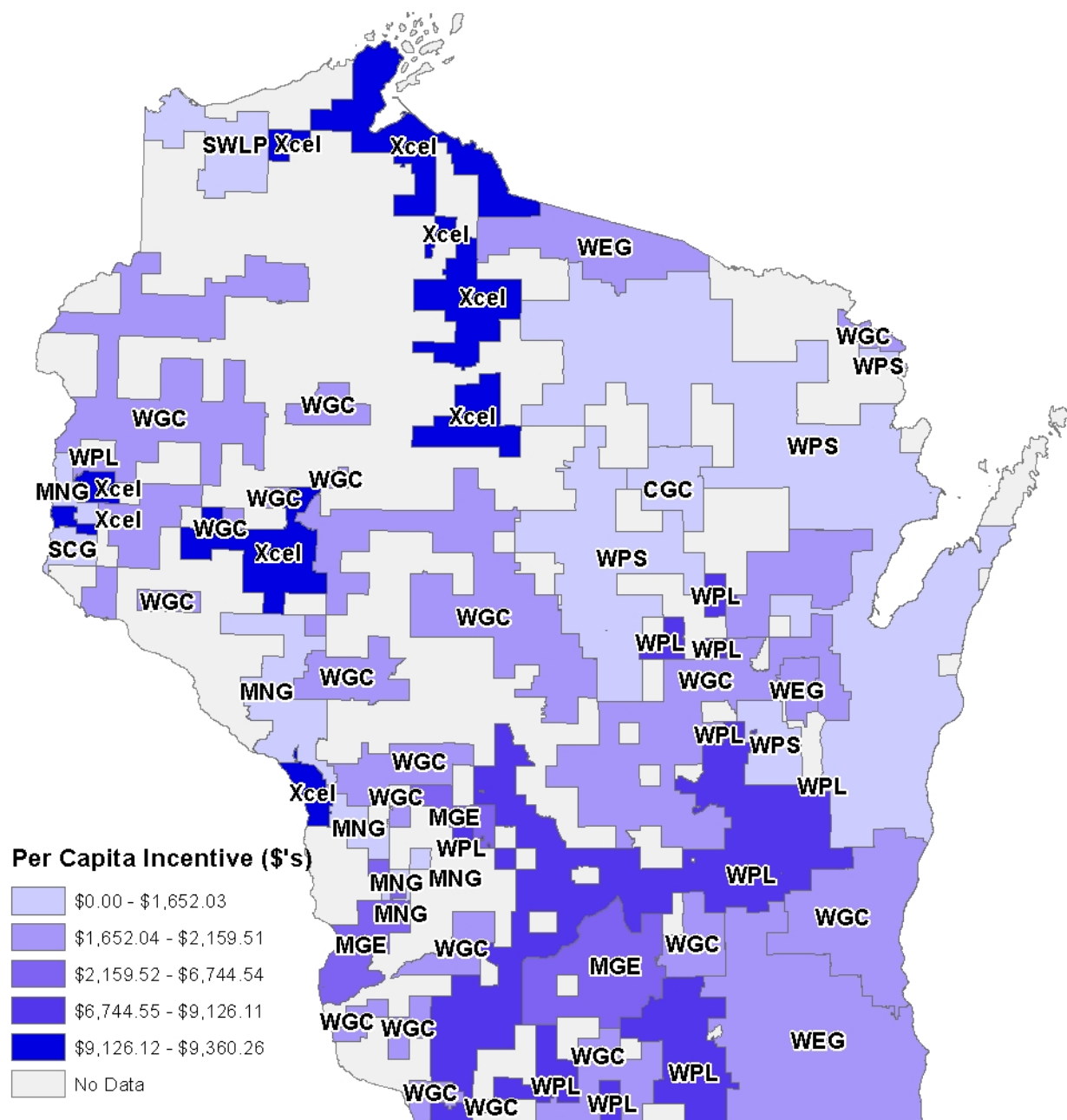
Figure 47. Industrial Participation Rate by Gas Territory

Figure 48. Industrial Per Capita Incentive Dollars Awarded by Gas Territory



Commercial

Figure 49. Commercial Per Capita Energy Bill Savings by Gas Territory

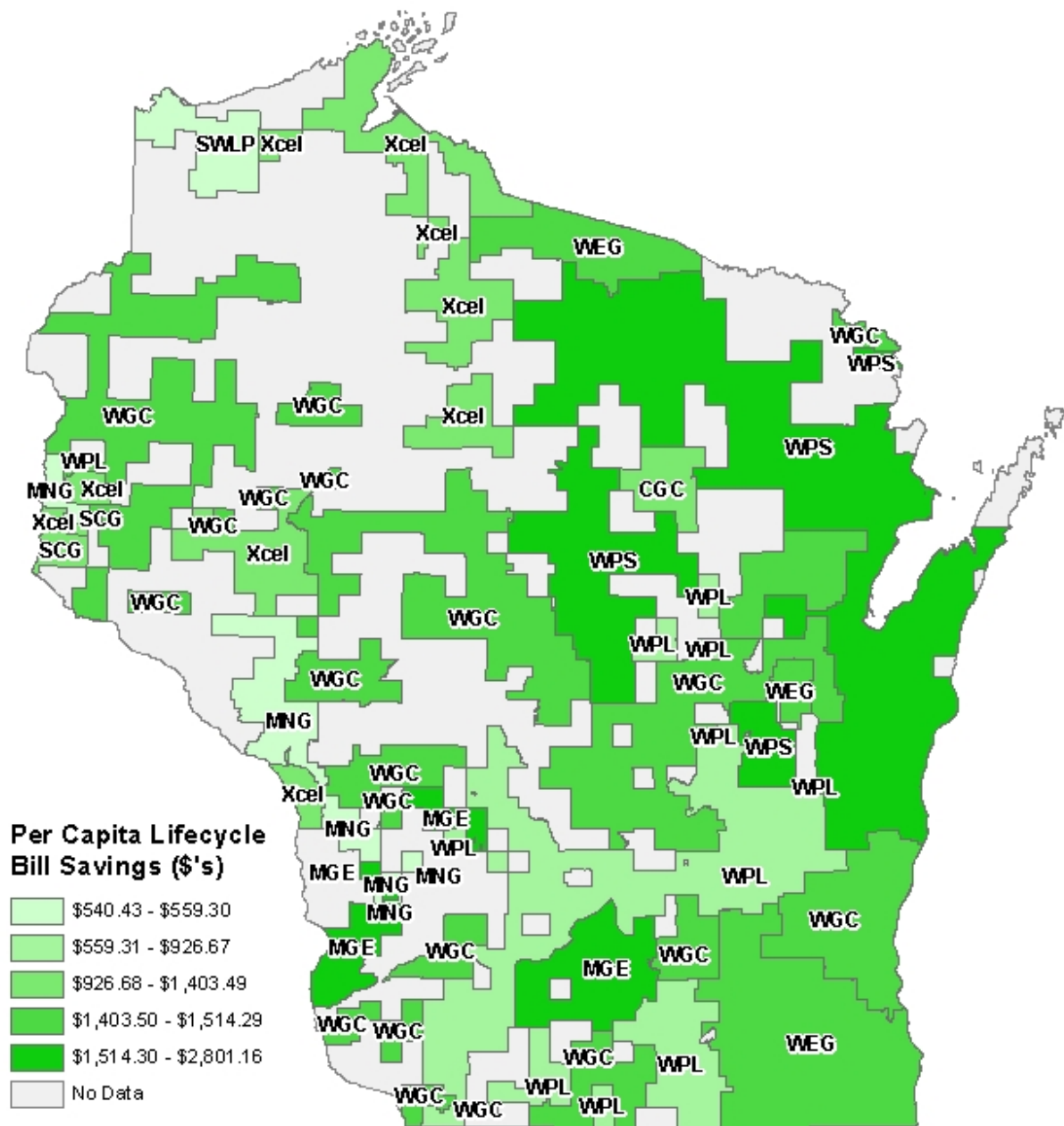


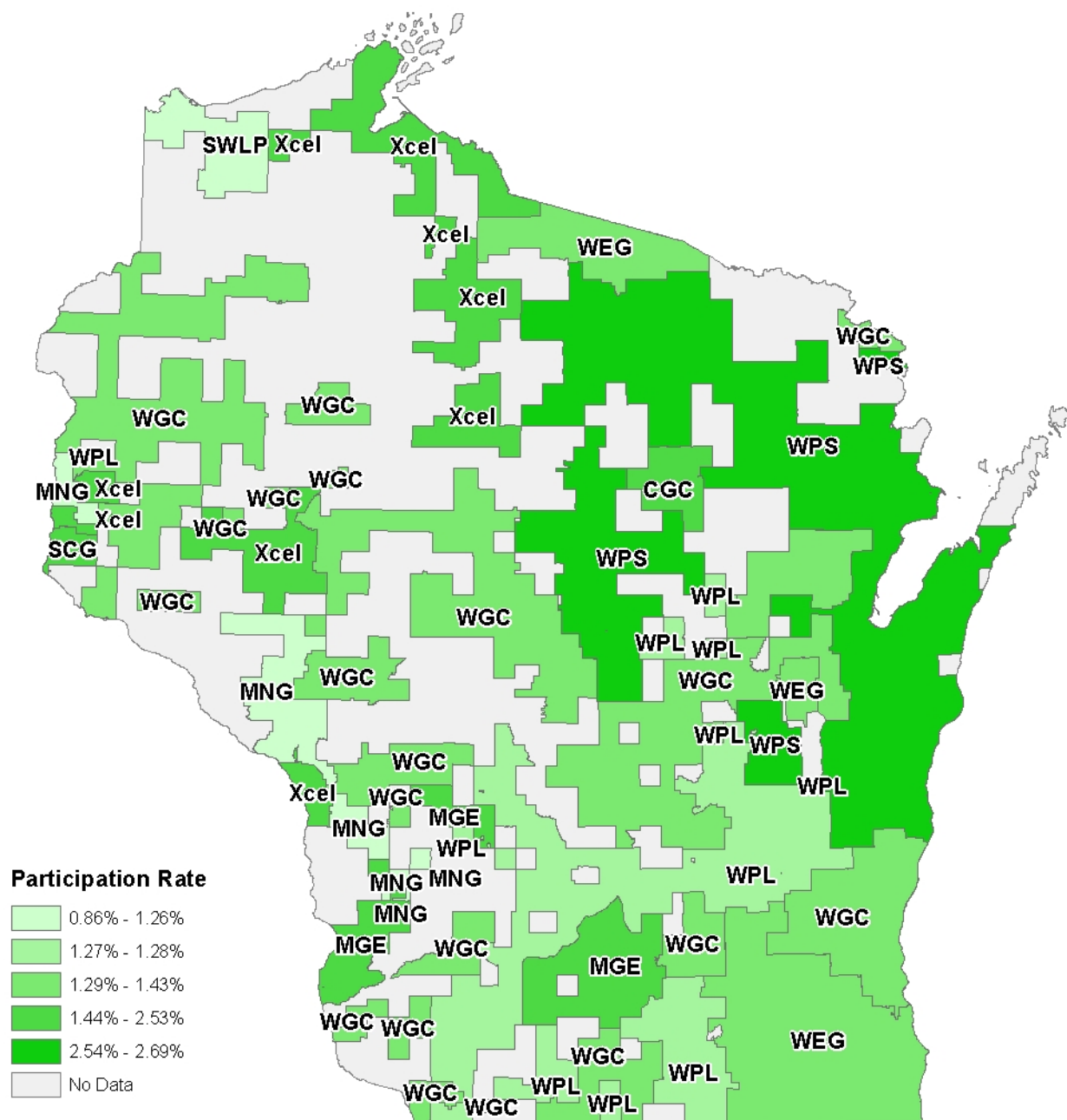
Figure 50. Commercial Participation Rate by Gas Territory

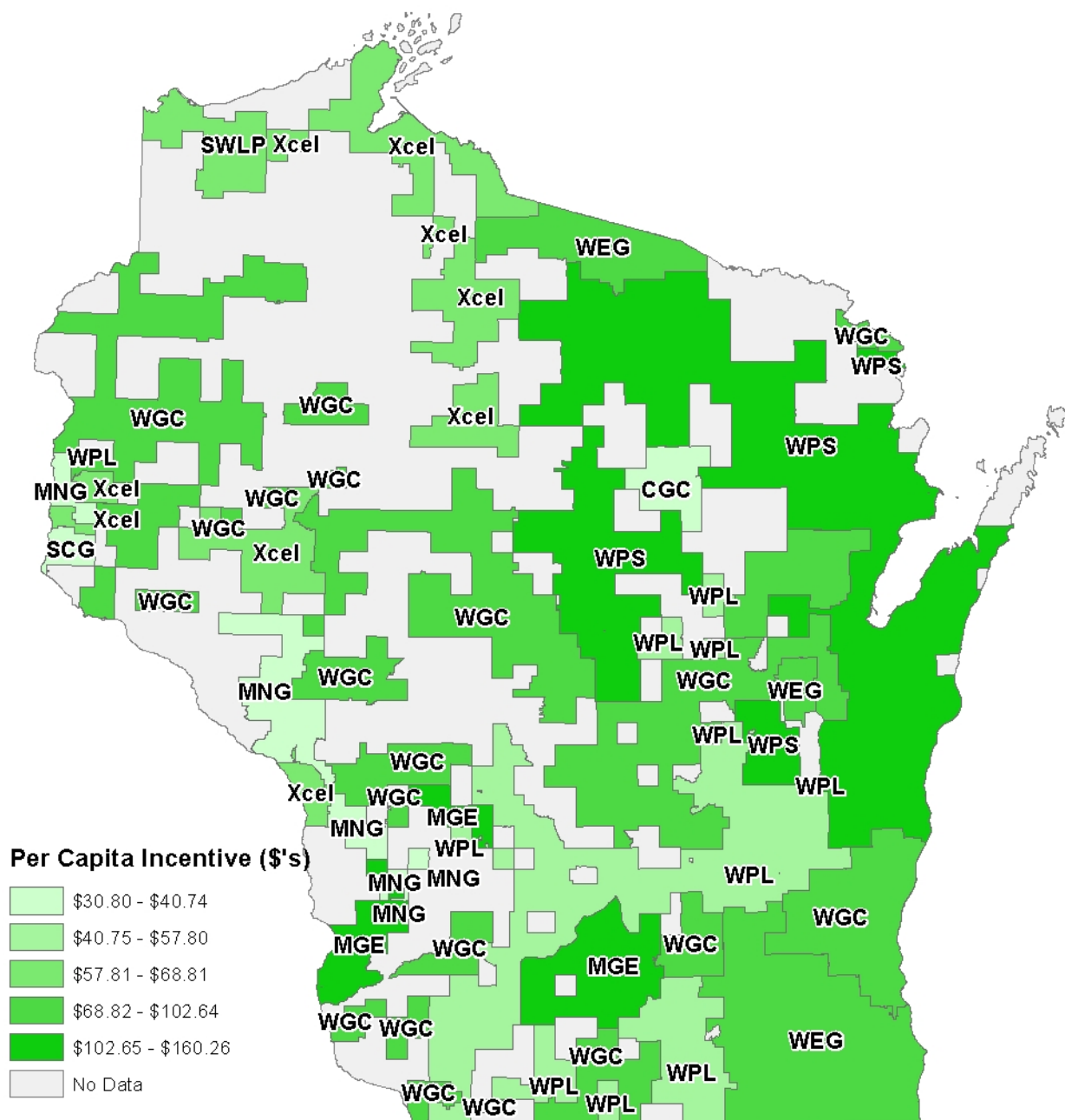
Figure 51. Commercial Per Capita Incentive Dollars Awarded by Gas Territory

Table 85. Savings and Participation by Territory and Sector

Territory	Utility Type	Sector	Per capita Life Cycle Bill Savings (\$)	Customer Participation Rate (%)	Per capita Incentive (\$)
Adams-Columbia Electric Cooperative	ELECTRIC	Commercial	\$637.36	4.1%	\$43.82
Algoma Utilities	ELECTRIC	Commercial	\$36.57	1.0%	\$2.22
Alliant Energy (WPL)	ELECTRIC	Commercial	\$711.74	3.6%	\$39.64
Arcadia Electric Utility	ELECTRIC	Commercial	\$648.04	1.6%	\$30.07
Argyle Municipal Electric Utility	ELECTRIC	Commercial	\$920.34	2.9%	\$44.50
Bangor Municipal Utility	ELECTRIC	Commercial	\$9.47	0.8%	\$0.38
Barron Light and Water Utility	ELECTRIC	Commercial	\$635.61	4.7%	\$46.23
Bayfield Electric Cooperative	ELECTRIC	Commercial	\$635.61	4.7%	\$46.23
Belmont Municipal Light And Water Utility	ELECTRIC	Commercial	\$223.55	45.9%	\$4.37
Benton Electric And Water Utility	ELECTRIC	Commercial	\$344.50	1.8%	\$18.97
Black Earth Electric Utilities	ELECTRIC	Commercial	\$92.13	1.4%	\$7.07
Black River Falls Municipal Utilities	ELECTRIC	Commercial	\$20.71	4.3%	\$1.91
Bloomer Electric And Water Utility	ELECTRIC	Commercial	\$49.96	1.3%	\$3.86
Boscobel Utilities	ELECTRIC	Commercial	\$370.33	3.2%	\$5.78
Brodhead Water And Light	ELECTRIC	Commercial	\$127.23	1.5%	\$6.53
Cadott Light And Water Department	ELECTRIC	Commercial	\$2,074.16	1.8%	\$41.30
Cashton Municipal Light And Water Plant	ELECTRIC	Commercial	\$4,204.17	10.5%	\$982.75
Cedarburg Light And Water Utility	ELECTRIC	Commercial	\$1,342.95	2.9%	\$594.52
Central Wisconsin Electric Cooperative	ELECTRIC	Commercial	\$657.99	5.6%	\$58.57
Centuria Municipal Electric Utility	ELECTRIC	Commercial	\$18.80	4.6%	\$0.47
Chippewa Valley Electric Cooperative	ELECTRIC	Commercial	\$0.85	0.2%	\$0.02
Clark Electric Cooperative	ELECTRIC	Commercial	\$13.98	3.3%	\$0.34
Clintonville Water And Electric Utility	ELECTRIC	Commercial	\$7,781.74	91.4%	\$581.24
Columbus Water And Light	ELECTRIC	Commercial	\$1,464.06	3.3%	\$156.84
Consolidated Water Power Co.	ELECTRIC	Commercial	\$363.71	3.0%	\$42.38
Cornell Municipal Electric Utility	ELECTRIC	Commercial	\$8.16	1.9%	\$0.22
Cuba City Light And Water	ELECTRIC	Commercial	\$4,007.96	3.6%	\$293.39
Cumberland Municipal Utility	ELECTRIC	Commercial	\$233.23	2.1%	\$8.59
Dahlberg Light And Power Co.	ELECTRIC	Commercial	\$5.23	1.1%	\$0.11
Dunn Energy Cooperative	ELECTRIC	Commercial	\$66.15	0.7%	\$2.94
Eagle River Light and Water Commission	ELECTRIC	Commercial	\$14.83	3.7%	\$0.39
East Central Energy Cooperative	ELECTRIC	Commercial	\$199.53	2.2%	\$7.00
Eau Claire Energy Cooperative	ELECTRIC	Commercial	\$2.17	0.6%	\$0.06
Elkhorn Light And Water	ELECTRIC	Commercial	\$322.97	3.8%	\$16.92
Elroy Electric And Water Utility	ELECTRIC	Commercial	\$450.55	1.1%	\$74.73
Evansville Water And Light Department	ELECTRIC	Commercial	\$2,387.60	1.6%	\$128.09
Fennimore Water and Light Plant	ELECTRIC	Commercial	\$7,330.37	20.1%	\$453.93

Territory	Utility Type	Sector	Per capita Life Cycle Bill Savings (\$)	Customer Participation Rate (%)	Per capita Incentive (\$)
Florence Utility Commission	ELECTRIC	Commercial	\$485.53	6.0%	\$19.68
Gresham Municipal Water And Electric	ELECTRIC	Commercial	\$1.16	0.3%	\$0.03
Hartford Electric	ELECTRIC	Commercial	\$484.17	2.1%	\$20.75
Hazel Green Light And Water Utility	ELECTRIC	Commercial	\$535.68	2.2%	\$27.79
Hustisford Utilities	ELECTRIC	Commercial	\$0.35	0.1%	\$0.01
Jackson Electric Cooperative	ELECTRIC	Commercial	\$702.01	1.5%	\$15.57
Jefferson Utilities	ELECTRIC	Commercial	\$46.60	9.5%	\$0.93
Jump River Electric Cooperative	ELECTRIC	Commercial	\$513.50	2.4%	\$20.06
Juneau Utilities	ELECTRIC	Commercial	\$23.19	4.2%	\$0.40
Kaukauna Utilities	ELECTRIC	Commercial	\$2,100.40	2.9%	\$382.64
Kiel Utilities	ELECTRIC	Commercial	\$1,672.83	4.1%	\$60.57
La Farge Municipal Utilities	ELECTRIC	Commercial	\$1,710.77	2.8%	\$63.14
Lake Mills Light And Water	ELECTRIC	Commercial	\$658.38	2.5%	\$50.34
Lodi Utilities	ELECTRIC	Commercial	\$267.28	0.4%	\$139.22
Madison Gas And Electric	ELECTRIC	Commercial	\$24.26	2.3%	\$1.81
Manitowoc Public Utilities	ELECTRIC	Commercial	\$1,801.89	3.6%	\$97.05
Marshfield Utilities	ELECTRIC	Commercial	\$961.25	2.1%	\$53.73
Mazomanie Electric Utility	ELECTRIC	Commercial	\$2,510.65	3.5%	\$106.49
Medford Electric Utility	ELECTRIC	Commercial	\$4.09	1.0%	\$0.10
Menasha Utilities	ELECTRIC	Commercial	\$825.01	4.5%	\$31.72
Merrillan Municipal Electric & Water Utility	ELECTRIC	Commercial	\$580.97	2.5%	\$30.61
Mount Horeb Utilities	ELECTRIC	Commercial	\$0.76	0.2%	\$0.02
Muscoda Utilities	ELECTRIC	Commercial	\$372.03	2.5%	\$77.96
New Glarus Light And Water	ELECTRIC	Commercial	\$34.11	2.6%	\$1.56
New Holstein Utilities	ELECTRIC	Commercial	\$671.12	5.0%	\$80.00
New Lisbon Municipal Light And Water	ELECTRIC	Commercial	\$187.14	4.3%	\$85.29
New London Utility Commission	ELECTRIC	Commercial	\$364.16	0.9%	\$9.82
New Richmond Utilities	ELECTRIC	Commercial	\$392.10	1.8%	\$4.83
North Central Power Co.	ELECTRIC	Commercial	\$1,615.38	2.3%	\$101.94
Northwestern Wisconsin Electric Co.	ELECTRIC	Commercial	\$14.07	0.8%	\$1.11
Oakdale Electric Cooperative	ELECTRIC	Commercial	\$519.80	1.1%	\$31.74
Oconomowoc Utilities	ELECTRIC	Commercial	\$359.49	5.3%	\$63.40
Oconto Electric Cooperative	ELECTRIC	Commercial	\$1,792.53	4.1%	\$85.26
Oconto Falls Municipal Utilities	ELECTRIC	Commercial	\$2,090.45	13.4%	\$99.56
Pardeeville Public Utilities	ELECTRIC	Commercial	\$242.33	5.2%	\$12.54
Pierce-Pepin Electric Cooperative	ELECTRIC	Commercial	\$15.59	3.8%	\$0.67
Pioneer Power And Light Co.	ELECTRIC	Commercial	\$23.98	4.8%	\$0.47
Plymouth Utilities	ELECTRIC	Commercial	\$441.16	4.8%	\$40.47
Polk-Burnett Electric Cooperative	ELECTRIC	Commercial	\$1,345.92	3.9%	\$37.01
Prairie Du Sac Utilities	ELECTRIC	Commercial	\$1,023.76	2.5%	\$34.88

Territory	Utility Type	Sector	Per capita Life Cycle Bill Savings (\$)	Customer Participation Rate (%)	Per capita Incentive (\$)
Price Electric Cooperative	ELECTRIC	Commercial	\$808.01	5.8%	\$42.63
Princeton Light And Water Department	ELECTRIC	Commercial	\$1,891.05	10.4%	\$30.71
Reedsburg Utility Commission	ELECTRIC	Commercial	\$89.73	3.1%	\$5.93
Rice Lake Utilities	ELECTRIC	Commercial	\$447.73	3.1%	\$9.79
Richland Center Municipal Utility	ELECTRIC	Commercial	\$4,043.83	2.7%	\$198.26
Richland Electric Cooperative	ELECTRIC	Commercial	\$119.85	2.7%	\$4.91
River Falls Municipal Utilities	ELECTRIC	Commercial	\$688.46	9.4%	\$36.55
Rock Energy Cooperative	ELECTRIC	Commercial	\$204.33	7.5%	\$8.29
Sauk City Utilities	ELECTRIC	Commercial	\$143.95	2.9%	\$11.27
Scenic Rivers Energy Coop	ELECTRIC	Commercial	\$1,933.41	10.8%	\$223.67
Shawano Municipal Utilities	ELECTRIC	Commercial	\$1,576.22	1.8%	\$126.49
Sheboygan Falls Utilities	ELECTRIC	Commercial	\$1,495.69	3.0%	\$34.69
Shullsburg Municipal Electric Utility	ELECTRIC	Commercial	\$136.91	1.1%	\$6.78
Slinger Utilities	ELECTRIC	Commercial	\$78.50	2.2%	\$7.78
Spooner Municipal Utilities	ELECTRIC	Commercial	\$1,024.13	2.7%	\$27.72
St Croix Electric Cooperative	ELECTRIC	Commercial	\$30.55	6.3%	\$1.06
Stoughton Utilities	ELECTRIC	Commercial	\$589.14	2.8%	\$21.88
Stratford Water And Electric Utility	ELECTRIC	Commercial	\$250.38	3.6%	\$10.98
Sturgeon Bay Utilities	ELECTRIC	Commercial	\$328.28	2.2%	\$24.44
Sun Prairie Water And Light	ELECTRIC	Commercial	\$711.50	2.1%	\$21.85
Superior Water, Light And Power Co	ELECTRIC	Commercial	\$323.72	0.9%	\$36.03
Taylor Electric Cooperative	ELECTRIC	Commercial	\$329.42	9.3%	\$14.56
Trempealeau Municipal Utility	ELECTRIC	Commercial	\$6.57	1.2%	\$0.09
Two Rivers Water And Light	ELECTRIC	Commercial	\$1,019.11	4.4%	\$40.19
Vernon Electric Cooperative	ELECTRIC	Commercial	\$640.26	5.7%	\$43.98
Viola Municipal Electric Utility	ELECTRIC	Commercial	\$3,582.69	3.6%	\$166.72
Washington Island Cooperative	ELECTRIC	Commercial	\$1.02	0.2%	\$0.02
Waterloo Utilities	ELECTRIC	Commercial	\$314.75	1.0%	\$19.99
Waunakee Utilities	ELECTRIC	Commercial	\$1,101.57	4.4%	\$30.34
Waupun Utilities	ELECTRIC	Commercial	\$3,791.49	3.5%	\$180.52
We Energies (WEPCO)	ELECTRIC	Commercial	\$3.45	0.8%	\$0.07
Westby Electric And Water Utility	ELECTRIC	Commercial	\$2,298.98	2.7%	\$101.45
Whitehall Electric Utility	ELECTRIC	Commercial	\$202.96	0.9%	\$11.09
Wisconsin Dells Water And Light Utilities	ELECTRIC	Commercial	\$976.95	4.0%	\$68.49
Wisconsin Public Service Corp.	ELECTRIC	Commercial	\$1,132.26	3.6%	\$60.70
Wisconsin Rapids Water Works And	ELECTRIC	Commercial	\$404.50	3.1%	\$18.55
Wonewoc Municipal Water And Light	ELECTRIC	Commercial	\$4.36	0.9%	\$0.09
Xcel Energy (NSP)	ELECTRIC	Commercial	\$886.36	2.5%	\$47.37
Adams-Columbia Electric Cooperative	ELECTRIC	Industrial	\$93.13	0.3%	\$4.53
Algoma Utilities	ELECTRIC	Industrial	\$13,388.99	100.0%	\$850.00

Territory	Utility Type	Sector	Per capita Life Cycle Bill Savings (\$)	Customer Participation Rate (%)	Per capita Incentive (\$)
Alliant Energy	ELECTRIC	Industrial	\$47,064.98	13.7%	\$2,819.20
Arcadia Electric Utility	ELECTRIC	Industrial	\$1,232.23	2.0%	\$240.00
Argyle Municipal Electric Utility	ELECTRIC	Industrial	\$15,344.44	100.0%	\$800.00
Black River Falls Municipal Utilities	ELECTRIC	Industrial	\$0.00	0.0%	\$0.00
Bloomer Electric And Water Utility	ELECTRIC	Industrial	\$1,057.32	3.6%	\$57.27
Brodhead Water And Light	ELECTRIC	Industrial	\$485,461.38	100.0%	\$24,600.00
Cadott Light And Water Department	ELECTRIC	Industrial	\$4,862.32	8.3%	\$275.00
Cedarburg Light And Water Utility	ELECTRIC	Industrial	\$17,102.63	100.0%	\$1,179.00
Clark Electric Cooperative	ELECTRIC	Industrial	\$0.00	0.0%	\$0.00
Columbus Water And Light	ELECTRIC	Industrial	\$21,130.70	100.0%	\$2,385.00
Consolidated Water Power Co.	ELECTRIC	Industrial	\$2,185,249.15	100.0%	\$57,542.56
Cumberland Municipal Utility	ELECTRIC	Industrial	\$9,998.30	9.5%	\$424.52
Eau Claire Energy Cooperative	ELECTRIC	Industrial	\$4,345.53	33.3%	\$1,025.00
Elkhorn Light And Water	ELECTRIC	Industrial	\$8,055.91	8.0%	\$404.82
Evansville Water And Light Department	ELECTRIC	Industrial	\$6,339,967.04	100.0%	\$422,208.06
Fennimore Water and Light Plant	ELECTRIC	Industrial	\$165.08	3.4%	\$9.66
Florence Utility Commission	ELECTRIC	Industrial	\$0.00	0.0%	\$0.00
Hartford Electric	ELECTRIC	Industrial	\$57,488.72	100.0%	\$3,443.94
Jefferson Utilities	ELECTRIC	Industrial	\$492,078.20	100.0%	\$34,305.33
Juneau Utilities	ELECTRIC	Industrial	\$26,188.88	100.0%	\$1,437.50
Kaukauna Utilities	ELECTRIC	Industrial	\$842,402.60	100.0%	\$58,499.72
Kiel Utilities	ELECTRIC	Industrial	\$25,094.67	31.3%	\$1,875.81
Lake Mills Light And Water	ELECTRIC	Industrial	\$0.00	0.0%	\$0.00
Lodi Utilities	ELECTRIC	Industrial	\$0.00	0.0%	\$0.00
Madison Gas And Electric	ELECTRIC	Industrial	\$105,587.22	57.4%	\$8,983.10
Manitowoc Public Utilities	ELECTRIC	Industrial	\$27,256.49	19.0%	\$2,050.12
Marshfield Utilities	ELECTRIC	Industrial	\$1,685.14	11.1%	\$142.70
Medford Electric Utility	ELECTRIC	Industrial	\$1,280.33	4.1%	\$40.26
Menasha Utilities	ELECTRIC	Industrial	\$22,857.50	33.3%	\$1,170.83
New Glarus Light And Water	ELECTRIC	Industrial	\$10,599.58	100.0%	\$600.00
New Holstein Utilities	ELECTRIC	Industrial	\$0.00	0.0%	\$0.00
New Lisbon Municipal Light And Water	ELECTRIC	Industrial	\$1,917.98	4.2%	\$82.33
New London Utility Commission	ELECTRIC	Industrial	\$889.61	16.7%	\$41.67
New Richmond Utilities	ELECTRIC	Industrial	\$112,628.59	100.0%	\$5,425.00
Northwestern Wisconsin Electric Co.	ELECTRIC	Industrial	\$3,329.56	7.4%	\$94.26
Oakdale Electric Cooperative	ELECTRIC	Industrial	\$0.00	5.3%	\$5.26
Oconomowoc Utilities	ELECTRIC	Industrial	\$28,005.79	42.9%	\$2,240.57
Oconto Electric Cooperative	ELECTRIC	Industrial	\$630.18	7.7%	\$30.77
Oconto Falls Municipal Utilities	ELECTRIC	Industrial	\$0.00	0.0%	\$0.00
Pioneer Power And Light Co.	ELECTRIC	Industrial	\$2,443.79	4.8%	\$161.67

Territory	Utility Type	Sector	Per capita Life Cycle Bill Savings (\$)	Customer Participation Rate (%)	Per capita Incentive (\$)
Plymouth Utilities	ELECTRIC	Industrial	\$57,729.40	77.8%	\$4,114.94
Reedsburg Utility Commission	ELECTRIC	Industrial	\$38,882.32	42.9%	\$3,854.00
Rice Lake Utilities	ELECTRIC	Industrial	\$387.97	1.4%	\$17.23
Richland Center Municipal Utility	ELECTRIC	Industrial	\$91,265.63	75.0%	\$3,703.00
Rock Energy Cooperative	ELECTRIC	Industrial	\$1,368.24	1.4%	\$64.08
Sauk City Utilities	ELECTRIC	Industrial	\$2,575.72	6.9%	\$246.55
Scenic Rivers Energy Coop	ELECTRIC	Industrial	\$473.98	5.9%	\$28.24
Shawano Municipal Utilities	ELECTRIC	Industrial	\$3,101.34	2.4%	\$276.63
Sheboygan Falls Utilities	ELECTRIC	Industrial	\$36,910.88	6.9%	\$1,345.43
Stoughton Utilities	ELECTRIC	Industrial	\$62,689.65	66.7%	\$2,533.33
Stratford Water And Electric Utility	ELECTRIC	Industrial	\$12,784.54	66.7%	\$572.50
Sturgeon Bay Utilities	ELECTRIC	Industrial	\$160,825.56	100.0%	\$8,148.00
Sun Prairie Water And Light	ELECTRIC	Industrial	\$111,512.80	100.0%	\$8,912.50
Superior Water, Light And Power Co	ELECTRIC	Industrial	\$9,577.74	3.5%	\$296.73
Two Rivers Water And Light	ELECTRIC	Industrial	\$450,452.39	100.0%	\$19,383.67
Waunakee Utilities	ELECTRIC	Industrial	\$9,408.71	33.3%	\$1,000.00
We Energies (WEPCO)	ELECTRIC	Industrial	\$213,325.73	100.0%	\$43,804.59
Whitehall Electric Utility	ELECTRIC	Industrial	\$116,424.05	49.7%	\$6,564.18
Wisconsin Public Service Corp.	ELECTRIC	Industrial	\$108,774.27	87.7%	\$7,256.06
Wisconsin Rapids Water Works And	ELECTRIC	Industrial	\$440,377.08	66.7%	\$33,711.67
Wonewoc Municipal Water And Light	ELECTRIC	Industrial	\$3,202.59	100.0%	\$150.00
Xcel Energy (Nsp)	ELECTRIC	Industrial	\$199,816.50	100.0%	\$12,242.79
Adams-Columbia Electric Cooperative	ELECTRIC	Residential	\$19.33	3.2%	\$2.33
Algoma Utilities	ELECTRIC	Residential	\$38.74	2.3%	\$2.43
Alliant Energy (WPL)	ELECTRIC	Residential	\$62.14	7.8%	\$5.17
Arcadia Electric Utility	ELECTRIC	Residential	\$14.05	1.0%	\$1.86
Argyle Municipal Electric Utility	ELECTRIC	Residential	\$51.96	8.7%	\$2.59
Bangor Municipal Utility	ELECTRIC	Residential	\$44.97	4.5%	\$3.14
Barron Light And Water Utility	ELECTRIC	Residential	\$81.88	14.3%	\$3.68
Bayfield Electric Cooperative	ELECTRIC	Residential	\$17.15	4.5%	\$0.34
Belmont Municipal Light And Water Utility	ELECTRIC	Residential	\$27.78	3.6%	\$2.72
Benton Electric And Water Utility	ELECTRIC	Residential	\$33.09	1.0%	\$6.39
Black Earth Electric Utilities	ELECTRIC	Residential	\$46.02	7.4%	\$3.46
Black River Falls Municipal Utilities	ELECTRIC	Residential	\$61.46	3.5%	\$10.57
Bloomer Electric And Water Utility	ELECTRIC	Residential	\$20.43	2.2%	\$1.68
Boscobel Utilities	ELECTRIC	Residential	\$14.84	2.8%	\$0.95
Brodhead Water And Light	ELECTRIC	Residential	\$19.64	5.8%	\$0.73
Cadott Light And Water Department	ELECTRIC	Residential	\$21.05	3.3%	\$1.57
Cashton Municipal Light And Water Plant	ELECTRIC	Residential	\$22.12	6.1%	\$0.82
Cedarburg Light And Water Utility	ELECTRIC	Residential	\$98.52	14.4%	\$5.42

Territory	Utility Type	Sector	Per capita Life Cycle Bill Savings (\$)	Customer Participation Rate (%)	Per capita Incentive (\$)
Central Wisconsin Electric Cooperative	ELECTRIC	Residential	\$19.79	5.6%	\$0.44
Centuria Municipal Electric Utility	ELECTRIC	Residential	\$2.88	1.1%	\$0.06
Chippewa Valley Electric Cooperative	ELECTRIC	Residential	\$12.44	3.7%	\$0.30
Clark Electric Cooperative	ELECTRIC	Residential	\$36.63	7.3%	\$3.41
Clintonville Water And Electric Utility	ELECTRIC	Residential	\$22.86	6.9%	\$0.65
Columbus Water And Light	ELECTRIC	Residential	\$49.93	5.8%	\$3.11
Consolidated Water Power Co.	ELECTRIC	Residential	\$34.14	8.4%	\$2.13
Cornell Municipal Electric Utility	ELECTRIC	Residential	\$13.88	3.4%	\$0.66
Cuba City Light And Water	ELECTRIC	Residential	\$30.69	2.7%	\$4.10
Cumberland Municipal Utility	ELECTRIC	Residential	\$20.89	4.2%	\$0.95
Dahlberg Light And Power Co.	ELECTRIC	Residential	\$14.83	1.0%	\$2.35
Dunn Energy Cooperative	ELECTRIC	Residential	\$12.37	3.3%	\$0.51
Eagle River Light and Water Commission	ELECTRIC	Residential	\$53.82	12.0%	\$2.81
East Central Energy Cooperative	ELECTRIC	Residential	\$1.68	0.6%	\$0.05
Eau Claire Energy Cooperative	ELECTRIC	Residential	\$164.92	4.6%	\$11.56
Elkhorn Light And Water	ELECTRIC	Residential	\$30.04	0.7%	\$1.23
Elroy Electric And Water Utility	ELECTRIC	Residential	\$43.20	3.6%	\$2.53
Evansville Water And Light Department	ELECTRIC	Residential	\$60.99	10.5%	\$3.28
Fennimore Water and Light Plant	ELECTRIC	Residential	\$75.28	17.2%	\$13.91
Florence Utility Commission	ELECTRIC	Residential	\$5.44	1.0%	\$0.42
Gresham Municipal Water And Electric	ELECTRIC	Residential	\$9.05	2.8%	\$0.22
Hartford Electric	ELECTRIC	Residential	\$63.33	5.5%	\$2.79
Hazel Green Light And Water Utility	ELECTRIC	Residential	\$11.00	0.8%	\$1.23
Hustisford Utilities	ELECTRIC	Residential	\$24.28	1.6%	\$2.22
Jackson Electric Cooperative	ELECTRIC	Residential	\$9.12	2.4%	\$0.18
Jefferson Utilities	ELECTRIC	Residential	\$27.58	4.2%	\$1.57
Jump River Electric Cooperative	ELECTRIC	Residential	\$21.04	4.8%	\$0.36
Juneau Utilities	ELECTRIC	Residential	\$50.11	4.3%	\$3.36
Kaukauna Utilities	ELECTRIC	Residential	\$72.52	7.2%	\$6.20
Kiel Utilities	ELECTRIC	Residential	\$50.96	7.1%	\$3.74
La Farge Municipal Utilities	ELECTRIC	Residential	\$50.44	2.0%	\$22.91
Lake Mills Light And Water	ELECTRIC	Residential	\$68.12	2.8%	\$4.08
Lodi Utilities	ELECTRIC	Residential	\$48.81	8.2%	\$2.96
Madison Gas And Electric	ELECTRIC	Residential	\$135.27	9.8%	\$11.29
Manitowoc Public Utilities	ELECTRIC	Residential	\$50.18	4.3%	\$2.98
Marshfield Utilities	ELECTRIC	Residential	\$59.04	7.5%	\$3.84
Mazomanie Electric Utility	ELECTRIC	Residential	\$23.15	3.4%	\$1.68
Medford Electric Utility	ELECTRIC	Residential	\$47.43	8.4%	\$2.65
Menasha Utilities	ELECTRIC	Residential	\$46.90	3.3%	\$6.80
Merrillan Municipal Electric & Water Utility	ELECTRIC	Residential	\$2.65	0.7%	\$0.05

Territory	Utility Type	Sector	Per capita Life Cycle Bill Savings (\$)	Customer Participation Rate (%)	Per capita Incentive (\$)
Mount Horeb Utilities	ELECTRIC	Residential	\$69.01	4.1%	\$4.24
Muscoda Utilities	ELECTRIC	Residential	\$29.17	7.2%	\$1.24
New Glarus Light And Water	ELECTRIC	Residential	\$66.35	10.8%	\$4.28
New Holstein Utilities	ELECTRIC	Residential	\$79.44	11.7%	\$5.04
New Lisbon Municipal Light And Water	ELECTRIC	Residential	\$28.35	1.9%	\$7.58
New London Utility Commission	ELECTRIC	Residential	\$26.13	4.7%	\$1.66
New Richmond Utilities	ELECTRIC	Residential	\$25.58	3.3%	\$3.91
North Central Power Co.	ELECTRIC	Residential	\$5.89	1.2%	\$0.68
Northwestern Wisconsin Electric Co.	ELECTRIC	Residential	\$7.88	1.4%	\$0.61
Oakdale Electric Cooperative	ELECTRIC	Residential	\$31.95	6.4%	\$3.24
Oconomowoc Utilities	ELECTRIC	Residential	\$125.45	10.9%	\$5.26
Oconto Electric Cooperative	ELECTRIC	Residential	\$36.82	5.9%	\$2.73
Oconto Falls Municipal Utilities	ELECTRIC	Residential	\$57.31	13.8%	\$2.88
Pardeeville Public Utilities	ELECTRIC	Residential	\$25.60	6.8%	\$0.89
Pierce-Pepin Electric Cooperative	ELECTRIC	Residential	\$47.55	5.3%	\$9.95
Pioneer Power And Light Co.	ELECTRIC	Residential	\$19.78	4.6%	\$1.00
Plymouth Utilities	ELECTRIC	Residential	\$64.20	8.8%	\$4.13
Polk-Burnett Electric Cooperative	ELECTRIC	Residential	\$23.68	2.5%	\$2.59
Prairie Du Sac Utilities	ELECTRIC	Residential	\$83.44	6.1%	\$10.57
Price Electric Cooperative	ELECTRIC	Residential	\$23.91	6.6%	\$0.85
Princeton Light And Water Department	ELECTRIC	Residential	\$23.32	3.9%	\$1.26
Reedsburg Utility Commission	ELECTRIC	Residential	\$69.07	6.3%	\$5.73
Rice Lake Utilities	ELECTRIC	Residential	\$13.52	1.2%	\$2.87
Richland Center Municipal Utility	ELECTRIC	Residential	\$50.54	7.7%	\$3.91
Richland Electric Cooperative	ELECTRIC	Residential	\$58.66	7.9%	\$8.12
River Falls Municipal Utilities	ELECTRIC	Residential	\$53.23	7.5%	\$2.16
Rock Energy Cooperative	ELECTRIC	Residential	\$71.33	7.3%	\$3.77
Sauk City Utilities	ELECTRIC	Residential	\$24.70	8.1%	\$3.00
Scenic Rivers Energy Coop	ELECTRIC	Residential	\$21.72	3.0%	\$1.19
Shawano Municipal Utilities	ELECTRIC	Residential	\$61.96	4.9%	\$3.19
Sheboygan Falls Utilities	ELECTRIC	Residential	\$12.90	5.0%	\$0.94
Shullsburg Municipal Electric Utility	ELECTRIC	Residential	\$48.33	2.2%	\$2.68
Slinger Utilities	ELECTRIC	Residential	\$26.64	7.7%	\$2.27
Spooner Municipal Utilities	ELECTRIC	Residential	\$22.79	4.0%	\$0.79
St Croix Electric Cooperative	ELECTRIC	Residential	\$71.46	5.1%	\$8.23
Stoughton Utilities	ELECTRIC	Residential	\$41.65	6.6%	\$1.84
Stratford Water And Electric Utility	ELECTRIC	Residential	\$58.02	10.4%	\$5.81
Sturgeon Bay Utilities	ELECTRIC	Residential	\$80.30	5.9%	\$4.39
Sun Prairie Water And Light	ELECTRIC	Residential	\$41.19	5.3%	\$3.66
Superior Water, Light And Power Co	ELECTRIC	Residential	\$28.16	1.6%	\$1.12

Territory	Utility Type	Sector	Per capita Life Cycle Bill Savings (\$)	Customer Participation Rate (%)	Per capita Incentive (\$)
Taylor Electric Cooperative	ELECTRIC	Residential	\$22.64	6.9%	\$2.21
Trempealeau Municipal Utility	ELECTRIC	Residential	\$70.88	2.6%	\$4.27
Two Rivers Water And Light	ELECTRIC	Residential	\$44.08	7.6%	\$8.30
Vernon Electric Cooperative	ELECTRIC	Residential	\$32.81	3.3%	\$7.06
Viola Municipal Electric Utility	ELECTRIC	Residential	\$1.79	2.1%	\$0.04
Washington Island Cooperative	ELECTRIC	Residential	\$31.07	0.5%	\$5.57
Waterloo Utilities	ELECTRIC	Residential	\$280.73	2.2%	\$7.80
Waunakee Utilities	ELECTRIC	Residential	\$24.24	10.0%	\$1.32
Waupun Utilities	ELECTRIC	Residential	\$35.94	5.7%	\$12.75
We Energies WEPCO)	ELECTRIC	Residential	\$15.80	7.7%	\$0.66
Westby Electric And Water Utility	ELECTRIC	Residential	\$25.90	3.8%	\$1.62
Westfield Milling And Electric Light	ELECTRIC	Residential	\$74.27	9.1%	\$6.07
Whitehall Electric Utility	ELECTRIC	Residential	\$84.68	10.8%	\$5.24
Wisconsin Dells Water And Light Utilities	ELECTRIC	Residential	\$66.55	5.6%	\$4.94
Wisconsin Public Service Corp.	ELECTRIC	Residential	\$27.88	7.4%	\$1.69
Wisconsin Rapids Water Works And	ELECTRIC	Residential	\$60.90	8.3%	\$6.00
Wonewoc Municipal Water And Light	ELECTRIC	Residential	\$637.36	4.4%	\$43.82
Xcel Energy (NSP)	ELECTRIC	Residential	\$36.57	5.0%	\$2.22
Alliant Energy (WPL)	GAS	Commercial	\$926.67	1.3%	\$57.80
City Gas Co	GAS	Commercial	\$1,004.36	2.2%	\$37.17
Madison Gas And Electric	GAS	Commercial	\$2,801.16	1.8%	\$160.26
Midwest Natural Gas Inc	GAS	Commercial	\$559.30	1.3%	\$30.80
St Croix Valley Natural Gas Co	GAS	Commercial	\$992.48	1.5%	\$40.74
Superior Water, Light And Power Co	GAS	Commercial	\$540.43	0.9%	\$61.43
We Energies (WEPCO and WG)	GAS	Commercial	\$1,514.29	1.4%	\$102.64
Wisconsin Public Service Corp.	GAS	Commercial	\$1,794.75	2.7%	\$108.55
Xcel Energy (NSP)	GAS	Commercial	\$1,403.49	2.5%	\$68.81
Alliant Energy (WPL)	GAS	Industrial	\$115,258.56	37.6%	\$9,126.11
City Gas Co	GAS	Industrial	\$19,325.61	22.2%	\$965.50
Madison Gas And Electric	GAS	Industrial	\$79,524.11	47.0%	\$6,744.54
Midwest Natural Gas Inc	GAS	Industrial	\$14,004.59	4.9%	\$1,620.23
St Croix Valley Natural Gas Co	GAS	Industrial	\$0.00	0.0%	\$0.00
Superior Water, Light And Power Co	GAS	Industrial	\$15,348.35	4.3%	\$473.30
We Energies (WEPCO and WG)	GAS	Industrial	\$38,774.47	13.6%	\$2,159.51
Wisconsin Public Service Corp.	GAS	Industrial	\$26,382.71	14.0%	\$1,652.03
Xcel Energy (NSP)	GAS	Industrial	\$187,203.72	100.0%	\$9,360.26
Alliant Energy (WPL)	GAS	Residential	\$60.35	1.6%	\$6.58
City Gas Co	GAS	Residential	\$24.66	0.8%	\$5.36
Madison Gas And Electric	GAS	Residential	\$137.53	2.7%	\$11.54
Midwest Natural Gas Inc	GAS	Residential	\$27.07	1.1%	\$5.52

Territory	Utility Type	Sector	Per capita Life Cycle Bill Savings (\$)	Customer Participation Rate (%)	Per capita Incentive (\$)
St Croix Valley Natural Gas Co	GAS	Residential	\$38.04	1.7%	\$5.65
Superior Water, Light And Power Co	GAS	Residential	\$48.53	0.6%	\$4.32
We Energies (WEPCO and WG)	GAS	Residential	\$57.65	1.6%	\$5.97
Wisconsin Public Service Corp.	GAS	Residential	\$58.30	1.5%	\$6.07
Xcel Energy (NSP)	GAS	Residential	\$97.44	2.5%	\$9.07