

CONSUMERS ENERGY

2017 Annual Energy Waste Reduction Report

Case No. U-20028

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Consumers Energy
Count on Us®



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Executive Summary

Continuing the Challenge

For more than 130 years, Consumers Energy has provided reliable, affordable electricity and natural gas to advance its customers' quality of life. Consumers Energy remains committed to planning for and ensuring an adequate electric supply to meet the needs of Michigan homes and businesses, now and in the future. The company's impact extends beyond merely supplying a commodity, as Consumers Energy is a vital part of the state's economic, social and environmental fabric and cares for the customers and communities it serves.

Under the Michigan energy law, adopted in 2008 and amended in 2016, Consumers Energy has taken major steps to help Michigan shape a secure, stable and reliable energy landscape, including:

- Making significant investments to improve electric reliability and customer service while building a balanced and diversified energy portfolio.
- Becoming a leading supplier of renewable energy in Michigan. Consumers Energy utilizes sources such as wind, solar, hydro, landfill gas, anaerobic digestion and biomass for the electricity supplied to customers.
- Achieving the state's required standard for renewables a full year ahead of schedule and below initial cost estimates.
- Installing billions of dollars of emissions control equipment at coal-fueled generating plants to help make Michigan's air the cleanest it has been in decades.
- Installing smart meters in the Company's service territory to improve reliability, help provide customers more control over their energy use and promote energy waste reduction.
- Helping customers save more than \$2 billion since 2009 by creating and implementing Energy Waste Reduction programs to reduce their use of electricity and natural gas.

Exceeding the Challenge – Helping Michigan Save Energy

Trade ally and customer reaction continued to be very positive, as evidenced by high program participation levels as well as electric and gas energy savings that exceeded the statutory targets. The total first-year energy savings delivered in 2017 by the residential Energy Waste Reduction programs represented enough to supply electricity to 23,000 residential homes and natural gas to 14,000 residential homes for a year. These energy savings were achieved cost-effectively.

As shown in Appendix Table 4-2, in 2017, the company achieved 169 percent of its statutory electric-savings target within the planned investment and a Utility Cost Test (UCT) score of 2.60. The company earned an incentive payment for its electric portfolio performance by exceeding lifetime-savings targets.

As shown in Appendix Table 4-3, in 2017, the company achieved 144 percent of its statutory natural gas-savings target within the planned investment and a UCT score of 1.94. The company earned an incentive payment for its natural gas portfolio performance by exceeding lifetime-savings targets.

Benefits for Michigan

Since 2009, the Company has worked with over 625,000 customers and 3,000 trade allies to deliver significant economic, social, and environmental benefits to Michigan, including:

- Saving customers over \$2 billion on their energy bills
- Creating or saving more than 7,000 Michigan jobs
- Adding \$2.4 billion in net growth to the Michigan economy
- Helping over 95,000 low income customers to make their homes and apartments more energy efficient and energy bills more affordable
- Protecting the environment by avoiding over 7 million tons of carbon dioxide (CO₂) greenhouse gas emissions



Why do we do it?

Why would Consumers Energy encourage people to use energy more efficiently? That's a good question. After all, energy is a product we produce and sell.

At Consumers Energy we have a strategic vision to meet the energy needs of our customers while continuing to protect the natural resources we all treasure. We understand that reducing energy waste is good for our state, our company, and every one of us.

In December 2016, Michigan adopted a comprehensive new energy policy that secures the state's energy future and helps us meet our customers' needs. The reforms, passed with bipartisan support and signed by Gov. Rick Snyder, will help us continue providing the reliable, affordable energy we all rely on to light and heat our homes and businesses.

We believe everyone has the power to save. Reducing waste is smart and relatively inexpensive. The energy you don't use is the lowest cost resource and using less electricity helps secure a more sustainable future for generations to come.

To us, sustainability means measuring a triple bottom line: people, planet and prosperity. We consider the company's impact in all three areas by operating soundly, governing ethically and interacting differently with society. We're determined to deliver excellent customer service and top-end earnings growth through sustainable business practices.

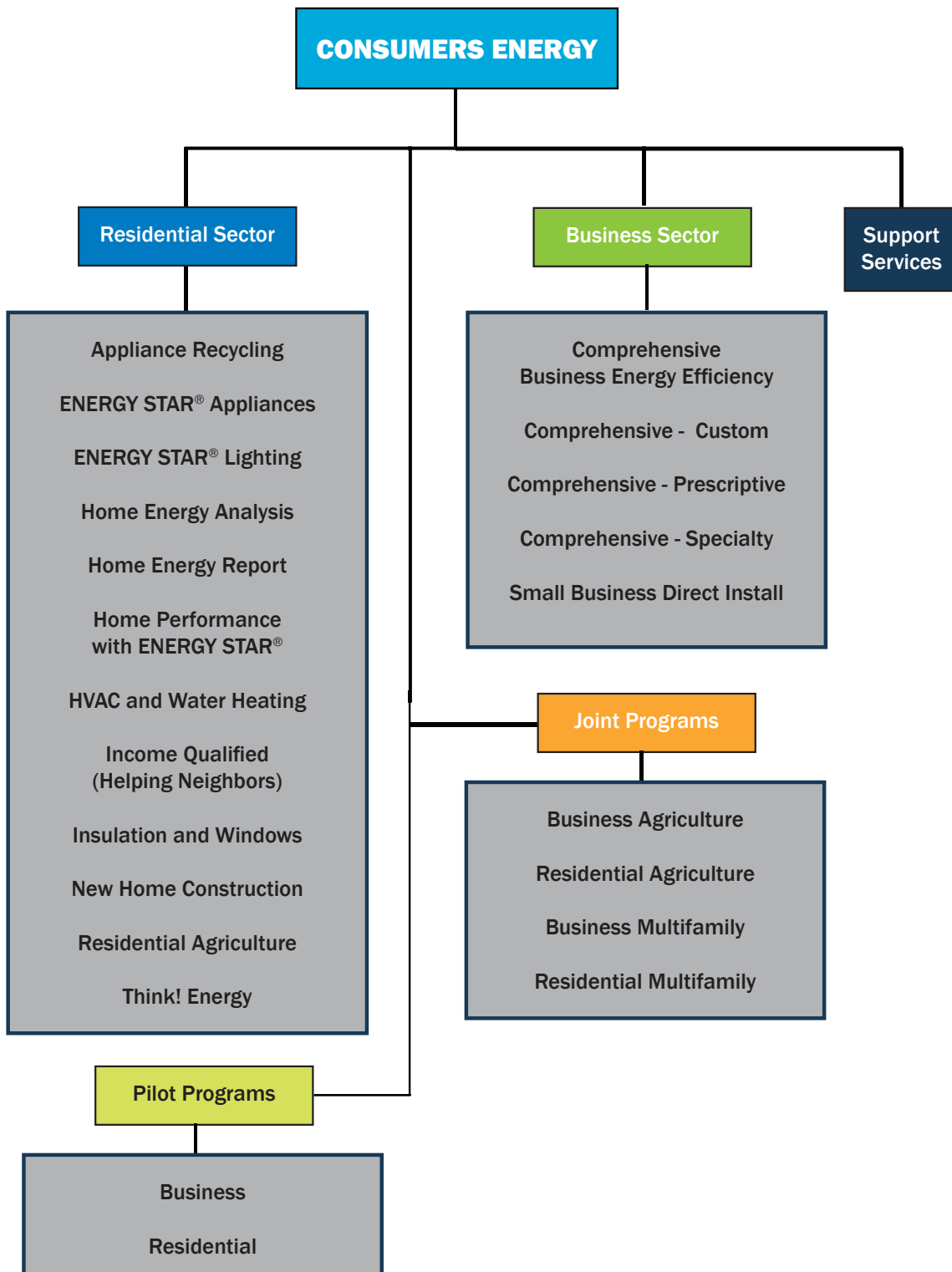
Sustainability is more than a word to us – it's our approach to business. The philosophy extends beyond our energy mix, power generation and distribution. It's our way of life, and it's evident in everything we do – from training our workforce, to caring for the communities we serve. It's how Consumers Energy achieves our purpose of World Class Performance Delivering Hometown Service.

Portfolio Development

The majority of programs contained in Consumers Energy's 2017 portfolio were a continuation of programs launched in 2009. The development of these programs was based on a national review of leading energy efficiency programs, and they achieved significant and immediate energy savings, while also building on established trade ally and retailer partnerships. The programs targeted all major sectors and customer classes, including low-income and small business customers. Programs were designed to capture both electric and natural gas savings. For those Consumers Energy customers with only electric or only natural gas service, efforts were made to coordinate and align with other utilities so that customers could easily take advantage of efficiency program offerings across both fuel types, thereby producing an overall benefit for Michigan's energy waste reduction goals. The company offered a diverse portfolio of programs across the residential and business sectors. Additionally, the Company continued to plan and implement residential and business pilots targeting experimental opportunities.

Program Portfolio Summary

The figure on the next page represents the company's 2017 portfolio of Energy Waste Reduction Report programs and pilots. By design, the programs are not divided by energy; rather, they are presented as a comprehensive program portfolio that seeks to capture all cost-effective electric and natural gas savings. In total, the company offered 13 residential programs, three residential pilots, three business programs, and 13 business pilots. Customer participation, investment levels and energy savings by fuel type are included in this report.





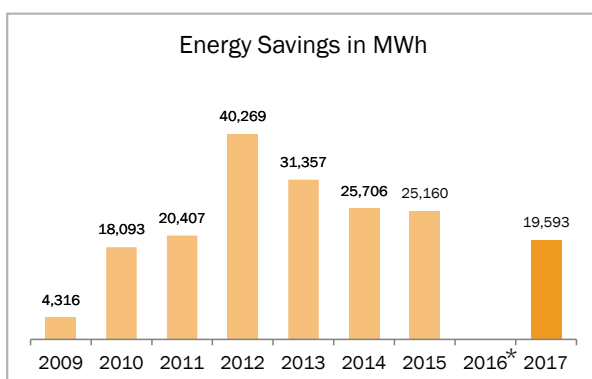
Appliance Recycling

The Appliance Recycling program relaunched in 2017, after pausing at the end of 2015 and all of 2016. This program targeted customers with inefficient second refrigerators and freezers, providing the dual benefit of cutting energy use and keeping the appliances out of the used appliance market. Consumers Energy provided appointment scheduling, appliance pickup, rebate processing, and recycling services. This program has made considerable impacts on the environment. For example, more than 95 percent of the recycled appliances have been transformed into new products and the hazardous oils, toxins, and chlorofluorocarbon gases were safely disposed.

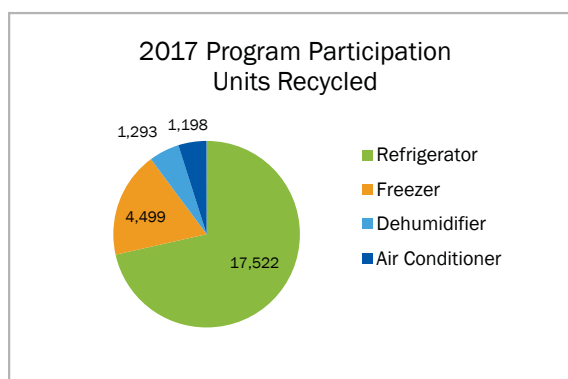
Customers were offered a \$50 rebate and free pickup and recycling of their old, operable, second refrigerators and freezers. Customers who recycled a fridge or freezer were also offered an additional \$15 rebate and free pickup and recycling of their old, operable window air conditioners and dehumidifiers.

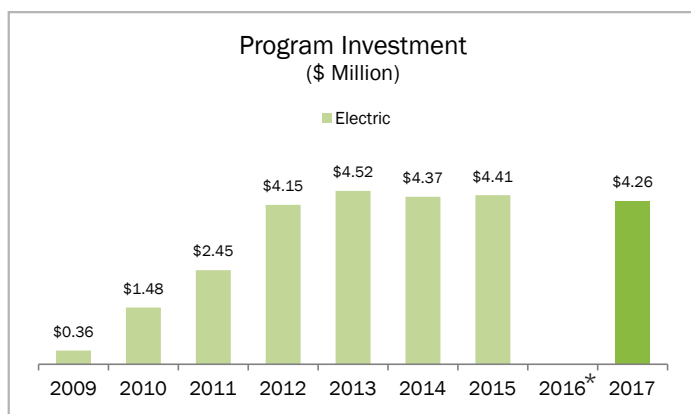


The Appliance Recycling program teamed up with Recycling Jackson (a local nonprofit recycler) and the Jackson Conservation District to operate a recycling event at the Jackson County Fair Grounds in September. The team collected 43 refrigerators/ freezers and 111 room air conditioners/ dehumidifiers during the 6-hour event. (An additional 39,000 pounds of electronics waste and 36,000 pounds of latex paint were also collected and recycled.) Consumers Energy provided volunteers for the event and donated \$5,000 to both the Jackson Habitat for Humanity and Recycling Jackson.



* Program paused in 2016





* Program paused in 2016

In 2017:

The successful relaunch of the program saw 232,000 miles driven with zero safety incidents.

Program reduced 180,900 metric tons of CO₂ emissions, equaling 19,500 homes' energy use for one year.

Achieved a 9.0 overall customer satisfaction score on a 10-point scale.

Since 2009 We have:



Awarded more than \$6.9 million in customer rebates

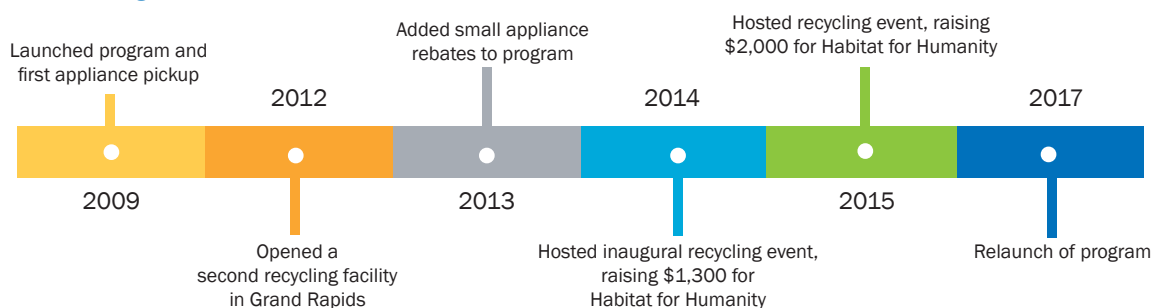


Recycled more than 157,000 large units



Recycled more than 14,000 tons of metal

Program Milestones 2009 through 2017



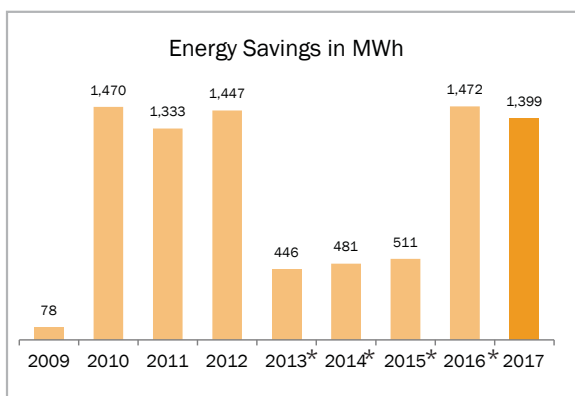


ENERGY STAR® Appliances

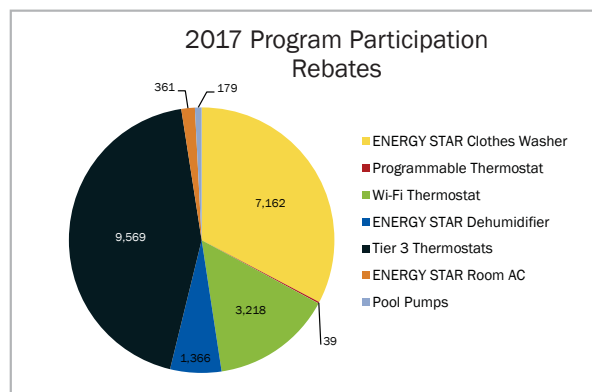
The ENERGY STAR Appliances program offered rebates on the purchase of qualifying ENERGY STAR home appliances. The program drives long-term energy savings by promoting energy-efficient clothes washers, room air conditioners, dehumidifiers, Wi-Fi enabled thermostats and variable speed pool pumps.

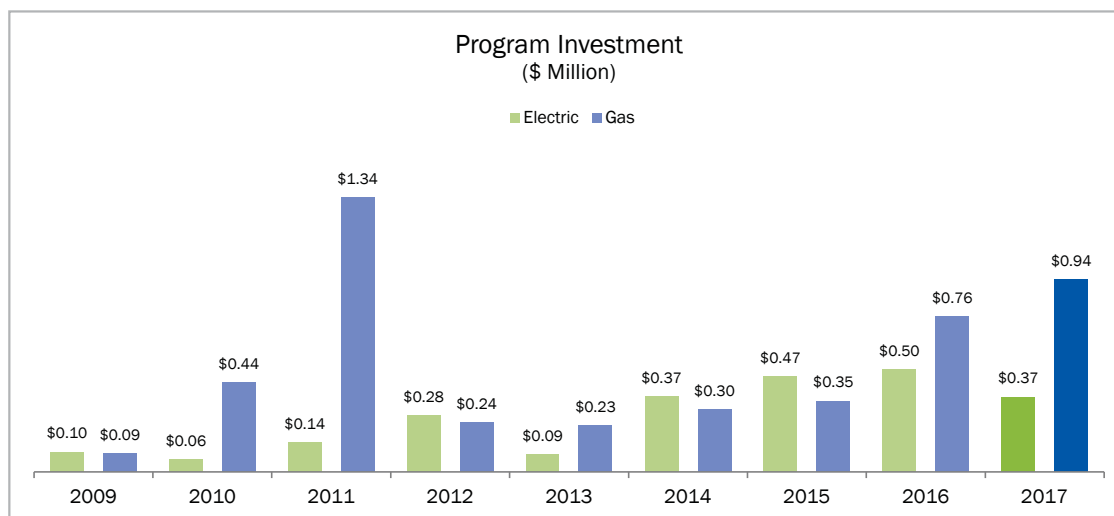
Consumers Energy field representatives educated and worked with retail associates to ensure that information about rebates and the benefits of ENERGY STAR qualified products was shared with customers. In 2017, the program expanded its offerings to include rebates on variable speed pool pumps and increased the program participation in retail stores by 180 percent over 2016 participation.

In March of 2017, the program launched a new component of the program – an online store featuring Wi-Fi enabled thermostats with instant rebates. Beyond the convenience of online shopping, one of the most notable features of the store is detailed product information, putting customers in touch with material to determine which products are best for them.



*Includes savings multipliers





Since 2009
 We have:



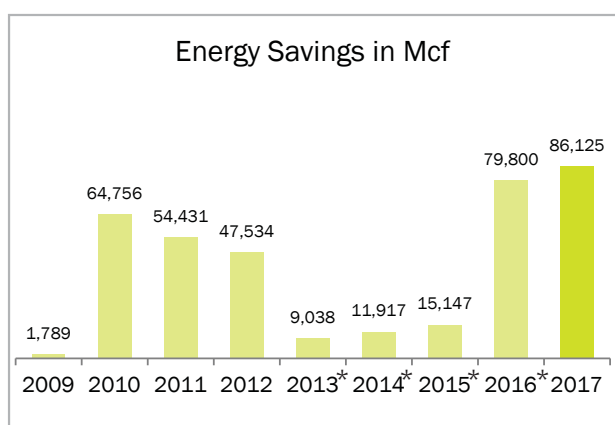
Issued rebates on energy-saving measures to more than 87,600 customers



Added variable speed pool pumps to the program in 2017, rebating more than 175 pumps.



Launched an online store in 2017, rebating over 2,000 Wi-Fi t-stats



*Includes savings multipliers

Program Milestones 2009 through 2017

- 2012
 Provided 10,000 appliance rebates
- 2014
 Launched new rebate application tool
- 2015
 Transitioned program implementer
- 2016
 Increased customer satisfaction from 8.5 in 2015 to 8.9 in 2016
- 2017
 Launched an online store featuring instant rebates on Wi-Fi thermostats delivered directly to customers' homes



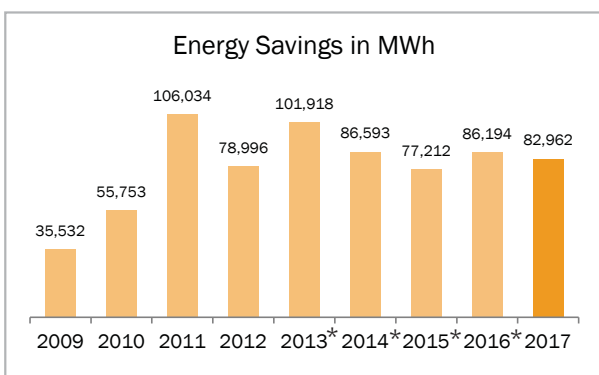
ENERGY STAR® Lighting

The ENERGY STAR Lighting program provided incentives to build market share and use of ENERGY STAR LEDs. Delivery of the program involved working with retailers and manufacturers to reimburse retailers for discounting the cost of qualifying products on store shelves. Field representatives also hosted over 240 in-store events to educate customers and help them select bulbs.

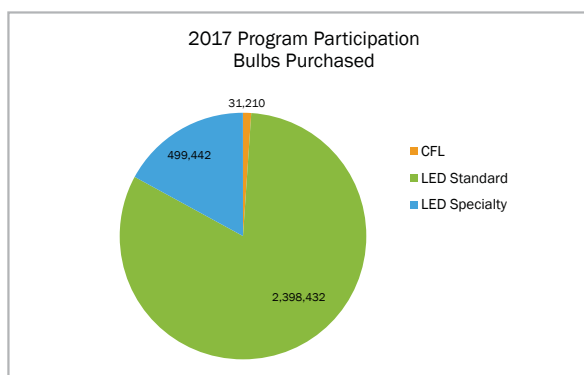
In 2017, the program focused on driving market transformation of LEDs in hard to reach markets, including low-income and e-commerce. Food bank bulb donations have been an important component of the program since 2012 and significant strides were made in 2017 to increase the impact. The program doubled its 2016 bulb donation to deliver a total of 175,000 LEDs to food banks and added a partnership in Saginaw. Recognizing the need for instant rebates in the e-commerce channel, the program offered instant rebates on online bulb purchases for the first time in 2017 through the launch of the online store. More than 30 ENERGY STAR certified lighting products were curated for customers on the online store.

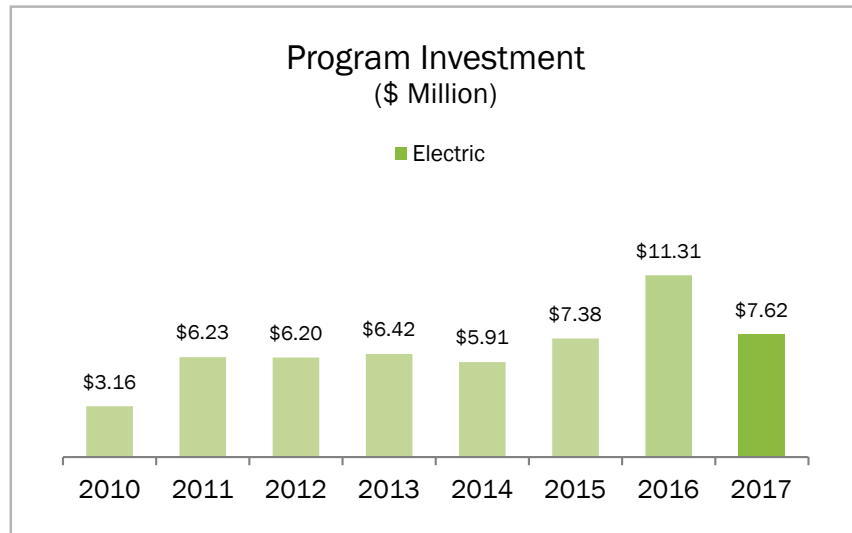


For the second year in a row, the Lighting program collaborated with ENERGY STAR to participate in its national “Light the Moment” campaign. Throughout the month of April, Consumers Energy donated one LED bulb for every LED purchased at a participating retailer up to 150,000 bulbs. To promote this initiative, Consumers Energy developed an integrated marketing strategy featuring digital advertising, radio spots, email communication, print ads and social media to promote “Buy a Bulb, Give a Bulb.”



*Includes savings multipliers





Since 2009
We have:

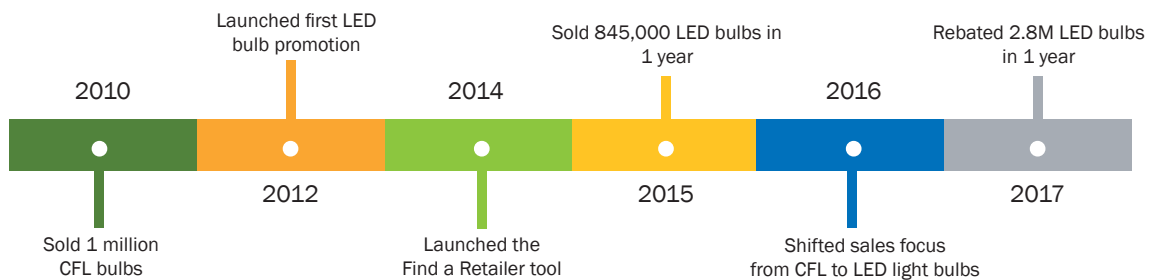


Sold more than 5.8 million
 LED bulbs



Added lighting products with
 instant rebates to our online store

Program Milestones 2009 through 2017





Home Energy Analysis

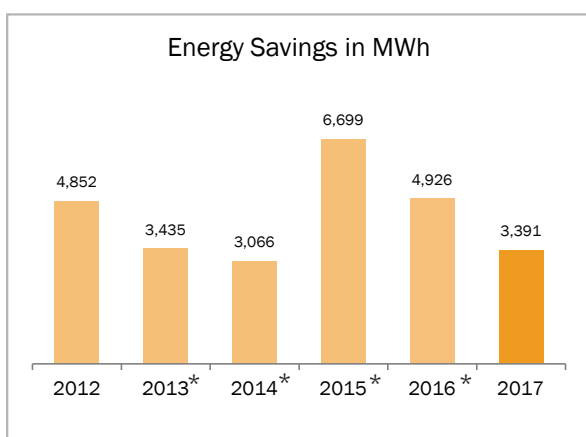
The Home Energy Analysis (HEA) program offered Michigan residents a free in-home analysis performed by a trained analyst, and provided participating customers with:

- Walk-through energy inspection of their home
- Direct installation of energy saving measures
- Customized summary report with energy saving tips and recommendations

The analysts performed a visual inspection of the home, while entering findings into an intake tool to create a personalized report. Free, low-cost measures were installed including LED bulbs, LED night lights, programmable thermostats, water heater pipe insulation and low-flow water devices. Finally, the analyst discussed the personalized report, focusing on energy education. On average, participating customers received \$50 worth of energy-saving measures which provided an estimated annual savings of up to \$150.



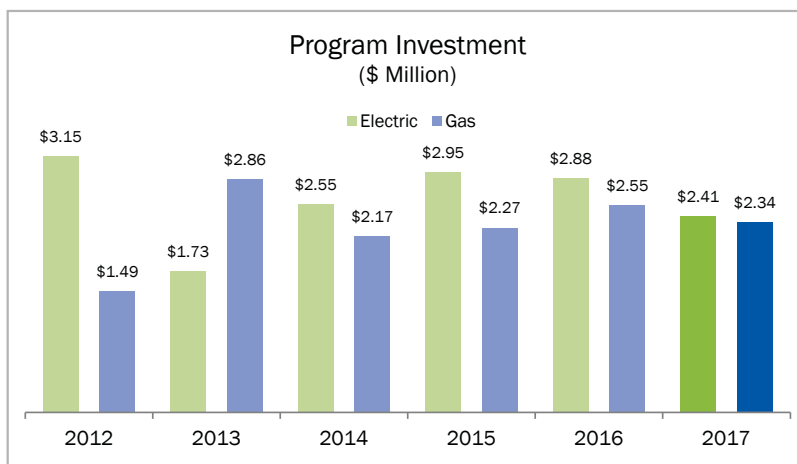
The House of Worship Rewards program is a outreach initiative launched in January 2017 to provide faith-based organizations with a financial incentive for referring congregation and community members to the Home Energy Analysis and Helping Neighbors programs. The program is designed to help community members realize energy savings at home while their house of worship of any denomination also earns an incentive. In 2017, the goal was to enroll ten Houses of Worship, and that goal was exceeded with 17 enrollments; a 70 percent increase.



*Includes savings multipliers

2017 Program Participation Measures

LED Night Lights.....	13,135
LED Light Bulb.....	63,638
Pipe Wrap.....	68,477 linear feet
Energy-Efficient Showerheads.....	14,312
Bathroom/Kitchen Faucet Aerators.....	20,513
Programmable Thermostat.....	3,644



The overall customer satisfaction for the program was 9.2 on a 10-point scale.

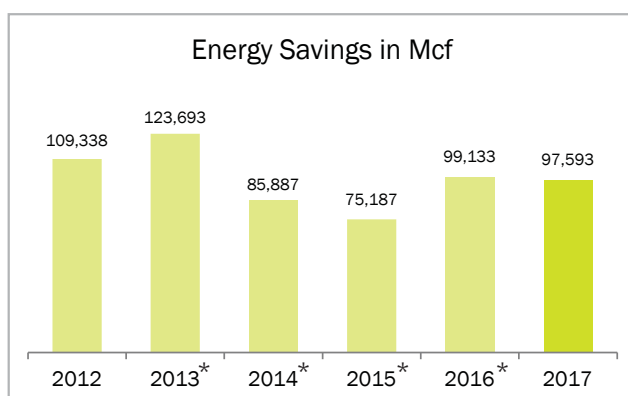
Since 2012
We have:



Performed more than 83,000 Home Energy Analyses



Installed more than 1.56 million energy-saving measures



*Includes savings multipliers

Program Milestones 2012 through 2017

- 2012
Launched program
- 2014
Completed over 43,000 Home Energy Analyses since 2012
- 2015
Customer referral program delivered nearly 10 percent of HEA appointments
- 2016
Achieved an average scheduling cycle time of 16 days (compared to target of less than 31 days)
- 2017
Launched the House of Worship Rewards Program, which incentivizes congregations with a financial reward by signing up members for a Home Energy Analysis.



Home Energy Report

The Home Energy Report (HER) program provided customers with personalized energy information to help them understand their energy use habits and make informed decisions to reduce their energy use and costs. Behavioral science research has demonstrated that peer-based comparisons are highly motivating. The program employed this approach by comparing the energy use of each participating residence with the energy use of nearby homes of similar size. Participating customers received targeted savings tips based on their energy-use patterns, housing characteristics and demographics. This technique was a driving force of consistent and reliable behavior-based energy efficiency.

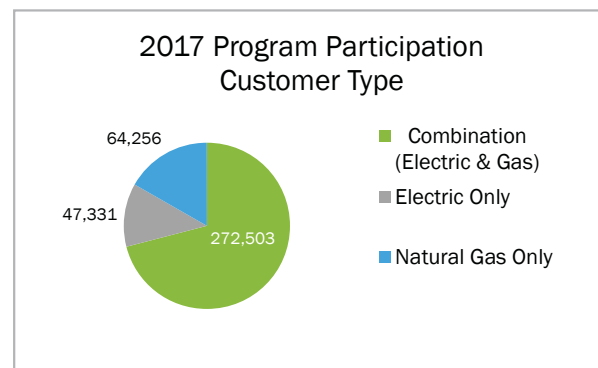
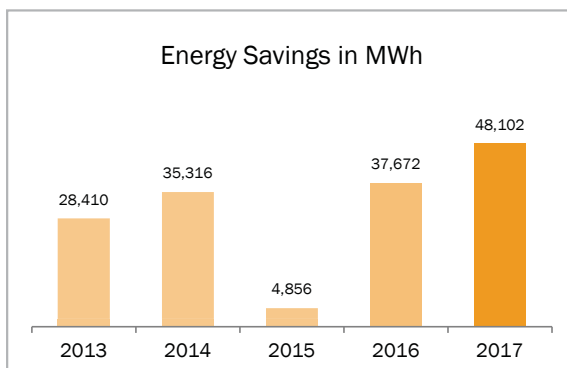
The HER program is organized around two concepts:

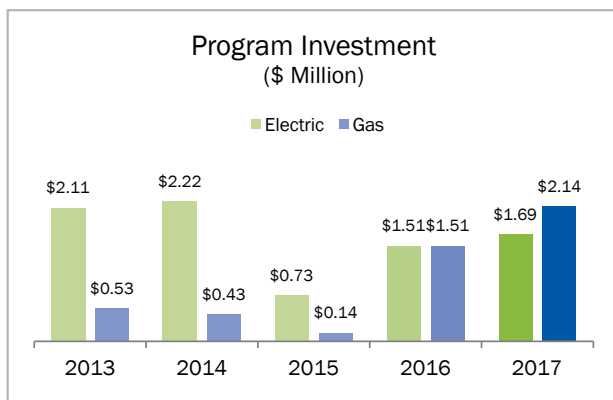
- Motivate customers to change their behavior by putting their energy use in context
- Provide them with personalized advice to capitalize on this motivation to use less energy and save money

Customers could also view energy use information with the Interval Web Portal (IWP), launched in late 2014. With the IWP, residential and business customers had insight into their energy use and cost. In 2017, nearly 1.5 million logins to the IWP were recorded by 192,000 residential and 7,000 business customers.



Extensive evaluation activities contributed key information that enabled the program to transition to a new vendor to produce and deliver reports in 2017. In addition to desk reviews provided by experts in behavior change science from across the country, online focus groups of Michigan residents collected detailed feedback on report content, design and usefulness. One finding that informed the new report structure was that customers are motivated by the idea of taking control of their energy costs and are more likely to act on personalized, attainable energy-saving tips.





Unlike other residential energy efficiency programs, households were automatically opted-in to receive HERs. All participants had a clear method for opting out of the program, however the opt-out rate continues to be less than one percent.

Program components:



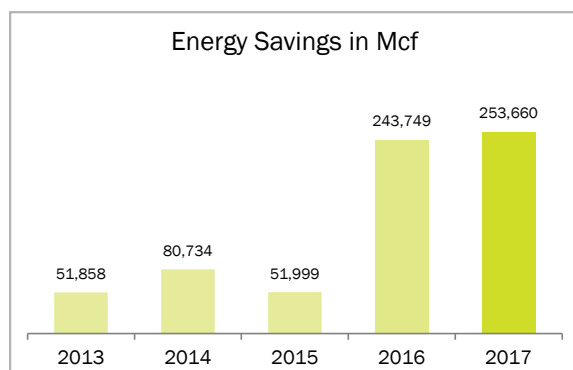
Delivered targeted savings tips based on customer segmentation and fuel type through printed reports



Annual evaluation assessed customer satisfaction with report layout and content, usefulness of information provided and impact on household energy use



Each report compared customer energy use to nearby similar homes and to historical energy use to identify trends and opportunities



Program Milestones

2011 through 2017

- 2012**
Behavior savings for HER pilot approved by the MPSC Program Design & Implementation Collaborative
- 2013**
Launched program to 270,000 households
- 2015**
Delivered more than 6.4 million reports since pilot launch
- 2016**
Nearly 440,000 households received reports
- 2017**
Reports redesigned based on behavioral science research and customer feedback



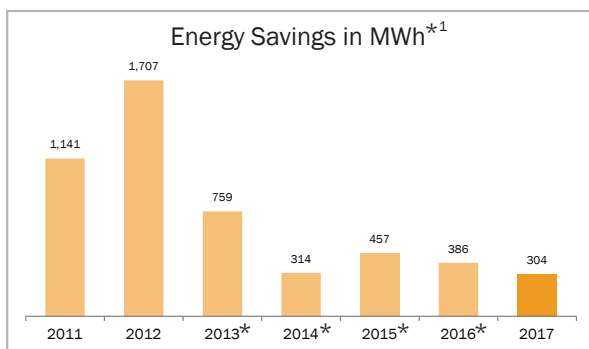
Home Performance with ENERGY STAR®

The Home Performance with ENERGY STAR (HPwES) program provided long-term energy savings by helping customers analyze their energy use and make home improvements that considered the home as a complete system. These deep savings will be realized for years to come. Building Performance Institute (BPI)-certified contractors offered Comprehensive Home Assessments that included diagnostic testing and a visual inspection for health and safety issues and generated a report that informed the customer of energy savings, costs and payback.

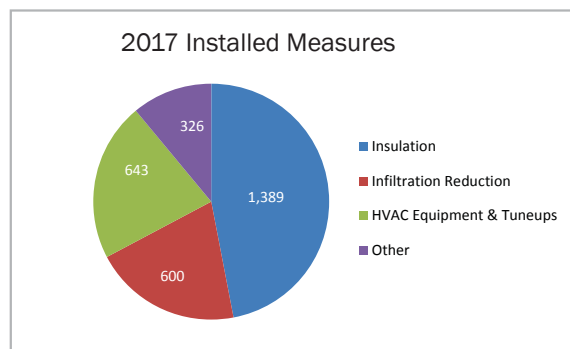
- Financial incentives were available for building shell improvements and energy-efficient heating and cooling equipment. Tiered bonus rebates ranging from \$100 to \$500 were available for customers who installed multiple measures.
- Contractors administered all required paperwork on behalf of the customer once improvements were completed. Customers received incentives in the form of a check or instant discount on the cost of the project.



In 2017, Consumers Energy was once again recognized as an ENERGY STAR Partner of the Year - Sustained Excellence. This was the second year in a row that the company received this extra designation, which is reserved for companies that demonstrate ongoing leadership across the ENERGY STAR program, and fifth time since 2011 that the company was named a Partner of the Year. HPwES is just one of many programs that build on and help promote the ENERGY STAR brand.

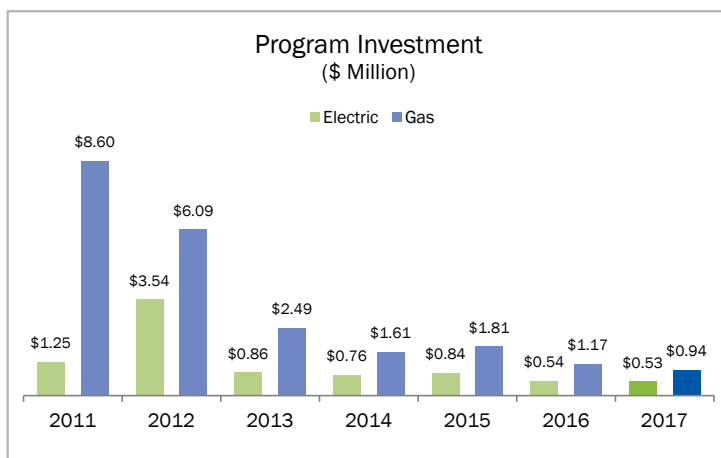


*Includes savings multipliers



Other measures included thermostats and windows

^{*1} Savings and investment initially included multiple components that transitioned into separate programs. The current program configuration has been in operation since June 2013.



For the third year in a row, an HPwES Trade Ally was a Governor's Energy Excellence Award winner in the residential project or contractor category.



Collaboration between Consumers Energy and Lansing Board of Water & Light provided customers of both utilities with access to zero-percent financing for home energy retrofit projects.



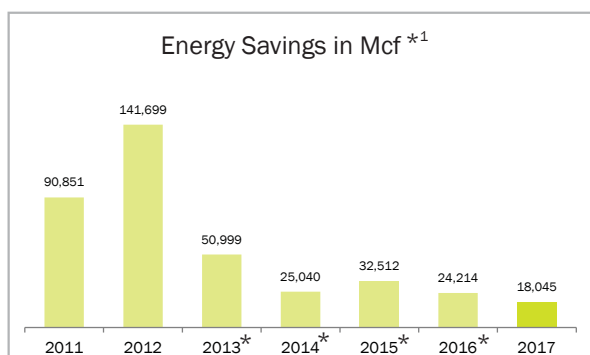
The program has issued more than \$15 million in rebates to customers for improving the efficiency of their homes since 2011.



For the fourth year in a row, Consumers Energy hosted the Excellence in Energy Efficiency (E3) Awards Banquet, honoring participating contractors across four programs for their contribution to delivering energy savings to customers. Seven HPwES contractors received awards in 2017 and 10 were recognized as achieving "Gold Level" status in a contractor ranking system that was introduced at the event.



Program Milestones 2012 through 2017



*Includes savings multipliers

- 2013**
Home Performance with Energy Star split with Insulation and Windows into separate programs
- 2014**
Hosted first Excellence in Energy Efficiency (E3) Awards Banquet for top contractors
- 2015**
Five contractors completed at least 100 HPwES jobs during the year, achieving Century Club status
- 2017**
A contractor ranking system informed search results of the online directory to better serve customers

^{*1} Savings and investment initially included multiple components that transitioned into separate programs. The current program configuration has been in operation since June 2013.



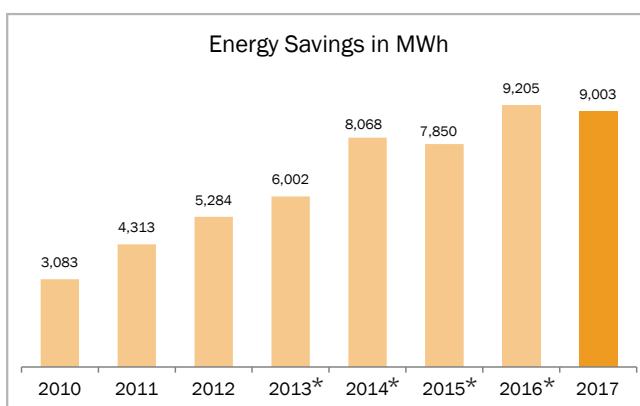
HVAC and Water Heating

The Heating, Ventilation and Air Conditioning (HVAC) program was designed to increase the demand for purchase and installation of high-efficiency heating, cooling and water heating equipment.

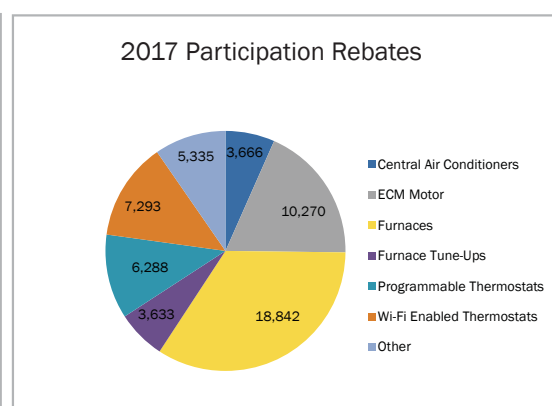
Our trade ally network of professional HVAC contractors assisted customers in determining the proper equipment for their home. The electric measures included high efficiency (15 SEER or greater) central air conditioning systems and diagnostic tuneups, electronically commutated motors (ECM) and high-efficiency heat pumps. Ductless mini split systems were added to the measure mix to provide energy efficient units to homes that have electric heat. Gas measures included natural gas furnaces (95 percent AFUE and greater) and boilers (92 percent AFUE and greater), high-efficiency storage gas water heaters and tankless natural gas water heaters. Combination measures included programmable thermostats and Wi-Fi enabled thermostats with a full setback educational component for customers



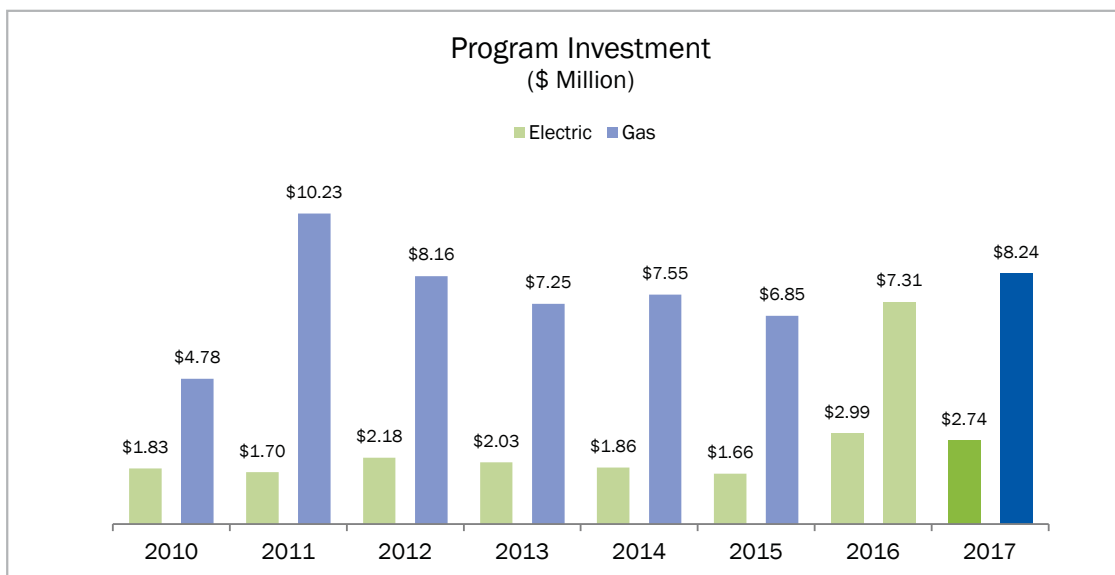
2017 saw the addition of 135 New Trade Ally contractors added to the current network – giving a total of 935 participating in the program. High-efficiency equipment and rebates were marketed through this network as trade allies are the most direct influencers of customer HVAC purchase decisions.



*Includes savings multipliers



Other measures included AC tuneups, heat pumps, boilers and water heaters



Since 2009
We have:



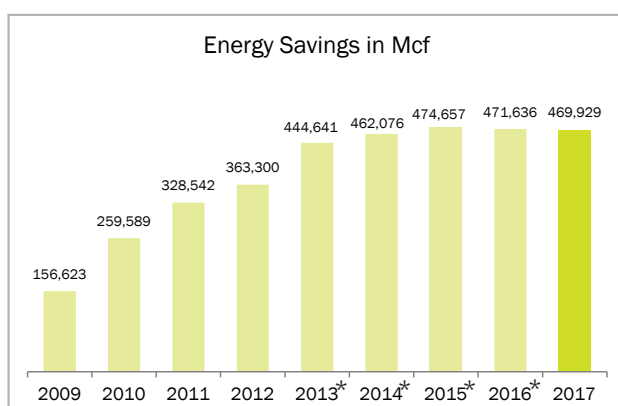
Served more than
164,000 customers



Provided rebates
totaling more than \$57 million

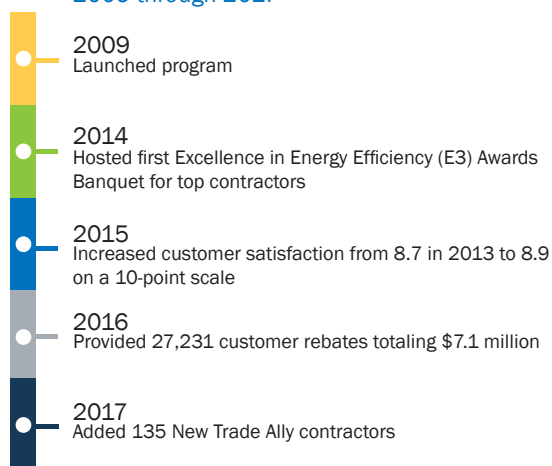


Collaborated with
Michigan Saves



*Includes savings multipliers

Program Milestones 2009 through 2017

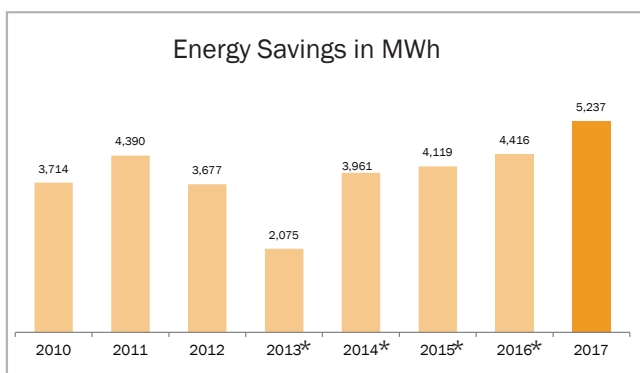




Income Qualified

The Income Qualified Energy Assistance program (also known as Helping Neighbors) is comprised of several initiatives that deliver free energy efficiency products, services and education to customers at or below 200 percent of the federal poverty level. This is part of Consumer Energy's commitment to helping customers achieve meaningful energy savings. The initiatives included outreach to both single and multifamily customers.

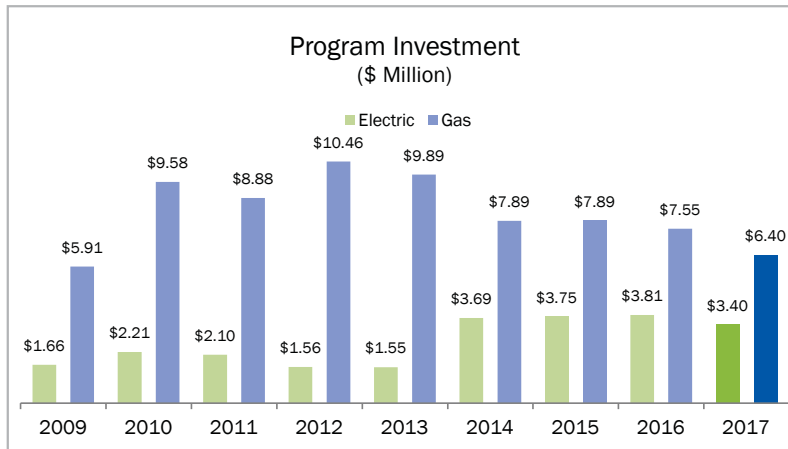
In addition, program staff worked closely with Community Action Agencies (CAAs) and other non-profit agencies to leverage existing state and federal funding to provide comprehensive weatherization assistance. The program's collaborative approach of engaging and cooperating with local agencies fully leveraged energy efficiency opportunities and provided more value to customers.



*Includes savings multipliers

2017 Program Participation Measures

LED Bulbs.....	116,489
Air Infiltration Reduction.....	2,601,480 sq. ft.
Faucet Aerators/Showerheads.....	12,548
Pipe Wrap.....	21,762 linear ft.
Insulation/Duct Sealing.....	2,228,325 sq. ft.
Programmable Thermostats.....	1,262
Refrigerator/Furnace Replacements.....	387



In 2017, overall customer satisfaction for the program was 9.5 on a 10-point scale.

Since 2009
We have:



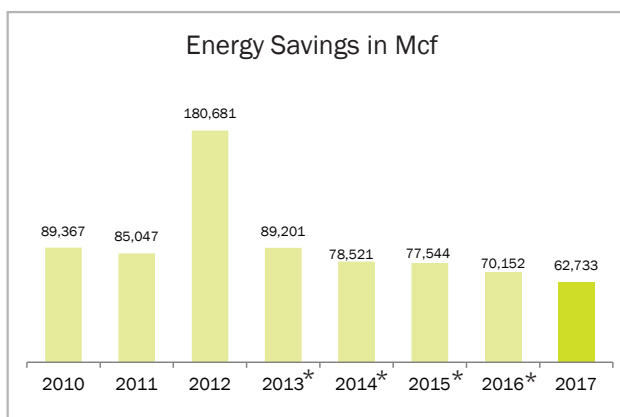
Reached more than 38,000 single-family homes



Installed more than 410,000 energy-efficient bulbs



Installed more than 75,000 energy efficient showerheads and kitchen/bath aerators



*Includes savings multipliers

Program Milestones 2009 through 2017

- 2009**
Program launched
- 2014**
More than 5,183 single-family homes and 8,429 multifamily homes received assistance
- 2015**
Replaced more than 3,000 refrigerators since 2009
- 2016**
Manufactured Housing initiative launched, serving 592 homes
- 2017**
Launched the Agency Rewards program, incentivizing CAA's and non-profits for recruitment of customers for a Helping Neighbors in home audit



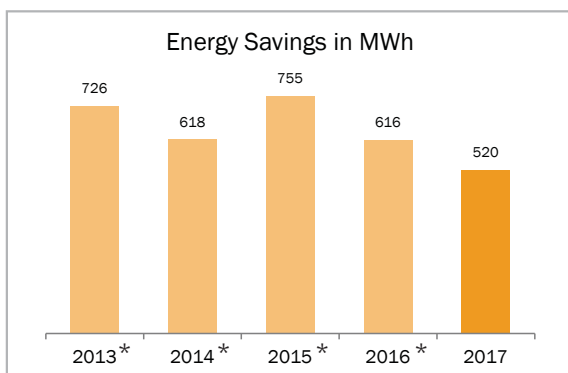
Insulation and Windows

The Insulation and Windows (INWIN) program offered rebates for a variety of insulation measures and qualifying high-efficiency doors and windows. The program offered customers the ability to use the services of a contractor or to perform the improvements themselves.

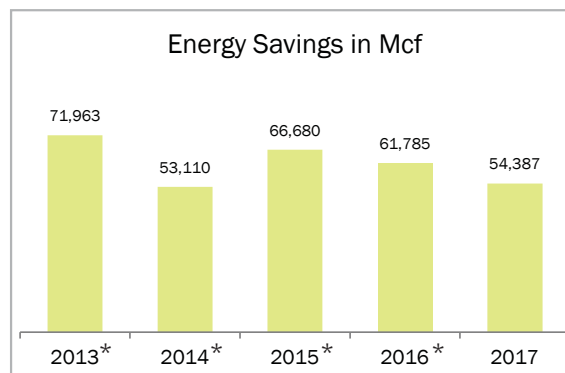
The program raised awareness of the comfort and savings benefits associated with the installation of insulation and energy-efficient windows and doors. The program provided information, training and marketing support to participating contractors and also offered a bonus program for customers that chose products from Michigan-based manufacturers.



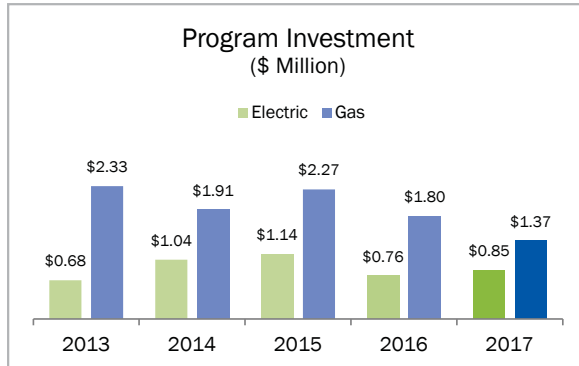
In 2017, the Insulation and Windows program had point of purchase (PoP) materials displayed in 75 big box stores in order to reach the DIY customer. The INWIN field representatives were responsible for keeping stores stocked with program marketing materials, applications, PoP displays and hosting in-store events to interact with customers. These representatives made 1,442 store visits and hosted 85 in-store events that reached more than 2,500 stores associates and DIY customers.



*Includes savings multipliers



*Includes savings multipliers



The program collaborated with many organizations, such as Michigan Saves, Made In Michigan and the Michigan Energy Efficiency Contractors' Association to support our contractor network.

Since 2013
We have:



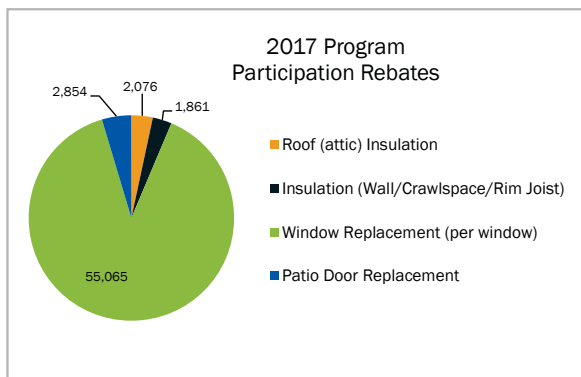
Provided more than \$8.3 million in rebates for more than 250,000 measures



Processed more than 51,686 rebate applications



Provided rebates for more than 276,000 energy-efficient window replacements



Program Milestones 2013 through 2017

- 2013**
 Launched program with 734 contractors participating and over 14,000 customer rebates
- 2014**
 Started marketing the program through the retail channel
- 2015**
 Launched Made in Michigan bonus program
- 2016**
 Offered a Preferred Contractor Network to insulation and window contractors
- 2017**
 Introduced a Contractor Ranking System for participating contractors

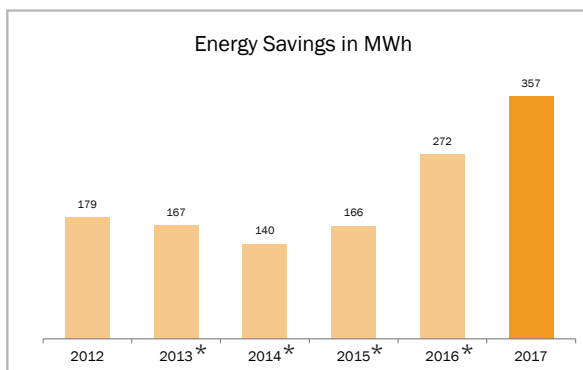


New Home Construction

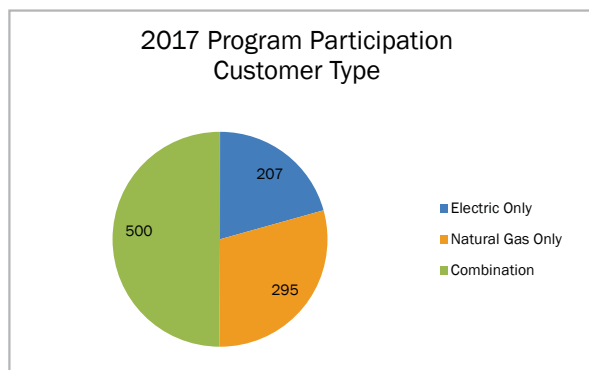
The New Home Construction program produced long-term electric and natural gas savings by encouraging the construction of single-family homes and duplexes to meet ENERGY STAR® standards. The ENERGY STAR certification is a whole-house building envelope approach versus only installing high-efficiency heating and/or cooling equipment.

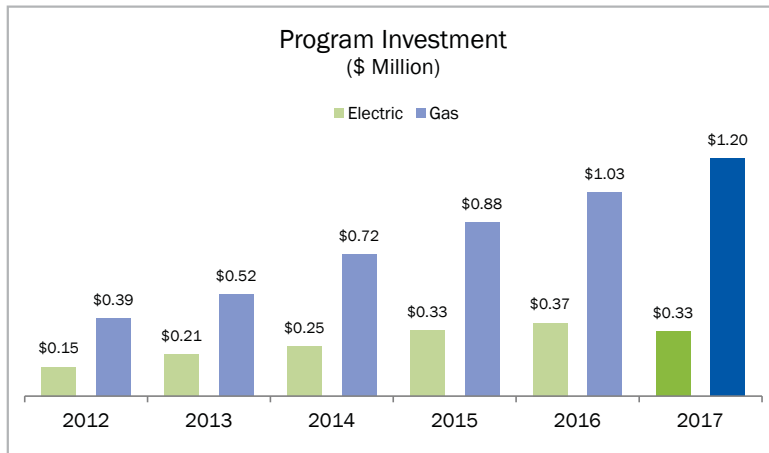
The program recruited builders to build homes exceeding baseline building codes for energy efficiency meeting ENERGY STAR requirements and certification by an independent Home Energy Rating System rater.

Builders who participated in the program gained access to cash-back incentives that covered approximately 40 percent of the cost to upgrade and certify each home. The amount of the specific incentive was based on the type of energy service provided by Consumers Energy.



*Includes savings multipliers





Provided rebate and administrative support for Kalamazoo Valley Habitat for Humanity's Net Zero home, which was awarded the Governor's Energy Excellence award.

Additionally, received the 2016 (awarded in 2017) ENERGY STAR® Certified Market Leader Award.

Since 2012
We have:



43 builders participated in the program

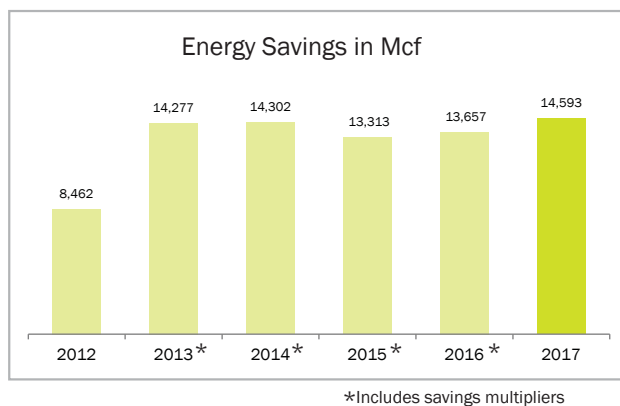


Provided rebates totaling \$4.16 million



Provided 4,804 rebates to builders

Program Milestones 2012 through 2017



- 2012**
Ramped up number of ENERGY STAR 3.0 Standard Homes
- 2016**
Received ENERGY STAR Certified Market Leader Award in 2014, 2015, 2016
- 2017**
Completed 1,002 certified ENERGY STAR homes

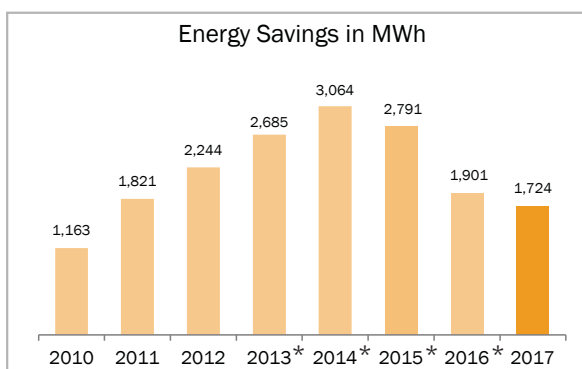


Think! Energy®

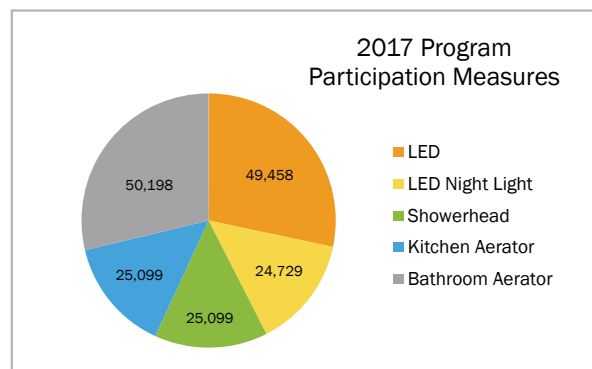
The Think! Energy program influenced students and their families to take actions to reduce their home energy use and increase efficiency. The primary objective was to develop a powerful culture of energy efficiency in elementary and middle school students (grades 4-6), teachers, schools and families throughout the service territory.

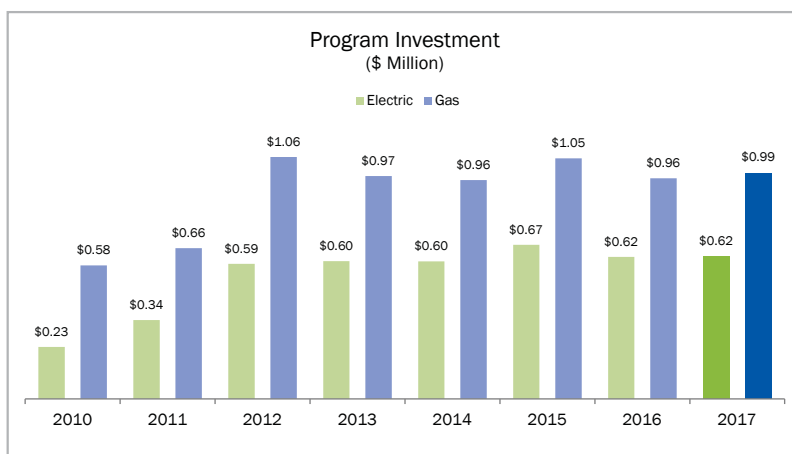
In-class energy efficiency presentations provided students and teachers a take-home kit filled with energy efficient devices. These activities raised awareness about how individual actions and low-cost measures can provide reductions in use of electricity, natural gas and water in Michigan households.

In 2017, two large programs were delivered to customers; the first in the combination electric and gas territory and the second in collaboration with DTE Energy. Three smaller collaborative programs were conducted with Lansing Board of Water & Light (BWL), Efficiency United and a new collaboration with SEMCO ENERGY Gas Company. Through collaboration we reached 383 schools and 31,870 households across Michigan.



*Includes savings multipliers





Take-Home Kits included:



Since 2010 We have:



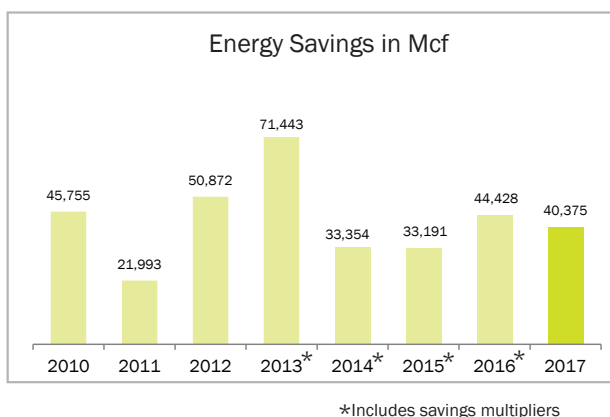
Achieved household satisfaction score of 9.1 and teacher satisfaction score of 9.5 out of 10



Increased number of schools participating to 383 per year



Provided *Take Action* and *Innovation* programs and kits to 191,143 students and families



Program Milestones 2010 through 2017

- 2010**
Launched program, reaching 13,265 students
- 2015**
Grew collaboration programs to include DTE, BWL and Efficiency United - SEMCO
- 2016**
Introduced a new online Home Energy Worksheet option for families to complete the survey with their computer or mobile device
- 2017**
Piloted a teacher workshop in Jackson. Provided teachers a binder of lessons, posters and activity materials to expand in-classroom energy units.

Comprehensive Business Energy Efficiency Program



Comprehensive - Prescriptive Program

This program offered incentives to customers who purchased specific high-efficiency measures that delivered a predetermined level of deemed energy savings based upon the Michigan Energy Measures Database. Prescriptive rebate applications were completed by customers and trade allies. The program significantly increased demand for energy-efficient products by educating business customers and trade allies about energy and money-saving benefits.

The Comprehensive program processed and paid 5,524 applications in 2017 for a total savings of 265,087 MWh and 1,333,393 Mcf.

In 2017 Consumers Energy:



Provided more than 350 measures to help customers save money



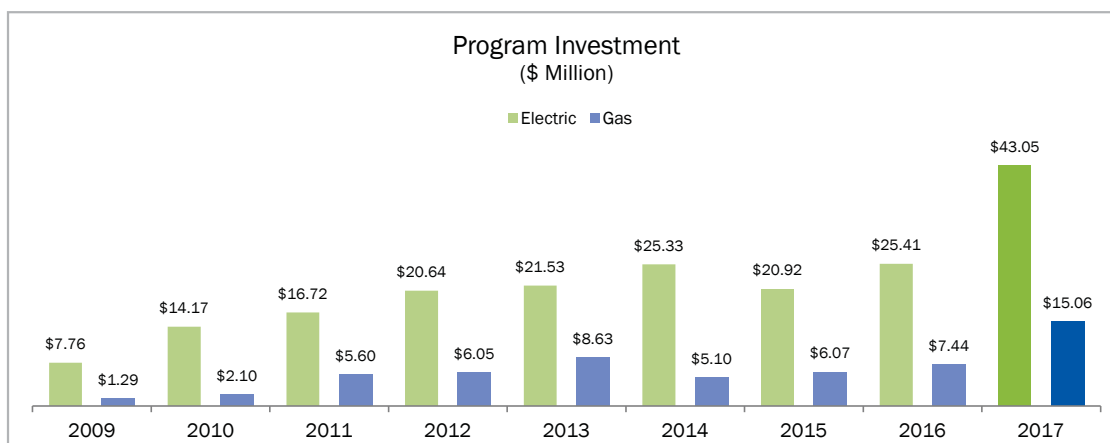
Increased trade ally network from 218 to 370



Provided \$37.7 million in customer incentives resulting in \$151 million in business to local contractors

Comprehensive Business Energy Efficiency Program Investments

Includes total investments from Comprehensive Prescriptive, Custom and Specialty Business Energy Efficiency programs.





Comprehensive - Custom Program

The Custom program assisted larger commercial and industrial customers with the analysis and selection of high-efficiency equipment or processes. The program approach identified more complex energy-saving projects with incentives based on a per kWh and/or per Mcf.

The program team worked with customers and trade allies on prospective projects to help complete custom engineering calculations that assessed energy savings potential, payback horizon, project eligibility and incentive amounts. The program provided customer outreach through energy advisers and corporate account managers, as well as technical assistance and assistance completing incentive applications and verifying savings. The custom program was responsible for 414,472 Mcf or 31 percent of the program's gas savings and 25,677MWh or 10 percent of the program's electric savings.

Since 2009
We have:



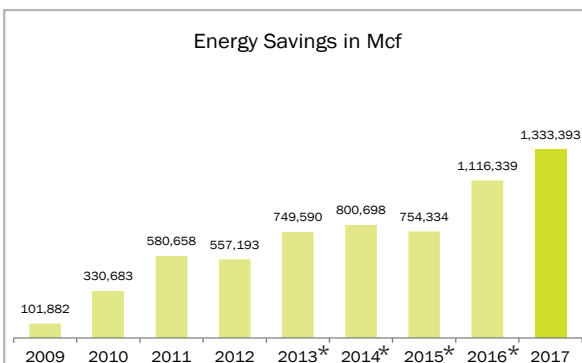
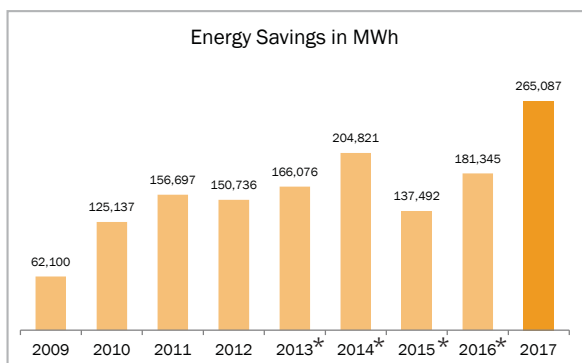
Completed 761 total
-custom projects



Incentivized more than 30,000 Energy Waste
Reduction projects.

Comprehensive Business Energy Efficiency Program Savings

Includes total energy savings from Comprehensive Prescriptive, Custom and Specialty Business Energy Efficiency programs.



* Includes savings multipliers

Comprehensive – Specialty Programs

Specialty programs were first introduced into the portfolio in 2013 as pilot programs that matured into full-scale program offerings. In 2013, four Specialty programs were introduced to the portfolio. At the end of 2017 there were 11 programs.

Total investment and deemed energy savings for Specialty programs are included in the Comprehensive Business Energy Efficiency Program Investments and Savings graphs on pages 44-48.

In 2017,
we had:



Building Operator Certification Program

Building Operator Certification (BOC) was a competency-based training program for operations and maintenance staff working in commercial, institutional or industrial buildings. BOC achieved energy savings by training individuals directly responsible for the maintenance of energy-using building equipment and day-to-day building operations.



Helped 24 customers become BOC Certified



Building Performance with ENERGY STAR®

The program was designed to assist multi-building organizations develop an energy management plan. Customers were eligible to receive technical assistance with the ENERGY STAR portfolio manager benchmark, a behavioral walk-through assessment and assistance developing an energy management plan which identifies energy efficient low-cost/no-cost measures, best practices and capital projects.



Provided approximately \$500,000 in incentives to customers representing 126 projects



Business Efficiency Report

This program was designed to create awareness among small business customers by providing them with bi-monthly printed reports and access to an online portal, which contained information regarding how they use energy in their business as well as recommendations on how they can become more energy efficient.



Provided more than 575,000 touches to approximately 71,000 small business customers



Buy Michigan

This program was created to provide a bonus to customers that participated in the comprehensive program, who purchased energy-efficient products manufactured in Michigan. Upon approval, the customer qualified for a 20 percent bonus of the total incentive (and 30 percent after Aug. 7) of the measure that was Michigan-made.



Awarded 248 project bonuses
 Paid \$367,000 in bonus incentives



Compressed Air Program

The Compressed Air program promoted the efficiency of compressed air system operation while minimizing waste. Incentives were provided for both system evaluation and capital projects.



Paid more than \$1.5 million in customer incentives through 228 measures

In 2017, we:



ENERGY STAR® Certification

This program leveraged the identification of potential building(s) within an organization by the benchmarking process and allowed those organizations to pursue ENERGY STAR Certification for eligible buildings. It provided methods to assist in the completion of the Portfolio Manager benchmarking model and external contracting services of a licensed professional to complete the certification process.



Jackson County was ranked 4th on the EPA list for Top Small Cities

Michigan was ranked #1 in the Midwest for certified schools with a total of 479



Industrial Energy Management

The Industrial Energy Management program was designed to help industries integrate Energy Management Systems into continuous improvement processes to help reduce energy use, CO₂ emissions, and operational costs. The program provided technical assistance and financial incentives to customers through training, energy teams, audits and development of energy metrics.



Helped customers achieve a 10 percent reduction in energy use and achieve the ENERGY STAR Challenge for Industry award



Municipal Program

This program identified energy savings opportunities in municipal government buildings and water/wastewater collection and distribution infrastructures. We worked with customers on identifying process improvement projects, energy benchmarking, and helped implementation of recommended energy efficiency measures. The support allowed local governments to achieve substantial energy cost savings across facilities, demonstrate energy and environmental leadership, and raise public awareness on energy efficiency.



Worked with 77 different municipal customers

Resulted in 172 applications and \$940,400 in paid incentives



New Construction Program

This program captured energy efficiency opportunities through comprehensive efforts to influence building design and construction practices. The program worked with design professionals and construction contractors to influence prospective building owners and developers to construct high-performance buildings that provided improved energy efficiency, systems performance and comfort.



425 new applications



Smart Buildings Program

The Smart Buildings program offered a retro-commissioning audit and consulting service to customers with energy management systems in need of improvement, enabling implementation of low-cost/no-cost building system efficiency measures for rebate. The focus of the Smart Buildings program was optimizing the existing HVAC systems, including the Building Automation System and individual heating, cooling and ventilation components, to meet their current facility's requirements.



More than 130,000 Mcf in projects identified since 2009



Small Business Direct Install

The Small Business Direct Install Program targeted small business customers who are less likely to participate in energy waste reduction offerings. Small businesses customers typically lack the technical and financial resources necessary to participate in efficiency programs, therefore the program offered highly discounted services for direct installation of efficient lighting and other low-cost energy-saving measures.

The program also sought out non-traditional businesses in 2017, such as non-profits and homeless shelters.

Services offered included:

- Providing efficiency audits and assessments
- Increased customer education and awareness
- Installation of cost-effective measures by authorized trade allies



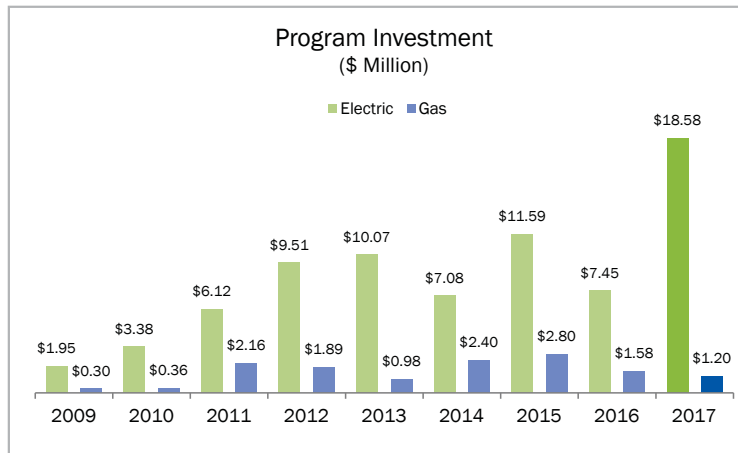
Consumers Energy was among eight organizations and individuals recognized at the Governor's Energy Excellence Awards (GEEA) for successful efforts to reduce energy waste on October 19, 2017. Consumers Energy was awarded for working through their Nonprofit Energy Efficiency (NEE) initiative to help those in Michigan communities who help others - nonprofits, houses of worship and local community organizations that operate out of historic buildings.



Since 2013, the Nonprofit Initiative helped nonprofit customers, including houses of worship, save money by installing electric and gas energy-saving measures such as LEDs, pre-rinse sprayers, faucet aerators, kitchen faucet swivel aerators, programmable thermostats and vending misers.

In 2017, another initiative developed to help homeless shelters across the state to reduce energy waste. A total of 39 homeless shelters received energy efficiency benefits via the Small Business program offerings. An investment of \$2.8 million was made with a projected \$163,000 of annual energy savings achieved.





Program Milestones 2009 through 2017

- 2014**
Installed 30,000 setback thermostats
- 2015**
Installed 100,000 screw-in LED bulbs (since 2009)
- 2016**
Completed 13,000 assessments
- 2016**
Completed 9,000 lighting projects
- 2017**
Completed 18,000th on-site assessment

Since 2015
We have:



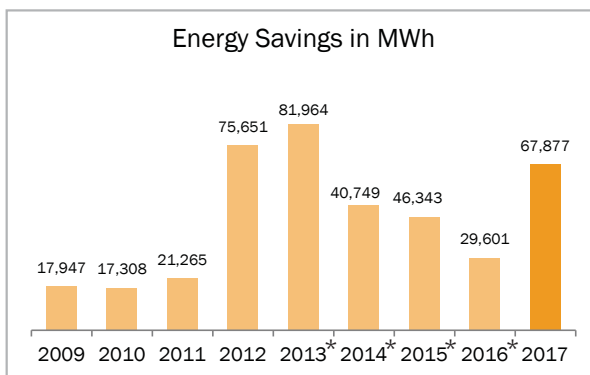
Installed 5,798 programmable and smart thermostats



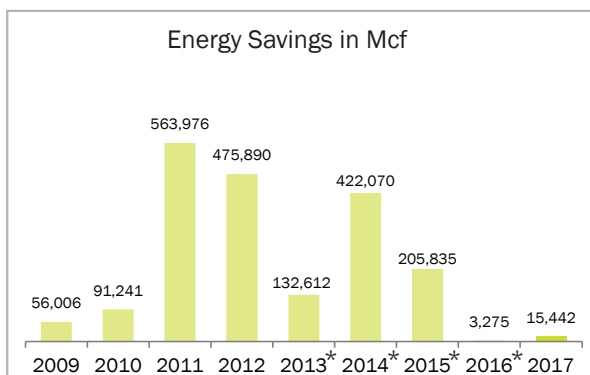
Installed 494,719 LED bulbs



Performed 23,679 energy assessments



*Includes savings multipliers



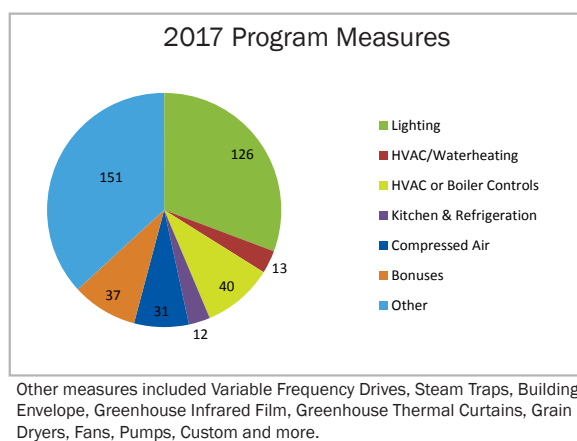
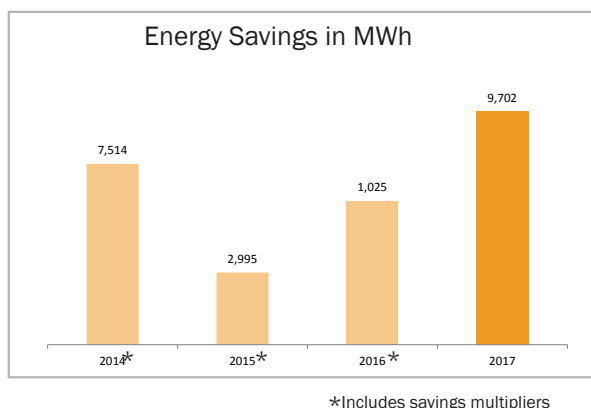
*Includes savings multipliers

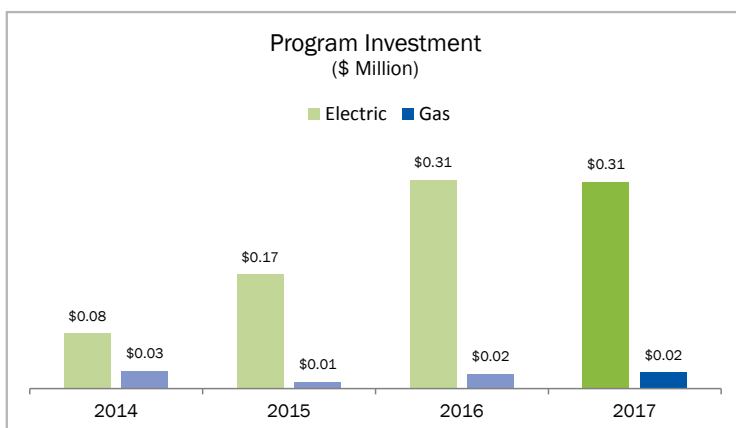


Business Agriculture

The Business Agriculture program was designed to offer two components to encourage and assist the Agricultural Industry's participation in the Consumers Energy Business Program. The first component incentivizes Tier II United States Department of Agriculture (USDA) Audits that are performed by Michigan State University (MSU) certified agricultural auditors for all residential and commercial agricultural industry customers. The second component provides the Consumers Energy agricultural industry customers with either a residential or commercial utility service to access all the applicable CEEBP C&I Large Business Program incentives, which includes the 42 specific agricultural measures.

Allowing Consumers Energy agriculture/agribusiness customers the ability to utilize other types of commercial and industrial process systems and equipment incentives (listed in the CEEBP application) will optimize access for this large, diverse Michigan business sector.





In 2017, two commercial audits were conducted, 223 qualifying commercial farm applications were processed. \$1,000 in audit incentives and \$1,697,598 in project incentives were provided.

Since 2014
We have:



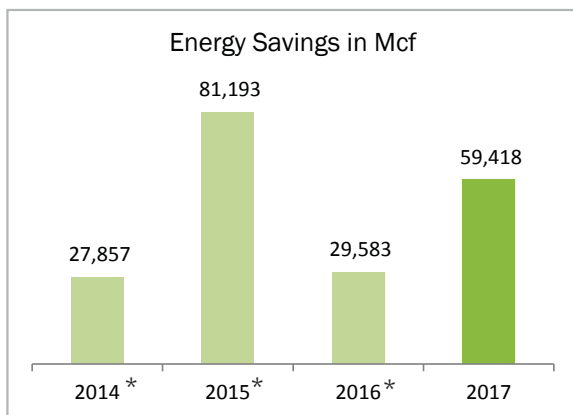
Provided over \$4,245,000 in incentives to commercial agriculture customers



Completed more than 750 applications with commercial customers



Incentivized 74 USDA Tier 2 farm audits



*Includes savings multipliers

Program Milestones 2011 through 2017

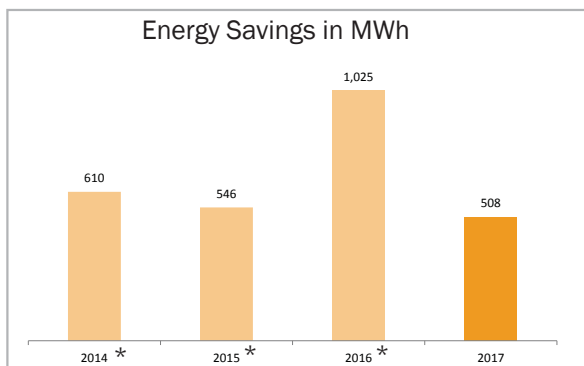
- 2013**
Paid more than \$350,000 in incentives to commercial agriculture customers
- 2014**
Transitioned from pilot to specialty (offered 27 prescriptive incentives)
- 2015**
Paid more than 70 audits and 390 applications
- 2016**
Paid \$2,550,000 project incentives and \$36,000 in audit incentives
- 2017**
Added a new measure for Grain Dryer Retrofits



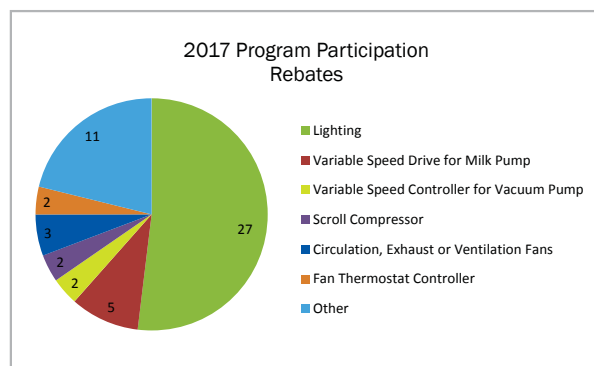
Residential Agriculture

The Residential Agriculture program was designed to offer residential agriculture customers incentives for energy saving measures included within the Business Energy Efficiency portfolio. By utilizing the program structure from the Consumers Energy Business program, the Residential Agriculture program was able to offer commercial incentives to residential farms that had industrial-grade equipment and operations.

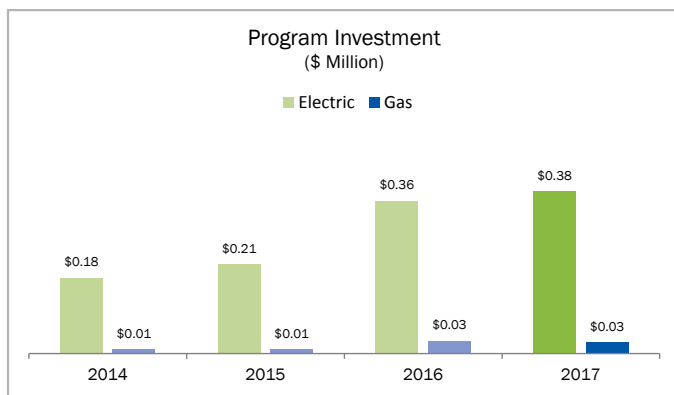
This program provided participating customers access to prescriptive and custom incentives through the Business Energy Efficiency program for residential agricultural farm customers. This program collaborated with Michigan State University's Farm Audit program to offer incentives to customers who had an audit completed at their facility. By combining resources of the residential and commercial programs, the agriculture sector had greater access to participate in Consumers Energy's energy efficiency programs.



*Includes savings multipliers



Other measures included the following: drip irrigation, dairy refrigeration tune-up, low-energy livestock waterer, bonuses.



In 2017, three residential audits were conducted, 34 qualifying residential farm applications were processed, \$1,361 in audit incentives and \$73,734 in project incentives were provided.

Since 2014
We have:



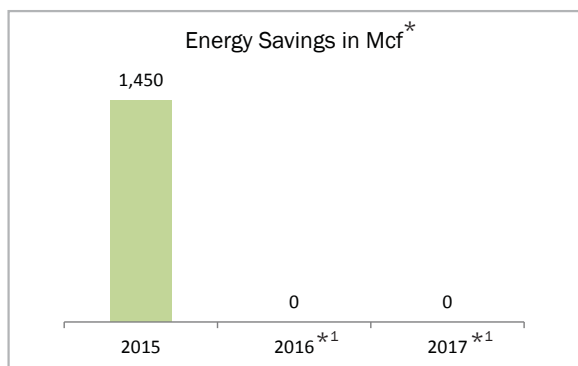
Provided more than \$391,000 in incentives to residential agriculture customers



Completed more than 215 projects with residential agriculture customers



Incentivized more than 75 USDA Tier 2 farm audits



^{*}Includes savings multipliers

¹ Measures for natural gas are often designed for commercial agriculture applications and it is not uncommon for there to be zero savings for residential agriculture.

Program Milestones 2011 through 2017

- 2013**
Paid more than \$100,000 in incentives to residential agriculture customers
- 2014**
Launched Residential Agriculture Specialty Program
- 2015**
Paid more than 200 audits and projects to residential agriculture customers
- 2016**
Paid more than \$100,000 in project and audit incentives combined to residential agriculture customers
- 2017**
Added a new measure for Grain Dryer Retrofits



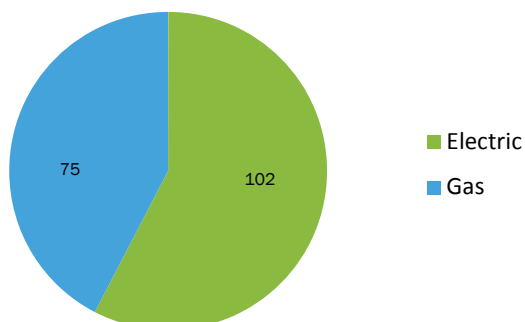
Business Multifamily

The Business Multifamily program was designed to offer property owners a free, turnkey service for helping reduce energy use through the direct installation of various energy-saving devices and promote high-efficiency equipment eligible for rebates from the Prescriptive, Custom and Comprehensive retrofit projects in both common areas and individual tenant units.

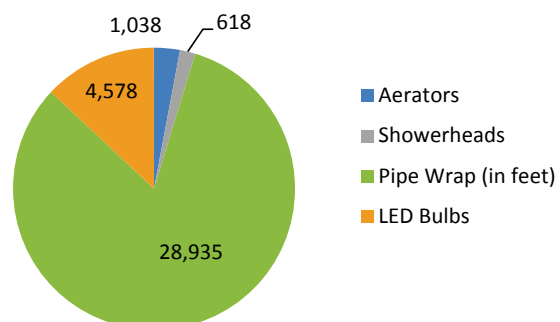
The program team assisted customers coordinating direct installations, identifying energy-saving equipment retrofit opportunities, providing resources and trade ally assistance and completing rebate application requirements. Program representatives also recruited participation through contractors and trade allies. Outreach included recruiting and training trade allies on the benefits of the program for potential Prescriptive and Custom multifamily retrofit projects, as well as orientation meetings and training for communicating the benefits of energy efficiency upgrades. Program staff also worked directly with property owners to help them find and select an approved trade ally.

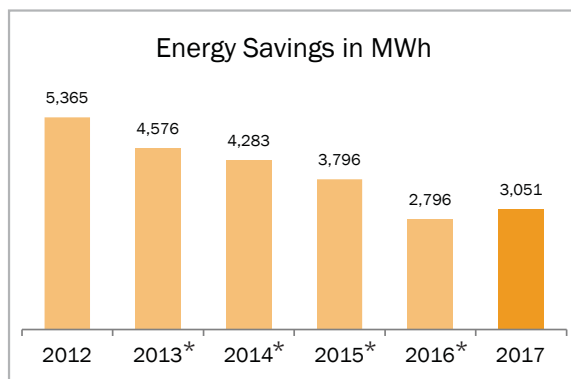
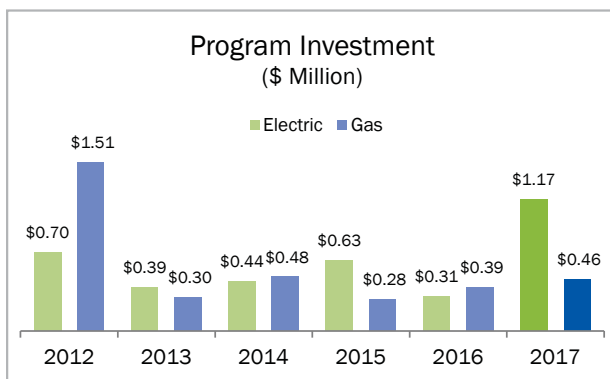


2017 Commercial Properties



2017 Commercial Direct Install Totals





*Includes savings multipliers

Since 2012
We have:



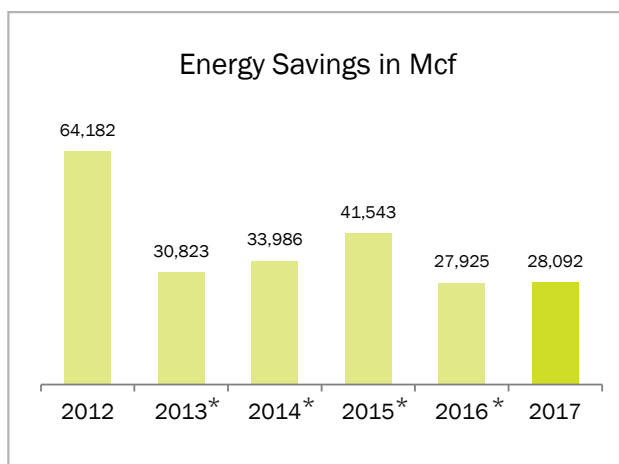
Installed more than 112,000 energy-efficient lightbulbs



Provided \$4.4 million in rebates for 1,149 projects



Installed more than 17,400 low-flow showerheads



*Includes savings multipliers

Program Milestones

2011 through 2017

2012

Launched a retrofit rebate program

2014

Installed more than 50,000 linear feet of pipe wrap

2015

Launched an outbound call campaign that had a conversion rate of 18 percent, with more than 430 energy advisor appointments

2016

Program developed and implemented a comprehensive clipboard audit tool

2017

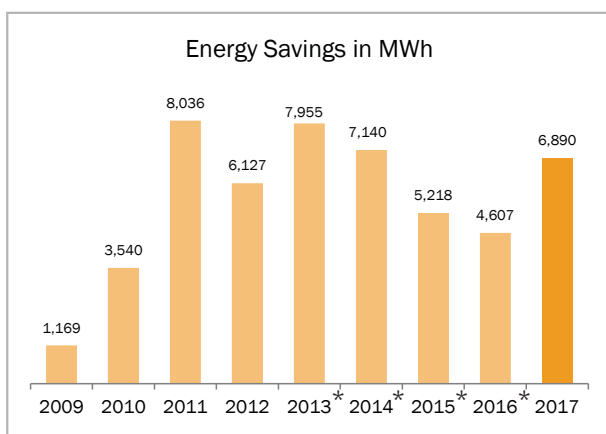
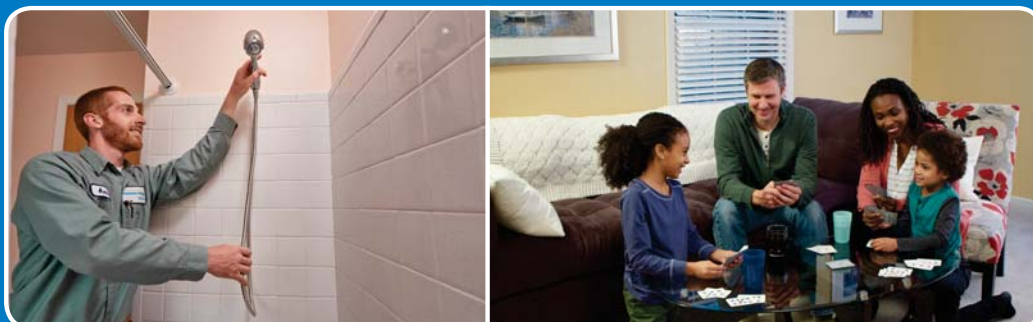
Program expanded offerings to include incentives for New Home Construction



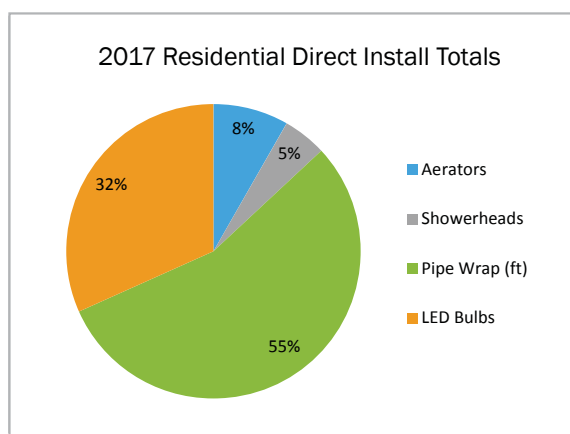
Residential Multifamily and Income Qualified Residential Multifamily

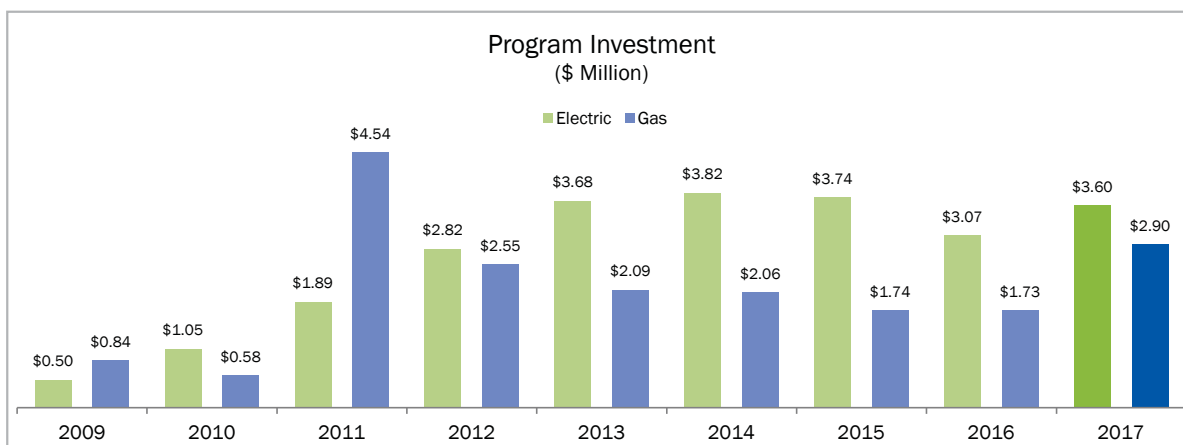
The Residential Multifamily program was designed to offer property owners a free, turnkey service for helping reduce energy use through the direct installation of various energy-saving devices and promote high-efficiency equipment eligible for rebates from the Prescriptive, Custom and Comprehensive retrofit projects in both common areas and individual tenant units.

The program team assisted customers, coordinating direct installations, identifying energy-saving equipment retrofit opportunities, providing resources and trade ally assistance and completing rebate application requirements. Program representatives also recruited participation through contractors and trade allies. Outreach included recruiting and training trade allies on the benefits of the program for potential Prescriptive and Custom multifamily retrofit projects, as well as orientation meetings and training for communicating the benefits of energy efficiency upgrades. Program staff also worked directly with property owners to help them find and select an approved trade ally.



*Includes savings multipliers

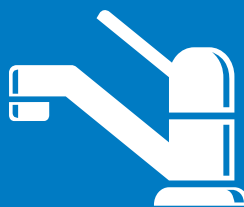




Since 2009
We have:



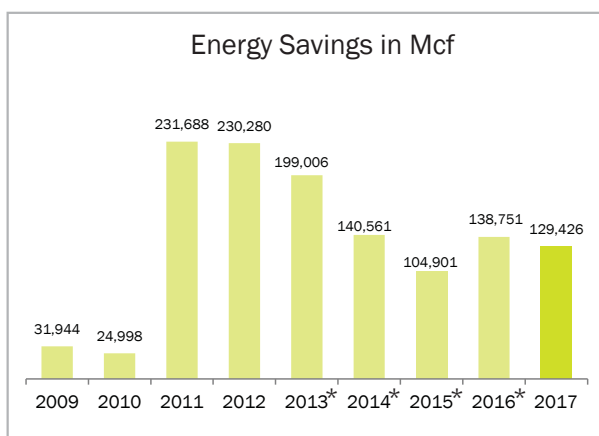
Installed more than 739,800
 energy-efficient bulbs



Installed more than 311,900
 faucet aerators



Installed more than 150,200
 low-flow showerheads



*Includes savings multipliers

Program Milestones 2009 through 2017

- 2010**
 Installed more than 52,000 CFL bulbs
- 2013**
 Transitioned program focus from CFL to LED bulbs
- 2015**
 Installed more than 160,000 LED bulbs since 2013
- 2016**
 Installed more than 33 miles of pipe wrap
- 2017**
 Expanded offerings to include new construction incentives

2017 Business Pilots

Each year, Consumers Energy pursues new initiatives and technology approaches that could capture additional energy savings within the business sector. In 2017, the Company worked with its implementation contractors to validate emerging strategies and applications that would support broader and more effective delivery of energy efficiency services to business customers.

Advanced Lighting Controls

The pilot program incentivized large and small business customers to take a holistic approach to lighting retrofits by transforming the market from a 'widget/gadget' approach to a systems approach of lighting improvements that produced deep energy savings. It provided education and incentives to complete projects using the latest technologies, while achieving the most comprehensive savings.



Generated 13 customer projects and 13 Gwh in savings and has created 20 additional new opportunities.

Steam System Optimization

This pilot provided a holistic and systematic approach to the complete steam cycle. By studying the aspects of water treatment, generation, distribution, recovery, and maintenance, the program is able to identify ways to optimize the entire facility's operations. This pilot provides an unbiased savings assessment with recommendations and payback cost analysis that helps customers identify opportunities for improvement or service.



28 customers participated with another seven committed to audits or assessments in early 2018

Commercial Real Estate (CRE)

This complex, multifaceted network contained many different asset types and stakeholders with unique implementation barriers and a variety of end-use solutions. The CRE pilot provided multiple offerings to engage the hard-to-reach market segment for participation in energy efficiency programs. A primary goal in delivering the CRE pilot was funneling more CRE customers to participate in incentive programs and to reach new customers whom have yet to be engaged. This engagement of CRE customers, both at the full building level and the tenant space level, was aimed to increase energy efficiency project implementation in this market.



Performed data analysis and identified key industry stakeholders.

Strategic Energy Management (SEM) K-12

The SEM K-12 pilot creates a holistic framework offering a deep dive service for K-12 customers, including but not limited to, benchmarking and energy assessment of the school district, creation of an energy team and an Energy Use Index (EUI) analysis to assist schools in spending their limited funding effectively and facilitating bond opportunities for energy efficiency projects.



Met with over 200 customers and 28 Trade Allies resulting in the engagement of 30 school districts with 114 buildings benchmarked.

Energy Efficiency Training Center

The Training Center program is designed to position energy efficiency programs as the trade ally and customer “go to” resource for actionable energy efficiency information and advice. The training center offers regularly scheduled courses on topics such as new and refresher Trade Ally trainings, end-uses, products, financing, BOC recertification classes, Industrial Energy Management forums, pilot program focus groups, technology refresher courses, CEM classes, Compressed Air, ENERGY STAR® Benchmarking, and Energy Team development. The training center will expand to include referrals to a collection of existing resources within the state, virtually linked together, to offer a better customer experience, with appropriate representation, referrals and follow through.



71 training sessions were developed that educated over 750 Trade Allies and customers on emerging technologies and core offerings.

Condensing Rooftop Units

Condensing technology offers an innovative option for heating and conditioning a commercial space. To capture the significant gas savings associated with condensing furnaces, Consumers Energy initiated a pilot program to demonstrate the viability of condensing technology in rooftop applications and to encourage market adoption by key manufacturers and end-users.



Developed and educated a network of 47 contractors, 49 customers and collaborated with key market leading manufacturers.

Energy Smart Grocery

The Energy Smart Grocery pilot program offers grocery and convenience store retailers a service which provides a comprehensive assessment, with specific focus around refrigeration, and subsequent report and technical assistance to help them make intelligent decisions on improving their store’s energy efficiency.



Delivered 196 audits which initiated 19 projects

Green Revolving Fund

This program identifies energy saving opportunities in K-12 schools and assists the school district in achieving implementation of these opportunities. The GRF pilot currently offers a single service: The Green Revolving Fund with Michigan Saves Loans. This is a financing strategy designed to incite a market transformation increase in K-12 energy efficiency projects. Installing an internal funding mechanism within each district makes more projects viable for all schools, but in particular at districts where financing has been a historical barrier to implementation. GRF Loans provides assistance on project implementation including education on financing, accounting strategies and savings verification.



Nine school districts signed a MOU committing to the implementation of the GRF financing strategy.

2017 Business Pilots (cont'd)

Marketplace

The Marketplace pilot program developed a branded “one-stop” online digital shopping market offering a variety of energy efficiency products exclusively for small business customers. Self-install energy efficient products meeting energy-saving specifications will be listed at rebated prices with shipping included in the online store. These items are available for purchase by qualified small business customers upon validation of their eligibility. The offered products may be installed without technical expertise by small business owners. Electric products include a variety of LED bulbs and exit signs. Natural gas products include smart thermostats, low faucet aerators, pre-rinse spray valves and pipe insulation.



2,236 products
were purchased
generating 240 MWh
of savings.

Smart Vent Zoning

Traditional zoning strategies for HVAC systems are expensive and invasive. The Smart Vent Zoning pilot program changes that by offering a low-cost, noninvasive wireless HVAC zoning system. By segmenting the business space into room-by-room zones, businesses can improve their occupant comfort by providing individualized temperature control as well as achieve energy savings. This pilot program targets light commercial electric or combo customers.



Program staff
commissioned
a commercial
installation and are
currently performing
data collection and
analysis of system
performance.

Zero Net Energy

This program's objective is to target key regional decision makers in an effort to educate on the principle value of zero net energy, and reduce barriers to the design, construction and operation of zero net energy buildings in Consumers Energy territory for newly constructed and existing buildings. To date, 96 customers have been educated on the program.



Collaborated
with USGBC and
the 2030 Grand
Rapids District to
develop a network
of 75 builders,
developers and
A&E firms.

2017 Residential Pilots

Consumers Energy pursues new initiatives and technology approaches that could capture additional energy savings within the residential sector. The Company works with its implementation contractors to validate emerging strategies and applications that would support broader and more effective delivery of energy efficiency services to customers.

Energy Savers Club

The Energy Savers Club (ESC) was a Non-Wires Alternative effort to reduce the peak substation load in Swartz Creek. It utilized a community-based outreach approach designed to promote energy efficiency programs and education for both residential and commercial customers. ESC engaged customers through multiple touchpoints, including an Energy Ambassador who provided a presence in the community, an Energy Task Force comprised of civic and community leaders, uniquely branded website, booths at local events and local civic groups. ESC led customers to energy efficiency program information and customers were given the opportunity to enter prize drawings by participating/enrolling in promoted energy efficiency programs and vote for a community project. Launched in October of 2017, ESC will continue to drive energy efficiency program participation and peak load reduction in Swartz Creek through late 2018.



More than 250
residential and business
customers registered and
163 DIY energy savings
kits distributed

Pay My Way™

Pay My Way™, previously known as PrePay, offered customers a convenient billing and payment option that enhanced their insight into energy use by translating use into dollars. Customers pre-paid an affordable amount prior to use and reloaded as needed. Customers also chose a preferred communication channel - email, text or phone call - to receive notifications on how much money was left in the account with an estimated number of days associated with the dollars. In 2018, Pay My Way will continue to focus on long-term energy savings in the residential sector by engaging customers with their energy use on a frequent basis through customer notifications and alerts via the customers' preferred communication channel.



Enrolled 2,274 customers

HVAC System Monitoring

HVAC System Monitoring (HSM) provided customers an opportunity to gain granular insight into their HVAC system performance through the installation and monitoring of a Fault Diagnostic & Detection (FDD) device. HSM allowed for 24/7 collection of diagnostic information and alerted both the installer and the homeowner of any changes to the system. With installations on new and existing equipment, HSM provided for Quality Install benchmarking, system problem prediction and ongoing efficiency. Regular communications such as system ongoing performance (operating efficiency), system operational issues (loss of efficiency, system sequence of operation issues (e.g. ignition faults) and more were provided in the form of online reports,. Alerts could also be sent directly to the installing contractor and homeowner via email and/or mobile app. Additional system installations will be completed in 2018 with monitoring activities continuing throughout the year.



70 Monitoring systems
installed

Appendix

Table 4-1. Statutory Savings Goals and Investment Levels

Electricity	2017
Electric Savings Goal as % of Total Sales	1.00%
Natural Gas	2017
Natural Gas Savings Goal as % of Total Sales	0.75%

Table 4-2. 2017 Electric Results

Savings	Achieved First Year	Target
MWh	562,121	331,830
% of Statutory Target	169%	100%
Investment		
\$ Millions	\$113.5	\$114.0
Benefit-Cost Test Results		
UCT Score	2.60	

Table 4-3. 2017 Natural Gas Results

Savings	Achieved First Year	Target
Mcf	2,812,098	1,958,913
% of Statutory Target	144%	100%
Investment		
\$ Millions	\$52.9	\$53.8
Benefit-Cost Test Results		
UCT Score	1.94	

Table 4-4. 2017 Portfolio Investment

	Utility System Resource Cost Test	Lifetime CCE /kWh*	Lifetime CCE /Mcf*	Electric Investment	Natural Gas Investment	Total Investment
RESIDENTIAL PROGRAMS						
Appliance Recycling	2.28	\$0.024	-	\$4,261,780	-	\$4,261,780
ENERGY STAR® Appliances	2.96	\$0.025	\$1.11	\$366,770	\$942,930	\$1,309,701
ENERGY STAR® Lighting	7.74	\$0.006	-	\$7,620,983	-	\$7,620,983
Home Energy Analysis	1.15	\$0.048	\$2.34	\$2,410,874	\$2,335,631	\$4,746,504
Home Energy Report	1.00	\$0.032	\$8.43	\$1,689,855	\$2,138,287	\$3,828,143
Home Performance with ENERGY STAR®	0.79	\$0.114	\$3.30	\$527,633	\$939,866	\$1,467,498
HVAC and Water Heating	2.32	\$0.026	\$1.28	\$2,743,313	\$8,239,531	\$10,982,843
Income Qualified Energy Assistance	0.59	\$0.044	\$7.96	\$3,442,332	\$6,414,022	\$9,856,355
Insulation and Windows Program	2.02	\$0.062	\$1.05	\$853,884	\$1,370,357	\$2,224,241
Residential Agriculture	0.95	\$0.049	-	\$381,537	\$26,611	\$408,148
Residential Multifamily	1.54	\$0.036	\$1.37	\$2,701,816	\$1,476,270	\$4,178,086
Residential Multifamily Income Qualified	1.11	\$0.030	\$3.27	\$857,844	\$1,460,013	\$2,317,858
New Home Construction	0.91	\$0.042	\$4.12	\$329,603	\$1,201,201	\$1,530,804
THINK! ENERGY®	1.51	\$0.023	\$2.45	\$622,222	\$987,667	\$1,609,890
Residential Pilot Programs	-	-	-	\$1,812,550	\$1,687,933	\$3,500,484
Residential Subtotal	1.78	\$0.020	\$2.56	\$30,622,997	\$29,220,320	\$59,843,317
BUSINESS PROGRAMS						
Comprehensive & Custom Business Solutions	4.34	\$0.010	\$0.65	\$43,045,749	\$15,055,089	\$58,100,839
Small Business Direct Install	2.19	\$0.020	\$5.73	\$18,576,738	\$1,200,821	\$19,777,560
Business Multifamily Direct Install	1.85	\$0.026	\$1.14	\$1,170,468	\$458,020	\$1,628,488
Business Pilots	-	-	-	\$3,821,303	\$989,603	\$4,810,906
Self-Direct	-	-	-	-	-	-
Business Subtotal	2.79	\$0.017	\$0.90	\$66,614,259	\$17,703,534	\$84,317,793
SUPPORT SERVICES						
Utility Oversight	-	-	-	\$7,177,748	\$2,420,867	\$9,598,615
Tracking System	-	-	-	\$1,009,568	\$340,501	\$1,350,069
Education & Awareness	-	-	-	\$3,429,622	\$1,619,583	\$5,049,205
EM&V	-	-	-	\$4,628,111	\$1,560,941	\$6,189,053
Support Services Subtotal	-	-	-	\$16,245,050	\$5,941,892	\$22,186,942
TOTAL	2.40	\$0.018	\$1.46	\$113,482,306	\$52,865,746	\$166,348,052

*Cost of Conserved Energy does not include savings multipliers, Pilots, or Education and Awareness

Table 4-5. 2017 Portfolio Savings

	First Year Net MWh Savings	MWh Lifetime Savings	First Year Net MW Savings	First Year Net Mcf Savings	Mcf Lifetime Savings
RESIDENTIAL PROGRAMS					
Appliance Recycling	19,593	162,155	2.4	-	-
ENERGY STAR® Appliances	1,399	14,640	0.3	86,125	847,394
ENERGY STAR® Lighting	82,962	1,240,319	9.9	-	-
Home Energy Analysis	3,391	45,555	0.2	97,593	997,041
Home Energy Report	48,102	48,102	-	253,660	253,660
Home Performance with ENERGY STAR®	304	4,235	0.1	18,045	285,018
HVAC and Water Heating	9,003	94,975	1.4	469,929	6,418,474
Income Qualified Energy Assistance	5,237	71,201	0.4	62,733	806,077
Insulation and Windows Program	520	12,632	0.3	54,387	1,299,809
Residential Agriculture	508	7,105	0.1	-	-
Residential Multifamily	4,743	69,352	0.6	98,024	1,074,966
Residential Multifamily Income Qualified	2,147	26,264	0.2	31,403	452,850
New Home Construction	357	7,134	-	14,593	291,866
THINK! ENERGY®	1,724	24,493	0.2	40,375	403,752
Residential Pilot Programs	8,936	8,936	-	61,343	61,343
Residential Subtotal	188,925	1,837,099	16.1	1,288,211	13,192,252
BUSINESS PROGRAMS					
Comprehensive & Custom Business Solutions	265,087	3,962,578	36.9	1,333,393	23,239,789
Small Business Direct Install	67,877	897,638	9.8	15,442	209,709
Business Multifamily Direct Install	3,051	42,463	0.3	28,092	403,388
Business Pilots	16,682	16,682	-	68,846	68,846
Self-Direct	5,019	5,019	-	-	-
Business Subtotal	357,716	4,924,380	47.0	1,445,773	23,921,733
SUPPORT SERVICES					
Utility Oversight	-	-	-	-	-
Tracking System	-	-	-	-	-
Education & Awareness	15,480	15,480	-	78,114	78,114
EM&V	-	-	-	-	-
Support Services Subtotal	15,480	15,480	-	78,114	78,114
TOTAL	562,121	6,776,959	63.1	2,812,098	37,192,099

Table 4-6. Summary of Electric Programs Benefit-Cost Test Results

	Utility Cost Test	Total Resource Cost Test	Participant Measure	Rate Impact Measure
RESIDENTIAL PROGRAMS				
Appliance Recycling	2.28	1.94	11.20	0.38
ENERGY STAR [®] Appliances	3.14	0.73	1.30	0.56
ENERGY STAR [®] Lighting	7.74	1.58	4.31	0.38
Home Energy Analysis	0.96	0.96	-	0.29
Home Energy Report	1.73	1.73	-	0.33
Home Performance with ENERGY STAR [®]	0.64	0.25	0.63	0.33
HVAC and Water Heating	2.24	0.80	2.08	0.42
Income Qualified Energy Assistance	0.98	0.98	-	0.28
Insulation and Windows Program	1.28	0.24	0.37	0.51
Residential Agriculture	1.01	0.45	1.79	0.32
Residential Multifamily	1.22	0.72	4.31	0.30
Residential Multifamily Income Qualified	1.48	1.48	-	0.32
New Home Construction	1.77	0.58	1.08	0.53
THINK! ENERGY [®]	1.84	1.84	-	0.32
Residential Portfolio Average*	2.29	1.07	4.09	0.36
BUSINESS PROGRAMS				
Comprehensive & Custom Business Solutions	4.40	1.49	3.25	0.50
Small Business Direct Install	2.30	2.06	14.91	0.44
Business Multifamily Direct Install	1.61	1.01	4.12	0.39
Business Portfolio Average	2.73	1.39	3.98	0.47
Total Portfolio without Incentive*	3.09	1.40	4.01	0.44
Total Portfolio with Incentive*	2.60	1.29	4.01	0.43

*Does not include Residential Income Qualified program

Table 4-7. Summary of Natural Gas Programs Benefit-Cost Test Results

	Utility Cost Test	Total Resource Cost Test	Participant Measure	Rate Impact Measure
RESIDENTIAL PROGRAMS				
Appliance Recycling	-	-	-	-
ENERGY STAR® Appliances	2.89	0.98	2.11	0.47
ENERGY STAR® Lighting	-	-	-	-
Home Energy Analysis	1.35	1.35	-	0.40
Home Energy Report	0.42	0.42	-	0.23
Home Performance with ENERGY STAR®	0.88	0.41	1.20	0.35
HVAC and Water Heating	2.35	0.93	2.12	0.46
Income Qualified Energy Assistance	0.38	0.38	-	0.23
Insulation and Windows Program	2.48	0.33	0.68	0.48
Residential Agriculture	-	-	-	-
Residential Multifamily	2.12	0.49	1.13	0.45
Residential Multifamily Income Qualified	0.89	0.89	-	0.35
New Home Construction	0.67	1.07	4.36	0.31
THINK! ENERGY®	1.30	1.30	-	0.39
Residential Portfolio Average*	1.19	0.64	2.02	0.38
BUSINESS PROGRAMS				
Comprehensive & Custom Business Solutions	4.19	1.74	3.73	0.50
Small Business Direct Install	0.53	0.53	-	0.27
Business Multifamily Direct Install	2.47	1.22	3.09	0.46
Business Portfolio Average	3.03	1.55	3.94	0.48
Total Portfolio without Incentive*	2.40	1.13	2.91	0.46
Total Portfolio with Incentive*	1.94	1.02	2.91	0.44

*Does not include Residential Income Qualified program

Table 4-8. 2018 Planned Investment

Electric Investment	2018
Planned Investment (\$M)	\$118.73
Natural Gas Investment	2018
Planned Investment (\$M)	\$54.17

MICHIGAN PUBLIC SERVICE COMMISSIONConsumers Energy Company

Calculation of Annual Energy Savings Targets

Electric Service (Megawatt-hours)

Case No.: U-20028

Exhibit No.: A-2 (TAY-2)

Page: 1 of 3

Witness: TAYkimoff

Date: May 2018

Line No.	Description	(a)	(b)
		2016	2017
1	WN Retail Electric Sales ⁽¹⁾	33,182,963	
2	Prior Year Weather Normal		33,182,963
3	Electric Statutory Savings Percentage		1.0%
4	Electric Statutory Savings Target		331,830

Case No.: U-20028
Hearing Date: 10-3-2018
Exhibit No.: A-2

Notes:

(1) Weather normalized calendar sales (excludes Wholesale and ROA).

MICHIGAN PUBLIC SERVICE COMMISSIONConsumers Energy Company

Calculation of Annual Energy Savings Targets

Natural Gas Service (Thousand Cubic Feet)

Case No.: U-20028

Exhibit No.: A-2 (TAY-2)

Page: 2 of 3

Witness: TAYkimoff

Date: May 2018

Line No.	Description	(a)	(b)
		2016	2017
1	Gas Sales ⁽¹⁾	223,550,000	
2	Total Transportation Deliveries ⁽²⁾	80,447,000	
3	Small & Medium Business (< 100,000 Mcf) ⁽³⁾	28,534,551	
4	Large Business (≥ 100,000 Mcf) ⁽³⁾	51,912,449	
5	Savings Reduction Factor (%) ⁽⁴⁾	17.5%	
6	Adjusted Transport ≥ 100,000 Mcf	9,103,790	
7	Total Adjusted Gas Deliveries	261,188,341	
8	Prior Year Weather Normal		261,188,341
9	Gas Statutory Savings Percentage		0.75%
10	Gas Statutory Savings Target		1,958,913

Notes:

(1) Exhibit A-2 (EMB-2), sum of columns (b) through (e), Case No. U-17771 (Amended)

(2) Exhibit A-2 (EMB-2), column (f), Case No. U-17771 (Amended)

(3) WP-EMB-3, Case No. U-17771 (Amended)

(4) Exhibit A-10 (TAY-1), page 3, line 6, Case No. U-17771 (Amended)

MICHIGAN PUBLIC SERVICE COMMISSIONConsumers Energy Company

Calculation of Annual Energy Savings Targets

Savings Reduction Factor

Case No.: U-20028

Exhibit No.: A-2 (TAY-2)

Page: 3 of 3

Witness: TAYkimoff

Date: May 2018

Line No.	Description	(a)	(b)	Source
		2016	2017	
1	Large Business Revenue (\$)	\$ 34,002,654	\$ 34,014,000 ⁽¹⁾	
2	Large Business Deliveries (Mcf)	51,912,449	53,785,000 ⁽¹⁾	
3	Average GCR Rate (\$/Mcf)	\$ 3.0800	\$ 3.2100	
4	Imputed Commodity Revenue (\$)	\$ 159,890,343	\$ 172,649,850	line 2 x line 3
5	Imputed Large Business Revenue (\$)	\$ 193,892,997	\$ 206,663,850	line 1 + line 4
6	Savings Reduction Factor (%)	17.5%	16.5%	line 1 / line 5

Notes:

(1) WP-EMB-3, Case No. U-17771 (Amended)

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company
 2017 Program Savings and Investment Summary
 Electric Service

Case No.: U-20028
 Exhibit No.: A-3 (TAY-3)
 Page: 1 of 2
 Witness: TAYkimoff
 Date: May 2018

		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
				Actual		Planned		Variance (Actual - Planned)	
Line No.	Description	UCT	CCE (\$ per kWh)	MWh Savings	Investments	MWh Savings	Investments	MWh Savings	Investments
	Residential								
1	Appliance Recycling	2.28	\$ 0.02	19,593	\$ 4,261,780	23,533	\$ 4,700,042	(3,940)	\$ (438,262)
2	ENERGY STAR Appliances	3.14	0.025	1,399	366,770	1,197	343,517	202	23,254
3	ENERGY STAR Lighting	7.74	0.006	82,962	7,620,983	74,497	7,786,192	8,465	(165,209)
4	Home Energy Analysis (HEA)	0.96	0.048	3,391	2,410,874	3,164	2,617,542	227	(206,668)
5	Home Energy Report (HER)	1.73	0.032	48,102	1,689,855	53,843	1,666,043	(5,741)	23,812
6	Home Performance with ENERGY STAR	0.64	0.114	304	527,633	281	411,759	23	115,874
7	HVAC & Water Heating	2.24	0.026	9,003	2,743,313	8,619	2,823,819	384	(80,506)
8	Income Qualified	0.98	0.044	5,237	3,442,332	2,978	3,434,011	2,259	8,321
9	Insulation and Windows Program	1.28	0.062	520	853,884	500	1,025,122	20	(171,238)
10	Residential Agriculture	1.01	0.049	508	381,537	894	168,594	(386)	212,943
11	Residential Multifamily	1.22	0.036	4,743	2,701,816	3,870	3,066,228	873	(364,412)
12	Residential Multifamily Income Qualified	1.48	0.030	2,147	857,844	943	360,870	1,204	496,974
13	New Home Construction	1.77	0.042	357	329,603	242	418,506	115	(88,903)
14	Think! Energy	1.84	0.023	1,724	622,222	1,708	622,000	16	222
15	Residential Pilots	-	-	8,936	1,812,550	9,580	1,853,808	(644)	(41,258)
16	Total Residential	2.29	0.020	188,925	30,622,997	185,849	31,298,052	3,076	(675,055)
	Business								
17	Business Solutions	4.40	0.010	265,087	43,045,749	263,357	53,310,500	1,730	(10,264,751)
18	Small Business Direct Install	2.30	0.020	67,877	18,576,738	36,120	9,588,993	31,757	8,987,745
19	Business Multifamily	1.61	0.026	3,051	1,170,468	2,661	419,024	390	751,444
20	Self-Direct Projects	-	-	5,019	-	-	-	5,019	-
21	Business Pilots	-	-	16,682	3,821,303	16,421	3,846,306	261	(25,003)
22	Total Business	2.73	0.017	357,716	66,614,259	318,559	67,164,823	39,157	(550,564)
	Support Services								
23	Utility Oversight	-	-	-	7,177,748	-	6,542,431	-	635,317
24	Tracking System	-	-	-	1,009,568	-	1,084,401	-	(74,833)
25	Education & Awareness	-	-	15,480	3,429,622	15,600	3,420,068	(120)	9,554
26	Evaluation, Measurement, & Verification	-	-	-	4,628,111	-	4,492,503	-	135,608
27	Total Support Services	-	-	15,480	16,245,050	15,600	15,539,403	(120)	705,647
28	Total Portfolio	2.60	\$ 0.018	562,121	\$ 113,482,306	520,008	\$ 114,002,278	42,113	\$ (519,972)

Notes:
 UCT - Utility Cost Test
 CCE - Cost of Conserved Energy

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company
2017 Program Savings and Investment Summary
Natural Gas Service

Case No.: U-20028
Exhibit No.: A-3 (TAY-3)
Page: 2 of 2
Witness: TAYkimoff
Date: May 2018

		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Line No.	Description	UCT	CCE (\$ per Mcf)	Actual		Planned		Variance (Actual - Planned)	
				Mcf Savings	Investments	Mcf Savings	Investments	Mcf Savings	Investments
	Residential								
1	Appliance Recycling	-	\$ -	-	\$ -	-	\$ -	-	\$ -
2	ENERGY STAR Appliances	2.89	1.11	86,125	942,930	40,816	680,060	45,309	262,870
3	ENERGY STAR Lighting	-	-	-	-	-	-	-	-
4	Home Energy Analysis (HEA)	1.35	2.34	97,593	2,335,631	88,370	2,248,601	9,223	87,030
5	Home Energy Report (HER)	0.42	8.43	253,660	2,138,287	246,820	2,336,295	6,841	(198,008)
6	Home Performance with ENERGY STAR	0.88	3.30	18,045	939,866	25,257	1,033,429	(7,211)	(93,563)
7	HVAC & Water Heating	2.35	1.28	469,929	8,239,531	535,149	9,802,525	(65,220)	(1,562,994)
8	Income Qualified	0.38	7.96	62,733	6,414,022	56,689	6,403,463	6,044	10,559
9	Insulation and Windows Program	2.48	1.05	54,387	1,370,357	53,001	1,389,349	1,386	(18,992)
10	Residential Agriculture	-	-	-	26,611	-	3,170	-	23,441
11	Residential Multifamily	2.12	1.37	98,024	1,476,270	105,191	1,631,837	(7,167)	(155,567)
12	Residential Multifamily Income Qualified	0.89	3.27	31,403	1,460,013	22,350	939,130	9,053	520,883
13	New Home Construction	0.67	4.12	14,593	1,201,201	17,574	1,189,730	(2,981)	11,471
14	Think! Energy	1.30	2.45	40,375	987,667	39,572	987,497	803	170
15	Residential Pilots	-	-	61,343	1,687,933	66,891	1,726,567	(5,548)	(38,634)
16	Total Residential	1.19	2.56	1,288,211	29,220,320	1,297,679	30,371,653	(9,468)	(1,151,333)
	Business								
17	Business Solutions	4.19	0.65	1,333,393	15,055,089	1,232,098	16,218,784	101,295	(1,163,695)
18	Small Business Direct Install	0.53	5.73	15,442	1,200,821	5,518	144,879	9,924	1,055,942
19	Business Multifamily	2.47	1.14	28,092	458,020	27,086	432,225	1,006	25,795
20	Self-Direct Projects	-	-	-	-	-	-	-	-
21	Business Pilots	-	-	68,846	989,603	68,734	965,205	112	24,398
22	Total Business	3.03	0.90	1,445,773	17,703,534	1,333,436	17,761,093	112,337	(57,559)
	Support Services								
23	Utility Oversight	-	-	-	2,420,867	-	2,206,639	-	214,228
24	Tracking System	-	-	-	340,501	-	365,748	-	(25,247)
25	Education & Awareness	-	-	78,114	1,619,583	81,374	1,615,063	(3,260)	4,520
26	Evaluation, Measurement, & Verification	-	-	-	1,560,941	-	1,515,237	-	45,704
27	Total Support Services	-	-	78,114	5,941,892	81,374	5,702,687	(3,260)	239,205
28	Total Portfolio	1.94	\$ 1.46	2,812,098	\$ 52,865,746	2,712,489	\$ 53,835,433	99,609	\$ (969,687)

Notes:
UCT - Utility Cost Test
CCE - Cost of Conserved Energy

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company
 2017 Electric and Gas EWR Performance Metrics

Case No.: U-20028
 Exhibit No.: A-4 (TAY-4)
 Page: 1 of 1
 Witness: TAYkimoff
 Date: May 2018

Line No.	Description	(a)	(b)	(c)	(d)
		Performance Metrics		Financial Incentive Percent	
		Target	Achieved ^(1)	Percent of Investment	Percent of Net Benefits
Electric					
	<u>Lifetime Energy Savings (MWh)</u>				
1	1.00% - 1.25%	3,992,398		15.0%	25.0%
2	1.26% - 1.50%	5,030,422		17.5%	27.5%
3	> 1.50%	5,988,597	6,776,959	20.0%	30.0%
Natural Gas					
	<u>Lifetime Energy Savings (Mcf)</u>				
4	0.75% - 0.875%	22,980,300		15.0%	25.0%
5	0.876% - 1.00%	26,840,990		17.5%	27.5%
6	> 1.00%	30,640,400	37,192,099	20.0%	30.0%

Notes:

(1) Exhibit A-1 (TAY-1), Table 4-5

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company
 2017 Electric and Gas EWR Financial Incentive
 (January 1st - December 31st)

Case No.: U-20028
 Exhibit No.: A-5 (TAY-5)
 Page: 1 of 3
 Witness: TAYkimoff
 Date: May 2018

Line No.	Description	(a) Electric	(b) Natural Gas	(c) Combined	Source
1	EWR Investments	\$ 113,482,306	\$ 52,865,746	\$ 166,348,052	Exhibit A-3 (TAY-3)
2	<u>Financial Incentive</u> % of Net Benefits	\$ 52,395,021	\$ 14,342,136	\$ 66,737,157	L6 page 2 + L6 page 3
3	% of Investments	\$ 21,398,658	\$ 9,971,017	\$ 31,369,675	L9 page 2 + L9 page 3
4	Financial Incentive Cap	<u>\$ 21,398,658</u>	<u>\$ 9,971,017</u>	<u>\$ 31,369,675</u>	Min(L2, L3)

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company
2017 Electric and Gas EWR Financial Incentive
(January 1st - April 19th)

Case No.: U-20028
Exhibit No.: A-5 (TAY-5)
Page: 2 of 3
Witness: TAYkimoff
Date: May 2018

		(a)	(b)	
Line No.	Description	Electric	Natural Gas	Source
	<u>Financial Incentive based on % of Net Benefits</u>			
1	EWR Investments	\$ 25,956,072	\$ 12,042,637	Exhibit A-21 (JPS-4)
2	Utility Cost Test Score	2.60	1.94	Exhibit A-3 (TAY-3)
3	NPV of Benefits	\$ 67,485,788	\$ 23,362,715	L1 x L2
4	Net Benefits	\$ 41,529,716	\$ 11,320,079	L3 - L1
5	Financial Incentive %	25.0%	25.0%	PA 295, Sec. 75(a)
6	Financial Incentive	\$ 10,382,429	\$ 2,830,020	L4 x L5
	<u>Financial Incentive based on % of Investments</u>			
7	EWR Investments	\$ 25,956,072	\$ 12,042,637	L1
8	Financial Incentive %	15.0%	15.0%	PA 295, Sec. 75(a)
9	Financial Incentive	\$ 3,893,411	\$ 1,806,396	L7 x L8

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company
2017 Electric and Gas EWR Financial Incentive
(April 20th - December 31st)

Case No.: U-20028
Exhibit No.: A-5 (TAY-5)
Page: 3 of 3
Witness: TAYkimoff
Date: May 2018

Line No.	Description	(a)	(b)	Source
		Electric	Natural Gas	
<u>Financial Incentive based on % of Net Benefits</u>				
1	EWR Investments	\$ 87,526,233	\$ 40,823,109	L1 page 1 - L1 page 2
2	Utility Cost Test Score	2.60	1.94	Exhibit A-3 (TAY-3)
3	NPV of Benefits	\$ 227,568,207	\$ 79,196,832	L1 x L2
4	Net Benefits	\$ 140,041,974	\$ 38,373,723	L3 - L1
5	Financial Incentive %	30.0%	30.0%	Exhibit A-4 (TAY-4)
6	Financial Incentive	\$ 42,012,592	\$ 11,512,117	L4 x L5
<u>Financial Incentive based on % of Investments</u>				
7	EWR Investments	\$ 87,526,233	\$ 40,823,109	L1
8	Financial Incentive %	20.0%	20.0%	Exhibit A-4 (TAY-4)
9	Financial Incentive	\$ 17,505,247	\$ 8,164,622	L7 x L8

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company
 2017 Electric Energy Waste Reduction (EWR) Credits

Case No.: U-20028
 Exhibit No.: A-6 (TAY-6)
 Page: 1 of 1
 Witness: TAYkimoff
 Date: May 2018

Line No.	Description	(a)	(b)
		<u>EWR Credits</u>	<u>Source</u>
1	EWR Credit beginning year balance	-	
2	Credits earned in current year	562,121	(1)
3	Credits used to meet statutory requirements	(331,830)	(2)
4	EWR Credit Excess / (Deficiency) relative to standard	230,291	L1 + L2 + L3
5	Credits substituted for Renewable Energy Credits	(230,291)	
6	EWR Credit Ending year balance	-	L4 + L5


Notes:

(1) Exhibit A-3 (TAY-3), Page 1, Line 28, column (c)

(2) Exhibit A-2 (TAY-2), Page 1, Line 4, column (b)



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Residential Energy Waste Reduction Certification Evaluation Report

2017 PROGRAM YEAR


May 2018

Presented to:

Joseph Forcillo, Director of
Evaluation, Measurement and
Verification, Clean Energy Products
Consumers Energy Company
One Energy Plaza
Jackson, MI 49201

Presented by:

Cadmus
1426 Pearl Street, Suite 400
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This report is a deliverable submitted to Consumers Energy as part of a multiyear, independent evaluation contract to conduct impact, process, and market assessment studies of residential energy waste reduction and demand response programs administered by Consumers Energy.

The independent evaluation team includes the following firms:

Cadmus, Contract Lead
Illume Advising
Apex Analytics
NMR Group
Public Sector Consultants

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Introduction

Overview

This report presents certified energy savings from all 2017 residential energy waste reduction (EWR) programs administered by Consumers Energy Company. Cadmus reviewed and verified these energy savings as part of a comprehensive evaluation of Consumers Energy's residential EWR portfolio.

Objective and Scope

For this certification, Cadmus reviewed, reconciled, and verified program-level energy savings tracked by Consumers Energy and third-party implementation firms. Cadmus reviewed reported participation and installation data, in addition to reported kWh, peak kW, and MCF savings data for each program in the Consumers Energy residential EWR portfolio. Table 1 lists Consumers Energy residential EWR programs and their respective third-party implementers.

Table 1. Consumers Energy Residential EWR and Programs and Third-Party Implementers

Program	Third-Party Implementer
Appliance Recycling	CLEAResult
ENERGY STAR Appliances	CLEAResult
ENERGY STAR® Lighting	CLEAResult
Home Energy Analysis	CLEAResult
Home Energy Reports	ICF International
Home Performance with ENERGY STAR	ICF International
HVAC and Water Heating	ICF International
Income Qualified	CLEAResult
Insulation and Windows	ICF International
Multifamily	Franklin Energy
Multifamily Income Qualified	Franklin Energy
New Home Construction	CLEAResult
Residential Agriculture	DNV GL
Think! Energy®	National Energy Foundation

For this certification, Cadmus completed the following actions:

- Reviewed and confirmed that participation and installation data in Consumers Energy's and implementers' databases accurately reflect actual program participation and measure installation throughout the 2017 program year.
- Confirmed that the annual and lifetime kWh savings, MCF savings; annual demand reduction; and measure lives attributed to individual program measures accurately reflect the following:
 - Values maintained in the 2017 Michigan Energy Measures Database (MEMD);
 - Weighted values for weather-sensitive measures, which a third party independently calculated by housing vintage, heating/cooling equipment, climate zone, and housing square footage; and
 - Approved work papers prepared by implementation contractors.

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- Verified the application of appropriate gross installation rates (ISR) as established by evaluation, measurement, and verification (EM&V) research, and net-to-gross (NTG) values as established and approved by the Michigan Public Service Commission (MPSC), to accurately calculate net savings for each measure.
- Reviewed a random sample of customer applications, installation reports, or other project or measure documentation for relevant programs to ensure data were consistently and accurately represented in tracking databases.
- Reviewed a random sample of installed Wi-Fi thermostats in Consumers Energy's tracking database to distinguish tier two and tier three units, and apply accurate per-unit annual and lifetime savings.
- Compared 2017 reported annual and lifetime net savings to certified net savings results for each program and to the entire portfolio of residential EWR programs, noting changes, updates, and differences.

Methodology

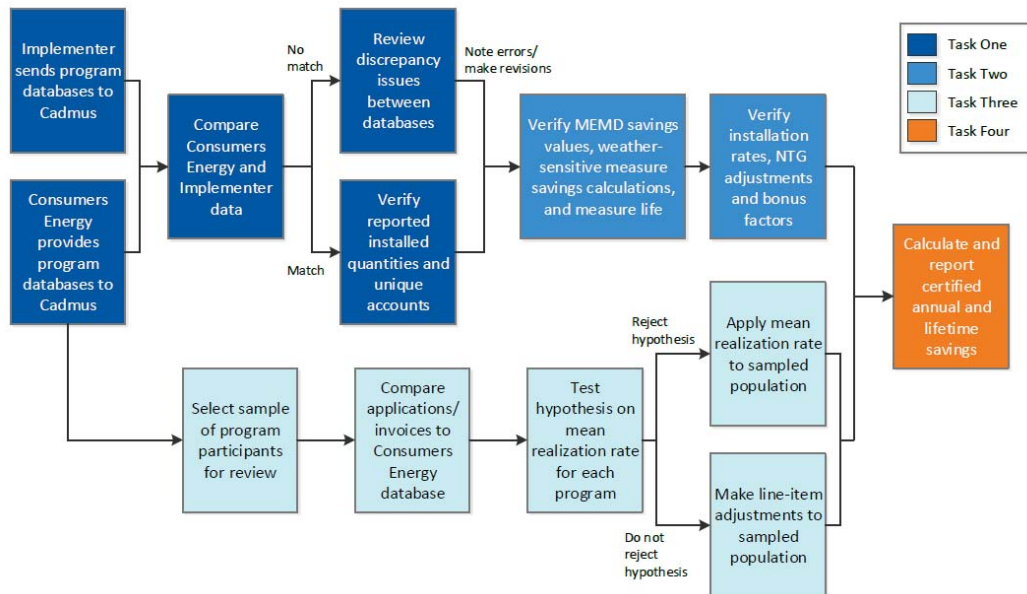
Cadmus performed four primary tasks to verify energy savings for each residential EWR program. Within each program appendix, discrepancies from the Consumers Energy reported savings are highlighted red, while updated/corrected values are highlighted green. The four tasks performed are:

1. **Task 1: Database Review:** Cadmus collected tracking databases for each program from implementation contractors and Consumers Energy. Cadmus reviewed and compared the Consumers Energy and implementer tracking databases for each program, documenting and reconciling all discrepancies by matching each measure's installation quantities and accounting for each household account number within an individual program.
2. **Task 2a: Measure-Level Savings Analysis:** Cadmus reviewed and verified the reported measure-level savings values, measure lives, and incremental costs (e.g., referenced in the 2017 MEMD, third-party calculation workbooks, and work papers).
Task 2b: Verify Installation and Net Adjustments: Cadmus verified gross ISRs and NTG adjustments for each program measure, derived from impact EM&V and respective MPSC orders.
3. **Task 3: Documentation Review:** For all programs with supporting documentation, Cadmus reviewed a random and statistically significant sample of program documents (e.g., incentive applications, product invoices, site reports, installation tally sheets). We also reviewed a random sample of thermostat measures within the HVAC and Water Heating, Home Performance with ENERGY STAR, and ENERGY STAR Appliance programs to ensure accurate distinction between tier three and non-tier three thermostats.
4. **Task 4: Calculation of Verified Annual and Lifetime Savings:** Using all verified inputs, Cadmus calculated annual savings along with lifetime savings.

The following sections outline details about each task. Figure 1 presents general steps Cadmus' took to verify energy savings from the 2017 program year.

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Figure 1. Methodology Overview



Task 1: Database Review

Cadmus obtained program tracking databases from each program implementation contractor and Consumers Energy¹. Cadmus reviewed the records for each program in the implementer's and Consumers Energy's databases to verify the following:

- The number of participants or households matched
- Reported quantities of installed measures matched for each measure code
- Appropriate application of energy savings for installed measures, according to customer type (e.g., only MCF savings would be reported for a gas-only customer)
- Reported measures were installed during the 2017 program year

Task 2a: Measure-Level Savings Analysis

Cadmus used eTracker to retrieve measure-level data for each residential EWR program. The program-level data in eTracker included the following:

- Descriptions of applicable measures and their corresponding codes
- Units of measure
- Deemed kWh, kW, and MCF savings per unit of measure
- Indicators of whether measure savings were weather sensitive

¹ Consumers Energy's tracking database is managed through eTracker, a web-based tracking system.

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- Measure lives
- Gross adjustment factors
- NTG factors
- Incremental costs
- The MEMD reference code or relevant information source for each measure

Cadmus mapped each program measure to the appropriate source data. This included mapping non-weather-sensitive measures to the 2017 MEMD and mapping weather-sensitive measures to databases developed independently by Navigant Consulting, Inc. Navigant calculated weighted kWh, kW, and MCF savings for each weather-sensitive measure, according to the characteristics of program measure installations (e.g., geographic distribution, equipment, building size, and vintage). Results from Navigant's analysis represented program-specific kWh, kW, and MCF savings for each unique weather-sensitive measure installed during the 2017 program year.

Cadmus verified the proper weighting for those measures, based on 2017 weather-sensitive MEMD savings. Cadmus mapped non-MEMD measures by using MPSC approved white papers and other supporting documentation.

After mapping each measure to an appropriate data source, Cadmus verified the kWh, kW, and MCF savings per unit of measure. Cadmus documented and corrected any discrepancies, as necessary, and verified the accuracy of each measure life, and incremental cost, based on the appropriate source data.

Task 2b: Verify Installation and Net Adjustments

After completing the measure-level savings analysis, Cadmus confirmed ISRs, based on program evaluations conducted by Cadmus, Navigant, and EMI Consulting. Only the Residential Agriculture Program's ISRs were updated in 2017. All other ISRs presented in this report are from past EM&V research.

The NTG rates are assumed to be 0.9 for all residential measures except: upstream lighting, for which we applied an NTG rate of 0.82 based on a statewide EM&V study conducted by Cadmus and Navigant²; Income Qualified, for which we assumed an NTG rate of 1.0; and Home Energy Reports, for which an NTG factor is included in its deemed savings value. MPSC orders regarding NTG rates are detailed in Table 2.

Table 2. MPSC NTG Orders and Descriptions

MPSC Oder	NTG Order Description
U-16670	Upholds a NTG ratio of 9.0 for Consumers Energy programs
U-17138	Upholds a NTG ratio of 1.0 for behavior programs.
U-17771	Upholds a NTG ratio 0.82 for buydown lighting CFLs and a NTG ratio of 1.0 for Income Qualified energy savings.

² Cadmus, Navigant, NMR Group. *Michigan CFL Net-to-Gross Advisory Panel Final Report*. April 14, 2014.

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Task 3: Documentation Review

For all programs with supporting documentation, Cadmus reviewed a random and statistically significant sample, including customer applications, purchase orders and/or receipts, and installation documents (e.g., site reports or measure installation tally sheets). Cadmus verified that the following data matched between documents and their respective entries in Consumers Energy's program tracking databases:

- Customer type (gas, electric, or combination)
- Measure types, efficiency levels, and/or size
- Measure installation quantities

For some programs, customer-level applications and/or installation forms were not applicable due to a program's design or delivery method (e.g., the upstream ENERGY STAR Lighting Program offers discounts on energy-efficient lighting products through a network of retailers and does not use application forms). Table 3 identifies programs for which Task 3 did not apply or was modified, and describes alternate documentation review activities Cadmus performed.

Table 3. Alternate Application and Installation Documentation

Program	Alternate Delivery Approach or Documentation Review
Appliance Recycling	The program generates savings by removing old equipment. Participants apply online, by telephone, or through a participating retailer to schedule a removal pick up; then Consumers Energy provides a rebate check by mail. Customers do not complete an application after the appliance removal. Pick up data is documented and tracked by the implementation contractor and verified by the evaluation team.
ENERGY STAR Lighting	The program is implemented through a network of retail stores that offer discounted lighting products throughout the Consumers Energy service area. Cadmus reviewed memorandums of understanding (MOUs) and invoices from manufacturers and retailers, and verified total bulb sales under those MOUs. Sampling for this program was stratified to ensure it included a representative number of participating companies. Cadmus conducted three sampling variations for manufacturers and retailers, representing over 5%, 1% to 5%, and under 1% of all Job IDs submitted.
Home Energy Reports	The program implementers identify customers selected to receive reports and track customers who opt out (i.e., request to not receive the reports), move, or otherwise cease participation. Cadmus reviewed the implementer's database, ensuring that appropriate factors were applied for program attrition.
Think!Energy	For this program, Consumers Energy provides curriculum materials and Energy Efficiency Kits to teachers at participating schools. The program implementer tracks the number of kits provided to each school where the kits are delivered to students to take home and install. Individual program participants do not apply for incentives. Cadmus reviewed the database and ensured that appropriate savings were tracked, based on kit measures distributed and the service(s) Consumers Energy provides in the territory where the school is located (i.e. gas, electric, or combination).

Sampling and Calculating Realization Rates

Cadmus reviewed program documentation for a random, representative sample of each relevant program's participant population. Using a finite population adjustment factor, Cadmus chose sample sizes to support findings with at least 90% confidence and 10% precision at the program level. In

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addition, Cadmus reviewed a sample of Wi-Fi thermostats from the ENERGY STAR Appliances, HVAC and Water Heating, and Home Performance with ENERGY STAR programs to determine if tier three and non-tier three thermostats were correctly claimed in the Consumers Energy tracking data.

Table 4 summarizes the sampling effort for each residential EWR program.

Table 4. Selected Sample Sizes and Descriptions by Program

Program	Sample Size (n)	Achieved Precision at 90% Confidence	Sample Description
Appliance Recycling	NA	NA	No application review
ENERGY STAR Appliance	69	±9.98%	Random sample at Job ID Level
ENERGY STAR Lighting	69	±9.95%	Random sample at Job ID level
Home Energy Analysis	69	±9.98%	Random sample at Job ID Level
Home Energy Reports	NA	NA	No application review
Home Performance with ENERGY STAR	61	±9.98%	Random sample at Job ID Level
HVAC and Water Heating	70	±9.94%	Random sample at Job ID Level
Income Qualified	69	±9.99%	Random sample at Job ID Level
Insulation and Windows	69	±9.97%	Random sample at Job ID Level
Multifamily/Multifamily Income Qualified	57	±9.93%	Random sample at Job ID Level
New Home Construction	62	±9.97%	Random sample at Job ID Level
Residential Agriculture	18	±9.94%	Random sample at Job ID Level
Think! Energy	NA	NA	No application review
HVAC, HPwES, ENERGY STAR Appliances Wi-Fi enabled thermostat measures	70	±9.93%	Random sample at Measure ID Level

Cadmus looked for inconsistencies between data recorded in program documents and data reported in program tracking databases, and determined whether these inconsistencies occurred randomly or presented systematic errors. In general, random errors result from unpredictable mistakes in transcription or data entry, while systematic errors result from inaccuracies persistent across numerous records.

To determine whether a given sample contained random or systematic errors, Cadmus tested whether each sample's mean kWh, kW, and MCF realization ratios were statistically equal to one (or a 100% realization rate). If a sample's mean realization ratio was *statistically equal* to one at the 90% confidence level, Cadmus considered the errors to be random, and did not apply the sample mean realization ratio to the relevant participant population. In such cases, Cadmus included individual data discrepancies in the final net savings calculations. If a sample's mean realization ratio was *statistically unequal* to one at the 90% confidence level, Cadmus considered the errors systematic, and applied the sample's mean realization ratio to the relevant participant population. Cadmus found no systematic errors in 2017.

Cadmus first calculated kWh, kW, and MCF realization rates for individual records in each program's sample (using identical calculations for kWh, kW, and MCF). To do so, Cadmus compared reported and certified savings by fuel type (shown in the equation below). Differences between reported and certified

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savings occurred due to discrepancies in customer types, measure types, or installed measure quantities.

$$kW\ RR_i = \frac{\sum_j \text{Certified } kW\ Savings_j}{\sum_j \text{Reported } kW\ Savings_j}$$

Where:

- RR = Calculated realization rate
- i = Unique record 'i'
- j = Individual application, invoice, etc.

Cadmus then used the following equation to calculate mean realization rates for each fuel type at the sample level (these calculations were identical for kW, kWh, and MCF):

$$\overline{kW\ RR} = \frac{\sum_i kW\ RR_i}{n}$$

Where:

- n = Number of unique records in the sample

For each fuel type, Cadmus conducted a hypothesis test to determine whether the sample's mean realization ratio equals one (or the realization rate equals 100%). The resulting test statistic (a t-statistic, $t_{kW\ RR}$) revealed whether differences discovered during the documentation review were random or systematic (i.e., if the realization ratio was significantly different from one). The sample realization rate was only applied to program savings when the differences were found to be systematic. Cadmus calculated t-statistics for each fuel type using the following equations (these calculations were identical for kW, kWh, and MCF):

$$StdDev_{kW\ RR} = \sqrt{\frac{\sum_i (kW\ RR_i - \overline{kW\ RR})^2}{n}}$$

$$SE_{kW\ RR} = \frac{StdDev_{kW\ RR}}{\sqrt{n}}$$

$$t_{kW\ RR} = \left| \frac{\overline{kW\ RR} - 100\%}{SE_{kW\ RR}} \right|$$

Where:

- $StdDev$ = Standard deviation
- SE = Standard error
- t = t-statistic based on $n - 1$ degrees of freedom

Wi-Fi Enabled and Tier Three Thermostat Model Number Sampling

Additionally, Cadmus reviewed a sample of Wi-Fi and tier three thermostat model numbers from the HVAC, Home Performance with ENERGY STAR, and ENERGY STAR Appliances programs to ensure that

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the correct savings was applied to the appropriate measure. Wi-Fi thermostats differ from tier three thermostats based on criteria approved by the MPSC³. The sample of thermostats reviewed by Cadmus showed no thermostat model numbers were assigned incorrect savings. Table 5 and Table 6 show the sample participation for thermostat application review and the sample realization rate.

Table 5. Sample Participation and Savings by Measure (Wi-Fi and Tier Three Thermostats)

Consumers Energy Measure ID	Sample Totals Reported by EWR Provider				Verified Sample Totals			
	Sample Participation	kWh	kW	MCF	Sample Participation	kWh	kW	MCF
RAC0328	12	1,854.6408	0.0000	124.7484	12	1,854.6408	0.0000	124.7484
RAE0329	5	780.6990	0.0000	0.0000	5	780.6990	0.0000	0.0000
RAG0330	25	0.0000	0.0000	239.4250	25	0.0000	0.0000	239.4250
RHC0101	4	521.1680	0.0000	28.0912	4	521.1680	0.0000	28.0912
RHC0105	1	143.8515	0.0000	9.6978	1	143.8515	0.0000	9.6978
RHE0022	3	439.9020	0.0000	0.0000	3	439.9020	0.0000	0.0000
RHE0026	2	296.8272	0.0000	0.0000	2	296.8272	0.0000	0.0000
RHG0022	16	0.0000	0.0000	153.1456	16	0.0000	0.0000	153.1456
RZC0078	1	181.1257	0.0000	9.7536	1	181.1257	0.0000	9.7536
RZG0090	1	0.0000	0.0000	15.4153	1	0.0000	0.0000	15.4153
Sample Total	70	4,218.2142	0.0000	580.2769	70	4,218.2142	0.0000	580.2769

Table 6. Sample Realization Rates and t-Statistic (Wi-Fi and Tier Three Thermostats)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	100.00%
Standard Error	0.0000	0.0000	0.0000
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to program population?	No	No	No

Task 4: Calculation of Verified Net Annual and Lifetime Savings

Cadmus calculated net annual savings incorporating verified inputs and certified annual net kWh, kW, and MCF savings using approved installation rates and NTG rates. Similarly, Cadmus calculated lifetime savings kWh and MCF with those same installation and NTG rates applied to the annual savings.

Summary of Verified and Certified Savings

This section summarizes annual and lifetime savings calculations for Consumers Energy's residential EWR programs and provides comparison to reported savings. Table 7 presents verified net savings for each residential EWR program by fuel type.

³ Navigant, Cadmus, EMI. *Residential Thermostat Definition for the 2016 MEMD*. May 2016.
https://www.michigan.gov/documents/mpsc/Res_Tstat_Definition_2016_05_16_615859_7.pdf



Table 7. Residential EWR Program Verified Net Savings by Fuel Type*

Program	2017 Verified Net Savings		
	kWh	kW	MCF
Appliance Recycling	19,593,388.85	2,382.13	NA
ENERGY STAR Appliances	1,398,706.83	327.59	86,125.46
ENERGY STAR Lighting	82,961,708.83	9,875.44	NA
Home Energy Analysis	3,390,628.33	239.26	97,593.23
Home Energy Reports	48,101,815.09	NA	253,660.05
Home Performance with ENERGY STAR	304,256.51	100.32	18,045.12
HVAC and Water Heating	9,003,400.92	1,381.28	469,928.82
Income Qualified	5,237,117.31	441.63	62,733.29
Insulation and Windows	519,562.50	321.73	54,387.02
Multifamily	4,742,637.97	558.61	98,023.91
Multifamily Income Qualified	2,147,145.30	221.98	31,402.59
New Home Construction	356,677.38	NA	14,593.32
Residential Agriculture	507,687.23	142.97	NA
Think! Energy	1,723,957.51	151.34	40,375.23
Total	179,988,690.56	16,144.28	1,226,868.05

* Tables may not sum due to rounding.

In this section, we present the following reported and verified net savings values from the 2017 program year, by fuel and savings type (i.e., kWh, kW, and MCF):

- Reported gross annual savings, and verified net annual savings.** Table 8 and Table 10 show reported gross savings (before applying installation rate adjustments and NTG factors), net verified savings, and associated program realization rates for each fuel and savings type. The installation rate adjustments and NTG factors account for most differences between reported and verified savings. ISRs resulted in adjusted savings claims to account for measure and savings persistence; Cadmus reviewed these adjustments through periodic program impact evaluations that captured variations in installation practices, early measure removal, or changes in operating characteristics. Cadmus assigned appropriate NTG factors to account for savings attributed to the program that could have occurred in its absence (i.e. freeridership) and program impacts that were influenced by the program but were not captured in the tracked data (i.e. spillover and market effects). The program realization rates (i.e. reported gross savings/verified net savings) also captured adjustments made throughout the certification process, but these resulted in small impacts (shown in the Table 8, Table 11, and Table 13).
- Reported net annual savings and certified net annual savings.** To determine reported net annual savings, Cadmus applied measure installation quantities, per-unit savings values, installation rate adjustments and NTG factors listed in Consumers Energy's eTracker database. The certified net annual savings reflect findings from Cadmus' review. The ratio of reported to certified savings was close to 100% across all programs, demonstrating the reporting accuracy across the residential EWR portfolio. Appendices A through N identify and discuss specific discrepancies for each program.

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- **Lifetime savings calculations.** For each program, Cadmus calculated net lifetime savings for kWh and MCF, using weighted average measure lifetimes.
- **Annual and lifetime net savings contributions by program.** For each fuel and savings type, Cadmus determined the proportion of annual and lifetime (kWh and MCF) savings from each program.

Certified Net kWh Savings

Table 8 summarizes reported gross annual and verified net annual kWh savings for each program and for the entire portfolio and Table 9 summarizes reported net annual and verified net annual kWh savings.

Table 8. Summary of Reported Gross and Verified Net Annual kWh Savings by Program

Program	2017 Reported Gross Annual kWh Savings	2017 Verified Net Annual kWh Savings	Realization Rate
Appliance Recycling	25,436,811.0000	19,593,388.8540	77.03%
ENERGY STAR Appliances	1,585,325.5615	1,398,706.8272	88.23%
ENERGY STAR Lighting	92,295,024.1000	82,961,708.8270	89.89%
Home Energy Analysis	3,807,939.7938	3,390,628.3288	89.04%
Home Energy Reports	49,761,293.2000	48,101,815.0935	96.67%
Home Performance with ENERGY STAR	338,062.7918	304,256.5129	90.00%
HVAC and Water Heating	10,003,778.7967	9,003,400.9171	90.00%
Income Qualified	5,273,621.3344	5,237,117.3126	99.31%
Insulation and Windows	577,297.6373	519,562.5012	89.99%
Multifamily	5,497,352.1011	4,742,637.9659	86.27%
Multifamily Income Qualified	2,175,796.8214	2,147,145.3040	98.68%
New Home Construction	396,308.1969	356,677.3772	90.00%
Residential Agriculture	577,315.1598	507,687.2314	87.94%
Think! Energy	1,953,591.0000	1,723,957.5060	88.24%
Total	199,679,517.4947	179,988,690.56	90.14%

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Table 9. Summary of Reported Net and Verified Net Annual kWh Savings by Program

Program	2017 Reported Gross Annual kWh Savings	2017 Verified Net Annual kWh Savings	Realization Rate
Appliance Recycling	19,593,388.8540	19,593,388.8540	100.00%
ENERGY STAR Appliances	1,398,706.8271	1,398,706.8272	100.00%
ENERGY STAR Lighting	82,961,708.8270	82,961,708.8270	100.00%
Home Energy Analysis	3,390,628.3288	3,390,628.3288	100.00%
Home Energy Reports	46,775,615.6080	48,101,815.0935	102.84%
Home Performance with ENERGY STAR	304,256.5126	304,256.5129	100.00%
HVAC and Water Heating	9,003,400.9170	9,003,400.9171	100.00%
Income Qualified	5,237,117.4671	5,237,117.3126	100.00%
Insulation and Windows	519,562.5011	519,562.5012	100.00%
Multifamily	4,763,148.4147	4,742,637.9659	99.57%
Multifamily Income Qualified	2,147,145.3040	2,147,145.3040	100.00%
New Home Construction	356,677.3772	356,677.3772	100.00%
Residential Agriculture	520,715.3104	507,687.2314	97.50%
Think! Energy	1,723,957.5060	1,723,957.5060	100.00%
Total	178,696,029.7550	179,988,690.56	100.72%

Table 10 shows lifetime kWh savings and the weighted average measure life for each program. Weighted average measure life is calculated by dividing the lifetime savings by the annual savings.

Table 10. Summary of Lifetime kWh Savings by Program

Program	2017 Verified kWh Lifetime Actual Savings	Weighted Average Measure Life
Appliance Recycling	162,154,829.8080	8.3
ENERGY STAR Appliances	14,640,413.6623	10.5
ENERGY STAR Lighting	1,240,319,393.1626	15.0
Home Energy Analysis	45,554,868.3026	13.4
Home Energy Reports	48,101,815.0935	1.0
Home Performance with ENERGY STAR	4,234,928.7268	13.9
HVAC and Water Heating	94,975,033.1133	10.5
Income Qualified	71,201,447.8094	13.6
Insulation and Windows	12,632,080.4816	24.3
Multifamily	69,352,222.3155	14.6
Multifamily Income Qualified	26,263,817.3696	12.2
New Home Construction	7,133,547.5442	20.0
Residential Agriculture	7,105,491.3409	14.0
Think! Energy	24,493,283.1720	14.1
Total	1,828,163,171.9023	10.2

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Figure 2 depicts each residential EWR programs' contribution to overall certified annual kWh savings in 2017. Over 46% of the portfolio's annual kWh savings came from the ENERGY STAR Lighting Program, and over 26% came from the Home Energy Reports Program, while the remaining 28% of annual kWh savings came from the other 12 residential programs.

Figure 2. Share of Certified Net Annual kWh Savings by Program

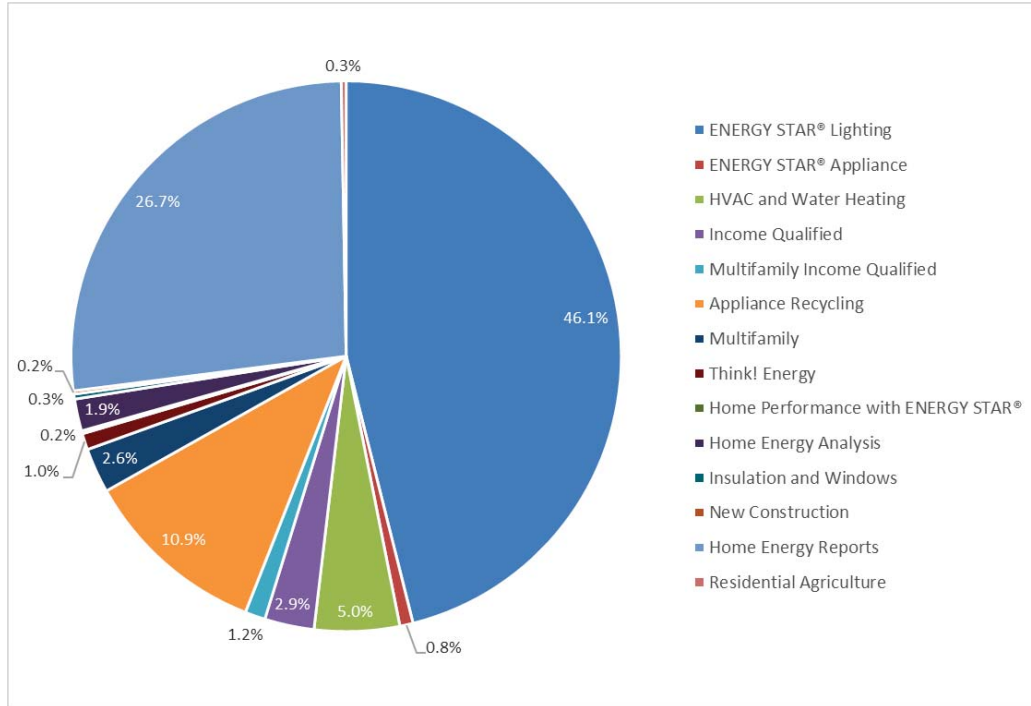
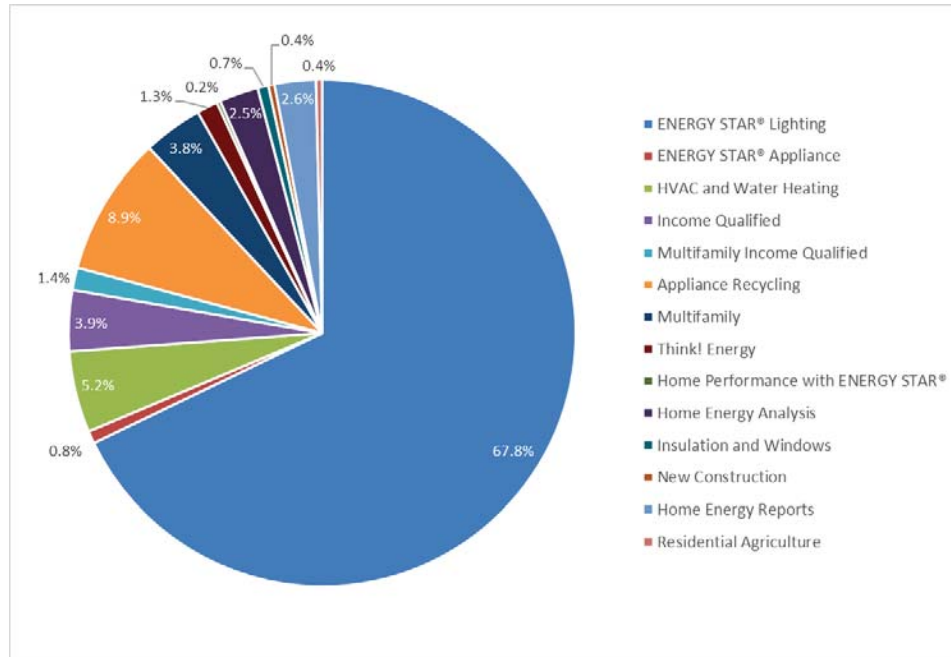


Figure 3 shows each program's contribution to lifetime kWh savings. The ENERGY STAR Lighting Program continued to contribute over two-thirds of the residential portfolio's lifetime kWh savings, while the other programs account for the remaining lifetime savings. With a deemed measure life of one year, however, the Home Energy Reports Program's share of savings decreased from 26.7% of kWh annual savings to 2.6% of kWh lifetime savings.

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Figure 3. Share of Certified Net Lifetime kWh Savings by Program



Certified Net kW Savings

Table 11 summarizes reported gross and verified net kW savings for each program and Table 12 summarizes reported net annual and verified net annual kWh savings.

Table 11. Summary of Reported Gross and Verified Net kW Savings by Program

Program	2017 Reported Gross kW Savings	2017 Verified Net kW Savings	Realization Rate
Appliance Recycling	3,075.6798	2,382.1282	77.45%
ENERGY STAR Appliances	371.2840	327.5923	88.23%
ENERGY STAR Lighting	10,986.6466	9,875.4390	89.89%
Home Energy Analysis	267.6798	239.2591	89.38%
Home Energy Reports	NA	NA	NA
Home Performance with ENERGY STAR	111.4653	100.3192	90.00%
HVAC and Water Heating	1,534.7520	1,381.2768	90.00%
Income Qualified	445.8604	441.6324	99.05%
Insulation and Windows	357.4826	321.7319	89.99%
Multifamily	647.5461	558.6144	86.27%
Multifamily Income Qualified	225.4150	221.9787	98.48%
New Home Construction	NA	NA	NA
Residential Agriculture	159.3759	142.9674	89.70%
Think! Energy	168.1572	151.3415	90.00%

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Program	2017 Reported Gross kW Savings	2017 Verified Net kW Savings	Realization Rate
Total	18,351.3447	16,144.2809	87.97%

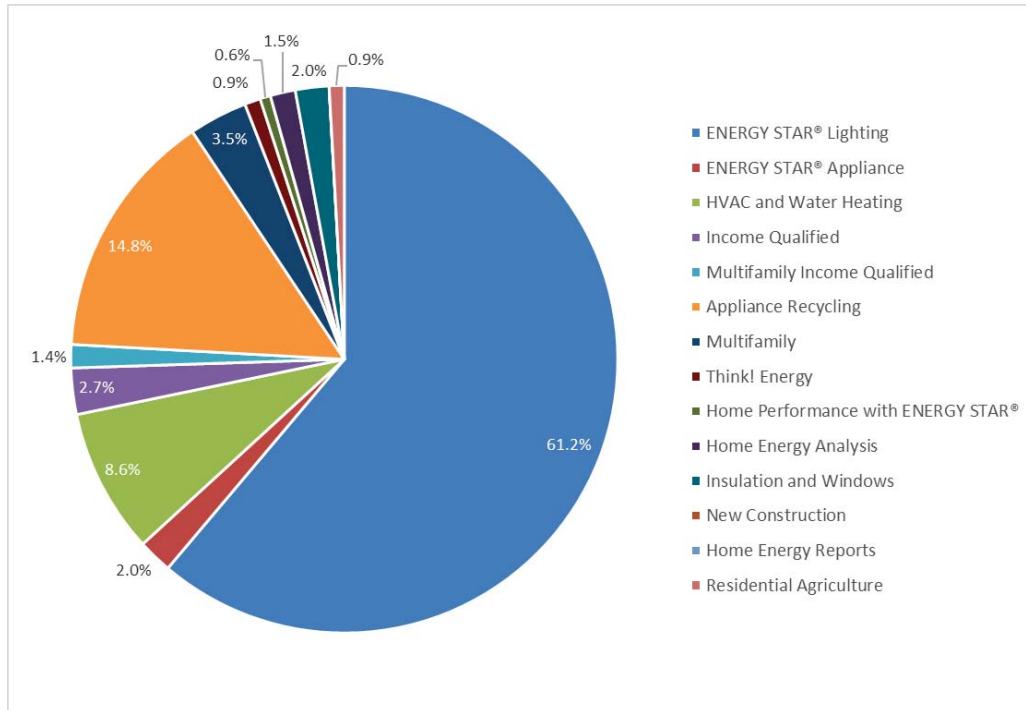
Table 12. Summary of Net Gross and Verified Net kW Savings by Program

Program	2017 Reported Gross kW Savings	2017 Verified Net kW Savings	Realization Rate
Appliance Recycling	2,382.1282	2,382.1282	100.00%
ENERGY STAR Appliances	327.5923	327.5923	100.00%
ENERGY STAR Lighting	9,875.4389	9,875.4390	100.00%
Home Energy Analysis	239.2593	239.2591	100.00%
Home Energy Reports	NA	NA	NA
Home Performance with ENERGY STAR	100.3188	100.3192	100.00%
HVAC and Water Heating	1,381.2768	1,381.2768	100.00%
Income Qualified	441.6323	441.6324	100.00%
Insulation and Windows	321.7319	321.7319	100.00%
Multifamily	562.1454	558.6144	99.37%
Multifamily Income Qualified	221.9786	221.9787	100.00%
New Home Construction	NA	NA	NA
Residential Agriculture	148.4192	142.9674	96.33%
Think! Energy	151.3415	151.3415	100.00%
Total	16,153.2632	16,144.2809	99.94%

Figure 4 depicts how each residential EWR program contributed to overall certified kW savings in 2017. The ENERGY STAR Lighting Program produced 61% of the portfolio kW savings, and the Appliance Recycling contributed the second most with 14.8% of the kW savings.

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Figure 4. Share of Certified Net kW Savings by Program



Certified Net MCF Savings

Table 13 summarizes reported gross and verified annual MCF savings for each program and for the entire portfolio and Table 14 summarizes reported net annual and verified net annual kWh savings.

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Table 13. Summary of Reported Gross and Verified Net Annual MCF Savings by Program

Program	2017 Reported Gross Annual MCF Savings	2017 Verified Net Annual MCF Savings	Realization Rate
Appliance Recycling	NA	NA	NA
ENERGY STAR Appliances	98,482.6427	86,125.4602	87.45%
ENERGY STAR Lighting	NA	NA	NA
Home Energy Analysis	111,894.8190	97,593.2290	87.22%
Home Energy Reports	261,719.3300	253,660.0514	96.92%
Home Performance with ENERGY STAR	20,050.1688	18,045.1227	89.99%
HVAC and Water Heating	522,144.0447	469,928.8233	89.99%
Income Qualified	63,203.1468	62,733.2919	99.26%
Insulation and Windows	60,429.6696	54,387.0197	90.00%
Multifamily	109,585.0201	98,023.9094	89.45%
Multifamily Income Qualified	31,443.9337	31,402.5892	99.87%
New Home Construction	16,214.8044	14,593.3240	90.00%
Residential Agriculture	NA	NA	NA
Think! Energy	96,984.0504	40,375.2277	41.63%
Total	1,392,151.6302	1,226,868.0485	88.13%

Table 14. Summary of Reported Net and Verified Net Annual MCF Savings by Program

Program	2017 Reported Net Annual MCF Savings	2017 Verified Net Annual MCF Savings	Realization Rate
Appliance Recycling	NA	NA	NA
ENERGY STAR Appliances	86,123.4011	86,125.4602	100.00%
ENERGY STAR Lighting	NA	NA	NA
Home Energy Analysis	97,607.1130	97,593.2290	99.99%
Home Energy Reports	246,016.1701	253,660.0514	103.11%
Home Performance with ENERGY STAR	18,045.1519	18,045.1227	100.00%
HVAC and Water Heating	469,929.6402	469,928.8233	100.00%
Income Qualified	62,736.6148	62,733.2919	99.99%
Insulation and Windows	54,387.0194	54,387.0197	100.00%
Multifamily	98,033.0768	98,023.9094	99.99%
Multifamily Income Qualified	31,401.1400	31,402.5892	100.00%
New Home Construction	14,593.3240	14,593.3240	100.00%
Residential Agriculture	NA	NA	NA
Think! Energy	40,378.7515	40,375.2277	99.99%
Total	1,219,251.4028	1,226,868.0485	100.62%

For each program, Table 15 shows lifetime MCF savings and the weighted average measure life.

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Table 15. Summary of Lifetime MCF Savings by Program

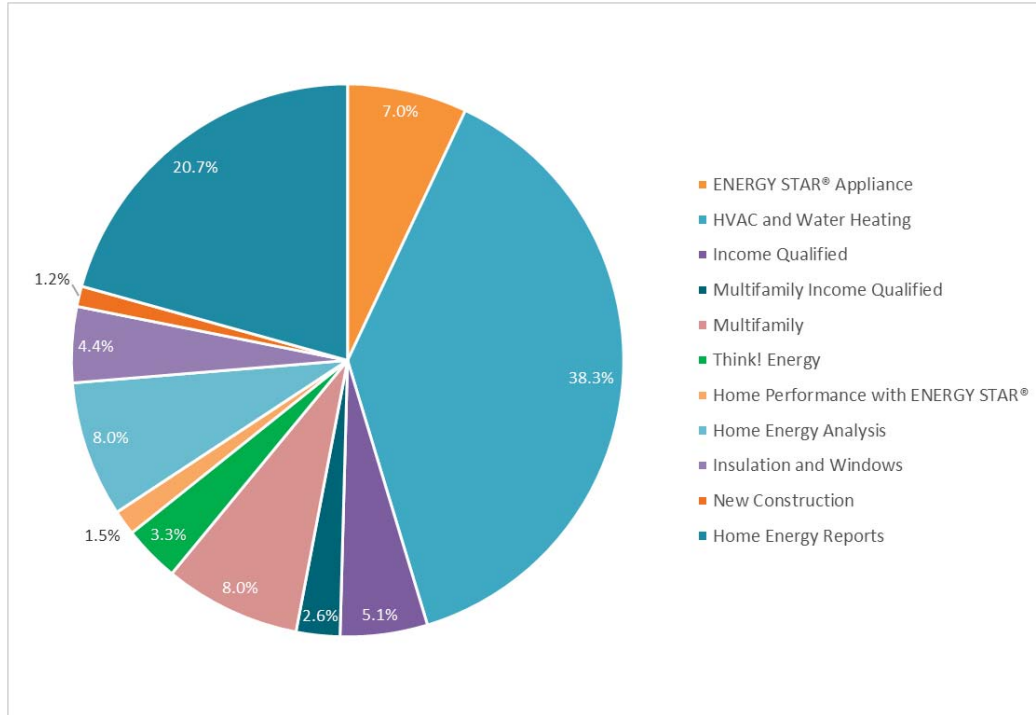
Program	2017 Verified MCF Lifetime Actual Savings	Weighted Average Measure Life
Appliance Recycling	NA	NA
ENERGY STAR Appliances	847,394.1281	9.8
ENERGY STAR Lighting	NA	NA
Home Energy Analysis	997,040.8950	10.2
Home Energy Reports	253,660.0514	1.0
Home Performance with ENERGY STAR	285,018.2658	15.8
HVAC and Water Heating	6,418,474.4960	13.7
Income Qualified	806,076.7864	12.8
Insulation and Windows	1,299,809.1165	23.9
Multifamily	1,074,965.9871	11.0
Multifamily Income Qualified	452,850.4316	14.4
New Home Construction	291,866.4792	20.0
Residential Agriculture	NA	NA
Think! Energy	403,752.2759	10.0
Total	13,130,908.9130	10.7

Figure 5 depicts how each Consumers Energy residential EWR program contributed to overall certified, annual MCF savings in 2017. Just over one-third of annual MCF savings came from the HVAC and Water Heating Program, and one-fifth came from the Home Energy Reports program. Other programs contributing significantly to overall MCF savings included the following:

- Multifamily program (8.0%)
- Home Energy Analysis program (8.0%)
- ENERGY STAR Appliances (7.0%)

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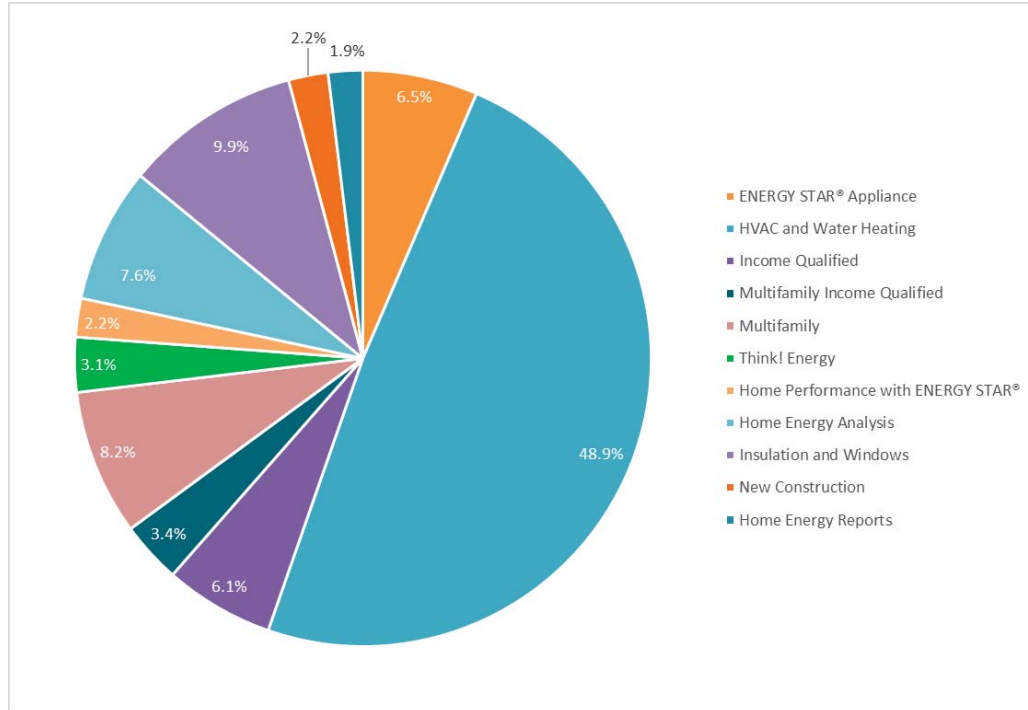
Figure 5. Share of Certified Net Annual MCF Savings by Program



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Figure 6 shows each program's contribution to lifetime MCF savings. The HVAC and Water Heating Program contributed almost 50% of the lifetime MCF savings, and the remaining programs contributed a similar share of lifetime savings as their annual savings—except for Home Energy Reports (where the program's one-year measure life substantially reduced its overall share of lifetime savings to 1.9%).

Figure 6. Share of Certified Net Lifetime MCF Savings by Program



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Appendix A: Appliance Recycling

Table 16 presents the reported gross and certified net energy savings and demand reduction for the Appliance Recycling Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 16. Participation and Savings (Appliance Recycling)

	Participation Total	Total kWh Savings	Total kW Savings
Reported Gross Participation and Savings	62,000.0000	25,436,811.0000	3,075.6798
Verified Net Participation and Savings	62,000.0000	19,593,388.8540	2,382.1282
Verified Actual Lifetime Savings	NA	162,154,829.8080	NA
Program Realization Rate	100.0000%	77.0277%	77.4505%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%
Lifetime Net Verified v. Net Reported Savings	NA	100.0000%	NA

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate applications of savings according to customer types. Cadmus verified that all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Analysis

Cadmus found no discrepancies between per-unit reported savings provided by Consumers Energy and per-unit verified savings reported in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus reviewed gross and net adjustment factors and found no discrepancies. Table 17 presents verified per-unit savings, measure life, and saving adjustment factors for all measures delivered through the 2017 Appliance Recycling Program.

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Table 17. Verified Per-Unit Measure Characteristics (Appliance Recycling)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RTE0020	Refrigerator recycling	1,135.0000	0.1310	0.0000	1,135.0000	0.1310	0.0000	8	0.87	0.9
RTE0021	Freezer recycling	944.0000	0.1160	0.0000	944.0000	0.1160	0.0000	8	0.75	0.9
RTE0022	Dehumidifier recycling	139.0000	0.0350	0.0000	139.0000	0.0350	0.0000	8	1	0.9
RTE0023	Room Unit Air Conditioner recycling	113.0000	0.1070	0.0000	113.0000	0.1070	0.0000	8	1	0.9
RTE0032	LED bulb replacing A-Line 60W - with savings (Kit)	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15	1	0.9
RTE0033	LED night light - with savings (Kit)	22.0000	0.0000	0.0000	22.0000	0.0000	0.0000	12	0.93	0.9

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Task 3: Documentation Review

As the Appliance Recycling Program did not have customer-level program documents available for review, Cadmus did not conduct a documentation review of this program.

Task 4: Calculation of Verified Annual and Lifetime Savings

Cadmus calculated annual and lifetime savings. The following tables present verified program participation, energy savings, and demand reduction by measure. Table 18 and Table 19 document first year and lifetime kWh savings, respectively, and Table 20 documents kW savings. The Appliance Recycling Program did not result in MCF savings.

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Table 18. Certified Program Participation and First-Year kWh Savings by Measure (Appliance Recycling)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RTE0020	17,522	17,522	19,887,470.0000	19,887,470.0000	0.8700	17,302,098.9000	0.9000	15,571,889.0100	0.7830
RTE0021	4,499	4,499	4,247,056.0000	4,247,056.0000	0.7500	3,185,292.0000	0.9000	2,866,762.8000	0.6750
RTE0022	1,293	1,293	179,727.0000	179,727.0000	1.0000	179,727.0000	0.9000	161,754.3000	0.9000
RTE0023	1,198	1,198	135,374.0000	135,374.0000	1.0000	135,374.0000	0.9000	121,836.6000	0.9000
RTE0032	24,992	24,992	712,272.0000	712,272.0000	1.0000	712,272.0000	0.9000	641,044.8000	0.9000
RTE0033	12,496	12,496	274,912.0000	274,912.0000	0.9300	255,668.1600	0.9000	230,101.3440	0.8370
Total:	62,000	62,000	25,436,811.0000	25,436,811.0000	0.9250	21,770,432.0600	0.9000	19,593,388.8540	0.8325

Table 19. Certified Lifetime kWh Savings by Measure (Appliance Recycling)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RTE0020	15,571,889.0100	8.0000	124,575,112.0800
RTE0021	2,866,762.8000	8.0000	22,934,102.4000
RTE0022	161,754.3000	8.0000	1,294,034.4000
RTE0023	121,836.6000	8.0000	974,692.8000
RTE0032	641,044.8000	15.0000	9,615,672.0000
RTE0033	230,101.3440	12.0000	2,761,216.1280
Total:	19,593,388.8540		162,154,829.8080

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Table 20. Certified Program Participation and kW Savings by Measure (Appliance Recycling)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RTE0020	17,522	17,522	2,295.3820	2,295.3820	0.8700	1,996.9823	0.9000	1,797.2841	0.7830
RTE0021	4,499	4,499	521.8840	521.8840	0.7500	391.4130	0.9000	352.2717	0.6750
RTE0022	1,293	1,293	45.2550	45.2550	1.0000	45.2550	0.9000	40.7295	0.9000
RTE0023	1,198	1,198	128.1860	128.1860	1.0000	128.1860	0.9000	115.3674	0.9000
RTE0032	24,992	24,992	84.9728	84.9728	1.0000	84.9728	0.9000	76.4755	0.9000
Total:	49,504	49,504	3,075.6798	3,075.6798	0.9240	2,646.8091	0.9000	2,382.1282	0.8316

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Appendix B: ENERGY STAR Appliances Program

Table 21 presents reported gross and certified net energy savings by fuel type and demand reduction for the ENERGY STAR Appliances Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 21. Participation and Savings (ENERGY STAR Appliances)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	21,895.0000	1,585,325.5615	371.2840	98,482.6427
Verified Net Participation and Savings	21,895.0000	1,398,706.8272	327.5923	86,125.4602
Verified Actual Lifetime Savings	NA	14,640,413.6623	NA	847,394.1281
Program Realization Rate	100.0000%	88.2284%	88.2323%	87.4524%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%	100.0024%
Lifetime Net Verified v. Net Reported Savings	NA	100.0000%	NA	100.0031%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) the appropriate application of savings according to customer types. Cadmus also verified that all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Analysis

Cadmus found small discrepancies in the conversion between per-unit measure MCF savings reported by Consumers Energy and therm values maintained in the MEMD for measures that claimed gas savings. Those measures were RAE0322 (combo measure), RAG0317, RAG0319, RAG0320. All measures had a discrepancy of 0.0001 MCF. One Job ID (RBT-1320764) received incorrect savings, based on the fourth-quarter weather-weighted savings calculations for the ENERGY STAR Appliance program. Cadmus used the corrected per-unit savings in the final net savings calculations. All measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus reviewed gross and net adjustment factors and found no discrepancies. Table 22 presents verified per-unit savings, measure life, and saving adjustment factors for all measures delivered through the 2017 ENERGY STAR Appliances Program.

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Table 22. Verified Per-Unit Measure Characteristics (ENERGY STAR Appliances)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RAC0308	Programmable thermostat - moderate setback - Combination Customers	111.6694	0.0000	6.2779	111.6694	0.0000	6.2779	9	0.971	0.9
RAC0309	Wi-Fi enabled thermostat - Combination Customers	125.6620	0.0000	6.8776	125.6620	0.0000	6.8776	9	0.971	0.9
RAC0328	Wi-Fi enabled thermostat - Tier 3 - Combination Customers	154.5817	0.0000	10.3957	154.5534	0.0000	10.3957	10	0.971	0.9
RAE0303	ENERGY STAR dehumidifier	168.7000	0.1030	0.0000	168.7000	0.1030	0.0000	12	0.972	0.9
RAE0304	ENERGY STAR room A/C	62.0000	0.1080	0.0000	62.0000	0.1080	0.0000	15	0.914	0.9
RAE0306	Programmable thermostat - moderate setback - Electric Customer only	139.3821	0.0000	0.0000	139.3821	0.0000	0.0000	9	0.971	0.9
RAE0310	Wi-Fi enabled thermostat - Electric Customers	138.6948	0.0000	0.0000	138.6948	0.0000	0.0000	9	0.971	0.9
RAE0315	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer - Electric Customers	17.0000	0.0020	0.0000	17.0000	0.0020	0.0000	11	1	0.9
RAE0318	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer - Electric Customer	108.0000	0.0150	0.0000	108.0000	0.0150	0.0000	11	1	0.9
RAE0321	Clothes Washer ENERGY STAR, Electric water heater, Gas Dryer - Electric Customer	84.0000	0.0120	0.0000	84.0000	0.0120	0.0000	11	1	0.9
RAE0322	Clothes Washer ENERGY STAR, Electric water heater, Gas Dryer - Combination Customer	84.0000	0.0120	0.3595	84.0000	0.0120	0.3594*	11	1	0.9
RAE0324	Clothes Washer ENERGY STAR, Electric water heater, Electric Dryer - Electric Customers	175.0000	0.0250	0.0000	175.0000	0.0250	0.0000	11	1	0.9
RAE0325	Clothes Washer ENERGY STAR, Electric water heater, Electric Dryer - Combination	175.0000	0.0250	0.0000	175.0000	0.0250	0.0000	11	1	0.9
RAE0327	Variable Speed Pool Pump	1,081.0000	0.7960	0.0000	1,081.0000	0.7960	0.0000	10	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RAE0329	Wi-Fi enabled thermostat - Tier 3 - Electric Customers	156.1398	0.0000	0.0000	156.1398	0.0000	0.0000	10	0.971	0.9
RAG0307	Programmable thermostat - moderate setback - Gas Customer Only	0.0000	0.0000	5.6766	0.0000	0.0000	5.6766	9	0.971	0.9
RAG0311	Wi-Fi enabled thermostat - Gas Customers	0.0000	0.0000	6.8170	0.0000	0.0000	6.8170	9	0.971	0.9
RAG0314	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer - Gas Customers	0.0000	0.0000	0.5826	0.0000	0.0000	0.5825*	11	1	0.9
RAG0316	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer - Combination Customers	17.0000	0.0020	0.5825	17.0000	0.0020	0.5825	11	1	0.9
RAG0317	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer - Gas Customers	0.0000	0.0000	0.2777	0.0000	0.0000	0.2776*	11	1	0.9
RAG0319	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer - Combination Custo	108.0000	0.0150	0.2777	108.0000	0.0150	0.2776*	11	1	0.9
RAG0320	Clothes Washer ENERGY STAR, Electric water heater, Gas Dryer - Gas Customers	0.0000	0.0000	0.3595	0.0000	0.0000	0.3594*	11	1	0.9
RAG0330	Wi-Fi enabled thermostat - Tier 3 - Gas Customers	0.0000	0.0000	9.5770	0.0000	0.0000	9.5770	10	0.971	0.9

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the ENERGY STAR Appliances appendix.

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Task 3: Documentation Review

Cadmus selected and reviewed program documentation for a random sample of 69 participants, drawn from the Consumers Energy eTracker database; these included invoices, applications, and any additional documentation available to validate the measure installation data. Cadmus additionally reviewed Wi-Fi enabled and tier three thermostat measures RAC0309, RAC0328, RAE0310, RAE0329, RAG0311, and RAG0330 as part of the Wi-Fi thermostat model number review (see Table 5). Table 23 documents reported and verified measure counts as well as reported and verified energy savings by fuel type and demand reduction for the sample applications.

Table 23. Sample Participation and Savings by Measure (ENERGY STAR Appliances)

Consumers Energy Measure ID	Reported by EWR Provider				Verified			
	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF
RAC0309	5	628.3100	0.0000	34.3880	5	628.3100	0.0000	34.3880
RAC0328	1	154.5534	0.0000	10.3957	1	154.5534	0.0000	10.3957
RAE0303	9	1518.3000	0.9270	0.0000	9	1518.3000	0.9270	0.0000
RAE0304	1	62.0000	0.1080	0.0000	1	62.0000	0.1080	0.0000
RAE0310	5	693.4740	0.0000	0.0000	5	693.4740	0.0000	0.0000
RAE0315	5	85.0000	0.0100	0.0000	5	85.0000	0.0100	0.0000
RAE0318	2	216.0000	0.0300	0.0000	2	216.0000	0.0300	0.0000
RAE0321	1	84.0000	0.0120	0.0000	1	84.0000	0.0120	0.0000
RAE0324	5	875.0000	0.1250	0.0000	5	875.0000	0.1250	0.0000
RAE0325	1	175.0000	0.0250	0.0000	1	175.0000	0.0250	0.0000
RAE0327	2	2162.0000	1.5920	0.0000	2	2162.0000	1.5920	0.0000
RAG0311	8	0.0000	0.0000	54.5360	7	0.0000	0.0000	50.4790
RAG0314	11	0.0000	0.0000	6.4086	11	0.0000	0.0000	6.4086
RAG0316	7	119.0000	0.0140	4.0775	7	119.0000	0.0140	4.0775
RAG0317	2	0.0000	0.0000	0.5554	2	0.0000	0.0000	0.5554
RAG0319	4	432.0000	0.0600	1.1108	4	432.0000	0.0600	1.1108
RAG0323	1	0.0000	0.0000	0.0000	1	0.0000	0.0000	0.0000
RAG0330	1	0.0000	0.0000	9.5770	2	0.0000	0.0000	19.1540
Sample Total	71	7204.6374	2.903	121.049	71	7204.6374	2.903	126.569

Cadmus found one tier three thermostat installed for a gas customer that was given non-tier three saving. Table 24 provides sample realization rates by fuel type, and shows the t-test statistics Cadmus used to analyze errors in the general sample.

Table 24. Sample Realization Rates and t-Statistic (ENERGY STAR Appliances)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	102.2853%
Standard Error	0.0000	0.0000	0.0452
t-Statistic	NA	NA	0.0762
p-Value	NA	NA	0.5056
Apply to Program Population?	No	No	No

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Task 4: Calculation of Verified Annual and Lifetime Savings

Cadmus calculated annual and lifetime savings. The following tables present verified program participation and energy savings by measure: Table 25 and Table 26 document kWh savings, Table 27 documents kW savings, and Table 28 and Table 29 document MCF savings.

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Table 25. Certified Program Participation and First-Year kWh Savings by Measure (ENERGY STAR Appliances)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RAC0308	12	12	1,340.0328	1,340.0328	0.9710	1,301.1718	0.9000	1,171.0547	0.8739
RAC0309	800	800	100,529.6000	100,529.6000	0.9710	97,614.2416	0.9000	87,852.8174	0.8739
RAC0328	2,257	2,257	348,890.8586	348,827.0238	0.9710	338,711.0401	0.9000	304,839.9361	0.8737
RAE0303	1,366	1,366	230,444.2000	230,444.2000	0.9720	223,991.7624	0.9000	201,592.5862	0.8748
RAE0304	361	361	22,382.0000	22,382.0000	0.9140	20,457.1480	0.9000	18,411.4332	0.8226
RAE0306	5	5	696.9105	696.9105	0.9710	676.7001	0.9000	609.0301	0.8739
RAE0310	584	584	80,997.7632	80,997.7632	0.9710	78,648.8281	0.9000	70,783.9453	0.8739
RAE0315	826	826	14,042.0000	14,042.0000	1.0000	14,042.0000	0.9000	12,637.8000	0.9000
RAE0318	586	586	63,288.0000	63,288.0000	1.0000	63,288.0000	0.9000	56,959.2000	0.9000
RAE0321	125	125	10,500.0000	10,500.0000	1.0000	10,500.0000	0.9000	9,450.0000	0.9000
RAE0322	112	112	9,408.0000	9,408.0000	1.0000	9,408.0000	0.9000	8,467.2000	0.9000
RAE0324	514	514	89,950.0000	89,950.0000	1.0000	89,950.0000	0.9000	80,955.0000	0.9000
RAE0325	245	245	42,875.0000	42,875.0000	1.0000	42,875.0000	0.9000	38,587.5000	0.9000
RAE0327	179	179	193,499.0000	193,499.0000	1.0000	193,499.0000	0.9000	174,149.1000	0.9000
RAE0329	1,618	1,618	252,634.1964	252,634.1964	0.9710	245,307.8047	0.9000	220,777.0242	0.8739
RAG0316	964	964	16,388.0000	16,388.0000	1.0000	16,388.0000	0.9000	14,749.2000	0.9000
RAG0319	995	995	107,460.0000	107,460.0000	1.0000	107,460.0000	0.9000	96,714.0000	0.9000
Total:	11,549	11,549	1,585,325.5615	1,585,261.7267	0.9831	1,554,118.6968	0.9000	1,398,706.8272	0.8847

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Table 26. Certified Lifetime kWh Savings by Measure (ENERGY STAR Appliances)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RAC0308	1,171.0547	9.0000	10,539.4920
RAC0309	87,852.8174	9.0000	790,675.3570
RAC0328	304,839.9361	10.0000	3,048,399.3610
RAE0303	201,592.5862	12.0000	2,419,111.0339
RAE0304	18,411.4332	15.0000	276,171.4980
RAE0306	609.0301	9.0000	5,481.2708
RAE0310	70,783.9453	9.0000	637,055.5073
RAE0315	12,637.8000	11.0000	139,015.8000
RAE0318	56,959.2000	11.0000	626,551.2000
RAE0321	9,450.0000	11.0000	103,950.0000
RAE0322	8,467.2000	11.0000	93,139.2000
RAE0324	80,955.0000	11.0000	890,505.0000
RAE0325	38,587.5000	11.0000	424,462.5000
RAE0327	174,149.1000	10.0000	1,741,491.0000
RAE0329	220,777.0242	10.0000	2,207,770.2423
RAG0316	14,749.2000	11.0000	162,241.2000
RAG0319	96,714.0000	11.0000	1,063,854.0000
Total:	1,398,706.8272		14,640,413.6623

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Table 27. Certified Program Participation and kW Savings by Measure (ENERGY STAR Appliances)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RAE0303	1366	1366	140.6980	140.6980	0.9720	136.7585	0.9000	123.0826	0.8748
RAE0304	361	361	38.9880	38.9880	0.9140	35.6350	0.9000	32.0715	0.8226
RAE0315	826	826	1.6520	1.6520	1.0000	1.6520	0.9000	1.4868	0.9000
RAE0318	586	586	8.7900	8.7900	1.0000	8.7900	0.9000	7.9110	0.9000
RAE0321	125	125	1.5000	1.5000	1.0000	1.5000	0.9000	1.3500	0.9000
RAE0322	112	112	1.3440	1.3440	1.0000	1.3440	0.9000	1.2096	0.9000
RAE0324	514	514	12.8500	12.8500	1.0000	12.8500	0.9000	11.5650	0.9000
RAE0325	245	245	6.1250	6.1250	1.0000	6.1250	0.9000	5.5125	0.9000
RAE0327	179	179	142.4840	142.4840	1.0000	142.4840	0.9000	128.2356	0.9000
RAG0316	964	964	1.9280	1.9280	1.0000	1.9280	0.9000	1.7352	0.9000
RAG0319	995	995	14.9250	14.9250	1.0000	14.9250	0.9000	13.4325	0.9000
Total:	6,273	6,273	371.2840	371.2840	0.9896	363.9915	0.9000	327.5923	0.8907

Table 28. Certified Program Participation and First-Year MCF Savings by Measure (ENERGY STAR Appliances)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RAC0308	12	12	75.3348	75.3348	0.9710	73.1501	0.9000	65.8351	0.8739
RAC0309	800	800	5,502.0800	5,502.0800	0.9710	5,342.5197	0.9000	4,808.2677	0.8739
RAC0328	2,257	2,257	23,463.0949	23,463.0949	0.9710	22,782.6651	0.9000	20,504.3986	0.8739
RAE0322	112	112	40.2640	40.2528	1.0000	40.2528	0.9000	36.2275	0.8997
RAG0307	22	22	124.8852	124.8852	0.9710	121.2635	0.9000	109.1372	0.8739
RAG0311	1,835	1,834	12,509.1950	12,502.3872	0.9710	12,139.8179	0.9000	10,925.8361	0.8734

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RAG0314	2,010	2,010	1,171.0260	1,170.8250	1.0000	1,170.8250	0.9000	1,053.7425	0.8998
RAG0316	964	964	561.5300	561.5300	1.0000	561.5300	0.9000	505.3770	0.9000
RAG0317	669	669	185.7813	185.7144	1.0000	185.7144	0.9000	167.1430	0.8997
RAG0319	995	995	276.3115	276.2120	1.0000	276.2120	0.9000	248.5908	0.8997
RAG0320	116	116	41.7020	41.6904	1.0000	41.6904	0.9000	37.5214	0.8998
RAG0330	5,694	5,695	54,531.4380	54,541.0039	0.9710	52,959.3148	0.9000	47,663.3833	0.8741
Total:	15,486	15,486	98,482.6427	98,485.0106	0.9855	95,694.9557	0.9000	86,125.4602	0.8868



Table 29. Certified Lifetime MCF Savings by Measure (ENERGY STAR Appliances)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RAC0308	65.8351	9.0000	592.5157
RAC0309	4,808.2677	9.0000	43,274.4094
RAC0328	20,504.3986	10.0000	205,043.9863
RAE0322	36.2275	11.0000	398.5027
RAG0307	109.1372	9.0000	982.2346
RAG0311	10,925.8361	9.0000	98,332.5252
RAG0314	1,053.7425	11.0000	11,591.1675
RAG0316	505.377	11.0000	5,559.147
RAG0317	167.143	11.0000	1,838.5726
RAG0319	248.5908	11.0000	2,734.4988
RAG0320	37.5214	11.0000	412.735
RAG0330	47,663.3833	10.0000	476,633.8333
Total:	86,125.4602		847,394.1281

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Appendix C: ENERGY STAR Lighting Program

Table 30 presents the reported gross and certified net energy savings and demand reduction for the ENERGY STAR Lighting Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 30. Participation and Savings (ENERGY STAR Lighting)

	Participation Total	Total kWh Savings	Total kW Savings
Reported Gross Participation and Savings	2,929,084.0000	92,295,024.1000	10,986.6466
Verified Net Participation and Savings	2,929,084.0000	82,961,708.8270	9,875.4390
Verified Actual Lifetime Savings	NA	1,240,319,393.1626	NA
Program Realization Rate	100.0000%	89.8875%	89.8858%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%
Lifetime Net Verified v. Net Reported Savings	NA	100.0000%	NA

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate applications of savings according to customer types. Cadmus verified that all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Analysis

Cadmus found no discrepancies between per-unit reported savings provided by Consumers Energy and per-unit verified savings reported in the MEMD. All measure lives reported by Consumers Energy were correct, based on the effective useful life (EUL) listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus reviewed gross and net adjustment factors and found no discrepancies. Table 31 verified per-unit savings, measure life, and saving adjustment factors for all measures delivered through the 2017 ENERGY STAR Lighting Program.

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Table 31. Verified Per-Unit Measure Characteristics (ENERGY STAR Lighting)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RBE0303	CFL bulbs - 14W	23.9000	0.0029	0.0000	23.9000	0.0029	0.0000	9	0.953	0.82
RBE0304	CFL bulbs - 20W	27.7000	0.0033	0.0000	27.7000	0.0033	0.0000	9	0.953	0.82
RBE0305	CFL bulbs - 26W	38.2000	0.0046	0.0000	38.2000	0.0046	0.0000	9	0.953	0.82
RBE0310	LED globe	27.0000	0.0032	0.0000	27.0000	0.0032	0.0000	15	1	0.9
RBE0311	Outdoor LED PAR/Flood	276.4000	0.0000	0.0000	276.4000	0.0000	0.0000	15	1	0.9
RBE0312	LED downlight	44.0000	0.0053	0.0000	44.0000	0.0053	0.0000	15	1	0.9
RBE0314	LED candelabra	23.7000	0.0028	0.0000	23.7000	0.0028	0.0000	15	1	0.9
RBE0315	LED bulb Replacing A-Line 29W	19.3000	0.0023	0.0000	19.3000	0.0023	0.0000	15	1	0.9
RBE0316	LED bulb Replacing A-Line 43W	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15	1	0.9
RBE0317	LED bulb Replacing A-Line 53W	33.6000	0.0040	0.0000	33.6000	0.0040	0.0000	15	1	0.9
RBE0318	LED bulb Replacing A-Line 100W (72W Halogen)	46.2000	0.0055	0.0000	46.2000	0.0055	0.0000	15	1	0.9
RLE0319	LED Flood PAR	54.0000	0.0064	0.0000	54.0000	0.0064	0.0000	15	1	0.9

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Task 3: Documentation Review

Cadmus reviewed program documents⁴ from a sample of 69 randomly selected Job ID numbers.

Table 32 documents reported and verified measure counts as well as reported and verified energy savings by fuel type and demand reduction for the sample applications.

Table 32. Sample Participation and Savings by Measure (ENERGY STAR Lighting)

Consumers Energy Measure ID	Reported by EWR Provider			Verified		
	Sample Participation	Sample Total kWh	Sample Total kW	Sample Participation	Sample Total kWh	Sample Total kW
RBE0310	124	5,346.0000	0.6336	124	5,346.0000	0.6336
RBE0312	273	28,952.0000	3.4874	273	28,952.0000	3.4874
RBE0314	5,014	358,818.0000	42.3920	5,014	358,818.0000	42.3920
RBE0315	239	10,113.2000	1.2052	239	10,113.2000	1.2052
RBE0316	4,849	590,377.5000	70.4310	4,849	590,377.5000	70.4310
RBE0317	81	3,897.6000	0.4640	81	3,897.6000	0.4640
RBE0318	312	47,493.6000	5.6540	312	47,493.6000	5.6540
RLE0319	611	90,072.0000	10.6752	611	90,072.0000	10.6752
Sample Total	11,503	1,135,069.9000	134.9424	11,503	1,135,069.9000	134.9424

Cadmus found no discrepancies between the Consumers Energy eTracker database and the supporting documentation. Table 33 provides sample realization rates by fuel type and shows the t-test statistics Cadmus used to analyze errors in the sample.

Table 33. Sample Realization Rates and t-Statistic (ENERGY STAR Lighting)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	100.00%
Standard Error	0.0000	0.0000	0.0000
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to program population?	No	No	No

Task 4: Calculation of Verified Annual and Lifetime Savings

Cadmus calculated annual and lifetime savings. The following tables present verified program participation, energy savings, and demand reduction by measure. Table 34 and Table 35 document first year and lifetime kWh savings, respectively, and Table 36 documents kW savings. The ENERGY STAR Lighting Program did not result in MCF savings.

⁴ Customer-level documents were not available due to the program design. Instead, Cadmus reviewed weekly sales invoices and MOUs from participating retailers and manufacturers.

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Table 34. Certified Program Participation and First-Year kWh Savings by Measure (ENERGY STAR Lighting)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RBE0303	20,254	20,254	484,070.6000	484,070.6000	0.9530	461,319.2818	0.8200	378,281.8111	0.7815
RBE0304	2,555	2,555	70,773.5000	70,773.5000	0.9530	67,447.1455	0.8200	55,306.6593	0.7815
RBE0305	8,401	8,401	320,918.2000	320,918.2000	0.9530	305,835.0446	0.8200	250,784.7366	0.7815
RBE0310	27,325	27,325	737,775.0000	737,775.0000	1.0000	737,775.0000	0.9000	663,997.5000	0.9000
RBE0311	349	349	96,463.6000	96,463.6000	1.0000	96,463.6000	0.9000	86,817.2400	0.9000
RBE0312	67,041	67,041	2,949,804.0000	2,949,804.0000	1.0000	2,949,804.0000	0.9000	2,654,823.6000	0.9000
RBE0314	128,323	128,323	3,041,255.1000	3,041,255.1000	1.0000	3,041,255.1000	0.9000	2,737,129.5900	0.9000
RBE0315	62,395	62,395	1,204,223.5000	1,204,223.5000	1.0000	1,204,223.5000	0.9000	1,083,801.1500	0.9000
RBE0316	2,213,524	2,213,524	63,085,434.0000	63,085,434.0000	1.0000	63,085,434.0000	0.9000	56,776,890.6000	0.9000
RBE0317	22,350	22,350	750,960.0000	750,960.0000	1.0000	750,960.0000	0.9000	675,864.0000	0.9000
RBE0318	100,163	100,163	4,627,530.6000	4,627,530.6000	1.0000	4,627,530.6000	0.9000	4,164,777.5400	0.9000
RLE0319	276,404	276,404	14,925,816.0000	14,925,816.0000	1.0000	14,925,816.0000	0.9000	13,433,234.4000	0.9000
Total:	2,929,084	2,929,084	92,295,024.1000	92,295,024.1000	0.9883	92,253,863.2719	0.8800	82,961,708.8270	0.8704

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Table 35. Certified Lifetime kWh Savings by Measure (ENERGY STAR Lighting)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RBE0303	378,281.8111	9.0000	3,404,536.2997
RBE0304	55,306.6593	9.0000	497,759.9338
RBE0305	250,784.7366	9.0000	2,257,062.6291
RBE0310	663,997.5000	15.0000	9,959,962.5000
RBE0311	86,817.2400	15.0000	1,302,258.6000
RBE0312	2,654,823.6000	15.0000	39,822,354.0000
RBE0314	2,737,129.5900	15.0000	41,056,943.8500
RBE0315	1,083,801.1500	15.0000	16,257,017.2500
RBE0316	56,776,890.6000	15.0000	851,653,359.0000
RBE0317	675,864.0000	15.0000	10,137,960.0000
RBE0318	4,164,777.5400	15.0000	62,471,663.1000
RLE0319	13,433,234.4000	15.0000	201,498,516.0000
Total:	82,961,708.8270		1,240,319,393.1626

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Table 36. Certified Program Participation and kW Savings by Measure (ENERGY STAR Lighting)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RBE0303	20,254.0000	20,254.0000	58.7366	58.7366	0.9530	55.9760	0.8200	45.9003	0.7815
RBE0304	2,555.0000	2,555.0000	8.4315	8.4315	0.9530	8.0352	0.8200	6.5889	0.7815
RBE0305	8,401.0000	8,401.0000	38.6446	38.6446	0.9530	36.8283	0.8200	30.1992	0.7815
RBE0310	27,325.0000	27,325.0000	87.4400	87.4400	1.0000	87.4400	0.9000	78.6960	0.9000
RBE0312	67,041.0000	67,041.0000	355.3173	355.3173	1.0000	355.3173	0.9000	319.7856	0.9000
RBE0314	128,323.0000	128,323.0000	359.3044	359.3044	1.0000	359.3044	0.9000	323.3740	0.9000
RBE0315	62,395.0000	62,395.0000	143.5085	143.5085	1.0000	143.5085	0.9000	129.1577	0.9000
RBE0316	2,213,524.0000	2,213,524.0000	7,525.9816	7,525.9816	1.0000	7,525.9816	0.9000	6,773.3834	0.9000
RBE0317	22,350.0000	22,350.0000	89.4000	89.4000	1.0000	89.4000	0.9000	80.4600	0.9000
RBE0318	100,163.0000	100,163.0000	550.8965	550.8965	1.0000	550.8965	0.9000	495.8069	0.9000
RLE0319	276,404.0000	276,404.0000	1,768.9856	1,768.9856	1.0000	1,768.9856	0.9000	1,592.0870	0.9000
Total:	2,928,735.0000	2,928,735.0000	10,986.6466	10,986.6466	0.9872	10,981.6734	0.8782	9,875.4390	0.8677

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Appendix D: Home Energy Analysis Program

Table 37 presents reported gross and certified net energy savings by fuel type and demand reduction for the Home Energy Analysis Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 37. Participation and Savings (Home Energy Analysis)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	192,709.0000	3,807,939.7938	267.6798	111,894.8190
Verified Net Participation and Savings	192,709.0000	3,390,628.3288	239.2591	97,593.2290
Verified Actual Lifetime Savings	NA	45,554,868.3026	NA	997,040.8950
Program Realization Rate	100.0000%	89.0410%	89.3826%	87.2187%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	99.9999%	99.9858%
Lifetime Net Verified v. Net Reported Savings	NA	100.0000%	NA	99.9830%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Review

Cadmus found a conversion factor error between per-unit measure MCF savings reported by Consumers Energy and the therm values maintained in the MEMD for gas savings measures RXG0323, RXG0326, RXG0328 with a discrepancy of 0.0001 MCF, and measures RZG0311, RXG0313, RXG0316, RXG0320, RXG0321, RXG0341 with a discrepancy of 0.0004 MCF. Cadmus used the corrected per-unit savings in the final net savings calculations. All measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus conducted a measure-level review of savings adjustments and found no discrepancies. Table 38 presents verified per-unit savings, measure lives, and saving adjustment factors for all measures delivered through the 2017 Home Energy Analysis Program.

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Table 38. Verified Per-Unit Measure Characteristics (Home Energy Analysis)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RXC0329	Setback thermostat - full setback - Combination Customer	257.5264	0.0000	17.4647	257.5264	0.0000	17.4647	9	1	0.9
RXC0343	Wifi thermostat - full setback - Combination Customer	283.2627	0.0000	19.0875	283.2627	0.0000	19.0875	9	1	0.9
RXE0312	Dual spray kitchen low flow aerator (1.5gpm) - Electric water heater	279.0000	0.0320	0.0000	279.0000	0.0320	0.0000	10	0.933	0.9
RXE0314	Handheld showerheads (1.5 gpm) - Electric water heater	334.0000	0.0270	0.0000	334.0000	0.0270	0.0000	10	1	0.9
RXE0315	Shower start (1.5 gpm) - Electric water heater	394.0000	0.0238	0.0000	394.0000	0.0238	0.0000	10	1	0.9
RXE0317	LED bulb replacing A-line 60W	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15	1	0.9
RXE0318	LED night light	22.0000	0.0000	0.0000	22.0000	0.0000	0.0000	12	0.926	0.9
RXE0319	Low flow showerheads (1.5 gpm) - Electric water heater	334.0000	0.0270	0.0000	334.0000	0.0270	0.0000	10	0.911	0.9
RXE0322	Low flow showerheads (1.5 gpm) + shower start - Electric water heater	334.0000	0.0270	0.0000	334.0000	0.0270	0.0000	10	1	0.9
RXE0324	Pipe wrap 1/2" - Electric water heater	51.0000	0.0058	0.0000	51.0000	0.0058	0.0000	15	1	0.9
RXE0325	Pipe wrap 3/4" - Electric water heater	51.0000	0.0058	0.0000	51.0000	0.0058	0.0000	15	1	0.9
RXE0327	Std low flow bath aerator (1.0 gpm) - Electric water heater	68.0000	0.0080	0.0000	68.0000	0.0080	0.0000	10	0.932	0.9
RXE0342	Shower flow optimizer (1.5gpm) - Electric water heater	334.0000	0.0270	0.0000	334.0000	0.0270	0.0000	10	0.911	0.9
RXE0343	Outdoor LED PAR/Flood	276.4000	0.0000	0.0000	276.4000	0.0000	0.0000	15	1	0.9
RXE0344	LED exterior fixture lamp replacement	81.0000	0.0000	0.0000	81.0000	0.0000	0.0000	12	1	0.9
RXG0311	Dual spray kitchen low flow aerator (1.5 gpm) - Gas water heater	0.0000	0.0000	1.1984	0.0000	0.0000	1.1980*	10	0.933	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RXG0313	Handheld showerheads (1.5 gpm) - Gas water heater	0.0000	0.0000	1.4322	0.0000	0.0000	1.4318*	10	1	0.9
RXG0316	Shower start (1.5 gpm) - Gas water heater	0.0000	0.0000	1.3348	0.0000	0.0000	1.3344*	10	1	0.9
RXG0320	Low flow showerheads (1.5 gpm) - Gas water heater	0.0000	0.0000	1.4322	0.0000	0.0000	1.4318*	10	0.911	0.9
RXG0321	Low flow showerheads (1.5 gpm) + shower start - Gas water heater	0.0000	0.0000	1.4322	0.0000	0.0000	1.4318*	10	1	0.9
RXG0323	Pipe wrap 1/2" - Gas water heater	0.0000	0.0000	0.2533	0.0000	0.0000	0.2532*	15	1	0.9
RXG0326	Pipe wrap 3/4" - gas water heater	0.0000	0.0000	0.2533	0.0000	0.0000	0.2532*	15	1	0.9
RXG0328	Std low flow bath aerator (1.0 gpm) - Gas water heater	0.0000	0.0000	0.2923	0.0000	0.0000	0.2922*	10	0.932	0.9
RXG0331	Setback thermostat - full setback - Gas Customer	0.0000	0.0000	15.1894	0.0000	0.0000	15.1894	9	0.9	0.9
RXG0341	Shower flow optimizer (1.5gpm) - Gas water heater	0.0000	0.0000	1.4322	0.0000	0.0000	1.4318*	10	0.911	0.9
RXG0344	Wifi thermostat - full setback - Gas Customer	0.0000	0.0000	17.8305	0.0000	0.0000	17.8305	9	1	0.9

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the Home Energy Analysis appendix.

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Task 3: Documentation Review

Cadmus selected and reviewed program documentation for a random sample of 69 participants, drawn from the Consumers Energy eTracker database, including invoices, applications, and any additional documentation available to validate the measure installation data. Table 39 documents reported and verified measure counts as well as reported and verified energy savings by fuel type, and demand reductions for the sample applications.

Table 39. Sample Participation and Savings by Measure (Home Energy Analysis)

Consumers Energy Measure ID	Reported by EWR Provider				Verified			
	Participation	Total kWh	Total kW	Total MCF	Participation	Total kWh	Total kW	Total MCF
RXC0329	1	257.5264	0.0000	17.4647	1	257.5264	0.0000	17.4647
RXC0338	31	0.0000	0.0000	0.0000	31	0.0000	0.0000	0.0000
RXC0343	2	566.5254	0.0000	38.1750	2	566.5254	0.0000	38.1750
RXE0312	2	558.0000	0.0640	0.0000	2	558.0000	0.0640	0.0000
RXE0314	2	668.0000	0.0540	0.0000	2	668.0000	0.0540	0.0000
RXE0317	305	8,692.5000	1.0370	0.0000	305	8,692.5000	1.0370	0.0000
RXE0318	66	1,452.0000	0.0000	0.0000	66	1,452.0000	0.0000	0.0000
RXE0319	1	334.0000	0.0270	0.0000	1	334.0000	0.0270	0.0000
RXE0325	13	663.0000	0.0754	0.0000	13	663.0000	0.0754	0.0000
RXE0327	2	136.0000	0.0160	0.0000	2	136.0000	0.0160	0.0000
RXE0340	5	0.0000	0.0000	0.0000	5	0.0000	0.0000	0.0000
RXE0343	8	2,211.2000	0.0000	0.0000	8	2,211.2000	0.0000	0.0000
RXE0344	22	1,782.0000	0.0000	0.0000	22	1,782.0000	0.0000	0.0000
RXG0302	1	0.0000	0.0000	0.0000	1	0.0000	0.0000	0.0000
RXG0311	24	0.0000	0.0000	28.7616	24	0.0000	0.0000	28.7616
RXG0313	45	0.0000	0.0000	64.4490	45	0.0000	0.0000	64.4490
RXG0320	25	0.0000	0.0000	35.8050	25	0.0000	0.0000	35.8050
RXG0323	89	0.0000	0.0000	22.5437	89	0.0000	0.0000	22.5437
RXG0326	371	0.0000	0.0000	93.9743	371	0.0000	0.0000	93.9743
RXG0328	68	0.0000	0.0000	19.8764	68	0.0000	0.0000	19.8764
RXG0331	7	0.0000	0.0000	106.3258	7	0.0000	0.0000	106.3258
RXG0339	32	0.0000	0.0000	0.0000	32	0.0000	0.0000	0.0000
RXG0341	4	0.0000	0.0000	5.7288	4	0.0000	0.0000	5.7288
RXG0344	7	0.0000	0.0000	124.8135	7	0.0000	0.0000	124.8135
Sample Total	1,133	17,320.7518	1.2734	557.9178	1,133	17,320.7518	1.2734	557.9178

Cadmus found no discrepancies between the Consumers Energy eTracker database and the supporting documentation. Table 40 provides sample realization rates by fuel type, and shows the t-test statistics Cadmus used to analyze errors in the general sample.

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Table 40. Sample Realization Rates and t-Statistic (Home Energy Analysis)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	100.00%
Standard Error	0.0000	0.0000	0.0000
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to Program Population?	No	No	No

Task 4: Calculation of Certified Annual and Lifetime Savings

Cadmus calculated annual and lifetime savings. The following tables present verified program participation, energy savings, and demand reductions by measure: Table 41 and Table 42 document kWh savings, Table 43 documents kW savings, and Table 44 and Table 45 document MCF savings.

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Table 41. Certified Program Participation and First-Year kWh Savings by Measure (Home Energy Analysis)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RXC0329	798	798	205,506.0672	205,506.0672	1.0000	205,506.0672	0.9000	184,955.4605	0.9000
RXC0343	758	758	214,713.1266	214,713.1266	1.0000	214,713.1266	0.9000	193,241.8139	0.9000
RXE0312	316	316	88,164.0000	88,164.0000	0.9330	82,257.0120	0.9000	74,031.3108	0.8397
RXE0314	353	353	117,902.0000	117,902.0000	1.0000	117,902.0000	0.9000	106,111.8000	0.9000
RXE0315	5	5	1,970.0000	1,970.0000	1.0000	1,970.0000	0.9000	1,773.0000	0.9000
RXE0317	64,382	64,382	1,834,887.0000	1,834,887.0000	1.0000	1,834,887.0000	0.9000	1,651,398.3000	0.9000
RXE0318	13,303	13,303	292,666.0000	292,666.0000	0.9260	271,008.7160	0.9000	243,907.8444	0.8334
RXE0319	328	328	109,552.0000	109,552.0000	0.9110	99,801.8720	0.9000	89,821.6848	0.8199
RXE0322	2	2	668.0000	668.0000	1.0000	668.0000	0.9000	601.2000	0.9000
RXE0324	254	254	12,954.0000	12,954.0000	1.0000	12,954.0000	0.9000	11,658.6000	0.9000
RXE0325	2,291	2,291	116,841.0000	116,841.0000	1.0000	116,841.0000	0.9000	105,156.9000	0.9000
RXE0327	628	628	42,704.0000	42,704.0000	0.9320	39,800.1280	0.9000	35,820.1152	0.8388
RXE0342	12	12	4,008.0000	4,008.0000	0.9110	3,651.2880	0.9000	3,286.1592	0.8199
RXE0343	1,769	1,769	488,951.6000	488,951.6000	1.0000	488,951.6000	0.9000	440,056.4400	0.9000
RXE0344	3,413	3,413	276,453.0000	276,453.0000	1.0000	276,453.0000	0.9000	248,807.7000	0.9000
Total:	88,612	88,612	3,807,939.7938	3,807,939.7938	0.9742	3,767,364.8098	0.9000	3,390,628.3288	0.8768

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Table 42. Certified Lifetime kWh Savings by Measure (Home Energy Analysis)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RXC0329	184,955.4605	9.0000	1,664,599.1443
RXC0343	193,241.8139	9.0000	1,739,176.3255
RXE0312	74,031.3108	10.0000	740,313.1080
RXE0314	106,111.8000	10.0000	1,061,118.0000
RXE0315	1,773.0000	10.0000	17,730.0000
RXE0317	1,651,398.3000	15.0000	24,770,974.5000
RXE0318	243,907.8444	12.0000	2,926,894.1328
RXE0319	89,821.6848	10.0000	898,216.8480
RXE0322	601.2000	10.0000	6,012.0000
RXE0324	11,658.6000	15.0000	174,879.0000
RXE0325	105,156.9000	15.0000	1,577,353.5000
RXE0327	35,820.1152	10.0000	358,201.1520
RXE0342	3,286.1592	10.0000	32,861.5920
RXE0343	440,056.4400	15.0000	6,600,846.6000
RXE0344	248,807.7000	12.0000	2,985,692.4000
Total:	3,390,628.3288		45,554,868.3026

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Table 43. Certified Program Participation and kW Savings by Measure (Home Energy Analysis)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RXE0312	316	316	10.1120	10.1120	0.9330	9.4345	0.9000	8.4910	0.8397
RXE0314	353	353	9.5310	9.5310	1.0000	9.5310	0.9000	8.5779	0.9000
RXE0315	5	5	0.1190	0.1190	1.0000	0.1190	0.9000	0.1071	0.9000
RXE0317	64,382	64,382	218.8988	218.8988	1.0000	218.8988	0.9000	197.0089	0.9000
RXE0319	328	328	8.8560	8.8560	0.9110	8.0678	0.9000	7.2610	0.8199
RXE0322	2	2	0.0540	0.0540	1.0000	0.0540	0.9000	0.0486	0.9000
RXE0324	254	254	1.4732	1.4732	1.0000	1.4732	0.9000	1.3259	0.9000
RXE0325	2,291	2,291	13.2878	13.2878	1.0000	13.2878	0.9000	11.9590	0.9000
RXE0327	628	628	5.0240	5.0240	0.9320	4.6824	0.9000	4.2141	0.8388
RXE0342	12	12	0.3240	0.3240	0.9110	0.2952	0.9000	0.2656	0.8198
Total:	68,571	68,571	267.6798	267.6798	0.9687	265.8437	0.9000	239.2591	0.8718

Table 44. Certified Program Participation and First-Year MCF Savings by Measure (Home Energy Analysis)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RXC0329	798	798	13,936.8306	13,936.8306	1.0000	13,936.8306	0.9000	12,543.1475	0.9000
RXC0343	758	758	14,468.3250	14,468.3250	1.0000	14,468.3250	0.9000	13,021.4925	0.9000
RXG0311	5,049	5,049	6,050.7216	6,048.7020	0.9330	5,643.4390	0.9000	5,079.0951	0.8394
RXG0313	7,124	7,124	10,202.9928	10,200.1432	1.0000	10,200.1432	0.9000	9,180.1289	0.8997
RXG0316	53	53	70.7444	70.7232	1.0000	70.7232	0.9000	63.6509	0.8997
RXG0320	6,477	6,477	9,276.3594	9,273.7686	0.9110	8,448.4032	0.9000	7,603.5629	0.8197
RXG0321	33	33	47.2626	47.2494	1.0000	47.2494	0.9000	42.5245	0.8997

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RXG0323	11,694	11,694	2,962.0902	2,960.9208	1.0000	2,960.9208	0.9000	2,664.8287	0.8996
RXG0326	56,079	56,079	14,204.8107	14,199.2028	1.0000	14,199.2028	0.9000	12,779.2825	0.8996
RXG0328	15,080	15,080	4,407.8840	4,406.3760	0.9320	4,106.7424	0.9000	3,696.0682	0.8385
RXG0331	1,232	1,232	18,713.3408	18,713.3408	0.9000	16,842.0067	0.9000	15,157.8060	0.8100
RXG0341	317	317	454.0074	453.8806	0.9110	413.4852	0.9000	372.1367	0.8197
RXG0344	959	959	17,099.4495	17,099.4495	1.0000	17,099.4495	0.9000	15,389.5046	0.9000
Total:	105,653	105,653	111,894.8190	111,878.9125	0.9682	108,436.9210	0.9000	97,593.2290	0.8712

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Table 45. Certified Lifetime MCF Savings by Measure (Home Energy Analysis)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RXC0329	12,543.1475	9.0000	112,888.3279
RXC0343	13,021.4925	9.0000	117,193.4325
RXG0311	5,079.0951	10.0000	50,790.9507
RXG0313	9,180.1289	10.0000	91,801.2888
RXG0316	63.6509	10.0000	636.5088
RXG0320	7,603.5629	10.0000	76,035.6288
RXG0321	42.5245	10.0000	425.2446
RXG0323	2,664.8287	15.0000	39,972.4308
RXG0326	12,779.2825	15.0000	191,689.2378
RXG0328	3,696.0682	10.0000	36,960.6819
RXG0331	15,157.8060	9.0000	136,420.2544
RXG0341	372.1367	10.0000	3,721.3670
RXG0344	15,389.5046	9.0000	138,505.5410
Total:	97,593.2290		997,040.8950

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Appendix E: Home Energy Reports Program

Table 46 presents reported gross and certified net energy savings by fuel type and demand reductions for the Home Energy Reports Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 46. Participation and Savings (Home Energy Reports)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	384,090.0000	49,761,293.2000	NA	261,719.3300
Verified Net Participation and Savings	384,090.0000	48,101,815.0935	NA	253,660.0514
Verified Actual Lifetime Savings	NA	48,101,815.0935	NA	253,660.0514
Program Realization Rate	100.0000%	96.6651%	NA	96.9206%
Annual Net Verified v. Net Reported Savings	NA	102.8352%	NA	103.1071%
Lifetime Net Verified v. Net Reported Savings	NA	102.8352%	NA	103.1071%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Analysis

Cadmus found no discrepancies between per-unit reported savings provided by Consumers Energy and per-unit verified savings reported in the MEMD. All measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus reviewed program documentation, verifying households that moved or opted-out of the Home Energy Report Program, and that appropriate savings gross adjustment factors were calculated for each measure and updated from the default of 0.94.

Table 47 presents verified per-unit savings, measure lives, and saving adjustment factors for all measures delivered through the 2017 Home Energy Reports Program.

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Table 47. Verified Per-Unit Measure Characteristics (Home Energy Reports)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
ROC0025	Track #5a: Kalamazoo (high Electric usage) Combination (2011/2012/2013 Start)	214.6563	0	0.6448	214.6563	0	0.6448	1	0.951*	1
ROC0026	Track #5a: Kalamazoo (high Electric usage) Combination (2014 Start)	203.1941	0	0.7195	203.1941	0	0.7195	1	0.966*	1
ROC0027	Track #5b: Kalamazoo (average Electric usage) Combination (2015 Start)	119.0912	0	0.6239	119.0912	0	0.6239	1	0.947*	1
ROC0028	Track #7a: New (high Electric usage) Combination (2016 Start)	168.5839	0	0.6985	168.5839	0	0.6985	1	0.972*	1
ROC0029	Track #8a: Expansion Kent/Genesee (average Electric usage) Combination (2016 Start)	85.2876	0	0.5101	85.2876	0	0.5101	1	0.962*	1
ROE0008	Track #8b: Expansion Kent/Genesee (high Electric usage) Electric (2016 Start)	221.2619	0	0	221.2619	0	0	1	0.971*	1
ROE0009	Track #11a: Electric test print report Combination (2017 Start)	108.7737	0	0	108.7737	0	0	1	0.941*	1
ROG0006	Track #6b: Farmington/Oakland Gas (2015 Start)	0	0	1.6788	0	0	1.6788	1	0.962*	1
ROG0007	Track #7b: New Gas (2016 Start)	0	0	1.3715	0	0	1.3715	1	0.969*	1
ROG0008	Track #9: Refill Gas (2016 Start)	0	0	1.1227	0	0	1.1227	1	0.975*	1
ROG0009	Track #10: Gas addition (2017 Start)	0	0	0.7806	0	0	0.7806	1	0.966*	1

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the Home Energy Reports appendix.

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Task 3: Documentation Review

No Home Energy Reports Program customer-level documents were available for Cadmus' review.

Task 4: Calculation of Verified Annual and Lifetime Savings

The following tables present verified program participation, energy savings, and demand reductions by measure: Table 48 and Table 49 document kWh savings, and Table 50 and Table 51 document MCF savings.

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Table 48. Certified Program Participation and First-Year kWh Savings by Measure (Home Energy Reports)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
ROC0025	13,267	13,267	2,847,845.1321	2,847,845.1321	0.9510	2,708,300.7206	1.0000	2,708,300.7206	0.9510
ROC0026	1,595	1,595	324,094.5895	324,094.5895	0.9660	313,075.3735	1.0000	313,075.3735	0.9660
ROC0027	10,038	10,038	1,195,437.4656	1,195,437.4656	0.9470	1,132,079.2799	1.0000	1,132,079.2799	0.9470
ROC0028	229,373	229,373	38,668,594.8947	38,668,594.8947	0.9720	37,585,874.2376	1.0000	37,585,874.2376	0.9720
ROC0029	18,230	18,230	1,554,792.9480	1,554,792.9480	0.9620	1,495,710.8160	1.0000	1,495,710.8160	0.9620
ROE0008	197	197	43,588.5943	43,588.5943	0.9710	42,324.5251	1.0000	42,324.5251	0.9710
ROE0009	47,134	47,134	5,126,939.5758	5,126,939.5758	0.9410	4,824,450.1408	1.0000	4,824,450.1408	0.9410
Total:	319,834	319,834	49,761,293.2000	49,761,293.2000	0.9586	48,101,815.0935	1.0000	48,101,815.0935	0.9586

Table 49. Certified Lifetime kWh Savings by Measure (Home Energy Reports)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
ROC0025	2,708,300.7206	1.0000	2,708,300.7206
ROC0026	313,075.3735	1.0000	313,075.3735
ROC0027	1,132,079.2799	1.0000	1,132,079.2799
ROC0028	37,585,874.2376	1.0000	37,585,874.2376
ROC0029	1,495,710.8160	1.0000	1,495,710.8160
ROE0008	42,324.5251	1.0000	42,324.5251
ROE0009	4,824,450.1408	1.0000	4,824,450.1408
Total:	48,101,815.0935		48,101,815.0935

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Table 50. Certified Program Participation and First-Year MCF Savings by Measure (Home Energy Reports)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
ROC0025	13,267	13,267	8,554.5617	8,554.5616	0.9510	8,135.3881	1.0000	8,135.3881	0.9510
ROC0026	1,595	1,595	1,147.6025	1,147.6025	0.9660	1,108.5840	1.0000	1,108.5840	0.9660
ROC0027	10,038	10,038	6,262.7082	6,262.7082	0.9470	5,930.7847	1.0000	5,930.7847	0.9470
ROC0028	229,373	229,373	160,217.0405	160,217.0405	0.9720	155,730.9634	1.0000	155,730.9634	0.9720
ROC0029	18,230	18,230	9,299.1230	9,299.1230	0.9620	8,945.7563	1.0000	8,945.7563	0.9620
ROG0006	9,169	9,169	15,392.9172	15,392.9172	0.9620	14,807.9863	1.0000	14,807.9863	0.9620
ROG0007	22,724	22,724	31,165.9660	31,165.9660	0.9690	30,199.8211	1.0000	30,199.8211	0.9690
ROG0008	12,911	12,911	14,495.1797	14,495.1797	0.9750	14,132.8002	1.0000	14,132.8002	0.9750
ROG0009	19,452	19,452	15,184.2312	15,184.2312	0.9660	14,667.9673	1.0000	14,667.9673	0.9660
Total:	336,759	336,759	261,719.3300	261,719.3299	0.9633	253,660.0514	1.0000	253,660.0514	0.9633

Table 51. Certified Lifetime MCF Savings by Measure (Home Energy Reports)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
ROC0025	8,135.3881	1.0000	8,135.3881
ROC0026	1,108.5840	1.0000	1,108.5840
ROC0027	5,930.7847	1.0000	5,930.7847
ROC0028	155,730.9634	1.0000	155,730.9634
ROC0029	8,945.7563	1.0000	8,945.7563
ROG0006	14,807.9863	1.0000	14,807.9863
ROG0007	30,199.8211	1.0000	30,199.8211
ROG0008	14,132.8002	1.0000	14,132.8002
ROG0009	14,667.9673	1.0000	14,667.9673
Total:	253,660.0514		253,660.0514

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Appendix F: Home Performance with ENERGY STAR Program

Table 52 presents the reported gross and certified net energy savings by fuel type and demand reduction for the Home Performance with ENERGY STAR Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 52. Participation and Savings (Home Performance with ENERGY STAR)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	13,832.0000	338,062.7918	111.4653	20,050.1688
Verified Net Participation and Savings	13,832.0000	304,256.5129	100.3192	18,045.1227
Verified Actual Lifetime Savings	NA	4,234,928.7268	NA	285,018.2658
Program Realization Rate	100.0000%	90.0000%	90.0004%	89.9999%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0004%	99.9998%
Lifetime Net Verified v. Net Reported Savings	NA	100.0000%	NA	99.9999%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) the appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Review

Cadmus found a conversion factor error between per-unit measure MCF savings reported by Consumers Energy and the therm values in the MEMD for gas savings measures RZG0056 and RZG0085 with a discrepancy of 0.0014 MCF, and measure RZG0057 with a discrepancy of 0.0015 MCF. Cadmus used the corrected per-unit savings in the final net savings calculations. All measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus conducted a measure-level review of savings adjustments and found no discrepancies. Table 53 presents verified per-unit savings, measure lives, and saving adjustment factors for all measures delivered through the 2017 Home Performance with ENERGY STAR Program.



Table 53. Verified Per-Unit Measure Characteristics (Home Performance with ENERGY STAR)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RZC0007	Basement wall insulation - Combination Customer	25.0188	-0.0289	5.6199	25.0188	-0.0289	5.6199	25	1	0.9
RZC0008	Crawlspace insulation - Combination Customer	-1.3722	-0.0183	2.3594	-1.3722	-0.0183	2.3594	25	1	0.9
RZC0009	Duct insulation and/or replacement - Combination Customer	19.3618	0.0262	4.2063	19.3618	0.0262	4.2063	20	1	0.9
RZC0010	Duct sealing 15% reduction - Combination Customer	34.6462	0.0188	1.4950	34.6462	0.0188	1.4950	18	1	0.9
RZC0011	Duct sealing 30% reduction - Combination Customer	111.9990	0.0793	4.3988	111.9990	0.0793	4.3988	18	1	0.9
RZC0018	Infiltration reduction of 20% - Combination Customer	118.1461	0.0510	8.3446	118.1461	0.0510	8.3446	13	1	0.9
RZC0019	Infiltration reduction of 30% - Combination Customer	186.2421	0.0836	13.5527	186.2421	0.0836	13.5527	13	1	0.9
RZC0020	Infiltration reduction of 50% - Combination Customer	343.3911	0.1748	25.3459	343.3911	0.1748	25.3459	13	1	0.9
RZC0022	Roof (attic) insulation - Combination Customer	76.6928	0.0381	5.2416	76.6928	0.0381	5.2416	20	1	0.9
RZC0023	Wall insulation - Combination Customer	94.0553	0.0295	6.4504	94.0553	0.0295	6.4504	25	1	0.9
RZC0024	Floor insulation- Combination Customer	-7.4468	-0.0084	2.7156	-7.4468	-0.0084	2.7156	25	1	0.9
RZC0055	Rim joist insulation - Combination Customer	72.7635	0.0214	5.2079	72.7635	0.0214	5.2079	25	1	0.9
RZC0060	Window replacement - Combination Customer	1.4290	0.0011	0.0525	1.4290	0.0011	0.0525	25	1	0.9
RZC0063	Natural gas boiler 95% - Combination Customer	-321.3119	0.0000	45.8397	-321.3119	0.0000	45.8397	20	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RZC0077	Setback thermostat - moderate setback - Combination Customer	189.3366	0.0000	9.8472	189.3366	0.0000	9.8472	9	1	0.9
RZC0078	Wi-Fi enabled thermostat – Combination Customer	181.1257	0.0000	9.7536	181.1257	0.0000	9.7536	9	1	0.9
RZC0081	MIM - Roof (attic) insulation - Combination Customer	92.2651	0.0397	6.3735	92.2651	0.0397	6.3735	20	1	0.9
RZC0082	MIM - Wall insulation - Combination Customer	96.6177	0.0301	6.6573	96.6177	0.0301	6.6573	25	1	0.9
RZC0085	MIM - Window replacement - Combination Customers	1.4778	0.0011	0.0530	1.4778	0.0011	0.0530	25	1	0.9
RZC0086	Knee wall insulation - Combination Customers	67.1249	0.0364	4.1647	67.1249	0.0364	4.1647	20	1	0.9
RZC0089	Tier 3 thermostat - Combination	193.7132	0.0000	12.2341	193.7132	0.0000	12.2341	10	1	0.9
RZC0090	R-30 sloped roof (attic) Insulation – Combination Customer	40.1997	0.0181	2.8627	40.1997	0.0181	2.8627	20	1	0.9
RZE0007	Basement wall insulation - Electric Customer	37.6469	-0.0212	0.0000	37.6469	-0.0212	0.0000	25	1	0.9
RZE0008	Crawlspace insulation - Electric Customer	4.0149	-0.0149	0.0000	4.0149	-0.0149	0.0000	25	1	0.9
RZE0009	Duct insulation and/or replacement - Electric Customer	54.1916	0.0315	0.0000	54.1916	0.0315	0.0000	20	1	0.9
RZE0011	Duct sealing 30% reduction - Electric Customer	170.5603	0.0946	0.0000	170.5603	0.0946	0.0000	18	1	0.9
RZE0012	Floor insulation - Electric Customer	12.9272	-0.0190	0.0000	12.9272	-0.0190	0.0000	25	1	0.9
RZE0018	Infiltration reduction of 20% - Electric Customer	133.8356	0.0408	0.0000	133.8356	0.0408	0.0000	13	1	0.9

CADMUS

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RZE0019	Infiltration reduction of 30% - Electric Customer	208.2900	0.0633	0.0000	208.2900	0.0633	0.0000	13	1	0.9
RZE0020	Infiltration reduction of 50% - Electric Customer	408.9870	0.1329	0.0000	408.9870	0.1329	0.0000	13	1	0.9
RZE0021	Operations & Maintenance HVAC tune up - Electric Customer	77.4994	0.1133	0.0000	77.4994	0.1133	0.0000	5	1	0.9
RZE0022	Roof (attic) insulation - Electric Customer	99.1564	0.0384	0.0000	99.1564	0.0384	0.0000	20	1	0.9
RZE0023	Wall insulation - Electric Customer	97.9964	0.0253	0.0000	97.9964	0.0253	0.0000	25	1	0.9
RZE0055	Rim joist insulation - Electric Customer	100.6058	0.0305	0.0000	100.6058	0.0305	0.0000	25	1	0.9
RZE0058	Split system central AC >SEER 15	237.6722	0.0927	0.0000	237.6722	0.0927	0.0000	15	1	0.9
RZE0063	Window replacement - Electric Customer	1.4450	0.0009	0.0000	1.4450	0.0009	0.0000	25	1	0.9
RZE0064	ECM Motor	730.0000	0.0657	0.0000	730.0000	0.0657	0.0000	10	1	0.9
RZE0077	Setback thermostat - moderate setback - Electric Customer	186.8250	0.0000	0.0000	186.8250	0.0000	0.0000	9	1	0.9
RZE0078	Wi-Fi enabled thermostat – Electric Customer	289.2329	0.0000	0.0000	289.2329	0.0000	0.0000	9	1	0.9
RZE0082	MIM - Roof (attic) insulation - Electric Customer	105.5696	0.0403	0.0000	105.5696	0.0403	0.0000	20	1	0.9
RZE0083	MIM - Wall insulation - Electric Customer	107.5433	0.0309	0.0000	107.5433	0.0309	0.0000	25	1	0.9
RZE0085	MIM - Window replacement - Electric Customers	1.4840	0.0010	0.0000	1.4840	0.0010	0.0000	25	1	0.9
RZE0086	Split system central AC >SEER 16	440.1341	0.3134	0.0000	440.1341	0.3134	0.0000	15	1	0.9

CADMUS

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RZE0087	Split system central AC >SEER 17	390.5289	0.2905	0.0000	390.5289	0.2905	0.0000	15	1	0.9
RZE0088	Split system central AC >SEER 18	483.1732	0.4219	0.0000	483.1732	0.4219	0.0000	15	1	0.9
RZE0089	Split system central AC >SEER 19	770.0815	0.7439	0.0000	770.0815	0.7439	0.0000	15	1	0.9
RZE0090	Split system central AC >SEER 20	604.2724	0.6173	0.0000	604.2724	0.6173	0.0000	15	1	0.9
RZE0093	Knee wall insulation - Electric Customer	196.3247	0.0705	0.0000	196.3247	0.0705	0.0000	20	1	0.9
RZE0096	Tier 3 thermostat - Electric Customer	206.7175	0.0000	0.0000	206.7175	0.0000	0.0000	10	1	0.9
RZE0097	R-30 Sloped roof (attic) insulation - Electric	48.1278	0.0186	0.0000	48.1278	0.0186	0.0000	20	1	0.9
RZG0007	Basement wall insulation - Gas Customer	0.0000	0.0000	4.6268	0.0000	0.0000	4.6268	25	1	0.9
RZG0008	Crawlspace insulation - Gas Customer	0.0000	0.0000	1.5980	0.0000	0.0000	1.5980	25	1	0.9
RZG0009	Duct insulation and/or replacement - Gas Customer	0.0000	0.0000	3.7023	0.0000	0.0000	3.7023	20	1	0.9
RZG0010	Duct sealing 15% reduction - Gas Customer	0.0000	0.0000	1.9634	0.0000	0.0000	1.9634	18	1	0.9
RZG0011	Duct sealing 30% reduction - Gas Customer	0.0000	0.0000	5.1712	0.0000	0.0000	5.1712	18	1	0.9
RZG0012	Floor insulation - Gas Customer	0.0000	0.0000	3.6027	0.0000	0.0000	3.6027	25	1	0.9
RZG0014	Gas Furnace 95% AFUE	0.0000	0.0000	18.4471	0.0000	0.0000	18.4471	15	1	0.9
RZG0015	Gas Furnace 96% AFUE	0.0000	0.0000	21.2007	0.0000	0.0000	21.2007	15	1	0.9
RZG0016	Gas Furnace 97% AFUE	0.0000	0.0000	23.3660	0.0000	0.0000	23.3660	15	1	0.9
RZG0017	Gas Furnace 98% AFUE	0.0000	0.0000	28.1472	0.0000	0.0000	28.1472	15	1	0.9
RZG0018	Infiltration reduction of 20% - Gas Customer	0.0000	0.0000	8.3384	0.0000	0.0000	8.3384	13	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RZG0019	Infiltration reduction of 30% - Gas Customer	0.0000	0.0000	12.8077	0.0000	0.0000	12.8077	13	1	0.9
RZG0020	Infiltration reduction of 50% - Gas Customer	0.0000	0.0000	20.2764	0.0000	0.0000	20.2764	13	1	0.9
RZG0021	Operations & Maintenance HVAC tune up - Gas Customer	0.0000	0.0000	5.5438	0.0000	0.0000	5.5438	5	1	0.9
RZG0022	Roof (attic) insulation - Gas Customer	0.0000	0.0000	5.0679	0.0000	0.0000	5.0679	20	1	0.9
RZG0023	Wall insulation - Gas Customer	0.0000	0.0000	5.0732	0.0000	0.0000	5.0732	25	1	0.9
RZG0055	Rim joist insulation - Gas Customer	0.0000	0.0000	5.6306	0.0000	0.0000	5.6306	25	1	0.9
RZG0056	Super high efficiency Gas water heater - Gas or Combination Customer	0.0000	0.0000	4.8714	0.0000	0.0000	4.8700*	13	1	0.9
RZG0057	Tankless water heater - Gas or Combination Customer	0.0000	0.0000	5.2611	0.0000	0.0000	5.2596*	20	1	0.9
RZG0060	Window replacement - Gas Customer	0.0000	0.0000	0.0483	0.0000	0.0000	0.0483	25	1	0.9
RZG0077	Setback thermostat - moderate setback -Gas Customer	0.0000	0.0000	9.6886	0.0000	0.0000	9.6886	9	1	0.9
RZG0078	Wi-Fi enabled thermostat – Gas Customer	0.0000	0.0000	10.7344	0.0000	0.0000	10.7344	9	1	0.9
RZG0081	MIM - Floor insulation - Gas Customer	0.0000	0.0000	2.3918	0.0000	0.0000	2.3918	25	1	0.9
RZG0082	MIM - Roof (attic) insulation - Gas Customer	0.0000	0.0000	5.3849	0.0000	0.0000	5.3849	20	1	0.9
RZG0083	MIM - Wall insulation - Gas Customer	0.0000	0.0000	3.6501	0.0000	0.0000	3.6501	25	1	0.9
RZG0085	MIM - Super high efficiency gas water heater	0.0000	0.0000	4.8714	0.0000	0.0000	4.8700*	13	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
	- Gas or Combination Customer									
RZG0086	MIM - Window replacement - Gas Customer	0.0000	0.0000	0.0485	0.0000	0.0000	0.0485	25	1	0.9
RZG0087	Knee wall insulation - Gas Customer	0.0000	0.0000	4.9727	0.0000	0.0000	4.9727	20	1	0.9
RZG0088	MIM - Knee wall insulation - Gas Customer	0.0000	0.0000	8.4562	0.0000	0.0000	8.4562	20	1	0.9
RZG0089	Wi-Fi enabled thermostat (Full Setback) – Gas Customer	0.0000	0.0000	20.7587	0.0000	0.0000	20.7587	9	1	0.9
RZG0090	Tier 3 thermostat – Gas Customer	0.0000	0.0000	15.4153	0.0000	0.0000	15.4153	10	1	0.9
RZG0091	R-30 Sloped roof (attic) insulation – Gas Customer	0.0000	0.0000	2.6908	0.0000	0.0000	2.6908	20	1	0.9

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the Home Performance with ENERGY STAR appendix.

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Task 3: Documentation Review

Cadmus selected and reviewed program documentation for a random sample of 61 participants from the Consumers Energy eTracker database, including invoices, applications, and any additional documentation available to validate measure installation data. Cadmus additionally reviewed Wi-Fi enabled and tier three thermostat measures RZC0078, RZC0089, RZE0078, RZE0096, RZG0078, and RZG0090 as part of the Wi-Fi thermostat model number review (see Table 5). Table 54 documents reported and verified measure counts as well as reported and verified energy savings by fuel type and demand reduction for the sample applications.

Table 54. Sample Participation and Savings by Measure (Home Performance with ENERGY STAR)

Consumers Energy Measure ID	Reported by EWR Provider				Verified			
	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF
RZC0008	4	-0.0732	9.4376	-5.4888	4	-0.0732	9.4376	-5.4888
RZC0010	2	0.0376	2.9900	69.2924	2	0.0376	2.9900	69.2924
RZC0011	4	0.3172	17.5952	447.9960	4	0.3172	17.5952	447.9960
RZC0018	1	0.0510	8.3446	118.1461	1	0.0510	8.3446	118.1461
RZC0019	3	0.2508	40.6581	558.7263	3	0.2508	40.6581	558.7263
RZC0020	1	0.1748	25.3459	343.3911	1	0.1748	25.3459	343.3911
RZC0022	1	0.0381	5.2416	76.6928	1	0.0381	5.2416	76.6928
RZC0023	3	0.0885	19.3512	282.1659	3	0.0885	19.3512	282.1659
RZC0055	7	0.1498	36.4553	509.3445	7	0.1498	36.4553	509.3445
RZC0060	170	0.1870	8.9250	1.4290	170	0.1870	8.9250	1.4290
RZC0078	5	0.0000	48.7680	905.6285	5	0.0000	48.7680	905.6285
RZC0081	1	0.0397	6.3735	92.2651	1	0.0397	6.3735	92.2651
RZC0085	35	0.0385	1.8550	1.4778	35	0.0385	1.8550	1.4778
RZC0089	8	0.0000	97.8728	1,549.7056	8	0.0000	97.8728	1,549.7056
RZC0090	1	0.0181	2.8627	40.1997	1	0.0181	2.8627	40.1997
RZC0103	3	0.0000	0.0000	0.0000	3	0.0000	0.0000	0.0000
RZC0104	9	0.0000	0.0000	0.0000	9	0.0000	0.0000	0.0000
RZC0105	3	0.0000	0.0000	0.0000	3	0.0000	0.0000	0.0000
RZC0113	5	0.0000	0.0000	0.0000	5	0.0000	0.0000	0.0000
RZE0007	1	-0.0212	0.0000	37.6469	1	-0.0212	0.0000	37.6469
RZE0012	1	-0.0190	0.0000	12.9272	1	-0.0190	0.0000	12.9272
RZE0018	4	0.1632	0.0000	535.3424	4	0.1632	0.0000	535.3424
RZE0020	2	0.2658	0.0000	817.9740	2	0.2658	0.0000	817.9740
RZE0022	1	0.0384	0.0000	99.1564	1	0.0384	0.0000	99.1564
RZE0023	1	0.0253	0.0000	97.9964	1	0.0253	0.0000	97.9964
RZE0055	6	0.1830	0.0000	603.6348	6	0.1830	0.0000	603.6348
RZE0058	1	0.0927	0.0000	237.6722	1	0.0927	0.0000	237.6722
RZE0063	249	0.2241	0.0000	4.3350	249	0.2241	0.0000	4.3350
RZE0064	11	0.7227	0.0000	8,030.0000	11	0.7227	0.0000	8,030.0000
RZE0082	5	0.2015	0.0000	527.8480	5	0.2015	0.0000	527.8480
RZE0083	1	0.0309	0.0000	107.5433	1	0.0309	0.0000	107.5433
RZE0086	3	0.9402	0.0000	1,320.4023	3	0.9402	0.0000	1,320.4023

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Consumers Energy Measure ID	Reported by EWR Provider				Verified			
	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF
RZE0087	4	1.1620	0.0000	1,562.1156	4	1.1620	0.0000	1,562.1156
RZE0089	3	2.2317	0.0000	2,310.2445	3	2.2317	0.0000	2,310.2445
RZE0093	1	0.0705	0.0000	196.3247	1	0.0705	0.0000	196.3247
RZE0097	1	0.0186	0.0000	48.1278	1	0.0186	0.0000	48.1278
RZE0103	2	0.0000	0.0000	0.0000	2	0.0000	0.0000	0.0000
RZE0104	2	0.0000	0.0000	0.0000	2	0.0000	0.0000	0.0000
RZE0105	2	0.0000	0.0000	0.0000	2	0.0000	0.0000	0.0000
RZG0008	2	0.0000	3.1960	0.0000	2	0.0000	3.1960	0.0000
RZG0009	7	0.0000	25.9161	0.0000	7	0.0000	25.9161	0.0000
RZG0010	3	0.0000	5.8902	0.0000	3	0.0000	5.8902	0.0000
RZG0011	3	0.0000	15.5136	0.0000	3	0.0000	15.5136	0.0000
RZG0015	3	0.0000	63.6021	0.0000	3	0.0000	63.6021	0.0000
RZG0016	4	0.0000	93.4640	0.0000	4	0.0000	93.4640	0.0000
RZG0017	8	0.0000	225.1776	0.0000	8	0.0000	225.1776	0.0000
RZG0018	7	0.0000	58.3688	0.0000	7	0.0000	58.3688	0.0000
RZG0019	12	0.0000	153.6924	0.0000	12	0.0000	153.6924	0.0000
RZG0020	4	0.0000	81.1056	0.0000	4	0.0000	81.1056	0.0000
RZG0021	7	0.0000	38.8066	0.0000	7	0.0000	38.8066	0.0000
RZG0022	15	0.0000	76.0185	0.0000	15	0.0000	76.0185	0.0000
RZG0023	3	0.0000	15.2196	0.0000	3	0.0000	15.2196	0.0000
RZG0055	20	0.0000	112.6120	0.0000	20	0.0000	112.6120	0.0000
RZG0056	1	0.0000	4.8714	0.0000	1	0.0000	4.8714	0.0000
RZG0060	22	0.0000	1.0626	0.0000	22	0.0000	1.0626	0.0000
RZG0078	6	0.0000	64.4064	0.0000	6	0.0000	64.4064	0.0000
RZG0082	9	0.0000	48.4641	0.0000	9	0.0000	48.4641	0.0000
RZG0087	9	0.0000	44.7543	0.0000	9	0.0000	44.7543	0.0000
RZG0088	1	0.0000	8.4562	0.0000	1	0.0000	8.4562	0.0000
RZG0089	1	0.0000	20.7587	0.0000	1	0.0000	20.7587	0.0000
RZG0101	8	0.0000	0.0000	0.0000	8	0.0000	0.0000	0.0000
RZG0103	10	0.0000	0.0000	0.0000	10	0.0000	0.0000	0.0000
RZG0104	5	0.0000	0.0000	0.0000	5	0.0000	0.0000	0.0000
RZG0105	4	0.0000	0.0000	0.0000	4	0.0000	0.0000	0.0000
RZG0106	2	0.0000	0.0000	0.0000	2	0.0000	0.0000	0.0000
RZG0107	4	0.0000	0.0000	0.0000	4	0.0000	0.0000	0.0000
RZG0118	1	0.0000	0.0000	0.0000	1	0.0000	0.0000	0.0000
Sample Total	748	7.6483	1,493.4333	21,540.2635	748	7.6483	1,493.4333	21,540.2635

Cadmus found no discrepancies between the Consumers Energy eTracker database and the supporting documentation. Table 55 provides sample realization rates by fuel type, and shows t-test statistics that Cadmus used to analyze errors in the general sample.

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Table 55. Sample Realization Rates and t-Statistic (Home Performance with ENERGY STAR)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	100.00%
Standard Error	0.0000	0.0000	0.0000
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to program population?	No	No	No

Task 4: Calculation of Certified Annual and Lifetime Savings

Cadmus calculated annual and lifetime savings. The following tables present verified program participation, energy savings by measure, and demand reduction: Table 56 and Table 57 document kWh savings, Table 58 documents kW savings, and Table 59 and Table 60 document MCF savings.

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Table 56. Certified Participation and First-Year kWh Savings by Measure (Home Performance with ENERGY STAR)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RZC0007	4	4	100.0752	100.0752	1.0000	100.0752	0.9000	90.0677	0.9000
RZC0008	38	38	-52.1436	-52.1436	1.0000	-52.1436	0.9000	-46.9292	0.0000
RZC0009	7	7	135.5326	135.5326	1.0000	135.5326	0.9000	121.9793	0.9000
RZC0010	22	22	762.2164	762.2164	1.0000	762.2164	0.9000	685.9948	0.9000
RZC0011	42	42	4,703.9580	4,703.9580	1.0000	4,703.9580	0.9000	4,233.5622	0.9000
RZC0018	42	42	4,962.1362	4,962.1362	1.0000	4,962.1362	0.9000	4,465.9226	0.9000
RZC0019	35	35	6,518.4735	6,518.4735	1.0000	6,518.4735	0.9000	5,866.6262	0.9000
RZC0020	39	39	13,392.2529	13,392.2529	1.0000	13,392.2529	0.9000	12,053.0276	0.9000
RZC0022	55	55	4,218.1040	4,218.1040	1.0000	4,218.1040	0.9000	3,796.2936	0.9000
RZC0023	52	52	4,890.8756	4,890.8756	1.0000	4,890.8756	0.9000	4,401.7880	0.9000
RZC0024	2	2	-14.8936	-14.8936	1.0000	-14.8936	0.9000	-13.4042	0.0000
RZC0055	115	115	8,367.8025	8,367.8025	1.0000	8,367.8025	0.9000	7,531.0223	0.9000
RZC0060	1,687	1,687	2,410.7230	2,410.7230	1.0000	2,410.7230	0.9000	2,169.6507	0.9000
RZC0063	1	1	-321.3119	-321.3119	1.0000	-321.3119	0.9000	-289.1807	0.0000
RZC0077	8	8	1,514.6928	1,514.6928	1.0000	1,514.6928	0.9000	1,363.2235	0.9000
RZC0078	86	86	15,576.8102	15,576.8102	1.0000	15,576.8102	0.9000	14,019.1292	0.9000
RZC0081	9	9	830.3859	830.3859	1.0000	830.3859	0.9000	747.3473	0.9000
RZC0082	4	4	386.4708	386.4708	1.0000	386.4708	0.9000	347.8237	0.9000
RZC0085	644	644	951.7032	951.7032	1.0000	951.7032	0.9000	856.5329	0.9000
RZC0086	20	20	1,342.4980	1,342.4980	1.0000	1,342.4980	0.9000	1,208.2482	0.9000
RZC0089	72	72	13,947.3504	13,947.3504	1.0000	13,947.3504	0.9000	12,552.6154	0.9000
RZC0090	13	13	522.5961	522.5961	1.0000	522.5961	0.9000	470.3365	0.9000
RZE0007	3	3	112.9407	112.9407	1.0000	112.9407	0.9000	101.6466	0.9000
RZE0008	14	14	56.2086	56.2086	1.0000	56.2086	0.9000	50.5877	0.9000
RZE0009	3	3	162.5748	162.5748	1.0000	162.5748	0.9000	146.3173	0.9000
RZE0011	1	1	170.5603	170.5603	1.0000	170.5603	0.9000	153.5043	0.9000
RZE0012	3	3	38.7816	38.7816	1.0000	38.7816	0.9000	34.9034	0.9000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RZE0018	47	47	6,290.2732	6,290.2732	1.0000	6,290.2732	0.9000	5,661.2459	0.9000
RZE0019	28	28	5,832.1200	5,832.1200	1.0000	5,832.1200	0.9000	5,248.9080	0.9000
RZE0020	16	16	6,543.7920	6,543.7920	1.0000	6,543.7920	0.9000	5,889.4128	0.9000
RZE0021	3	3	232.4982	232.4982	1.0000	232.4982	0.9000	209.2484	0.9000
RZE0022	22	22	2,181.4408	2,181.4408	1.0000	2,181.4408	0.9000	1,963.2967	0.9000
RZE0023	20	20	1,959.9280	1,959.9280	1.0000	1,959.9280	0.9000	1,763.9352	0.9000
RZE0055	130	130	13,078.7540	13,078.7540	1.0000	13,078.7540	0.9000	11,770.8786	0.9000
RZE0058	36	36	8,556.1992	8,556.1992	1.0000	8,556.1992	0.9000	7,700.5793	0.9000
RZE0063	3,610	3,610	5,216.4500	5,216.4500	1.0000	5,216.4500	0.9000	4,694.8050	0.9000
RZE0064	170	170	124,100.0000	124,100.0000	1.0000	124,100.0000	0.9000	111,690.0000	0.9000
RZE0077	2	2	373.6500	373.6500	1.0000	373.6500	0.9000	336.2850	0.9000
RZE0078	3	3	867.6987	867.6987	1.0000	867.6987	0.9000	780.9288	0.9000
RZE0082	74	74	7,812.1504	7,812.1504	1.0000	7,812.1504	0.9000	7,030.9354	0.9000
RZE0083	17	17	1,828.2361	1,828.2361	1.0000	1,828.2361	0.9000	1,645.4125	0.9000
RZE0085	676	676	1,003.1840	1,003.1840	1.0000	1,003.1840	0.9000	902.8656	0.9000
RZE0086	34	34	14,964.5594	14,964.5594	1.0000	14,964.5594	0.9000	13,468.1035	0.9000
RZE0087	53	53	20,698.0317	20,698.0317	1.0000	20,698.0317	0.9000	18,628.2285	0.9000
RZE0088	5	5	2,415.8660	2,415.8660	1.0000	2,415.8660	0.9000	2,174.2794	0.9000
RZE0089	19	19	14,631.5485	14,631.5485	1.0000	14,631.5485	0.9000	13,168.3937	0.9000
RZE0090	15	15	9,064.0860	9,064.0860	1.0000	9,064.0860	0.9000	8,157.6774	0.9000
RZE0093	20	20	3,926.4940	3,926.4940	1.0000	3,926.4940	0.9000	3,533.8446	0.9000
RZE0096	2	2	413.4350	413.4350	1.0000	413.4350	0.9000	372.0915	0.9000
RZE0097	8	8	385.0224	385.0224	1.0000	385.0224	0.9000	346.5202	0.9000
Total:	8,031	8,031	338,062.7918	338,062.7918	1.0000	338,062.7918	0.9000	304,256.5129	0.8460



Table 57. Certified Lifetime kWh Savings by Measure (Home Performance with ENERGY STAR)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RZC0007	90.0677	25.0000	2,251.6920
RZC0008	-46.9292	25.0000	-1,173.2310
RZC0009	121.9793	20.0000	2,439.5868
RZC0010	685.9948	18.0000	12,347.9057
RZC0011	4,233.5622	18.0000	76,204.1196
RZC0018	4,465.9226	13.0000	58,056.9935
RZC0019	5,866.6262	13.0000	76,266.1400
RZC0020	12,053.0276	13.0000	156,689.3589
RZC0022	3,796.2936	20.0000	75,925.8720
RZC0023	4,401.7880	25.0000	110,044.7010
RZC0024	-13.4042	25.0000	-335.1060
RZC0055	7,531.0223	25.0000	188,275.5563
RZC0060	2,169.6507	25.0000	54,241.2675
RZC0063	-289.1807	20.0000	-5,783.6142
RZC0077	1,363.2235	9.0000	12,269.0117
RZC0078	14,019.1292	9.0000	126,172.1626
RZC0081	747.3473	20.0000	14,946.9462
RZC0082	347.8237	25.0000	8,695.5930
RZC0085	856.5329	25.0000	21,413.3220
RZC0086	1,208.2482	20.0000	24,164.9640
RZC0089	12,552.6154	10.0000	125,526.1536
RZC0090	470.3365	20.0000	9,406.7298
RZE0007	101.6466	25.0000	2,541.1658
RZE0008	50.5877	25.0000	1,264.6935
RZE0009	146.3173	20.0000	2,926.3464
RZE0011	153.5043	18.0000	2,763.0769
RZE0012	34.9034	25.0000	872.5860
RZE0018	5,661.2459	13.0000	73,596.1964
RZE0019	5,248.9080	13.0000	68,235.8040
RZE0020	5,889.4128	13.0000	76,562.3664
RZE0021	209.2484	5.0000	1,046.2419
RZE0022	1,963.2967	20.0000	39,265.9344
RZE0023	1,763.9352	25.0000	44,098.3800
RZE0055	11,770.8786	25.0000	294,271.9650
RZE0058	7,700.5793	15.0000	115,508.6892
RZE0063	4,694.8050	25.0000	117,370.1250
RZE0064	111,690.0000	10.0000	1,116,900.0000
RZE0077	336.2850	9.0000	3,026.5650

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Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RZE0078	780.9288	9.0000	7,028.3595
RZE0082	7,030.9354	20.0000	140,618.7072
RZE0083	1,645.4125	25.0000	41,135.3123
RZE0085	902.8656	25.0000	22,571.6400
RZE0086	13,468.1035	15.0000	202,021.5519
RZE0087	18,628.2285	15.0000	279,423.4280
RZE0088	2,174.2794	15.0000	32,614.1910
RZE0089	13,168.3937	15.0000	197,525.9048
RZE0090	8,157.6774	15.0000	122,365.1610
RZE0093	3,533.8446	20.0000	70,676.8920
RZE0096	372.0915	10.0000	3,720.9150
RZE0097	346.5202	20.0000	6,930.4032
Total:	304,256.5129		4,234,928.7268

CADMUS

Table 58. Certified Program Participation and kW Savings by Measure (Home Performance with ENERGY STAR)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RZC0007	4	4	-0.1156	-0.1156	1.0000	-0.1156	0.9000	-0.1040	0.0000
RZC0008	38	38	-0.6954	-0.6954	1.0000	-0.6954	0.9000	-0.6259	0.0000
RZC0009	7	7	0.1834	0.1834	1.0000	0.1834	0.9000	0.1651	0.9002
RZC0010	22	22	0.4136	0.4136	1.0000	0.4136	0.9000	0.3722	0.8999
RZC0011	42	42	3.3306	3.3306	1.0000	3.3306	0.9000	2.9975	0.9000
RZC0018	42	42	2.1420	2.1420	1.0000	2.1420	0.9000	1.9278	0.9000
RZC0019	35	35	2.9260	2.9260	1.0000	2.9260	0.9000	2.6334	0.9000
RZC0020	39	39	6.8172	6.8172	1.0000	6.8172	0.9000	6.1355	0.9000
RZC0022	55	55	2.0955	2.0955	1.0000	2.0955	0.9000	1.8860	0.9000
RZC0023	52	52	1.5340	1.5340	1.0000	1.5340	0.9000	1.3806	0.9000
RZC0024	2	2	-0.0168	-0.0168	1.0000	-0.0168	0.9000	-0.0151	0.0000
RZC0055	115	115	2.4610	2.4610	1.0000	2.4610	0.9000	2.2149	0.9000
RZC0060	1,687	1,687	1.8557	1.8557	1.0000	1.8557	0.9000	1.6701	0.9000
RZC0081	9	9	0.3573	0.3573	1.0000	0.3573	0.9000	0.3216	0.9001
RZC0082	4	4	0.1204	0.1204	1.0000	0.1204	0.9000	0.1084	0.9003
RZC0085	644	644	0.7084	0.7084	1.0000	0.7084	0.9000	0.6376	0.9001
RZC0086	20	20	0.7280	0.7280	1.0000	0.7280	0.9000	0.6552	0.9000
RZC0090	13	13	0.2353	0.2353	1.0000	0.2353	0.9000	0.2118	0.9001
RZE0007	3	3	-0.0636	-0.0636	1.0000	-0.0636	0.9000	-0.0572	0.0000
RZE0008	14	14	-0.2086	-0.2086	1.0000	-0.2086	0.9000	-0.1877	0.0000
RZE0009	3	3	0.0945	0.0945	1.0000	0.0945	0.9000	0.0851	0.9005
RZE0011	1	1	0.0946	0.0946	1.0000	0.0946	0.9000	0.0851	0.8996
RZE0012	3	3	-0.0570	-0.0570	1.0000	-0.0570	0.9000	-0.0513	0.0000
RZE0018	47	47	1.9176	1.9176	1.0000	1.9176	0.9000	1.7258	0.9000
RZE0019	28	28	1.7724	1.7724	1.0000	1.7724	0.9000	1.5952	0.9000
RZE0020	16	16	2.1264	2.1264	1.0000	2.1264	0.9000	1.9138	0.9000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RZE0021	3	3	0.3399	0.3399	1.0000	0.3399	0.9000	0.3059	0.9000
RZE0022	22	22	0.8448	0.8448	1.0000	0.8448	0.9000	0.7603	0.9000
RZE0023	20	20	0.5060	0.5060	1.0000	0.5060	0.9000	0.4554	0.9000
RZE0055	130	130	3.9650	3.9650	1.0000	3.9650	0.9000	3.5685	0.9000
RZE0058	36	36	3.3372	3.3372	1.0000	3.3372	0.9000	3.0035	0.9000
RZE0063	3,610	3,610	3.2490	3.2490	1.0000	3.2490	0.9000	2.9241	0.9000
RZE0064	170	170	11.1690	11.1690	1.0000	11.1690	0.9000	10.0521	0.9000
RZE0082	74	74	2.9822	2.9822	1.0000	2.9822	0.9000	2.6840	0.9000
RZE0083	17	17	0.5253	0.5253	1.0000	0.5253	0.9000	0.4728	0.9001
RZE0085	676	676	0.6760	0.6760	1.0000	0.6760	0.9000	0.6084	0.9000
RZE0086	34	34	10.6556	10.6556	1.0000	10.6556	0.9000	9.5900	0.9000
RZE0087	53	53	15.3965	15.3965	1.0000	15.3965	0.9000	13.8569	0.9000
RZE0088	5	5	2.1095	2.1095	1.0000	2.1095	0.9000	1.8986	0.9000
RZE0089	19	19	14.1341	14.1341	1.0000	14.1341	0.9000	12.7207	0.9000
RZE0090	15	15	9.2595	9.2595	1.0000	9.2595	0.9000	8.3336	0.9000
RZE0093	20	20	1.4100	1.4100	1.0000	1.4100	0.9000	1.2690	0.9000
RZE0097	8	8	0.1488	0.1488	1.0000	0.1488	0.9000	0.1339	0.8999
Total:	7,857	7,857	111.4653	111.4653	1.0000	111.4653	0.9000	100.3192	0.7744

CADMUS

Table 59. Certified Program Participation and First-Year MCF Savings by Measure (Home Performance with ENERGY STAR)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RZC0007	4	4	22.4796	22.4796	1.0000	22.4796	0.9000	20.2316	0.9000
RZC0008	38	38	89.6572	89.6572	1.0000	89.6572	0.9000	80.6915	0.9000
RZC0009	7	7	29.4441	29.4441	1.0000	29.4441	0.9000	26.4997	0.9000
RZC0010	22	22	32.8900	32.8900	1.0000	32.8900	0.9000	29.6010	0.9000
RZC0011	42	42	184.7496	184.7496	1.0000	184.7496	0.9000	166.2746	0.9000
RZC0018	42	42	350.4732	350.4732	1.0000	350.4732	0.9000	315.4259	0.9000
RZC0019	35	35	474.3445	474.3445	1.0000	474.3445	0.9000	426.9101	0.9000
RZC0020	39	39	988.4901	988.4901	1.0000	988.4901	0.9000	889.6411	0.9000
RZC0022	55	55	288.2880	288.2880	1.0000	288.2880	0.9000	259.4592	0.9000
RZC0023	52	52	335.4208	335.4208	1.0000	335.4208	0.9000	301.8787	0.9000
RZC0024	2	2	5.4312	5.4312	1.0000	5.4312	0.9000	4.8881	0.9000
RZC0055	115	115	598.9085	598.9085	1.0000	598.9085	0.9000	539.0177	0.9000
RZC0060	1,687	1,687	88.5675	88.5675	1.0000	88.5675	0.9000	79.7108	0.9000
RZC0063	1	1	45.8397	45.8397	1.0000	45.8397	0.9000	41.2557	0.9000
RZC0077	8	8	78.7776	78.7776	1.0000	78.7776	0.9000	70.8998	0.9000
RZC0078	86	86	838.8096	838.8096	1.0000	838.8096	0.9000	754.9286	0.9000
RZC0081	9	9	57.3615	57.3615	1.0000	57.3615	0.9000	51.6254	0.9000
RZC0082	4	4	26.6292	26.6292	1.0000	26.6292	0.9000	23.9663	0.9000
RZC0085	644	644	34.1320	34.1320	1.0000	34.1320	0.9000	30.7188	0.9000
RZC0086	20	20	83.2940	83.2940	1.0000	83.2940	0.9000	74.9646	0.9000
RZC0089	72	72	880.8552	880.8552	1.0000	880.8552	0.9000	792.7697	0.9000
RZC0090	13	13	37.2151	37.2151	1.0000	37.2151	0.9000	33.4936	0.9000
RZG0007	7	7	32.3876	32.3876	1.0000	32.3876	0.9000	29.1488	0.9000
RZG0008	32	32	51.1360	51.1360	1.0000	51.1360	0.9000	46.0224	0.9000
RZG0009	53	53	196.2219	196.2219	1.0000	196.2219	0.9000	176.5997	0.9000
RZG0010	29	29	56.9386	56.9386	1.0000	56.9386	0.9000	51.2447	0.9000
RZG0011	17	17	87.9104	87.9104	1.0000	87.9104	0.9000	79.1194	0.9000

CADMUS

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RZG0012	12	12	43.2324	43.2324	1.0000	43.2324	0.9000	38.9092	0.9000
RZG0014	8	8	147.5768	147.5768	1.0000	147.5768	0.9000	132.8191	0.9000
RZG0015	65	65	1,378.0455	1,378.0455	1.0000	1,378.0455	0.9000	1,240.2410	0.9000
RZG0016	49	49	1,144.9340	1,144.9340	1.0000	1,144.9340	0.9000	1,030.4406	0.9000
RZG0017	76	76	2,139.1872	2,139.1872	1.0000	2,139.1872	0.9000	1,925.2685	0.9000
RZG0018	97	97	808.8248	808.8248	1.0000	808.8248	0.9000	727.9423	0.9000
RZG0019	147	147	1,882.7319	1,882.7319	1.0000	1,882.7319	0.9000	1,694.4587	0.9000
RZG0020	56	56	1,135.4784	1,135.4784	1.0000	1,135.4784	0.9000	1,021.9306	0.9000
RZG0021	92	92	510.0296	510.0296	1.0000	510.0296	0.9000	459.0266	0.9000
RZG0022	174	174	881.8146	881.8146	1.0000	881.8146	0.9000	793.6331	0.9000
RZG0023	58	58	294.2456	294.2456	1.0000	294.2456	0.9000	264.8210	0.9000
RZG0055	263	263	1,480.8478	1,480.8478	1.0000	1,480.8478	0.9000	1,332.7630	0.9000
RZG0056	16	16	77.9424	77.9200	1.0000	77.9200	0.9000	70.1280	0.8997
RZG0057	4	4	21.0444	21.0384	1.0000	21.0384	0.9000	18.9346	0.8997
RZG0060	2,224	2,224	107.4192	107.4192	1.0000	107.4192	0.9000	96.6773	0.9000
RZG0077	1	1	9.6886	9.6886	1.0000	9.6886	0.9000	8.7197	0.9000
RZG0078	50	50	536.7200	536.7200	1.0000	536.7200	0.9000	483.0480	0.9000
RZG0081	1	1	2.3918	2.3918	1.0000	2.3918	0.9000	2.1526	0.9000
RZG0082	97	97	522.3353	522.3353	1.0000	522.3353	0.9000	470.1018	0.9000
RZG0083	3	3	10.9503	10.9503	1.0000	10.9503	0.9000	9.8553	0.9000
RZG0085	3	3	14.6142	14.6100	1.0000	14.6100	0.9000	13.1490	0.8997
RZG0086	2,051	2,051	99.4735	99.4735	1.0000	99.4735	0.9000	89.5262	0.9000
RZG0087	88	88	437.5976	437.5976	1.0000	437.5976	0.9000	393.8378	0.9000
RZG0088	1	1	8.4562	8.4562	1.0000	8.4562	0.9000	7.6106	0.9000
RZG0089	1	1	20.7587	20.7587	1.0000	20.7587	0.9000	18.6828	0.9000
RZG0090	21	21	323.7213	323.7213	1.0000	323.7213	0.9000	291.3492	0.9000
RZG0091	5	5	13.4540	13.4540	1.0000	13.4540	0.9000	12.1086	0.9000
Total:	8,798	8,798	20,050.1688	20,050.1362	1.0000	20,050.1362	0.9000	18,045.1227	0.9000

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Table 60. Certified Lifetime MCF Savings by Measure (Home Performance with ENERGY STAR)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RZC0007	20.2316	25.0000	505.7910
RZC0008	80.6915	25.0000	2,017.2870
RZC0009	26.4997	20.0000	529.9938
RZC0010	29.6010	18.0000	532.8180
RZC0011	166.2746	18.0000	2,992.9435
RZC0018	315.4259	13.0000	4,100.5364
RZC0019	426.9101	13.0000	5,549.8307
RZC0020	889.6411	13.0000	11,565.3342
RZC0022	259.4592	20.0000	5,189.1840
RZC0023	301.8787	25.0000	7,546.9680
RZC0024	4.8881	25.0000	122.2020
RZC0055	539.0177	25.0000	13,475.4413
RZC0060	79.7108	25.0000	1,992.7688
RZC0063	41.2557	20.0000	825.1146
RZC0077	70.8998	9.0000	638.0986
RZC0078	754.9286	9.0000	6,794.3578
RZC0081	51.6254	20.0000	1,032.5070
RZC0082	23.9663	25.0000	599.1570
RZC0085	30.7188	25.0000	767.9700
RZC0086	74.9646	20.0000	1,499.2920
RZC0089	792.7697	10.0000	7,927.6968
RZC0090	33.4936	20.0000	669.8718
RZG0007	29.1488	25.0000	728.7210
RZG0008	46.0224	25.0000	1,150.5600
RZG0009	176.5997	20.0000	3,531.9942
RZG0010	51.2447	18.0000	922.4053
RZG0011	79.1194	18.0000	1,424.1485
RZG0012	38.9092	25.0000	972.7290
RZG0014	132.8191	15.0000	1,992.2868
RZG0015	1,240.2410	15.0000	18,603.6143
RZG0016	1,030.4406	15.0000	15,456.6090
RZG0017	1,925.2685	15.0000	28,879.0272
RZG0018	727.9423	13.0000	9,463.2502
RZG0019	1,694.4587	13.0000	22,027.9632
RZG0020	1,021.9306	13.0000	13,285.0973
RZG0021	459.0266	5.0000	2,295.1332
RZG0022	793.6331	20.0000	15,872.6628
RZG0023	264.8210	25.0000	6,620.5260

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Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RZG0055	1,332.7630	25.0000	33,319.0755
RZG0056	70.1280	13.0000	911.6640
RZG0057	18.9346	20.0000	378.6912
RZG0060	96.6773	25.0000	2,416.9320
RZG0077	8.7197	9.0000	78.4777
RZG0078	483.0480	9.0000	4,347.4320
RZG0081	2.1526	25.0000	53.8155
RZG0082	470.1018	20.0000	9,402.0354
RZG0083	9.8553	25.0000	246.3818
RZG0085	13.1490	13.0000	170.9370
RZG0086	89.5262	25.0000	2,238.1538
RZG0087	393.8378	20.0000	7,876.7568
RZG0088	7.6106	20.0000	152.2116
RZG0089	18.6828	9.0000	168.1455
RZG0090	291.3492	10.0000	2,913.4917
RZG0091	12.1086	20.0000	242.1720
Total:	18,045.1227		285,018.2658

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Appendix G: HVAC and Water Heating Program

Table 61 presents reported gross and certified net energy savings by fuel type and demand reduction for the HVAC and Water Heating Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 61. Participation and Savings (HVAC and Water Heating)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	53,362.0000	10,003,778.7967	1,534.7520	522,144.0447
Verified Net Participation and Savings	53,362.0000	9,003,400.9171	1,381.2768	469,928.8233
Verified Actual Lifetime Savings	NA	94,975,033.1133	NA	6,418,474.4960
Program Realization Rate	100.0000%	90.0000%	90.0000%	89.9998%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%	99.9998%
Lifetime Net Verified v. Net Reported Savings	NA	96.3157%	NA	92.2768%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Analysis

Cadmus found a conversion factor error between per-unit measure MCF savings, reported by Consumers Energy, and therm values maintained in the MEMD for gas savings measures RHG0002, RHG0008, and RHG0025. RHG0008 and RHG0025 had discrepancies of 0.0014, and RHG0002 has a discrepancy of 0.0015. Cadmus used the corrected per-unit savings in the final net savings calculations. Wi-Fi enabled thermostat measures RHC0101, RHE0022, RHG0022 had claimed incorrect measures lives of 20 years, while the MEMD records the measure lives for Wi-Fi enabled thermostats as nine years. The measures lives were updated in accordance with the MEMD. All other measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus reviewed gross and net adjustment factors and found no discrepancies. Table 62 presents verified per-unit savings, measure life, and saving adjustment factors for all measures delivered through the 2017 HVAC and Water Heating Program.



Table 62. Verified Per-Unit Measure Characteristics (HVAC and Water Heating)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RHC0100	Setback thermostat - moderate setback - Combination	121.1071	0.0000	6.5309	121.1071	0.0000	6.5309	9	1	0.9
RHC0101	Wi-Fi enabled thermostat - Combination	130.2920	0.0000	7.0228	130.2920	0.0000	7.0228	9*	1	0.9
RHC0103	Setback thermostat - full setback - Combination	184.4109	0.0000	12.7236	184.4109	0.0000	12.7236	9	1	0.9
RHC0104	Wi-Fi enabled thermostat (full setback) - Combination	221.0541	0.0000	15.0357	221.0541	0.0000	15.0357	9	1	0.9
RHC0105	Wi-Fi enabled thermostat tier 3 - Combination	143.8515	0.0000	9.6978	143.8515	0.0000	9.6978	10	1	0.9
RHE0001	ECM blower - intermittent - Electric Customer	730.0000	0.0657	0.0000	730.0000	0.0657	0.0000	10	1	0.9
RHE0004	Setback thermostat - moderate setback - Electric Customer Only	137.1270	0.0000	0.0000	137.1270	0.0000	0.0000	9	1	0.9
RHE0006	Split system central AC >SEER 15	267.3662	0.0820	0.0000	267.3662	0.0820	0.0000	15	1	0.9
RHE0007	Split system central AC >SEER 16	359.4920	0.2294	0.0000	359.4920	0.2294	0.0000	15	1	0.9
RHE0009	Tier 2 ground source heat pump >19 EER	2,385.9714	0.5057	0.0000	2,385.9714	0.5057	0.0000	15	1	0.9
RHE0011	Tier 2 air source heat pump >15 SEER	742.3451	0.2883	0.0000	742.3451	0.2883	0.0000	15	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RHE0012	Tier 3 air source heat pump >16 SEER	839.4490	0.3946	0.0000	839.4490	0.3946	0.0000	15	1	0.9
RHE0016	Operations & maintenance HVAC tune up - Electric	91.9827	0.1300	0.0000	91.9827	0.1300	0.0000	5	1	0.9
RHE0017	Split system central AC >SEER 17	440.1427	0.3317	0.0000	440.1427	0.3317	0.0000	15	1	0.9
RHE0018	Split system central AC >SEER 18	457.9840	0.3841	0.0000	457.9840	0.3841	0.0000	15	1	0.9
RHE0019	Split system central AC >SEER 19	729.6613	0.6449	0.0000	729.6613	0.6449	0.0000	15	1	0.9
RHE0020	Split system central AC >SEER 20	596.1611	0.5763	0.0000	596.1611	0.5763	0.0000	15	1	0.9
RHE0021	Split system central AC >SEER 21	587.1293	0.6154	0.0000	587.1293	0.6154	0.0000	15	1	0.9
RHE0022	Wi-Fi enabled thermostat - Electric	146.6340	0.0000	0.0000	146.6340	0.0000	0.0000	9*	1	0.9
RHE0023	SEER21 minisplit heat pump - Electric only	5,669.0302	-0.0174	0.0000	5,669.0302	-0.0174	0.0000	15	1	0.9
RHE0024	Setback thermostat - full setback (Electric)	174.0812	0.0000	0.0000	174.0812	0.0000	0.0000	9	1	0.9
RHE0025	Wi-Fi enabled thermostat (full setback) - Electric Customer	192.1981	0.0000	0.0000	192.1981	0.0000	0.0000	9	1	0.9
RHE0026	Wi-Fi enabled thermostat tier 3 - Electric	148.4136	0.0000	0.0000	148.4136	0.0000	0.0000	10	1	0.9
RHG0002	Tankless gas water htr. EF > 0.82	0.0000	0.0000	5.2611	0.0000	0.0000	5.2596*	20	1	0.9
RHG0004	Setback thermostat - moderate setback -- Gas Customer	0.0000	0.0000	6.6065	0.0000	0.0000	6.6065	9	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RHG0008	Super high efficiency gas water heater EF>= 0.67	0.0000	0.0000	4.8714	0.0000	0.0000	4.8700*	13	1	0.9
RHG0010	Natural gas furnace 95% AFUE	0.0000	0.0000	18.2238	0.0000	0.0000	18.2238	15	1	0.9
RHG0011	Natural gas furnace 96% AFUE	0.0000	0.0000	20.7065	0.0000	0.0000	20.7065	15	1	0.9
RHG0012	Natural gas furnace 97% AFUE	0.0000	0.0000	23.2025	0.0000	0.0000	23.2025	15	1	0.9
RHG0013	Natural gas furnace 98% AFUE	0.0000	0.0000	24.6200	0.0000	0.0000	24.6200	15	1	0.9
RHG0015 (Combined Fuel)	Natural gas boiler > 92% AFUE (Combined Fuel Savings)	-512.3231	0.0000	66.7842	-512.3231	0.0000	66.7842	20	1	0.9
RHG0015 (Gas Only)	Natural gas boiler > 92% AFUE (Gas Only Savings)	0.0000	0.0000	66.7842	0.0000	0.0000	66.7842	20	1	0.9
RHG0016 (Combined Fuel)	Natural gas boiler > 95% AFUE (Combined Fuel Savings)	-452.2916	0.0000	65.5785	-452.2916	0.0000	65.5785	20	1	0.9
RHG0016 (Gas Only)	Natural gas boiler > 95% AFUE (Gas Only Savings)	0.0000	0.0000	65.5785	0.0000	0.0000	65.5785	20	1	0.9
RHG0022	Wi-Fi enabled thermostat - Gas	0.0000	0.0000	9.5716	0.0000	0.0000	9.5716	9*	1	0.9
RHG0023	Operations & maintenance HVAC Furnace tune up - Gas	0.0000	0.0000	5.4070	0.0000	0.0000	5.4070	2	1	0.9
RHG0024	Operations & maintenance HVAC boiler tune up - Gas	0.0000	0.0000	6.9719	0.0000	0.0000	6.9719	5	1	0.9
RHG0025	MIM super high efficiency gas water	0.0000	0.0000	4.8714	0.0000	0.0000	4.8700*	13	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
	heater (EF greater than or equal to 0.67)									
RHG0026	Setback thermostat - full setback - Gas	0.0000	0.0000	13.9064	0.0000	0.0000	13.9064	9	1	0.9
RHG0027	Wi-Fi enabled thermostat - full setback - Gas	0.0000	0.0000	13.1950	0.0000	0.0000	13.1950	9	1	0.9
RHG0028	Wi-Fi enabled thermostat Tier 3 - Gas	0.0000	0.0000	9.9371	0.0000	0.0000	9.9371	10	1	0.9

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the HVAC and Water Heating appendix

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Task 3: Documentation Review

Cadmus selected and reviewed program documentation for a random sample of 70 participants from the Consumers Energy eTracker database, including invoices, applications, and any additional documentation available to validate measure installation data. Cadmus additionally reviewed Wi-Fi enabled and tier three thermostat measures RHC0101, RHC0105, RHE0022, RHE0026, RHG0022, and RHG0028 as part of the Wi-Fi thermostat model number review (see Table 5). Table 63 documents reported and verified measure counts as well as reported and verified energy savings by fuel type and demand reduction for the sampled applications.

Table 63. Sample Participation and Savings by Measure (HVAC and Water Heating)

Consumers Energy Measure ID	Reported by EWR Provider				Verified			
	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF
RHC0100	2	242.2142	0.0000	13.0618	2	242.2142	0.0000	13.0618
RHC0101	4	521.1680	0.0000	28.0912	4	521.1680	0.0000	28.0912
RHC0103	1	184.4109	0.0000	12.7236	1	184.4109	0.0000	12.7236
RHE0001	25	18,250.0000	1.6425	0.0000	25	18,250.0000	1.6425	0.0000
RHE0004	1	137.1270	0.0000	0.0000	1	137.1270	0.0000	0.0000
RHE0006	2	534.7324	0.1640	0.0000	2	534.7324	0.1640	0.0000
RHE0007	3	1,078.4760	0.6882	0.0000	3	1,078.4760	0.6882	0.0000
RHE0016	3	275.9481	0.3900	0.0000	3	275.9481	0.3900	0.0000
RHE0017	1	440.1427	0.3317	0.0000	1	440.1427	0.3317	0.0000
RHE0020	1	596.1611	0.5763	0.0000	1	596.1611	0.5763	0.0000
RHE0022	3	439.9020	0.0000	0.0000	3	439.9020	0.0000	0.0000
RHE0026	1	148.4136	0.0000	0.0000	1	148.4136	0.0000	0.0000
RHG0004	1	0.0000	0.0000	6.6065	1	0.0000	0.0000	6.6065
RHG0008	1	0.0000	0.0000	4.8714	1	0.0000	0.0000	4.8714
RHG0010	10	0.0000	0.0000	182.2380	10	0.0000	0.0000	182.2380
RHG0011	20	0.0000	0.0000	414.1300	20	0.0000	0.0000	414.1300
RHG0013	2	0.0000	0.0000	49.2400	2	0.0000	0.0000	49.2400
RHG0016	4	-904.5832	0.0000	262.3140	4	-904.5832	0.0000	262.3140
RHG0022	13	0.0000	0.0000	124.4308	13	0.0000	0.0000	124.4308
RHG0023	7	0.0000	0.0000	37.8490	7	0.0000	0.0000	37.8490
RHG0027	1	0.0000	0.0000	13.1950	1	0.0000	0.0000	13.1950
RHG0028	2	0.0000	0.0000	19.8742	2	0.0000	0.0000	19.8742
RHG3000	2	0.0000	0.0000	0.0000	2	0.0000	0.0000	0.0000
Sample Total	110	21,944.1128	3.7927	1,168.6255	110	21,944.1128	3.7927	1,168.6255

Cadmus found no discrepancies between the Consumers Energy eTracker database and the supporting documentation. Table 64 provides sample realization rates by fuel type and shows the t-test statistics Cadmus used to analyze errors in the sample.

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Table 64. Sample Realization Rates and t-Statistic (HVAC and Water Heating)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	100.00%
Standard Error	0.0000	0.0000	0.0000
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to Program Population?	No	No	No

Task 4: Calculation of Verified Annual and Lifetime Savings

Cadmus calculated annual savings and lifetime savings. The following tables present verified program participation, energy savings, and demand reduction by measure. Table 65 and Table 66 document kWh savings, Table 67 documents kW savings, and Table 68 and Table 69 document MCF savings.

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Table 65. Certified Program Participation and First-Year kWh Savings by Measure (HVAC and Water Heating)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RHC0100	2,005	2,005	242,819.7355	242,819.7355	1.0000	242,819.7355	0.9000	218,537.7620	0.9000
RHC0101	1,412	1,412	183,972.3040	183,972.3040	1.0000	183,972.3040	0.9000	165,575.0736	0.9000
RHC0103	9	9	1,659.6981	1,659.6981	1.0000	1,659.6981	0.9000	1,493.7283	0.9000
RHC0104	32	32	7,073.7312	7,073.7312	1.0000	7,073.7312	0.9000	6,366.3581	0.9000
RHC0105	240	240	34,524.3600	34,524.3600	1.0000	34,524.3600	0.9000	31,071.9240	0.9000
RHE0001	10,270	10,270	7,497,100.0000	7,497,100.0000	1.0000	7,497,100.0000	0.9000	6,747,390.0000	0.9000
RHE0004	2,027	2,027	277,956.4290	277,956.4290	1.0000	277,956.4290	0.9000	250,160.7861	0.9000
RHE0006	1,576	1,576	421,369.1312	421,369.1312	1.0000	421,369.1312	0.9000	379,232.2181	0.9000
RHE0007	1,582	1,582	568,716.3440	568,716.3440	1.0000	568,716.3440	0.9000	511,844.7096	0.9000
RHE0009	43	43	102,596.7702	102,596.7702	1.0000	102,596.7702	0.9000	92,337.0932	0.9000
RHE0011	12	12	8,908.1412	8,908.1412	1.0000	8,908.1412	0.9000	8,017.3271	0.9000
RHE0012	31	31	26,022.9190	26,022.9190	1.0000	26,022.9190	0.9000	23,420.6271	0.9000
RHE0016	874	874	80,392.8798	80,392.8798	1.0000	80,392.8798	0.9000	72,353.5918	0.9000
RHE0017	303	303	133,363.2381	133,363.2381	1.0000	133,363.2381	0.9000	120,026.9143	0.9000
RHE0018	38	38	17,403.3920	17,403.3920	1.0000	17,403.3920	0.9000	15,663.0528	0.9000
RHE0019	66	66	48,157.6458	48,157.6458	1.0000	48,157.6458	0.9000	43,341.8812	0.9000
RHE0020	68	68	40,538.9548	40,538.9548	1.0000	40,538.9548	0.9000	36,485.0593	0.9000
RHE0021	33	33	19,375.2669	19,375.2669	1.0000	19,375.2669	0.9000	17,437.7402	0.9000
RHE0022	1,248	1,248	182,999.2320	182,999.2320	1.0000	182,999.2320	0.9000	164,699.3088	0.9000
RHE0023	20	20	113,380.6040	113,380.6040	1.0000	113,380.6040	0.9000	102,042.5436	0.9000
RHE0024	5	5	870.4060	870.4060	1.0000	870.4060	0.9000	783.3654	0.9000
RHE0025	30	30	5,765.9430	5,765.9430	1.0000	5,765.9430	0.9000	5,189.3487	0.9000
RHE0026	399	399	59,217.0264	59,217.0264	1.0000	59,217.0264	0.9000	53,295.3238	0.9000
RHG0015 (Combined Fuel)	5	5	-2,561.6155	-2,561.6155	1.0000	-2,561.6155	0.9000	-2,305.4540	0.9000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RHG0016 (Combined Fuel)	150	150	-67,843.7400	-67,843.7400	1.0000	-67,843.7400	0.9000	-61,059.3660	0.9000
Total:	22,478	22,478	10,003,778.7967	10,003,778.7967	1.0000	10,003,778.7967	0.9000	9,003,400.9171	0.9000

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Table 66. Certified Program Lifetime kWh Savings by Measure (HVAC and Water Heating)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RHC0100	218,537.7620	9.0000	1,966,839.8576
RHC0101	165,575.0736	9.0000	1,490,175.6624
RHC0103	1,493.7283	9.0000	13,443.5546
RHC0104	6,366.3581	9.0000	57,297.2227
RHC0105	31,071.9240	10.0000	310,719.2400
RHE0001	6,747,390.0000	10.0000	67,473,900.0000
RHE0004	250,160.7861	9.0000	2,251,447.0749
RHE0006	379,232.2181	15.0000	5,688,483.2712
RHE0007	511,844.7096	15.0000	7,677,670.6440
RHE0009	92,337.0932	15.0000	1,385,056.3977
RHE0011	8,017.3271	15.0000	120,259.9062
RHE0012	23,420.6271	15.0000	351,309.4065
RHE0016	72,353.5918	5.0000	361,767.9591
RHE0017	120,026.9143	15.0000	1,800,403.7144
RHE0018	15,663.0528	15.0000	234,945.7920
RHE0019	43,341.8812	15.0000	650,128.2183
RHE0020	36,485.0593	15.0000	547,275.8898
RHE0021	17,437.7402	15.0000	261,566.1032
RHE0022	164,699.3088	9.0000	1,482,293.7792
RHE0023	102,042.5436	15.0000	1,530,638.1540
RHE0024	783.3654	9.0000	7,050.2886
RHE0025	5,189.3487	9.0000	46,704.1383
RHE0026	53,295.3238	10.0000	532,953.2376
RHG0015 (Combined Fuel)	-2,305.4540	20.0000	-46,109.0790
RHG0016 (Combined Fuel)	-61,059.3660	20.0000	-1,221,187.3200
Total:	9,003,400.9171		94,975,033.1133

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Table 67. Certified Program Participation and kW Savings by Measure (HVAC and Water Heating)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RHE0001	10,270	10,270	674.7390	674.7390	1.0000	674.7390	0.9000	607.2651	0.9000
RHE0006	1,576	1,576	129.2320	129.2320	1.0000	129.2320	0.9000	116.3088	0.9000
RHE0007	1,582	1,582	362.9108	362.9108	1.0000	362.9108	0.9000	326.6197	0.9000
RHE0009	43	43	21.7451	21.7451	1.0000	21.7451	0.9000	19.5706	0.9000
RHE0011	12	12	3.4596	3.4596	1.0000	3.4596	0.9000	3.1136	0.9000
RHE0012	31	31	12.2326	12.2326	1.0000	12.2326	0.9000	11.0093	0.9000
RHE0016	874	874	113.6200	113.6200	1.0000	113.6200	0.9000	102.2580	0.9000
RHE0017	303	303	100.5051	100.5051	1.0000	100.5051	0.9000	90.4546	0.9000
RHE0018	38	38	14.5958	14.5958	1.0000	14.5958	0.9000	13.1362	0.9000
RHE0019	66	66	42.5634	42.5634	1.0000	42.5634	0.9000	38.3071	0.9000
RHE0020	68	68	39.1884	39.1884	1.0000	39.1884	0.9000	35.2696	0.9000
RHE0021	33	33	20.3082	20.3082	1.0000	20.3082	0.9000	18.2774	0.9000
RHE0023	20	20	-0.3480	-0.3480	1.0000	-0.3480	0.9000	-0.3132	0.9000
Total:	14,916	14,916	1,534.7520	1,534.7520	1.0000	1,534.7520	0.9000	1,381.2768	0.9000

Table 68. Certified Program Participation and First-Year MCF Savings by Measure (HVAC and Water Heating)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RHC0100	2,005	2,005	13,094.4545	13,094.4545	1.0000	13,094.4545	0.9000	11,785.0091	0.9000
RHC0101	1,412	1,412	9,916.1936	9,916.1936	1.0000	9,916.1936	0.9000	8,924.5742	0.9000
RHC0103	9	9	114.5124	114.5124	1.0000	114.5124	0.9000	103.0612	0.9000
RHC0104	32	32	481.1424	481.1424	1.0000	481.1424	0.9000	433.0282	0.9000
RHC0105	240	240	2,327.4720	2,327.4720	1.0000	2,327.4720	0.9000	2,094.7248	0.9000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RHG0002	286	286	1,504.6746	1,504.2456	1.0000	1,504.2456	0.9000	1,353.8210	0.8997
RHG0004	2,256	2,256	14,904.2640	14,904.2640	1.0000	14,904.2640	0.9000	13,413.8376	0.9000
RHG0008	332	332	1,617.3048	1,616.8400	1.0000	1,616.8400	0.9000	1,455.1560	0.8997
RHG0010	3,935	3,935	71,710.6530	71,710.6530	1.0000	71,710.6530	0.9000	64,539.5877	0.9000
RHG0011	12,289	12,289	254,462.1785	254,462.1785	1.0000	254,462.1785	0.9000	229,015.9607	0.9000
RHG0012	870	870	20,186.1750	20,186.1750	1.0000	20,186.1750	0.9000	18,167.5575	0.9000
RHG0013	1,308	1,308	32,202.9600	32,202.9600	1.0000	32,202.9600	0.9000	28,982.6640	0.9000
RHG0015 (Combined Fuel)	5	5	333.9210	333.9210	1.0000	333.9210	0.9000	300.5289	0.9000
RHG0015 (Gas Only)	7	7	467.4894	467.4894	1.0000	467.4894	0.9000	420.7405	0.9000
RHG0016 (Combined Fuel)	150	150	9,836.7750	9,836.7750	1.0000	9,836.7750	0.9000	8,853.0975	0.9000
RHG0016 (Gas Only)	192	192	12,591.0720	12,591.0720	1.0000	12,591.0720	0.9000	11,331.9648	0.9000
RHG0022	4,633	4,633	44,345.2228	44,345.2228	1.0000	44,345.2228	0.9000	39,910.7005	0.9000
RHG0023	3,418	3,418	18,481.1260	18,481.1260	1.0000	18,481.1260	0.9000	16,633.0134	0.9000
RHG0024	81	81	564.7239	564.7239	1.0000	564.7239	0.9000	508.2515	0.9000
RHG0025	10	10	48.7140	48.7000	1.0000	48.7000	0.9000	43.8300	0.8997
RHG0026	29	29	403.2856	403.2856	1.0000	403.2856	0.9000	362.9570	0.9000
RHG0027	76	76	1,002.8200	1,002.8200	1.0000	1,002.8200	0.9000	902.5380	0.9000
RHG0028	1,162	1,162	11,546.9102	11,546.9102	1.0000	11,546.9102	0.9000	10,392.2192	0.9000
Total:	34,737	34,737	522,144.0447	522,143.1369	1.0000	522,143.1369	0.9000	469,928.8233	0.9000

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Table 69. Certified Lifetime MCF Savings by Measure (HVAC and Water Heating)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RHC0100	11,785.0091	9.0000	106,065.0815
RHC0101	8,924.5742	9.0000	80,321.1682
RHC0103	103.0612	9.0000	927.5504
RHC0104	433.0282	9.0000	3,897.2534
RHC0105	2,094.7248	10.0000	20,947.2480
RHG0002	1,353.8210	20.0000	27,076.4208
RHG0004	13,413.8376	9.0000	120,724.5384
RHG0008	1,455.1560	13.0000	18,917.0280
RHG0010	64,539.5877	15.0000	968,093.8155
RHG0011	229,015.9607	15.0000	3,435,239.4098
RHG0012	18,167.5575	15.0000	272,513.3625
RHG0013	28,982.6640	15.0000	434,739.9600
RHG0015 (Combined Fuel)	300.5289	20.0000	6,010.5780
RHG0015 (Gas Only)	420.7405	20.0000	8,414.8092
RHG0016 (Combined Fuel)	8,853.0975	20.0000	177,061.9500
RHG0016 (Gas Only)	11,331.9648	20.0000	226,639.2960
RHG0022	39,910.7005	9.0000	359,196.3047
RHG0023	16,633.0134	2.0000	33,266.0268
RHG0024	508.2515	5.0000	2,541.2576
RHG0025	43.8300	13.0000	569.7900
RHG0026	362.9570	9.0000	3,266.6134
RHG0027	902.5380	9.0000	8,122.8420
RHG0028	10,392.2192	10.0000	103,922.1918
Total:	469,928.8233		6,418,474.4960

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Appendix H: Income Qualified Program

Table 70 presents the reported gross and certified net energy savings by fuel type and demand reductions for the Income Qualified Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 70. Participation and Savings (Income Qualified)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	5,638,320.0000	5,273,621.3344	445.8604	63,203.1468
Verified Net Participation and Savings	5,638,181.0000	5,237,117.3126	441.6324	62,733.2919
Verified Actual Lifetime Savings	NA	71,201,447.8094	NA	806,076.7864
Program Realization Rate	99.9975%	99.3078%	99.0517%	99.2566%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%	99.9947%
Lifetime Net Verified v. Net Reported Savings	NA	88.4079%	NA	99.9950%

Task 1: Database Review

The Consumers Energy and implementer databases for both the Income Qualified Program matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified that all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Review

Cadmus found a conversion factor error between per-unit measure MCF savings reported by Consumers Energy and the therm values in the MEMD of 0.0001 MCF for gas savings measures RIG0009, RIG0049, RIG0050, RIG0093, RIG0097, and RIG0159; and a difference of 0.0006 MCF for measure RIG0142. Cadmus used the corrected per-unit savings in the final net savings calculations.

Cadmus found an LED measure, RIE0088, that showed an incorrect measure life of 20 years, while the MEMD claims the measure life is 15; and a Refrigerator replacement measure, RIE0002, had an incorrect measure life of 12 years, when the calculated measure life based on MEMD measures is 8.3 years. Cadmus corrected the lifetime savings for the Income Qualified program to reflect the MEMD values.

All other measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

During the custom measure review, Cadmus removed 0.138 kWh that was claimed from plug-in monitors, which have no deemed savings in the MEMD. Cadmus also removed 0.0001 MCF during the custom measure review, which was claimed under “supplemental gas incentive adjustment” and not related to any equipment installed.

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Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus reviewed gross and net adjustment factors and found no discrepancies. Table 71 presents verified per-unit savings, measure lives, and saving adjustment factors for all measures delivered through the 2017 Income Qualified Program.

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Table 71. Verified Per-Unit Measure Characteristics (Income Qualified)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RCE0002	Residential Income Qualified Custom - Electric (NON-CAA)	417.5623	0.0000	0.0000	754.5415	0.0000	0.0000	11.9309	1	1
RCG0002	Residential Income Qualified Custom - Gas (NON-CAA)	0.0000	0.0000	2.8966	0.0000	0.0000	2.9247	11.2376	1	1
RIC0003	Setback thermostat - full setback - Combination (NON-CAA)	206.1709	0.0000	11.7271	206.1709	0.0000	11.7271	9	1	1
RIC0005	Setback thermostat - full setback - Combination (MI Neighborhood Weatherization)	231.4476	0.0000	13.3911	231.4476	0.0000	13.3911	9	1	1
RIC0010	Air infiltration reduction >=10% and <15% (MHI _ NON-CAA)	0.0212	0.0000	0.0014	0.0212	0.0000	0.0014	13	1	1
RIC0011	Air infiltration reduction >=15% (MHI _ NON-CAA)	0.0322	0.0000	0.0021	0.0322	0.0000	0.0021	13	1	1
RIC0012	Duct sealing >=15% and <20% leakage base (MHI _ NON-CAA)	0.0595	0.0000	0.0037	0.0595	0.0000	0.0037	18	1	1
RIC0013	Duct sealing >=20% and <25%leakage base (MHI _ NON-CAA)	0.0952	0.0001	0.0058	0.0952	0.0001	0.0058	18	1	1
RIC0014	Duct sealing >=25% and <30% leakage base (MHI _ NON-CAA)	0.1299	0.0001	0.0079	0.1299	0.0001	0.0079	18	1	1
RIC0015	Duct sealing >=30% and <35% leakage base (MHI _ NON-CAA)	0.1985	0.0001	0.0120	0.1985	0.0001	0.0120	18	1	1
RIC0016	Duct sealing >=35% and <40% leakage base (MHI _ NON-CAA)	0.2357	0.0001	0.0141	0.2357	0.0001	0.0141	18	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RIC0017	Duct sealing >=40% and <45% leakage base (MHI - NON-CAA)	0.2725	0.0001	0.0163	0.2725	0.0001	0.0163	18	1	1
RIE0002	Agency refrigerator replacement - ENERGY STAR (CAA)	1,175.8000	0.1379	0.0000	1,175.8000	0.1379	0.0000	8.3*	1	1
RIE0015	Setback thermostat - full setback -- Electric single family Customer Only (NON-CAA)	132.9134	0.0000	3.7374	132.9134	0.0000	0.0000	9	1	1
RIE0018	ECM blower - intermittent - Electric or Combination Customer (CAA)	730.0000	0.0657	0.0000	730.0000	0.0657	0.0000	10	1	1
RIE0025	LED night light (NON-CAA)	22.0000	0.0000	0.0000	22.0000	0.0000	0.0000	12	1	1
RIE0035	Low flow showerhead - 1.5 gpm (NON-CAA)	334.0000	0.0270	0.0000	334.0000	0.0270	0.0000	10	1.01	1
RIE0036	Low flow showerhead - 1.5 gpm Handheld (NON-CAA)	334.0000	0.0270	0.0000	334.0000	0.0270	0.0000	10	1	1
RIE0039	Low flow kitchen faucet aerator - Electric 1.5gpm (NON-CAA)	279.0000	0.0320	0.0000	279.0000	0.0320	0.0000	10	0.9	1
RIE0048	Low flow bath faucet Aerators - Electric 1.0gpm (NON-CAA)	68.0000	0.0080	0.0000	68.0000	0.0080	0.0000	10	0.9	1
RIE0050	Pipe wrap - electric (NON-CAA)	51.0000	0.0058	0.0000	51.0000	0.0058	0.0000	15	0.94	1
RIE0054	LED bulb replacing A-line 60W (Base Incandescent) (NON-CAA)	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15	1	1
RIE0070	LED bulb replacing A-line 60W (Base Incandescent) (CAA)	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RIE0083	Outdoor LED PAR/Flood (Lighting _ NON-CAA)	276.4000	0.0000	0.0000	276.4000	0.0000	0.0000	15	1	1
RIE0086	LED exterior fixture lamp replacement (Lighting _ NON-CAA)	81.0000	0.0000	0.0000	81.0000	0.0000	0.0000	12	1	1
RIE0087	LED night light (Lighting Kit _ NON-CAA)	22.0000	0.0000	0.0000	22.0000	0.0000	0.0000	12	1	1
RIE0088	LED interior fixture lamp Replacement (Lighting Kit _ NON-CAA)	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15*	1	1
RIG0004	Setback thermostat (5/2) (CAA)	0.0000	0.0000	14.0583	0.0000	0.0000	14.0583	9	1	1
RIG0006	High efficiency gas furnace - .92 AFUE+ (CAA)	0.0000	0.0000	8.8128	0.0000	0.0000	8.8128	15	1	1
RIG0009	Low flow bath faucet aerators - Gas 1.5gpm (NON-CAA)	0.0000	0.0000	0.1754	0.0000	0.0000	0.1753*	10	0.9	1
RIG0011	Setback thermostat - full setback - Gas or Combination (NON-CAA)	0.0000	0.0000	10.6879	0.0000	0.0000	10.6871	9	1	1
RIG0017	Ceiling insulation - minimum of 10% reduction (CAA)	0.0000	0.0000	0.0053	0.0000	0.0000	0.0053	13	0.936	1
RIG0018	Mobile home belly insulation (Floor Insulation) (CAA)	0.0000	0.0000	0.0039	0.0000	0.0000	0.0039	25	0.909	1
RIG0019	Wall insulation - 4 walls - no partial (CAA)	0.0000	0.0000	0.0051	0.0000	0.0000	0.0051	25	1	1
RIG0020	Band joint insulation (Rim Joist) (CAA)	0.0000	0.0000	0.0020	0.0000	0.0000	0.0020	25	1	1
RIG0029	Natural gas furnace 95% AFUE (CAA)	0.0000	0.0000	17.2651	0.0000	0.0000	17.2651	15	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RIG0030	Natural gas furnace 96% AFUE (CAA)	0.0000	0.0000	14.8514	0.0000	0.0000	14.8514	15	1	1
RIG0034	Air infiltration reduction 20% - Gas Customer (CAA)	0.0000	0.0000	0.0034	0.0000	0.0000	0.0034	13	1	1
RIG0035	Air infiltration reduction 30% - Gas Customer (CAA)	0.0000	0.0000	0.0053	0.0000	0.0000	0.0053	13	1	1
RIG0036	Air infiltration reduction 50% - Gas Customer (CAA)	0.0000	0.0000	0.0098	0.0000	0.0000	0.0098	13	1	1
RIG0049	Low flow showerhead - 1.5 gpm (NON-CAA)	0.0000	0.0000	1.4322	0.0000	0.0000	1.4318*	10	1.01	1
RIG0050	Low flow showerhead - 1.5 gpm handheld (NON-CAA)	0.0000	0.0000	1.4322	0.0000	0.0000	1.4318*	10	1	1
RIG0052	O&M tuneup furnace only - Direct Install (NON-CAA)	0.0000	0.0000	5.2826	0.0000	0.0000	5.2826	2	1	1
RIG0053	Low flow kitchen faucet Aerator - Gas 1.5gpm (NON-CAA)	0.0000	0.0000	1.1980	0.0000	0.0000	1.1980	10	0.9	1
RIG0062	Air infiltration reduction 20% - Gas Customer (MI Neighborhood Weatherization)	0.0000	0.0000	0.0040	0.0000	0.0000	0.0040	13	1	1
RIG0063	Air infiltration reduction 30% - Gas Customer (MI Neighborhood Weatherization)	0.0000	0.0000	0.0060	0.0000	0.0000	0.0060	13	1	1
RIG0066	Attic insulation (MI Neighborhood Weatherization)	0.0000	0.0000	0.0036	0.0000	0.0000	0.0036	20	0.97	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RIG0067	Wall insulation R-13 (MI Neighborhood Weatherization)	0.0000	0.0000	0.0054	0.0000	0.0000	0.0054	25	1	1
RIG0068	Band joist: insulate (MI Neighborhood Weatherization)	0.0000	0.0000	0.0021	0.0000	0.0000	0.0021	25	1	1
RIG0071	HE furnace replacement 95% (MI Neighborhood Weatherization)	0.0000	0.0000	18.9143	0.0000	0.0000	18.9143	15	1	1
RIG0074	Boiler replacement 95% (MI Neighborhood Weatherization)	-676.8579	0.0000	41.1362	-676.8579	0.0000	41.1362	15	1	1
RIG0086	Air infiltration reduction 10% - Gas Customer (NON-CAA)	0.0000	0.0000	0.0018	0.0000	0.0000	0.0018	13	1	1
RIG0087	Air infiltration reduction 15% - Gas Customer (NON-CAA)	0.0000	0.0000	0.0029	0.0000	0.0000	0.0029	13	1	1
RIG0088	Air infiltration reduction 20% - Gas Customer (NON-CAA)	0.0000	0.0000	0.0038	0.0000	0.0000	0.0038	13	1	1
RIG0089	Air infiltration reduction 30% - Gas Customer (NON-CAA)	0.0000	0.0000	0.0059	0.0000	0.0000	0.0059	13	1	1
RIG0093	Low flow bath faucet aerators - Gas 1.0gpm (NON-CAA)	0.0000	0.0000	0.2923	0.0000	0.0000	0.2922*	10	0.9	1
RIG0095	Door weather stripping (Single Family) (NON-CAA)	0.0000	0.0000	0.2252	0.0000	0.0000	0.2252	5	1	1
RIG0097	Pipe wrap - Gas (NON-CAA)	0.0000	0.0000	0.2387	0.0000	0.0000	0.2386*	15	1	1
RIG0100	O&M tune-up boiler only - Single Family (NON-CAA)	0.0000	0.0000	5.8500	0.0000	0.0000	5.8500	2	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RIG0106	Crawlspace wall insulation (CAA)	0.0000	0.0000	0.0064	0.0000	0.0000	0.0064	25	1	1
RIG0113	Attic hatch insulation (R-38 scuttle hole) (NON-CAA)	0.0000	0.0000	0.7818	0.0000	0.0000	0.7818	20	0.97	1
RIG0116	Knee wall insulation R0 to R19 (CAA)	0.0000	0.0000	0.0268	0.0000	0.0000	0.0268	20	1	1
RIG0121	Attic hatch insulation R-38 scuttle (MI Neighborhood Weatherization)	0.0000	0.0000	0.8247	0.0000	0.0000	0.8247	20	0.97	1
RIG0125	High efficiency 96 AFUE furnace with ECM (MI Neighborhood Weatherization)	390.8269	0.0000	21.1814	390.8269	0.0000	21.1814	15	1	1
RIG0126	High efficiency 96 AFUE furnace without ECM (MI Neighborhood Weatherization)	0.0000	0.0000	20.6634	0.0000	0.0000	20.6634	15	1	1
RIG0130	Band/Rim joist insulation partial >=35% and <50% (NON-CAA)	0.0000	0.0000	0.0021	0.0000	0.0000	0.0021	25	1	1
RIG0131	Band/Rim joist insulation partial >=50% and <65% (NON-CAA)	0.0000	0.0000	0.0021	0.0000	0.0000	0.0021	25	1	1
RIG0132	Band/Rim joist insulation partial >=65% and <80% (NON-CAA)	0.0000	0.0000	0.0021	0.0000	0.0000	0.0021	25	1	1
RIG0135	Duct sealing >=15% and <20% leakage base (Manufactured _ NON-CAA)	0.0000	0.0000	0.0037	0.0000	0.0000	0.0037	18	1	1
RIG0136	Duct sealing >=20% and <25% leakage base	0.0000	0.0000	0.0058	0.0000	0.0000	0.0058	18	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
	(Manufactured _ NON-CAA)									
RIG0137	Duct sealing >=25% and <30% leakage base (Manufactured _ NON-CAA)	0.0000	0.0000	0.0079	0.0000	0.0000	0.0079	18	1	1
RIG0138	Duct sealing >=30% leakage base (Manufactured _ NON-CAA)	0.0000	0.0000	0.0100	0.0000	0.0000	0.0100	18	1	1
RIG0139	Air infiltration reduction >=10% and <15% (Manufactured _ NON-CAA)	0.0000	0.0000	0.0014	0.0000	0.0000	0.0014	13	1	1
RIG0140	Air infiltration reduction >=15% (Manufactured _ NON-CAA)	0.0000	0.0000	0.0021	0.0000	0.0000	0.0021	13	1	1
RIG0142	High efficiency gas water heater 0.67 EF (CAA)	0.0000	0.0000	2.0460	0.0000	0.0000	2.0454*	13	1	1
RIG0145	Duct sealing >=30% and <35% leakage base (Manufactured _ NON-CAA)	0.0000	0.0000	0.0120	0.0000	0.0000	0.0120	18	1	1
RIG0146	Duct sealing >=35% and <40% leakage base (Manufactured _ NON-CAA)	0.0000	0.0000	0.0141	0.0000	0.0000	0.0141	18	1	1
RIG0147	Duct sealing >=40% and <45% leakage base (Manufactured _ NON-CAA)	0.0000	0.0000	0.0163	0.0000	0.0000	0.0163	18	1	1
RIG0148	Duct sealing >=45% and <50% leakage base (Manufactured _ NON-CAA)	0.0000	0.0000	0.0184	0.0000	0.0000	0.0184	18	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RIG0149	Duct sealing >=50% leakage base (Manufactured _ NON-CAA)	0.0000	0.0000	0.0206	0.0000	0.0000	0.0206	18	1	1
RIG0159	Shower start added to existing low flow showerhead (1.5 gpm) - Gas water heater	0.0000	0.0000	0.2629	0.0000	0.0000	0.2630*	10	1	1
RIG0160	Low flow showerheads (1.5 gpm) + shower start - Gas water heater (NON-CAA)	0.0000	0.0000	1.6850	0.0000	0.0000	1.6850	10	1.01	1
RIG0161	Shower flow optimizer (1.5gpm) - Gas water heater (NON-CAA)	0.0000	0.0000	1.4318	0.0000	0.0000	1.4318	10	1.01	1
RIG0162	Setback thermostat - full setback - Gas Only (MI Neighborhood Weatherization)	0.0000	0.0000	14.5602	0.0000	0.0000	14.5602	9	1	1

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the Income Qualified appendix

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Task 3: Documentation Review

Cadmus selected and reviewed program documentation for a random sample of 69 participants from the Consumers Energy eTracker database, including invoices, applications, and any additional documentation available to validate the measure installation data. Table 72 documents reported and verified measure counts as well as reported and verified energy savings by fuel type and demand reduction for the sampled applications.

Table 72. Sample Participation and Savings by Measure (Income Qualified)

Consumers Energy Measure ID	Reported by EWR Provider				Verified			
	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF
RCE0002	2	12.0010	0.0000	0.0000	2	12.0010	0.0000	0.0000
RIC0003	2	412.3418	0.0000	23.4542	2	412.3418	0.0000	23.4542
RIC0004	16	0.0000	0.0000	0.0000	16	0.0000	0.0000	0.0000
RIE0025	32	704.0000	0.0000	0.0000	32	704.0000	0.0000	0.0000
RIE0035	2	668.0000	0.0540	0.0000	2	668.0000	0.0540	0.0000
RIE0036	6	2,004.0000	0.1620	0.0000	6	2,004.0000	0.1620	0.0000
RIE0039	4	1,116.0000	0.1280	0.0000	4	1,116.0000	0.1280	0.0000
RIE0048	8	544.0000	0.0640	0.0000	8	544.0000	0.0640	0.0000
RIE0050	40	2,040.0000	0.2320	0.0000	40	2,040.0000	0.2320	0.0000
RIE0054	141	4,018.5000	0.4794	0.0000	141	4,018.5000	0.4794	0.0000
RIE0086	22	1,782.0000	0.0000	0.0000	22	1,782.0000	0.0000	0.0000
RIE0087	90	1,980.0000	0.0000	0.0000	90	1,980.0000	0.0000	0.0000
RIE0088	360	10,260.0000	1.2240	0.0000	360	10,260.0000	1.2240	0.0000
RIE0093	31	0.0000	0.0000	0.0000	31	0.0000	0.0000	0.0000
RIG0011	4	0.0000	0.0000	42.7484	4	0.0000	0.0000	42.7484
RIG0049	5	0.0000	0.0000	7.1610	5	0.0000	0.0000	7.1610
RIG0050	7	0.0000	0.0000	10.0254	7	0.0000	0.0000	10.0254
RIG0052	2	0.0000	0.0000	10.5652	2	0.0000	0.0000	10.5652
RIG0053	6	0.0000	0.0000	7.1880	6	0.0000	0.0000	7.1880
RIG0082	6	0.0000	0.0000	0.0000	6	0.0000	0.0000	0.0000
RIG0083	5	0.0000	0.0000	0.0000	5	0.0000	0.0000	0.0000
RIG0084	1	0.0000	0.0000	0.0000	1	0.0000	0.0000	0.0000
RIG0085	19	0.0000	0.0000	0.0000	19	0.0000	0.0000	0.0000
RIG0093	10	0.0000	0.0000	2.9230	10	0.0000	0.0000	2.9230
RIG0095	1	0.0000	0.0000	0.2252	1	0.0000	0.0000	0.2252
RIG0097	43	0.0000	0.0000	10.2641	43	0.0000	0.0000	10.2641
RIG0136	6,386	0.0000	0.0000	37.0388	6,386	0.0000	0.0000	37.0388
RIG0137	980	0.0000	0.0000	7.7420	980	0.0000	0.0000	7.7420
RIG0138	2,222	0.0000	0.0000	22.2200	2,222	0.0000	0.0000	22.2200
RIG0139	9,958	0.0000	0.0000	13.9412	9,958	0.0000	0.0000	13.9412
RIG0140	980	0.0000	0.0000	2.0580	980	0.0000	0.0000	2.0580
RIG0141	4	0.0000	0.0000	0.0000	4	0.0000	0.0000	0.0000
RIG0145	1,350	0.0000	0.0000	16.2000	1,350	0.0000	0.0000	16.2000
RIG0150	5	0.0000	0.0000	0.0000	5	0.0000	0.0000	0.0000

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Consumers Energy Measure ID	Reported by EWR Provider				Verified			
	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF
RIG0151	5	0.0000	0.0000	0.0000	5	0.0000	0.0000	0.0000
Sample Total	22,755	25,540.8428	2.3434	213.7545	22,755	25,540.8428	2.3434	213.7545

Cadmus found no discrepancies between the Consumers Energy eTracker database and the supporting documentation. Table 73 provides sample realization rates by fuel type, and shows t-test statistics Cadmus used to analyze errors in the sample.

Table 73. Sample Realization Rates and t-Statistic (Income Qualified)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	100.00%
Standard Error	0	0	0
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to program population?	No	No	No

Task 4: Calculation of Certified Annual and Lifetime Savings

Cadmus calculated annual savings and lifetime savings. The following tables present verified program participation, energy savings, and demand reduction by measure. Table 74 and Table 75 document kWh savings, Table 76 documents kW savings, and Table 77 and Table 78 document MCF savings.

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Table 74. Certified Program Participation and First-Year kWh Savings by Measure (Income Qualified)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RCE0002	309	171	129,026.7380	129,026.5962	1.0000	129,026.5962	1.0000	129,026.5962	1.0000
RIC0003	444	444	91,539.8796	91,539.8796	1.0000	91,539.8796	1.0000	91,539.8796	1.0000
RIC0005	37	37	8,563.5612	8,563.5612	1.0000	8,563.5612	1.0000	8,563.5612	1.0000
RIC0010	147,683	147,683	3,130.8796	3,130.8796	1.0000	3,130.8796	1.0000	3,130.8796	1.0000
RIC0011	57,019	57,019	1,836.0118	1,836.0118	1.0000	1,836.0118	1.0000	1,836.0118	1.0000
RIC0012	2,219	2,219	132.0305	132.0305	1.0000	132.0305	1.0000	132.0305	1.0000
RIC0013	154,046	154,046	14,665.1792	14,665.1792	1.0000	14,665.1792	1.0000	14,665.1792	1.0000
RIC0014	18,706	18,706	2,429.9094	2,429.9094	1.0000	2,429.9094	1.0000	2,429.9094	1.0000
RIC0015	19,292	19,292	3,829.4620	3,829.4620	1.0000	3,829.4620	1.0000	3,829.4620	1.0000
RIC0016	12,789	12,789	3,014.3673	3,014.3673	1.0000	3,014.3673	1.0000	3,014.3673	1.0000
RIC0017	4,148	4,148	1,130.3300	1,130.3300	1.0000	1,130.3300	1.0000	1,130.3300	1.0000
RIE0002	90	90	105,822.0000	105,822.0000	1.0000	105,822.0000	1.0000	105,822.0000	1.0000
RIE0015	2	2	265.8268	265.8268	1.0000	265.8268	1.0000	265.8268	1.0000
RIE0018	23	23	16,790.0000	16,790.0000	1.0000	16,790.0000	1.0000	16,790.0000	1.0000
RIE0025	6,979	6,979	153,538.0000	153,538.0000	1.0000	153,538.0000	1.0000	153,538.0000	1.0000
RIE0035	277	277	92,518.0000	92,518.0000	1.0100	93,443.1800	1.0000	93,443.1800	1.0100
RIE0036	842	842	281,228.0000	281,228.0000	1.0000	281,228.0000	1.0000	281,228.0000	1.0000
RIE0039	671	671	187,209.0000	187,209.0000	0.9000	168,488.1000	1.0000	168,488.1000	0.9000
RIE0048	1,052	1,052	71,536.0000	71,536.0000	0.9000	64,382.4000	1.0000	64,382.4000	0.9000
RIE0050	3,776	3,776	192,576.0000	192,576.0000	0.9400	181,021.4400	1.0000	181,021.4400	0.9400
RIE0054	33,439	33,439	953,011.5000	953,011.5000	1.0000	953,011.5000	1.0000	953,011.5000	1.0000
RIE0070	569	569	16,216.5000	16,216.5000	1.0000	16,216.5000	1.0000	16,216.5000	1.0000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RIE0083	1,482	1,482	409,624.8000	409,624.8000	1.0000	409,624.8000	1.0000	409,624.8000	1.0000
RIE0086	4,509	4,509	365,229.0000	365,229.0000	1.0000	365,229.0000	1.0000	365,229.0000	1.0000
RIE0087	15,694	15,694	345,268.0000	345,268.0000	1.0000	345,268.0000	1.0000	345,268.0000	1.0000
RIE0088	62,768	62,768	1,788,888.0000	1,788,888.0000	1.0000	1,788,888.0000	1.0000	1,788,888.0000	1.0000
RIG0074	2	2	-1,353.7158	-1,353.7158	1.0000	-1,353.7158	1.0000	-1,353.7158	0.0000
RIG0125	92	92	35,956.0748	35,956.0748	1.0000	35,956.0748	1.0000	35,956.0748	1.0000
Total:	548,959	548,821	5,273,621.3344	5,273,621.1926	0.9911	5,237,117.3126	1.0000	5,237,117.3126	0.9554

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Table 75. Certified Lifetime kWh Savings by Measure (Income Qualified)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RCE0002	129,026.5962	11.9309	1,539,403.4166
RIC0003	91,539.8796	9.0000	823,858.9164
RIC0005	8,563.5612	9.0000	77,072.0508
RIC0010	3,130.8796	13.0000	40,701.4348
RIC0011	1,836.0118	13.0000	23,868.1534
RIC0012	132.0305	18.0000	2,376.5490
RIC0013	14,665.1792	18.0000	263,973.2256
RIC0014	2,429.9094	18.0000	43,738.3692
RIC0015	3,829.4620	18.0000	68,930.3160
RIC0016	3,014.3673	18.0000	54,258.6114
RIC0017	1,130.3300	18.0000	20,345.9400
RIE0002	105,822.0000	8.3000	878,322.6000
RIE0015	265.8268	9.0000	2,392.4412
RIE0018	16,790.0000	10.0000	167,900.0000
RIE0025	153,538.0000	12.0000	1,842,456.0000
RIE0035	93,443.1800	10.0000	934,431.8000
RIE0036	281,228.0000	10.0000	2,812,280.0000
RIE0039	168,488.1000	10.0000	1,684,881.0000
RIE0048	64,382.4000	10.0000	643,824.0000
RIE0050	181,021.4400	15.0000	2,715,321.6000
RIE0054	953,011.5000	15.0000	14,295,172.5000
RIE0070	16,216.5000	15.0000	243,247.5000
RIE0083	409,624.8000	15.0000	6,144,372.0000
RIE0086	365,229.0000	12.0000	4,382,748.0000
RIE0087	345,268.0000	12.0000	4,143,216.0000
RIE0088	1,788,888.0000	15.0000	26,833,320.0000
RIG0074	-1,353.7158	15.0000	-20,305.7370
RIG0125	35,956.0748	15.0000	539,341.1220
Total:	5,237,117.3126		71,201,447.8094

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Table 76. Certified Program Participation and kW Savings by Measure (Income Qualified)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RIC0013	154,046	154,046	15.4046	15.4046	1.0000	15.4046	1.0000	15.4046	1.0000
RIC0014	18,706	18,706	1.8706	1.8706	1.0000	1.8706	1.0000	1.8706	1.0000
RIC0015	19,292	19,292	1.9292	1.9292	1.0000	1.9292	1.0000	1.9292	1.0000
RIC0016	12,789	12,789	1.2789	1.2789	1.0000	1.2789	1.0000	1.2789	1.0000
RIC0017	4,148	4,148	0.4148	0.4148	1.0000	0.4148	1.0000	0.4148	1.0000
RIE0002	90	90	12.4110	12.4110	1.0000	12.4110	1.0000	12.4110	1.0000
RIE0018	23	23	1.5111	1.5111	1.0000	1.5111	1.0000	1.5111	1.0000
RIE0035	277	277	7.4790	7.4790	1.0100	7.5538	1.0000	7.5538	1.0100
RIE0036	842	842	22.7340	22.7340	1.0000	22.7340	1.0000	22.7340	1.0000
RIE0039	671	671	21.4720	21.4720	0.9000	19.3248	1.0000	19.3248	0.9000
RIE0048	1,052	1,052	8.4160	8.4160	0.9000	7.5744	1.0000	7.5744	0.9000
RIE0050	3,776	3,776	21.9008	21.9008	0.9400	20.5868	1.0000	20.5868	0.9400
RIE0054	33,439	33,439	113.6926	113.6926	1.0000	113.6926	1.0000	113.6926	1.0000
RIE0070	569	569	1.9346	1.9346	1.0000	1.9346	1.0000	1.9346	1.0000
RIE0088	62,768	62,768	213.4112	213.4112	1.0000	213.4112	1.0000	213.4112	1.0000
Total:	312,488	312,488	445.8604	445.8604	0.9833	441.6324	1.0000	441.6324	0.9833

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Table 77. Certified Program Participation and First-Year MCF Savings by Measure (Income Qualified)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RCG0002	104	103	301.2491	301.2443	1.0000	301.2443	1.0000	301.2443	1.0000
RIC0003	444	444	5,206.8324	5,206.8324	1.0000	5,206.8324	1.0000	5,206.8324	1.0000
RIC0005	37	37	495.4707	495.4707	1.0000	495.4707	1.0000	495.4707	1.0000
RIC0010	147,683	147,683	206.7562	206.7562	1.0000	206.7562	1.0000	206.7562	1.0000
RIC0011	57,019	57,019	119.7399	119.7399	1.0000	119.7399	1.0000	119.7399	1.0000
RIC0012	2,219	2,219	8.2103	8.2103	1.0000	8.2103	1.0000	8.2103	1.0000
RIC0013	154,046	154,046	893.4668	893.4668	1.0000	893.4668	1.0000	893.4668	1.0000
RIC0014	18,706	18,706	147.7774	147.7774	1.0000	147.7774	1.0000	147.7774	1.0000
RIC0015	19,292	19,292	231.5040	231.5040	1.0000	231.5040	1.0000	231.5040	1.0000
RIC0016	12,789	12,789	180.3249	180.3249	1.0000	180.3249	1.0000	180.3249	1.0000
RIC0017	4,148	4,148	67.6124	67.6124	1.0000	67.6124	1.0000	67.6124	1.0000
RIE0015	1	2	7.4748	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000
RIG0004	32	32	449.8656	449.8656	1.0000	449.8656	1.0000	449.8656	1.0000
RIG0006	4	4	35.2512	35.2512	1.0000	35.2512	1.0000	35.2512	1.0000
RIG0009	1	1	0.1754	0.1753	0.9000	0.1578	1.0000	0.1578	0.8997
RIG0011	719	719	7,684.6106	7,684.0249	1.0000	7,684.0249	1.0000	7,684.0249	0.9999
RIG0017	173,421	173,421	919.1313	919.1313	0.9360	860.3069	1.0000	860.3069	0.9360
RIG0018	23,664	23,664	92.2896	92.2896	0.9090	83.8912	1.0000	83.8912	0.9090
RIG0019	65,134	65,134	332.1834	332.1834	1.0000	332.1834	1.0000	332.1834	1.0000
RIG0020	9,544	9,544	19.0880	19.0880	1.0000	19.0880	1.0000	19.0880	1.0000
RIG0029	68	68	1,174.0268	1,174.0268	1.0000	1,174.0268	1.0000	1,174.0268	1.0000
RIG0030	44	44	653.4616	653.4616	1.0000	653.4616	1.0000	653.4616	1.0000
RIG0034	103,422	103,422	351.6348	351.6348	1.0000	351.6348	1.0000	351.6348	1.0000
RIG0035	136,051	136,051	721.0703	721.0703	1.0000	721.0703	1.0000	721.0703	1.0000
RIG0036	13,464	13,464	131.9472	131.9472	1.0000	131.9472	1.0000	131.9472	1.0000
RIG0049	1,357	1,357	1,943.4954	1,942.9526	1.0100	1,962.3821	1.0000	1,962.3821	1.0097

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RIG0050	2,852	2,852	4,084.6344	4,083.4936	1.0000	4,083.4936	1.0000	4,083.4936	0.9997
RIG0052	718	718	3,792.9068	3,792.9068	1.0000	3,792.9068	1.0000	3,792.9068	1.0000
RIG0053	2,424	2,424	2,903.9520	2,903.9520	0.9000	2,613.5568	1.0000	2,613.5568	0.9000
RIG0062	1,728	1,728	6.9120	6.9120	1.0000	6.9120	1.0000	6.9120	1.0000
RIG0063	832	832	4.9920	4.9920	1.0000	4.9920	1.0000	4.9920	1.0000
RIG0066	1,408	1,408	5.0688	5.0688	0.9700	4.9167	1.0000	4.9167	0.9700
RIG0067	848	848	4.5792	4.5792	1.0000	4.5792	1.0000	4.5792	1.0000
RIG0068	96	96	0.2016	0.2016	1.0000	0.2016	1.0000	0.2016	1.0000
RIG0071	37	37	699.8291	699.8291	1.0000	699.8291	1.0000	699.8291	1.0000
RIG0074	2	2	82.2724	82.2724	1.0000	82.2724	1.0000	82.2724	1.0000
RIG0086	68,752	68,752	123.7536	123.7536	1.0000	123.7536	1.0000	123.7536	1.0000
RIG0087	11,452	11,452	33.2108	33.2108	1.0000	33.2108	1.0000	33.2108	1.0000
RIG0088	11,157	11,157	42.3966	42.3966	1.0000	42.3966	1.0000	42.3966	1.0000
RIG0089	9,859	9,859	58.1681	58.1681	1.0000	58.1681	1.0000	58.1681	1.0000
RIG0093	4,090	4,090	1,195.5070	1,195.0980	0.9000	1,075.5882	1.0000	1,075.5882	0.8997
RIG0095	148	148	33.3296	33.3296	1.0000	33.3296	1.0000	33.3296	1.0000
RIG0097	14,194	14,194	3,388.1078	3,386.6884	1.0000	3,386.6884	1.0000	3,386.6884	0.9996
RIG0100	19	19	111.1500	111.1500	1.0000	111.1500	1.0000	111.1500	1.0000
RIG0106	10,698	10,698	68.4672	68.4672	1.0000	68.4672	1.0000	68.4672	1.0000
RIG0113	22	22	17.1996	17.1996	0.9700	16.6836	1.0000	16.6836	0.9700
RIG0116	6,857	6,857	183.7676	183.7676	1.0000	183.7676	1.0000	183.7676	1.0000
RIG0121	2	2	1.6494	1.6494	0.9700	1.5999	1.0000	1.5999	0.9700
RIG0125	92	92	1,948.6888	1,948.6888	1.0000	1,948.6888	1.0000	1,948.6888	1.0000
RIG0126	45	45	929.8530	929.8530	1.0000	929.8530	1.0000	929.8530	1.0000
RIG0130	13,871	13,871	29.1291	29.1291	1.0000	29.1291	1.0000	29.1291	1.0000
RIG0131	5,697	5,697	11.9637	11.9637	1.0000	11.9637	1.0000	11.9637	1.0000
RIG0132	4,281	4,281	8.9901	8.9901	1.0000	8.9901	1.0000	8.9901	1.0000
RIG0135	20,493	20,493	75.8241	75.8241	1.0000	75.8241	1.0000	75.8241	1.0000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RIG0136	1,279,267	1,279,267	7,419.7486	7,419.7486	1.0000	7,419.7486	1.0000	7,419.7486	1.0000
RIG0137	457,188	457,188	3,611.7852	3,611.7852	1.0000	3,611.7852	1.0000	3,611.7852	1.0000
RIG0138	172,958	172,958	1,729.5800	1,729.5800	1.0000	1,729.5800	1.0000	1,729.5800	1.0000
RIG0139	1,617,472	1,617,472	2,264.4608	2,264.4608	1.0000	2,264.4608	1.0000	2,264.4608	1.0000
RIG0140	549,598	549,598	1,154.1558	1,154.1558	1.0000	1,154.1558	1.0000	1,154.1558	1.0000
RIG0142	8	8	16.3680	16.3632	1.0000	16.3632	1.0000	16.3632	0.9997
RIG0145	105,243	105,243	1,262.9160	1,262.9160	1.0000	1,262.9160	1.0000	1,262.9160	1.0000
RIG0146	67,999	67,999	958.7859	958.7859	1.0000	958.7859	1.0000	958.7859	1.0000
RIG0147	43,242	43,242	704.8446	704.8446	1.0000	704.8446	1.0000	704.8446	1.0000
RIG0148	20,373	20,373	374.8632	374.8632	1.0000	374.8632	1.0000	374.8632	1.0000
RIG0149	56,366	56,366	1,161.1396	1,161.1396	1.0000	1,161.1396	1.0000	1,161.1396	1.0000
RIG0159	6	6	1.5774	1.5780	1.0000	1.5780	1.0000	1.5780	1.0004
RIG0160	1	1	1.6850	1.6850	1.0100	1.7019	1.0000	1.7019	1.0100
RIG0161	10	10	14.3180	14.3180	1.0100	14.4612	1.0000	14.4612	1.0100
RIG0162	21	21	305.7642	305.7642	1.0000	305.7642	1.0000	305.7642	1.0000
Total:	5,505,839	5,505,839	63,203.1468	63,191.5652	0.9925	62,733.2919	1.0000	62,733.2919	0.9780

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Table 78. Certified Lifetime MCF Savings by Measure (Income Qualified)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RCG0002	301.2443	11.2376	3,385.2632
RIC0003	5,206.8324	9.0000	46,861.4916
RIC0005	495.4707	9.0000	4,459.2363
RIC0010	206.7562	13.0000	2,687.8306
RIC0011	119.7399	13.0000	1,556.6187
RIC0012	8.2103	18.0000	147.7854
RIC0013	893.4668	18.0000	16,082.4024
RIC0014	147.7774	18.0000	2,659.9932
RIC0015	231.5040	18.0000	4,167.0720
RIC0016	180.3249	18.0000	3,245.8482
RIC0017	67.6124	18.0000	1,217.0232
RIE0015	0.0000	9.0000	0.0000
RIG0004	449.8656	9.0000	4,048.7904
RIG0006	35.2512	15.0000	528.7680
RIG0009	0.1578	10.0000	1.5777
RIG0011	7,684.0249	9.0000	69,156.2241
RIG0017	860.3069	13.0000	11,183.9897
RIG0018	83.8912	25.0000	2,097.2812
RIG0019	332.1834	25.0000	8,304.5850
RIG0020	19.0880	25.0000	477.2000
RIG0029	1,174.0268	15.0000	17,610.4020
RIG0030	653.4616	15.0000	9,801.9240
RIG0034	351.6348	13.0000	4,571.2524
RIG0035	721.0703	13.0000	9,373.9139
RIG0036	131.9472	13.0000	1,715.3136
RIG0049	1,962.3821	10.0000	19,623.8213
RIG0050	4,083.4936	10.0000	40,834.9360
RIG0052	3,792.9068	2.0000	7,585.8136
RIG0053	2,613.5568	10.0000	26,135.5680
RIG0062	6.9120	13.0000	89.8560
RIG0063	4.9920	13.0000	64.8960
RIG0066	4.9167	20.0000	98.3347
RIG0067	4.5792	25.0000	114.4800
RIG0068	0.2016	25.0000	5.0400
RIG0071	699.8291	15.0000	10,497.4365
RIG0074	82.2724	15.0000	1,234.0860
RIG0086	123.7536	13.0000	1,608.7968
RIG0087	33.2108	13.0000	431.7404

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Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RIG0088	42.3966	13.0000	551.1558
RIG0089	58.1681	13.0000	756.1853
RIG0093	1,075.5882	10.0000	10,755.8820
RIG0095	33.3296	5.0000	166.6480
RIG0097	3,386.6884	15.0000	50,800.3260
RIG0100	111.1500	2.0000	222.3000
RIG0106	68.4672	25.0000	1,711.6800
RIG0113	16.6836	20.0000	333.6722
RIG0116	183.7676	20.0000	3,675.3520
RIG0121	1.5999	20.0000	31.9984
RIG0125	1,948.6888	15.0000	29,230.3320
RIG0126	929.8530	15.0000	13,947.7950
RIG0130	29.1291	25.0000	728.2275
RIG0131	11.9637	25.0000	299.0925
RIG0132	8.9901	25.0000	224.7525
RIG0135	75.8241	18.0000	1,364.8338
RIG0136	7,419.7486	18.0000	133,555.4748
RIG0137	3,611.7852	18.0000	65,012.1336
RIG0138	1,729.5800	18.0000	31,132.4400
RIG0139	2,264.4608	13.0000	29,437.9904
RIG0140	1,154.1558	13.0000	15,004.0254
RIG0142	16.3632	13.0000	212.7216
RIG0145	1,262.9160	18.0000	22,732.4880
RIG0146	958.7859	18.0000	17,258.1462
RIG0147	704.8446	18.0000	12,687.2028
RIG0148	374.8632	18.0000	6,747.5376
RIG0149	1,161.1396	18.0000	20,900.5128
RIG0159	1.5780	10.0000	15.7800
RIG0160	1.7019	10.0000	17.0185
RIG0161	14.4612	10.0000	144.6118
RIG0162	305.7642	9.0000	2,751.8778
Total:	62,733.2919		806,076.7864

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Appendix I: Insulation and Windows Program

Table 79 presents reported gross and certified net energy savings by fuel type and demand reductions for the Insulation and Windows Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 79. Participation and Savings (Insulation and Windows)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	62,637.0000	577,297.6373	357.4826	60,429.6696
Verified Net Participation and Savings	62,637.0000	519,562.5012	321.7319	54,387.0197
Verified Actual Lifetime Savings	NA	12,632,080.4816	NA	1,299,809.1165
Program Realization Rate	100.0000%	89.9991%	89.9993%	90.0005%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%	100.0000%
Lifetime Net Verified v. Net Reported Savings	NA	100.0000%	NA	100.0000%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Review

Cadmus found two Job IDs (C47872F67C6E4510806E553D53CD1A5C and C47872F67C6E4510806E553D53CD1A5C) within the data provided by Consumers Energy that claimed incorrect savings, based on the fourth-quarter weather weighted savings calculations for the Insulation and Windows Program. Cadmus used the corrected per-unit savings in the final net savings calculations. All measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus conducted a measure-level review of savings adjustment factors and found no discrepancies. Table 80 presents verified per-unit savings, measure lives, and saving adjustment factors for all measures delivered through the 2017 Insulation and Windows Program.

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Table 80. Verified Per-Unit Measure Characteristics (Insulation and Windows)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RWC0001	Roof (attic) insulation R-38-Combo	58.3068	0.0269	3.9570	58.2941	0.0269	3.9570	20	1	0.9
RWC0002	Wall insulation-Combo	82.0418	0.0256	5.5667	82.0339	0.0256	5.5667	25	1	0.9
RWC0003	Basement wall insulation-Combo	24.1327	-0.0240	4.9110	24.1327	-0.0240	4.9110	25	1	0.9
RWC0004	Crawlspace insulation-Combo	-2.3417	-0.0191	2.4724	-2.3417	-0.0191	2.4724	25	1	0.9
RWC0006	Rim joist insulation - Combo	62.0621	0.0184	4.4555	62.0621	0.0184	4.4555	25	1	0.9
RWC0008	Window replacement (Per Unit) - Combo	18.4932	0.0141	0.7000	18.4932	0.0141	0.7000	25	1	0.9
RWC0009	Door replacement (Per Unit) - Combo	57.5615	0.0438	2.1609	57.5615	0.0438	2.1609	25	1	0.9
RWC0010	MIM - Roof (attic) insulation - Combo	59.8587	0.0317	4.0282	59.8587	0.0317	4.0282	20	1	0.9
RWC0011	MIM - Wall insulation - Combo	84.0056	0.0249	5.4782	84.0056	0.0249	5.4782	25	1	0.9
RWC0015	MIM - Window replacement (Per Unit) - Combo	20.0407	0.0152	0.7332	20.0407	0.0152	0.7332	25	1	0.9
RWC0016	MIM - Door replacement (Per Unit) - Combo	73.8886	0.0572	2.6486	73.8886	0.0572	2.6486	25	1	0.9
RWC0017	Roof (attic) insulation R-49-Combo	79.3379	0.0345	5.4402	79.3379	0.0345	5.4402	20	1	0.9
RWC0018	MIM - Roof (attic) insulation R-38-Combo	65.9511	0.0339	4.4504	65.9511	0.0339	4.4504	20	1	0.9
RWC0019	MIM - Roof (attic) insulation R-49-Combo	78.9151	0.0434	5.3503	78.9151	0.0434	5.3503	20	1	0.9
RWC0020	Roof (attic) insulation R-30-Combo	38.9179	0.0182	2.7142	38.9179	0.0182	2.7142	20	1	0.9
RWC0021	Roof (attic) insulation R-60-Combo	89.5480	0.0412	6.1903	89.5480	0.0412	6.1903	20	1	0.9
RWC0022	MIM - Roof (attic) insulation R-30-Combo	58.4609	0.0307	3.9057	58.4609	0.0307	3.9057	20	1	0.9
RWC0023	MIM - Roof (attic) insulation R-60-Combo	115.2815	0.0645	7.7997	115.2815	0.0645	7.7997	20	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RWE0001	Roof (attic) insulation R-38-Electric	59.5675	0.0234	0.0000	59.5675	0.0234	0.0000	20	1	0.9
RWE0002	Wall insulation-Electric	103.0572	0.0277	0.0000	103.0572	0.0277	0.0000	25	1	0.9
RWE0003	Basement wall insulation-Electric	33.0280	-0.0173	0.0000	33.0280	-0.0173	0.0000	25	1	0.9
RWE0004	Crawlspace insulation-Electric	8.1789	-0.0196	0.0000	8.1789	-0.0196	0.0000	25	1	0.9
RWE0006	Rim joist insulation - Electric	74.0150	0.0203	0.0000	74.0150	0.0203	0.0000	25	1	0.9
RWE0008	Window replacement (Per Unit) - Electric	18.6194	0.0108	0.0000	18.6194	0.0108	0.0000	25	1	0.9
RWE0009	Door replacement (Per Unit) - Electric	59.0499	0.0342	0.0000	59.0499	0.0342	0.0000	25	1	0.9
RWE0010	MIM - Roof (attic) insulation - Electric	65.9197	0.0255	0.0000	65.9197	0.0255	0.0000	20	1	0.9
RWE0011	MIM - Wall insulation - Electric	64.3232	0.0144	0.0000	64.3232	0.0144	0.0000	25	1	0.9
RWE0015	MIM - Window replacement (Per Unit) - Electric	16.1037	0.0105	0.0000	16.1037	0.0105	0.0000	25	1	0.9
RWE0017	Roof (attic) insulation R-49 - Electric	88.9305	0.0351	0.0000	88.9305	0.0351	0.0000	20	1	0.9
RWE0018	MIM - Roof (attic) insulation R-38-Electric	54.8201	0.0229	0.0000	54.8201	0.0229	0.0000	20	1	0.9
RWE0019	MIM - Roof (attic) insulation R-49-Electric	82.1621	0.0328	0.0000	82.1621	0.0328	0.0000	20	1	0.9
RWE0020	Roof (attic) insulation R-30-Electric	38.5904	0.0148	0.0000	38.5904	0.0148	0.0000	20	1	0.9
RWE0021	Roof (attic) insulation R-60-Electric	84.3305	0.0316	0.0000	84.3305	0.0316	0.0000	20	1	0.9
RWG0001	Roof (attic) insulation R-38-Gas	0.0000	0.0000	3.5375	0.0000	0.0000	3.5375	20	1	0.9
RWG0002	Wall insulation-Gas	0.0000	0.0000	5.1958	0.0000	0.0000	5.1958	25	1	0.9
RWG0003	Basement wall insulation-Gas	0.0000	0.0000	5.0541	0.0000	0.0000	5.0541	25	1	0.9
RWG0004	Crawlspace insulation-Gas	0.0000	0.0000	2.3640	0.0000	0.0000	2.3640	25	1	0.9
RWG0006	Rim joist insulation - Gas	0.0000	0.0000	4.4847	0.0000	0.0000	4.4847	25	1	0.9
RWG0008	Window replacement (Per Unit) - Gas	0.0000	0.0000	0.7172	0.0000	0.0000	0.7172	25	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RWG0009	Door replacement (Per Unit) - Gas	0.0000	0.0000	1.9713	0.0000	0.0000	1.9713	25	1	0.9
RWG0010	MIM - Roof (attic) insulation - Gas	0.0000	0.0000	4.5505	0.0000	0.0000	4.5505	20	1	0.9
RWG0011	MIM - Wall insulation - Gas	0.0000	0.0000	4.0638	0.0000	0.0000	4.0638	25	1	0.9
RWG0015	MIM - Window replacement (Per Unit) - Gas	0.0000	0.0000	0.7556	0.0000	0.0000	0.7556	25	1	0.9
RWG0016	MIM - Door replacement (Per Unit) - Gas	0.0000	0.0000	1.9947	0.0000	0.0000	1.9947	25	1	0.9
RWG0017	Roof (attic) insulation R-49 -Gas	0.0000	0.0000	5.4927	0.0000	0.0000	5.4927	20	1	0.9
RWG0018	MIM - Roof (attic) insulation R-38-Gas	0.0000	0.0000	1.7078	0.0000	0.0000	1.7078	20	1	0.9
RWG0019	MIM - Roof (attic) insulation R-49-Gas	0.0000	0.0000	5.5885	0.0000	0.0000	5.5885	20	1	0.9
RWG0020	Roof (attic) insulation R-30-Gas	0.0000	0.0000	2.6600	0.0000	0.0000	2.6600	20	1	0.9
RWG0021	Roof (attic) insulation R-60-Gas	0.0000	0.0000	6.1460	0.0000	0.0000	6.1460	20	1	0.9
RWG0023	MIM - Roof (attic) insulation R-60-Gas	0.0000	0.0000	5.6789	0.0000	0.0000	5.6789	20	1	0.9

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Task 3: Documentation Review

Cadmus selected and reviewed program documentation for a random sample of 69 participants from the Consumers Energy eTracker database, including invoices, applications, and any additional documentation available to validate the measure installation data. Table 81 documents reported and verified measure counts as well as reported and verified energy savings by fuel type, and demand reductions for the sample applications.

Table 81. Sample Participation and Savings by Measure (Insulation and Windows)

Consumers Energy Measure ID	Reported by EWR Provider				Verified			
	Participation	Total kWh	Total kW	Total MCF	Participation	Total kWh	Total kW	Total MCF
RWC0001	2	116.5882	0.0538	7.9140	2	116.5882	0.0538	7.9140
RWC0002	1	82.0339	0.0256	5.5667	1	82.0339	0.0256	5.5667
RWC0004	1	-2.3417	-0.0191	2.4724	1	-2.3417	-0.0191	2.4724
RWC0006	4	248.2484	0.0736	17.8220	4	248.2484	0.0736	17.8220
RWC0008	100	1,849.3200	1.4100	70.0000	100	1,849.3200	1.4100	70.0000
RWC0009	3	172.6845	0.1314	6.4827	3	172.6845	0.1314	6.4827
RWC0017	3	238.0137	0.1035	16.3206	3	238.0137	0.1035	16.3206
RWC0020	1	38.9179	0.0182	2.7142	1	38.9179	0.0182	2.7142
RWE0001	1	59.5675	0.0234	0.0000	1	59.5675	0.0234	0.0000
RWE0002	1	103.0572	0.0277	0.0000	1	103.0572	0.0277	0.0000
RWE0004	1	8.1789	-0.0196	0.0000	1	8.1789	-0.0196	0.0000
RWE0006	1	74.0150	0.0203	0.0000	1	74.0150	0.0203	0.0000
RWE0008	38	707.5372	0.4104	0.0000	38	707.5372	0.4104	0.0000
RWE0009	3	177.1497	0.1026	0.0000	3	177.1497	0.1026	0.0000
RWG0002	6	0.0000	0.0000	31.1748	6	0.0000	0.0000	31.1748
RWG0003	1	0.0000	0.0000	5.0541	1	0.0000	0.0000	5.0541
RWG0006	4	0.0000	0.0000	17.9388	4	0.0000	0.0000	17.9388
RWG0008	220	0.0000	0.0000	157.7840	220	0.0000	0.0000	157.7840
RWG0009	15	0.0000	0.0000	29.5695	15	0.0000	0.0000	29.5695
RWG0010	1	0.0000	0.0000	4.5505	1	0.0000	0.0000	4.5505
RWG0017	9	0.0000	0.0000	49.4343	9	0.0000	0.0000	49.4343
RWG0020	1	0.0000	0.0000	2.6600	1	0.0000	0.0000	2.6600
RWG0021	2	0.0000	0.0000	12.2920	2	0.0000	0.0000	12.2920
Sample Total	419	3,872.9704	2.3618	439.7506	419	3,872.9704	2.3618	439.7506

Cadmus found no discrepancies between the Consumers Energy eTracker database and the supporting documentation. Table 82 provides sample realization rates by fuel type and shows t-test statistics Cadmus used to analyze errors in the general sample.

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Table 82. Sample Realization Rates and t-Statistic (Insulation and Windows)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	100.00%
Standard Error	0.0000	0.0000	0.0000
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to program population?	No	No	No

Task 4: Calculation of Certified Annual and Lifetime Savings

Cadmus calculated annual savings and lifetime savings. The following tables present verified program participation, energy savings by measure, and demand reductions: Table 83 and Table 84 document kWh savings, Table 85 documents kW savings, and Table 86 and Table 87 document MCF savings.

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Table 83. Certified Program Participation and First-Year kWh Savings by Measure (Insulation and Windows)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RWC0001	269	269	15,684.5402	15,681.1129	1.0000	15,681.1129	0.9000	14,113.0016	0.8998
RWC0002	320	320	26,253.3901	26,250.8480	1.0000	26,250.8480	0.9000	23,625.7632	0.8999
RWC0003	54	54	1,303.1658	1,303.1658	1.0000	1,303.1658	0.9000	1,172.8492	0.9000
RWC0004	115	115	-269.2955	-269.2955	1.0000	-269.2955	0.9000	-242.3660	0.0000
RWC0006	220	220	13,653.6620	13,653.6620	1.0000	13,653.6620	0.9000	12,288.2958	0.9000
RWC0008	13,854	13,854	256,204.7928	256,204.7928	1.0000	256,204.7928	0.9000	230,584.3135	0.9000
RWC0009	587	587	33,788.6005	33,788.6005	1.0000	33,788.6005	0.9000	30,409.7405	0.9000
RWC0010	37	37	2,214.7719	2,214.7719	1.0000	2,214.7719	0.9000	1,993.2947	0.9000
RWC0011	15	15	1,260.0840	1,260.0840	1.0000	1,260.0840	0.9000	1,134.0756	0.9000
RWC0015	47	47	941.9129	941.9129	1.0000	941.9129	0.9000	847.7216	0.9000
RWC0016	2	2	147.7772	147.7772	1.0000	147.7772	0.9000	132.9995	0.9000
RWC0017	317	317	25,150.1143	25,150.1143	1.0000	25,150.1143	0.9000	22,635.1029	0.9000
RWC0018	6	6	395.7066	395.7066	1.0000	395.7066	0.9000	356.1359	0.9000
RWC0019	67	67	5,287.3117	5,287.3117	1.0000	5,287.3117	0.9000	4,758.5805	0.9000
RWC0020	68	68	2,646.4172	2,646.4172	1.0000	2,646.4172	0.9000	2,381.7755	0.9000
RWC0021	138	138	12,357.6240	12,357.6240	1.0000	12,357.6240	0.9000	11,121.8616	0.9000
RWC0022	1	1	58.4609	58.4609	1.0000	58.4609	0.9000	52.6148	0.9000
RWC0023	2	2	230.5630	230.5630	1.0000	230.5630	0.9000	207.5067	0.9000
RWE0001	53	53	3,157.0775	3,157.0775	1.0000	3,157.0775	0.9000	2,841.3698	0.9000
RWE0002	55	55	5,668.1460	5,668.1460	1.0000	5,668.1460	0.9000	5,101.3314	0.9000
RWE0003	25	25	825.7000	825.7000	1.0000	825.7000	0.9000	743.1300	0.9000
RWE0004	22	22	179.9358	179.9358	1.0000	179.9358	0.9000	161.9422	0.9000
RWE0006	59	59	4,366.8850	4,366.8850	1.0000	4,366.8850	0.9000	3,930.1965	0.9000
RWE0008	7,231	7,231	134,636.8814	134,636.8814	1.0000	134,636.8814	0.9000	121,173.1933	0.9000
RWE0009	318	318	18,777.8682	18,777.8682	1.0000	18,777.8682	0.9000	16,900.0814	0.9000
RWE0010	2	2	131.8394	131.8394	1.0000	131.8394	0.9000	118.6555	0.9000
RWE0011	1	1	64.3232	64.3232	1.0000	64.3232	0.9000	57.8909	0.9000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RWE0015	10	10	161.0370	161.0370	1.0000	161.0370	0.9000	144.9333	0.9000
RWE0017	97	97	8,626.2585	8,626.2585	1.0000	8,626.2585	0.9000	7,763.6327	0.9000
RWE0018	1	1	54.8201	54.8201	1.0000	54.8201	0.9000	49.3381	0.9000
RWE0019	8	8	657.2968	657.2968	1.0000	657.2968	0.9000	591.5671	0.9000
RWE0020	17	17	656.0368	656.0368	1.0000	656.0368	0.9000	590.4331	0.9000
RWE0021	24	24	2,023.9320	2,023.9320	1.0000	2,023.9320	0.9000	1,821.5388	0.9000
Total:	24,042	24,042	577,297.6373	577,291.6679	1.0000	577,291.6679	0.9000	519,562.5012	0.8727

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Table 84. Certified Lifetime kWh Savings by Measure (Insulation and Windows)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RWC0001	14,113.0016	20.0000	282,260.0322
RWC0002	23,625.7632	25.0000	590,644.0800
RWC0003	1,172.8492	25.0000	29,321.2305
RWC0004	-242.3660	25.0000	-6,059.1488
RWC0006	12,288.2958	25.0000	307,207.3950
RWC0008	230,584.3135	25.0000	5,764,607.8380
RWC0009	30,409.7405	25.0000	760,243.5113
RWC0010	1,993.2947	20.0000	39,865.8942
RWC0011	1,134.0756	25.0000	28,351.8900
RWC0015	847.7216	25.0000	21,193.0403
RWC0016	132.9995	25.0000	3,324.9870
RWC0017	22,635.1029	20.0000	452,702.0574
RWC0018	356.1359	20.0000	7,122.7188
RWC0019	4,758.5805	20.0000	95,171.6106
RWC0020	2,381.7755	20.0000	47,635.5096
RWC0021	11,121.8616	20.0000	222,437.2320
RWC0022	52.6148	20.0000	1,052.2962
RWC0023	207.5067	20.0000	4,150.1340
RWE0001	2,841.3698	20.0000	56,827.3950
RWE0002	5,101.3314	25.0000	127,533.2850
RWE0003	743.1300	25.0000	18,578.2500
RWE0004	161.9422	25.0000	4,048.5555
RWE0006	3,930.1965	25.0000	98,254.9125
RWE0008	121,173.1933	25.0000	3,029,329.8315
RWE0009	16,900.0814	25.0000	422,502.0345
RWE0010	118.6555	20.0000	2,373.1092
RWE0011	57.8909	25.0000	1,447.2720
RWE0015	144.9333	25.0000	3,623.3325
RWE0017	7,763.6327	20.0000	155,272.6530
RWE0018	49.3381	20.0000	986.7618
RWE0019	591.5671	20.0000	11,831.3424
RWE0020	590.4331	20.0000	11,808.6624
RWE0021	1,821.5388	20.0000	36,430.7760
Total:	519,562.5012		12,632,080.4816

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Table 85. Certified Program Participation and kW Savings by Measure (Insulation and Windows)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RWC0001	269	269	7.2379	7.2361	1.0000	7.2361	0.9000	6.5125	0.8998
RWC0002	320	320	8.1929	8.1920	1.0000	8.1920	0.9000	7.3728	0.8999
RWC0003	54	54	-1.2960	-1.2960	1.0000	-1.2960	0.9000	-1.1664	0.0000
RWC0004	115	115	-2.1965	-2.1965	1.0000	-2.1965	0.9000	-1.9769	0.0000
RWC0006	220	220	4.0480	4.0480	1.0000	4.0480	0.9000	3.6432	0.9000
RWC0008	13,854	13,854	195.3414	195.3414	1.0000	195.3414	0.9000	175.8073	0.9000
RWC0009	587	587	25.7106	25.7106	1.0000	25.7106	0.9000	23.1395	0.9000
RWC0010	37	37	1.1729	1.1729	1.0000	1.1729	0.9000	1.0556	0.9000
RWC0011	15	15	0.3735	0.3735	1.0000	0.3735	0.9000	0.3362	0.9001
RWC0015	47	47	0.7144	0.7144	1.0000	0.7144	0.9000	0.6430	0.9001
RWC0016	2	2	0.1144	0.1144	1.0000	0.1144	0.9000	0.1030	0.9003
RWC0017	317	317	10.9365	10.9365	1.0000	10.9365	0.9000	9.8429	0.9000
RWC0018	6	6	0.2034	0.2034	1.0000	0.2034	0.9000	0.1831	0.9002
RWC0019	67	67	2.9078	2.9078	1.0000	2.9078	0.9000	2.6170	0.9000
RWC0020	68	68	1.2376	1.2376	1.0000	1.2376	0.9000	1.1138	0.9000
RWC0021	138	138	5.6856	5.6856	1.0000	5.6856	0.9000	5.1170	0.9000
RWC0022	1	1	0.0307	0.0307	1.0000	0.0307	0.9000	0.0276	0.8990
RWC0023	2	2	0.1290	0.1290	1.0000	0.1290	0.9000	0.1161	0.9000
RWE0001	53	53	1.2402	1.2402	1.0000	1.2402	0.9000	1.1162	0.9000
RWE0002	55	55	1.5235	1.5235	1.0000	1.5235	0.9000	1.3712	0.9000
RWE0003	25	25	-0.4325	-0.4325	1.0000	-0.4325	0.9000	-0.3893	0.0000
RWE0004	22	22	-0.4312	-0.4312	1.0000	-0.4312	0.9000	-0.3881	0.0000
RWE0006	59	59	1.1977	1.1977	1.0000	1.1977	0.9000	1.0779	0.9000
RWE0008	7,231	7,231	78.0948	78.0948	1.0000	78.0948	0.9000	70.2853	0.9000
RWE0009	318	318	10.8756	10.8756	1.0000	10.8756	0.9000	9.7880	0.9000
RWE0010	2	2	0.0510	0.0510	1.0000	0.0510	0.9000	0.0459	0.9000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RWE0011	1	1	0.0144	0.0144	1.0000	0.0144	0.9000	0.0130	0.9028
RWE0015	10	10	0.1050	0.1050	1.0000	0.1050	0.9000	0.0945	0.9000
RWE0017	97	97	3.4047	3.4047	1.0000	3.4047	0.9000	3.0642	0.9000
RWE0018	1	1	0.0229	0.0229	1.0000	0.0229	0.9000	0.0206	0.8996
RWE0019	8	8	0.2624	0.2624	1.0000	0.2624	0.9000	0.2362	0.9002
RWE0020	17	17	0.2516	0.2516	1.0000	0.2516	0.9000	0.2264	0.8998
RWE0021	24	24	0.7584	0.7584	1.0000	0.7584	0.9000	0.6826	0.9001
Total:	24,042	24,042	357.4826	357.4799	1.0000	357.4799	0.9000	321.7319	0.7910

Table 86. Certified Program Participation and First-Year MCF Savings by Measure (Insulation and Windows)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RWC0001	269	269	1,064.4330	1,064.4330	1.0000	1,064.4330	0.9000	957.9897	0.9000
RWC0002	320	320	1,781.3440	1,781.3440	1.0000	1,781.3440	0.9000	1,603.2096	0.9000
RWC0003	54	54	265.1940	265.1940	1.0000	265.1940	0.9000	238.6746	0.9000
RWC0004	115	115	284.3260	284.3260	1.0000	284.3260	0.9000	255.8934	0.9000
RWC0006	220	220	980.2100	980.2100	1.0000	980.2100	0.9000	882.1890	0.9000
RWC0008	13,854	13,854	9,697.4265	9,697.8000	1.0000	9,697.8000	0.9000	8,728.0200	0.9000
RWC0009	587	587	1,268.4699	1,268.4483	1.0000	1,268.4483	0.9000	1,141.6035	0.9000
RWC0010	37	37	149.0434	149.0434	1.0000	149.0434	0.9000	134.1391	0.9000
RWC0011	15	15	82.1730	82.1730	1.0000	82.1730	0.9000	73.9557	0.9000
RWC0015	47	47	34.4604	34.4604	1.0000	34.4604	0.9000	31.0144	0.9000
RWC0016	2	2	5.2972	5.2972	1.0000	5.2972	0.9000	4.7675	0.9000
RWC0017	317	317	1,724.5434	1,724.5434	1.0000	1,724.5434	0.9000	1,552.0891	0.9000
RWC0018	6	6	26.7024	26.7024	1.0000	26.7024	0.9000	24.0322	0.9000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RWC0019	67	67	358.4701	358.4701	1.0000	358.4701	0.9000	322.6231	0.9000
RWC0020	68	68	184.5656	184.5656	1.0000	184.5656	0.9000	166.1090	0.9000
RWC0021	138	138	854.2614	854.2614	1.0000	854.2614	0.9000	768.8353	0.9000
RWC0022	1	1	3.9057	3.9057	1.0000	3.9057	0.9000	3.5151	0.9000
RWC0023	2	2	15.5994	15.5994	1.0000	15.5994	0.9000	14.0395	0.9000
RWG0001	359	359	1,269.9625	1,269.9625	1.0000	1,269.9625	0.9000	1,142.9663	0.9000
RWG0002	473	473	2,457.6134	2,457.6134	1.0000	2,457.6134	0.9000	2,211.8521	0.9000
RWG0003	85	85	429.5985	429.5985	1.0000	429.5985	0.9000	386.6387	0.9000
RWG0004	94	94	222.2160	222.2160	1.0000	222.2160	0.9000	199.9944	0.9000
RWG0006	306	306	1,372.3182	1,372.3182	1.0000	1,372.3182	0.9000	1,235.0864	0.9000
RWG0008	33,716	33,716	24,181.1152	24,181.1152	1.0000	24,181.1152	0.9000	21,763.0037	0.9000
RWG0009	1,919	1,919	3,782.9247	3,782.9247	1.0000	3,782.9247	0.9000	3,404.6322	0.9000
RWG0010	45	45	204.7725	204.7725	1.0000	204.7725	0.9000	184.2953	0.9000
RWG0011	17	17	69.0846	69.0846	1.0000	69.0846	0.9000	62.1761	0.9000
RWG0015	207	207	156.4092	156.4092	1.0000	156.4092	0.9000	140.7683	0.9000
RWG0016	28	28	55.8516	55.8516	1.0000	55.8516	0.9000	50.2664	0.9000
RWG0017	897	897	4,926.9519	4,926.9519	1.0000	4,926.9519	0.9000	4,434.2567	0.9000
RWG0018	1	1	1.7078	1.7078	1.0000	1.7078	0.9000	1.5370	0.9000
RWG0019	32	32	178.8320	178.8320	1.0000	178.8320	0.9000	160.9488	0.9000
RWG0020	61	61	162.2600	162.2600	1.0000	162.2600	0.9000	146.0340	0.9000
RWG0021	346	346	2,126.5160	2,126.5160	1.0000	2,126.5160	0.9000	1,913.8644	0.9000
RWG0023	9	9	51.1101	51.1101	1.0000	51.1101	0.9000	45.9991	0.9000
Total:	54,714	54,714	60,429.6696	60,430.0215	1.0000	60,430.0215	0.9000	54,387.0197	0.9000

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Table 87. Certified Lifetime MCF Savings by Measure (Insulation and Windows)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RWC0001	957.9897	20.0000	19,159.7940
RWC0002	1,603.2096	25.0000	40,080.2400
RWC0003	238.6746	25.0000	5,966.8650
RWC0004	255.8934	25.0000	6,397.3350
RWC0006	882.1890	25.0000	22,054.7250
RWC0008	8,728.0200	25.0000	218,200.5000
RWC0009	1,141.6035	25.0000	28,540.0868
RWC0010	134.1391	20.0000	2,682.7812
RWC0011	73.9557	25.0000	1,848.8925
RWC0015	31.0144	25.0000	775.3590
RWC0016	4.7675	25.0000	119.1870
RWC0017	1,552.0891	20.0000	31,041.7812
RWC0018	24.0322	20.0000	480.6432
RWC0019	322.6231	20.0000	6,452.4618
RWC0020	166.1090	20.0000	3,322.1808
RWC0021	768.8353	20.0000	15,376.7052
RWC0022	3.5151	20.0000	70.3026
RWC0023	14.0395	20.0000	280.7892
RWG0001	1,142.9663	20.0000	22,859.3250
RWG0002	2,211.8521	25.0000	55,296.3015
RWG0003	386.6387	25.0000	9,665.9663
RWG0004	199.9944	25.0000	4,999.8600
RWG0006	1,235.0864	25.0000	30,877.1595
RWG0008	21,763.0037	25.0000	544,075.0920
RWG0009	3,404.6322	25.0000	85,115.8058
RWG0010	184.2953	20.0000	3,685.9050
RWG0011	62.1761	25.0000	1,554.4035
RWG0015	140.7683	25.0000	3,519.2070
RWG0016	50.2664	25.0000	1,256.6610
RWG0017	4,434.2567	20.0000	88,685.1342
RWG0018	1.5370	20.0000	30.7404
RWG0019	160.9488	20.0000	3,218.9760
RWG0020	146.0340	20.0000	2,920.6800
RWG0021	1,913.8644	20.0000	38,277.2880
RWG0023	45.9991	20.0000	919.9818
Total:	54,387.0197		1,299,809.1165

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Appendix J: Multifamily Program

Table 88 presents reported gross and certified net energy savings by fuel type and demand reductions for the Multifamily Program. The implementation of the Multifamily Program is identical to the commercial and industrial (C&I) Multifamily Program. The Multifamily Program captures energy savings from energy efficient equipment installed in Multifamily complexes that use residential rate accounts as opposed to C&I rate accounts. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 88. Participation and Savings (Multifamily)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	570,840.3100	5,497,352.1011	647.5461	109,585.0201
Verified Net Participation and Savings	570,840.3100	4,742,637.9659	558.6144	98,023.9094
Verified Actual Lifetime Savings	NA	69,352,222.3155	NA	1,074,965.9871
Program Realization Rate	100.0000%	86.2713%	86.2664%	89.4501%
Annual Net Verified v. Net Reported Savings	NA	99.5694%	99.3719%	99.9906%
Lifetime Net Verified v. Net Reported Savings	NA	99.4492%	NA	99.9872%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Review

Cadmus found a conversion factor error between per-unit measure MCF savings reported by Consumers Energy and the therm values in the MEMD for gas savings measures RMG0014, RMG0023, RMG0119, RMG0120, RMG0145, RMG0146, RMG0149, RMG0154, RMG0168, and RMG0171. These differences were within or less than 0.0004 MCF per measure. Measure RMG0010 had a conversion factor error of 0.0083 MCF. Cadmus used the corrected per-unit savings in the final net savings calculations.

Task 2b: Verification of Installation and Net Adjustment Factors

Two pipe wrap measures, RME0247 and RME0248, incorrectly claimed a NTG value of 1.0. These measures are not Income Qualified eligible, and Cadmus corrected the NTG values to 0.9 for both measures. Table 89 presents verified per-unit savings, measure lives, and saving adjustment factors for all measures delivered through the 2017 Multifamily Program.

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Table 89. Verified Per-Unit Measure Characteristics (Multifamily)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RME0019	DI - 1.5 gpm kitchen aerator - Electric	202.0000	0.0230	0.0000	202.0000	0.0230	0.0000	10	0.976	0.9
RME0031	Occupancy sensors under 500W	288.2500	0.0078	0.0000	288.2500	0.0078	0.0000	10	1	0.9
RME0033	LED downlight fixture	141.5000	0.0260	0.0000	141.5000	0.0260	0.0000	15	1	0.9
RME0050	DI - 1.5 gpm showerhead - Electric	326.0000	0.0260	0.0000	326.0000	0.0260	0.0000	10	0.945	0.9
RME0051	DI - 1.5 gpm showerhead - handheld - Electric	70.0000	0.0080	0.0000	70.0000	0.0080	0.0000	10	1	0.9
RME0104	Low flow bath faucet aerators - Prescriptive Electric	41.0000	0.0050	0.0000	41.0000	0.0050	0.0000	10	0.976	0.9
RME0119	Low flow kitchen faucet aerators- Prescriptive Electric	202.0000	0.0230	0.0000	202.0000	0.0230	0.0000	10	0.976	0.9
RME0121	Low flow showerhead - Electric - 1.5gpm	326.0000	0.0260	0.0000	326.0000	0.0260	0.0000	10	0.945	0.9
RME0151	DI - LED candelabra lamp (3-5W) - 24/7 operation	247.0000	0.0283	0.0000	247.0000	0.0283	0.0000	9	1	0.9
RME0152	DI - LED candelabra lamp (3-5W)	124.0000	0.0000	0.0000	124.0000	0.0000	0.0000	9	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RME0161	LED candelabra lamp (3-5W) - Common	124.0000	0.0000	0.0000	124.0000	0.0000	0.0000	9	1	0.9
RME0164	LED fixture - In Unit	44.0000	0.0053	0.0000	44.0000	0.0053	0.0000	15	1	0.9
RME0167	LED lamp - 50-80W replacement - Common	46.2000	0.0055	0.0000	46.2000	0.0055	0.0000	15	0.943	0.9
RME0168	LED lamp - 60W replacement - In Unit	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15	0.943	0.9
RME0171	LED lamp - Flood/PAR - Common	145.5000	0.0267	0.0000	145.5000	0.0267	0.0000	9	1	0.9
RME0173	LED lamp - PAR - In Unit	54.0000	0.0064	0.0000	54.0000	0.0064	0.0000	15	1	0.9
RME0178	Low flow bath faucet aerators 1.0gpm - Electric - DI	70.0000	0.0080	0.0000	70.0000	0.0080	0.0000	10	0.976	0.9
RME0180	DI - LED candelabra lamp (3-5W) - In Unit	23.7000	0.0028	0.0000	23.7000	0.0028	0.0000	15	1	0.9
RME0182	LED candelabra lamp (3-5W) - In-Unit	27.0000	0.0010	0.0000	27.0000	0.0010	0.0000	12	1	0.9
RME0194	DI - LED A-line 60W replacement	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15	0.943	0.9
RME0197	Exterior HID to LED (Per Watt Reduced)	4.3190	0.0000	0.0000	4.3190	0.0000	0.0000	16	1	0.9
RME0198	Exterior HID to LED (24/7) (Per Watt Reduced)	8.7600	0.0010	0.0000	8.7600	0.0010	0.0000	16	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RME0199	Exterior HID to Induction (Per Watt Reduced)	4.3190	0.0000	0.0000	4.3190	0.0000	0.0000	16	1	0.9
RME0204	LED lamp - Common DI	98.8000	0.0181	0.0000	98.8000	0.0181	0.0000	9	0.943	0.9
RME0209	4-Foot T12 to 4-foot LED tube lights (common)	50.7000	0.0093	0.0000	50.7000	0.0093	0.0000	18	1	0.9
RME0215	LED BR30 flood - Common 24/7	560.6400	0.0640	0.0000	560.6400	0.0640	0.0000	15	1	0.9
RME0216	LED BR30 flood In-Unit (Res)	54.0000	0.0064	0.0000	54.0000	0.0064	0.0000	15	1	0.9
RME0219	LED BR30 flood - Common (Res)	280.3200	0.0640	0.0000	280.3200	0.0640	0.0000	15	1	0.9
RME0222	Energy Star Window (electric)	1.9791	0.0007	0.0000	1.9791	0.0007	0.0000	25	1	0.9
RME0224	LED Globe - In Unit DI	27.0000	0.0032	0.0000	27.0000	0.0032	0.0000	15	1	0.9
RME0225	LED Globe - Common Area	85.7000	0.0158	0.0000	85.7000	0.0158	0.0000	9	1	0.9
RME0226	LED Globe - In Unit	27.0000	0.0032	0.0000	27.0000	0.0032	0.0000	15	1	0.9
RME0247	Pipe wrap - Electric DHW - Common	44.7350	0.0086	0.0000	44.7350	0.0086	0.0000	20	1	0.9*
RME0248	Pipe wrap - Electric DHW – In-Unit	45.0000	0.0051	0.0000	45.0000	0.0051	0.0000	15	1	0.9*
RMG0007	Pipe wrap - Gas - DHW - In-Unit DI	0.0000	0.0000	0.2240	0.0000	0.0000	0.2240	15	1	0.9
RMG0009	Boiler Controls	0.0000	0.0000	0.0441	0.0000	0.0000	0.0441	15	1	0.9
RMG0010	Steam Traps	0.0000	0.0000	29.0335	0.0000	0.0000	29.0252*	5	1	0.9
RMG0011	Space heating boiler tune-up	0.0000	0.0000	0.0504	0.0000	0.0000	0.0504	2	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RMG0012	High-efficiency boiler - >90%	0.0000	0.0000	0.3022	0.0000	0.0000	0.3022	20	1	0.9
RMG0014	1.5 gpm kitchen aerator – Gas DI	0.0000	0.0000	0.8671	0.0000	0.0000	0.8669*	10	0.976	0.9
RMG0020	Furnace tune-up 40,000 - 80,000 BTU	0.0000	0.0000	2.1301	0.0000	0.0000	2.1301	2	1	0.9
RMG0021	Furnace tune-up 80,001 - 120,000 BTU	0.0000	0.0000	3.6323	0.0000	0.0000	3.6323	2	1	0.9
RMG0023	Pipe wrap - Gas – In-Unit	0.0000	0.0000	0.2241	0.0000	0.0000	0.2240*	15	1	0.9
RMG0030	Energy Star Doors	0.0000	0.0000	1.5299	0.0000	0.0000	1.5299	20	1	0.9
RMG0035	Energy Star Window	0.0000	0.0000	0.0398	0.0000	0.0000	0.0398	25	1	0.9
RMG0037	Setback thermostat - Common Area - Gas	0.0000	0.0000	1.0158	0.0000	0.0000	1.0158	9	1	0.9
RMG0050	1.5 gpm Showerhead – Gas DI	0.0000	0.0000	1.4318	0.0000	0.0000	1.4318	10	0.945	0.9
RMG0051	1.5 gpm Showerhead handheld – Gas DI	0.0000	0.0000	1.4318	0.0000	0.0000	1.4318	10	1	0.9
RMG0108	Setback thermostat - moderate setback -- Prescriptive Gas or Combination	0.0000	0.0000	1.1614	0.0000	0.0000	1.1614	9	1	0.9
RMG0119	Low flow kitchen aerator - Gas	0.0000	0.0000	0.8671	0.0000	0.0000	0.8669*	10	0.976	0.9
RMG0120	Low flow bath aerator - Gas	0.0000	0.0000	0.1754	0.0000	0.0000	0.1753*	10	0.976	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RMG0121	Furnace replacement - 92% - In-Unit	0.0000	0.0000	8.3434	0.0000	0.0000	8.3434	15	1	0.9
RMG0123	Pipe wrap - DHW - Gas - Common - DI	0.0000	0.0000	0.2079	0.0000	0.0000	0.2079	20	1	0.9
RMG0131	DHW boiler tune-up	0.0000	0.0000	0.0558	0.0000	0.0000	0.0558	2	1	0.9
RMG0140	Furnace tune-up (>120MBH) - Common	0.0000	0.0000	4.9587	0.0000	0.0000	4.9587	2	1	0.9
RMG0141	Furnace tune-up (40-80 MBH) - Common	0.0000	0.0000	2.7506	0.0000	0.0000	2.7506	2	1	0.9
RMG0142	Furnace tune-up (80-120MBH) - Common	0.0000	0.0000	4.4511	0.0000	0.0000	4.4511	2	1	0.9
RMG0145	In-direct water Heater (e90% Eff)	0.0000	0.0000	0.2418	0.0000	0.0000	0.2417*	15	1	0.9
RMG0146	In-direct water heater (84-90% Eff)	0.0000	0.0000	0.1037	0.0000	0.0000	0.1036*	15	1	0.9
RMG0149	Low flow showerhead - 1.5 gpm - Prescriptive	0.0000	0.0000	1.4030	0.0000	0.0000	1.4026*	10	0.945	0.9
RMG0152	Roof Insulation	0.0000	0.0000	2.4324	0.0000	0.0000	2.4324	25	1	0.9
RMG0154	Low flow bath faucet aerators 1.0gpm - Gas - DI	0.0000	0.0000	0.3020	0.0000	0.0000	0.3019*	10	0.976	0.9
RMG0168	Low flow Showerhead - Common - 1.5gpm - Gas	0.0000	0.0000	1.4030	0.0000	0.0000	1.4026*	10	0.945	0.9
RMG0171	Pipe wrap - space heat - Common DI	0.0000	0.0000	0.3897	0.0000	0.0000	0.3896*	20	1	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RMG0172	NC - low flow bath faucet aerator - Prescriptive Gas	0.0000	0.0000	0.1753	0.0000	0.0000	0.1753	10	0.976	0.9
RMG0173	NC - low flow kitchen aerator - Gas	0.0000	0.0000	0.8669	0.0000	0.0000	0.8669	10	0.976	0.9
RMG0174	NC - low flow showerhead - 1.5 gpm - Prescriptive	0.0000	0.0000	1.4026	0.0000	0.0000	1.4026	10	0.945	0.9
RMG0177	NC - furnace replacement - 92% - In Unit	0.0000	0.0000	10.0718	0.0000	0.0000	10.0718	15	1	0.9
RMG0178	NC - furnace replacement - 95% - In Unit	0.0000	0.0000	10.7625	0.0000	0.0000	10.7625	15	1	0.9
RMG0181	NC - furnace replacement - 95% - Common	0.0000	0.0000	6.6006	0.0000	0.0000	6.6006	15	1	0.9
RMG0184	NC - Energy Star Doors	0.0000	0.0000	1.4583	0.0000	0.0000	1.4583	20	1	0.9

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the Multifamily appendix

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Task 3: Documentation Review

Cadmus selected and reviewed program documentation for a random sample of 57 participants drawn from the Consumers Energy eTracker database for the Multifamily and Multifamily Income Qualified Programs. The sample utilized invoices, applications, and any additional documentation available to validate measure installation data. Table 90 documents reported and verified measure counts as well as reported and verified energy savings by fuel type, and demand reductions for the sample applications.

Table 90. Sample Participation and Savings by Measure (Multifamily and Multifamily Income Qualified)

Consumers Energy Measure ID	Sample Totals Reported by EWR Provider				Verified Sample Totals			
	Sample Participation	kWh	kW	MCF	Sample Participation	kWh	kW	MCF
RME0031	1	288.2500	0.0078	0.0000	1	288.2500	0.0078	0.0000
RME0151	21	5,187.0000	0.5943	0.0000	21	5,187.0000	0.5943	0.0000
RME0167	24	1,108.8000	0.1320	0.0000	24	1,108.8000	0.1320	0.0000
RME0168	8,430	240,255.0000	28.6620	0.0000	8,430	240,255.0000	28.6620	0.0000
RME0180	151	3,578.7000	0.4228	0.0000	151	3,578.7000	0.4228	0.0000
RME0182	1,002	27,054.0000	1.0020	0.0000	1,002	27,054.0000	1.0020	0.0000
RME0194	2,004	57,114.0000	6.8136	0.0000	2,004	57,114.0000	6.8136	0.0000
RME0197	4,705	20,320.8950	0.0000	0.0000	4,705	20,320.8950	0.0000	0.0000
RME0199	3,200	13,820.8000	0.0000	0.0000	3,200	13,820.8000	0.0000	0.0000
RME0204	1	98.8000	0.0181	0.0000	1	98.8000	0.0181	0.0000
RME0209	60	3,042.0000	0.5580	0.0000	60	3,042.0000	0.5580	0.0000
RME0215	4	2,242.5600	0.2560	0.0000	4	2,242.5600	0.2560	0.0000
RME0216	4	216.0000	0.0256	0.0000	4	216.0000	0.0256	0.0000
RME0223	291,200	0.0000	0.0000	0.0000	291,200	0.0000	0.0000	0.0000
RME0224	113	3,051.0000	0.3616	0.0000	113	3,051.0000	0.3616	0.0000
RMG0007	3,214	0.0000	0.0000	719.9360	3,214	0.0000	0.0000	719.9360
RMG0011	19,220	0.0000	0.0000	968.6880	19,220	0.0000	0.0000	968.6880
RMG0014	759	0.0000	0.0000	658.1289	759	0.0000	0.0000	658.1289
RMG0020	1,063	0.0000	0.0000	2,264.2963	1,063	0.0000	0.0000	2,264.2963
RMG0021	9	0.0000	0.0000	32.6907	9	0.0000	0.0000	32.6907
RMG0030	317	0.0000	0.0000	484.9783	317	0.0000	0.0000	484.9783
RMG0035	5,145	0.0000	0.0000	204.7535	5,145	0.0000	0.0000	204.7535
RMG0050	622	0.0000	0.0000	890.5796	600	0.0000	0.0000	859.0800
RMG0051	392	0.0000	0.0000	561.2656	414	0.0000	0.0000	592.7652
RMG0108	61	0.0000	0.0000	70.8454	61	0.0000	0.0000	70.8454
RMG0119	68	0.0000	0.0000	58.9628	68	0.0000	0.0000	58.9628
RMG0120	339	0.0000	0.0000	59.4606	339	0.0000	0.0000	59.4606
RMG0123	1,500	0.0000	0.0000	311.8500	1,500	0.0000	0.0000	311.8500
RMG0131	2,500	0.0000	0.0000	139.5000	2,500	0.0000	0.0000	139.5000
RMG0140	2	0.0000	0.0000	9.9174	2	0.0000	0.0000	9.9174
RMG0141	2	0.0000	0.0000	5.5012	2	0.0000	0.0000	5.5012
RMG0142	2	0.0000	0.0000	8.9022	2	0.0000	0.0000	8.9022
RMG0145	700	0.0000	0.0000	169.2600	700	0.0000	0.0000	169.2600
RMG0146	990	0.0000	0.0000	102.6630	990	0.0000	0.0000	102.6630

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Consumers Energy Measure ID	Sample Totals Reported by EWR Provider				Verified Sample Totals			
	Sample Participation	kWh	kW	MCF	Sample Participation	kWh	kW	MCF
RMG0154	656	0.0000	0.0000	198.1120	656	0.0000	0.0000	198.1120
RMG0168	1	0.0000	0.0000	1.4030	1	0.0000	0.0000	1.4030
RMG0171	6,316	0.0000	0.0000	2,461.3452	6,316	0.0000	0.0000	2,461.3452
RMG0177	6	0.0000	0.0000	60.4308	6	0.0000	0.0000	60.4308
RMG0184	12	0.0000	0.0000	17.4996	12	0.0000	0.0000	17.4996
RQE0031	3	864.7500	0.0234	0.0000	3	864.7500	0.0234	0.0000
RQE0166	5	96.5000	0.0115	0.0000	5	96.5000	0.0115	0.0000
RQE0167	24	1,108.8000	0.1320	0.0000	24	1,108.8000	0.1320	0.0000
RQE0168	2,694	76,779.0000	9.1596	0.0000	2,694	76,779.0000	9.1596	0.0000
RQE0171	4	582.0000	0.1068	0.0000	4	582.0000	0.1068	0.0000
RQE0180	143	3,861.0000	0.1430	0.0000	143	3,861.0000	0.1430	0.0000
RQE0194	511	14,563.5000	1.7374	0.0000	511	14,563.5000	1.7374	0.0000
RQE0197	4,094	17,680.2584	0.0000	0.0000	4,094	17,680.2584	0.0000	0.0000
RQE0210	150	5,010.0000	0.9150	0.0000	150	5,010.0000	0.9150	0.0000
RQE0216	12	648.0000	0.0768	0.0000	12	648.0000	0.0768	0.0000
RQE0225	256	6,912.0000	0.8192	0.0000	256	6,912.0000	0.8192	0.0000
RQE0230	64	75,251.2000	8.8256	0.0000	64	75,251.2000	8.8256	0.0000
RQE0255	7	84.0000	0.0154	0.0000	7	84.0000	0.0154	0.0000
RQG0001	1	0.0000	0.0000	2,195.2000	1	0.0000	0.0000	2,195.2000
RQG0011	610	0.0000	0.0000	30.8660	610	0.0000	0.0000	30.8660
RQG0020	220	0.0000	0.0000	544.0820	220	0.0000	0.0000	544.0820
RQG0030	251	0.0000	0.0000	396.7306	251	0.0000	0.0000	396.7306
RQG0035	7,959	0.0000	0.0000	327.9153	7,959	0.0000	0.0000	327.9153
Sample Total	371,823	580,818.8134	60.8195	13,955.7640	371,823	580,818.8134	60.8195	13,955.7640

Cadmus found 22 handheld showerheads in application documentation that was claimed in eTracker as regular showerheads. Cadmus moved the installation quantity of the 22 shower heads from RMG0050 to RMG0051. Because handheld showerheads and regular showerheads both claim the same per unit savings, there was no savings discrepancy.

Table 91 provides sample realization rates by fuel type and shows the t-test statistics Cadmus used to analyze errors in the general sample. Changes from the documentation review were slight and did not affect the sample realization rate for the Multifamily Program's MCF savings.

Table 91. Sample Realization Rates and t-Statistic (Multifamily)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	100.00%
Standard Error	0.0000	0.0000	0.0000
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to program population?	No	No	No

CADMUS

Task 4: Calculation of Certified Annual and Lifetime Savings

Cadmus calculated annual savings and lifetime savings. The following tables present verified program participation, energy savings and demand reduction by measure: Table 92 and Table 93 document kWh savings, Table 94 documents kW savings, and Table 95 and Table 96 document MCF savings.

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Table 92. Certified Program Participation and First-Year kWh Savings by Measure (Multifamily)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RME0019	417	417	84,234.0000	84,234.0000	0.9760	82,212.3840	0.9000	73,991.1456	0.8784
RME0031	162	162	46,696.5000	46,696.5000	1.0000	46,696.5000	0.9000	42,026.8500	0.9000
RME0033	165	165	23,347.5000	23,347.5000	1.0000	23,347.5000	0.9000	21,012.7500	0.9000
RME0050	512	512	166,912.0000	166,912.0000	0.9450	157,731.8400	0.9000	141,958.6560	0.8505
RME0051	91	91	6,370.0000	6,370.0000	1.0000	6,370.0000	0.9000	5,733.0000	0.9000
RME0104	212	212	8,692.0000	8,692.0000	0.9760	8,483.3920	0.9000	7,635.0528	0.8784
RME0119	205	205	41,410.0000	41,410.0000	0.9760	40,416.1600	0.9000	36,374.5440	0.8784
RME0121	214	214	69,764.0000	69,764.0000	0.9450	65,926.9800	0.9000	59,334.2820	0.8505
RME0151	179	179	44,213.0000	44,213.0000	1.0000	44,213.0000	0.9000	39,791.7000	0.9000
RME0152	22	22	2,728.0000	2,728.0000	1.0000	2,728.0000	0.9000	2,455.2000	0.9000
RME0161	99	99	12,276.0000	12,276.0000	1.0000	12,276.0000	0.9000	11,048.4000	0.9000
RME0164	372	372	16,368.0000	16,368.0000	1.0000	16,368.0000	0.9000	14,731.2000	0.9000
RME0167	1,600	1,600	73,920.0000	73,920.0000	0.9430	69,706.5600	0.9000	62,735.9040	0.8487
RME0168	90,538	90,538	2,580,333.0000	2,580,333.0000	0.9430	2,433,254.0190	0.9000	2,189,928.6171	0.8487
RME0171	28	28	4,074.0000	4,074.0000	1.0000	4,074.0000	0.9000	3,666.6000	0.9000
RME0173	2,676	2,676	144,504.0000	144,504.0000	1.0000	144,504.0000	0.9000	130,053.6000	0.9000
RME0178	557	557	38,990.0000	38,990.0000	0.9760	38,054.2400	0.9000	34,248.8160	0.8784
RME0180	3,133	3,133	74,252.1000	74,252.1000	1.0000	74,252.1000	0.9000	66,826.8900	0.9000
RME0182	1,030	1,030	27,810.0000	27,810.0000	1.0000	27,810.0000	0.9000	25,029.0000	0.9000
RME0194	34,286	34,286	977,151.0000	977,151.0000	0.9430	921,453.3930	0.9000	829,308.0537	0.8487
RME0197	16,010	16,010	69,146.3262	69,146.3262	1.0000	69,146.3262	0.9000	62,231.6936	0.9000
RME0198	6,440	6,440	56,414.4000	56,414.4000	1.0000	56,414.4000	0.9000	50,772.9600	0.9000
RME0199	3,200	3,200	13,820.8000	13,820.8000	1.0000	13,820.8000	0.9000	12,438.7200	0.9000
RME0204	637	637	62,935.6000	62,935.6000	0.9430	59,348.2708	0.9000	53,413.4437	0.8487
RME0209	490	490	24,843.0000	24,843.0000	1.0000	24,843.0000	0.9000	22,358.7000	0.9000
RME0215	383	383	214,725.1200	214,725.1200	1.0000	214,725.1200	0.9000	193,252.6080	0.9000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RME0216	503	503	27,162.0000	27,162.0000	1.0000	27,162.0000	0.9000	24,445.8000	0.9000
RME0219	65	65	18,220.8000	18,220.8000	1.0000	18,220.8000	0.9000	16,398.7200	0.9000
RME0222	4,507	4,507	8,920.1599	8,920.1599	1.0000	8,920.1599	0.9000	8,028.1439	0.9000
RME0224	3,714	3,714	100,278.0000	100,278.0000	1.0000	100,278.0000	0.9000	90,250.2000	0.9000
RME0225	9	9	771.3000	771.3000	1.0000	771.3000	0.9000	694.1700	0.9000
RME0226	9,295	9,295	250,965.0000	250,965.0000	1.0000	250,965.0000	0.9000	225,868.5000	0.9000
RME0247	3,417	3,417	152,859.4950	152,859.4950	1.0000	152,859.4950	0.9000	137,573.5455	0.9000
RME0248	1,161	1,161	52,245.0000	52,245.0000	1.0000	52,245.0000	0.9000	47,020.5000	0.9000
Total:	186,329	186,329	5,497,352.1011	5,497,352.1011	0.9586	5,269,597.7399	0.9000	4,742,637.9659	0.8633

CADMUS

Table 93. Certified Lifetime kWh Savings by Measure (Multifamily)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RME0019	73,991.1456	10.0000	739,911.4560
RME0031	42,026.8500	10.0000	420,268.5000
RME0033	21,012.7500	15.0000	315,191.2500
RME0050	141,958.6560	10.0000	1,419,586.5600
RME0051	5,733.0000	10.0000	57,330.0000
RME0104	7,635.0528	10.0000	76,350.5280
RME0119	36,374.5440	10.0000	363,745.4400
RME0121	59,334.2820	10.0000	593,342.8200
RME0151	39,791.7000	9.0000	358,125.3000
RME0152	2,455.2000	9.0000	22,096.8000
RME0161	11,048.4000	9.0000	99,435.6000
RME0164	14,731.2000	15.0000	220,968.0000
RME0167	62,735.9040	15.0000	941,038.5600
RME0168	2,189,928.6171	15.0000	32,848,929.2565
RME0171	3,666.6000	9.0000	32,999.4000
RME0173	130,053.6000	15.0000	1,950,804.0000
RME0178	34,248.8160	10.0000	342,488.1600
RME0180	66,826.8900	15.0000	1,002,403.3500
RME0182	25,029.0000	12.0000	300,348.0000
RME0194	829,308.0537	15.0000	12,439,620.8055
RME0197	62,231.6936	16.0000	995,707.0973
RME0198	50,772.9600	16.0000	812,367.3600
RME0199	12,438.7200	16.0000	199,019.5200
RME0204	53,413.4437	9.0000	480,720.9935
RME0209	22,358.7000	18.0000	402,456.6000
RME0215	193,252.6080	15.0000	2,898,789.1200
RME0216	24,445.8000	15.0000	366,687.0000
RME0219	16,398.7200	15.0000	245,980.8000
RME0222	8,028.1439	25.0000	200,703.5987
RME0224	90,250.2000	15.0000	1,353,753.0000
RME0225	694.1700	9.0000	6,247.5300
RME0226	225,868.5000	15.0000	3,388,027.5000
RME0247	137,573.5455	20.0000	2,751,470.9100
RME0248	47,020.5000	15.0000	705,307.5000
Total:	4,742,637.9659		69,352,222.3155

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Table 94. Certified Program Participation and kW Savings by Measure (Multifamily)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RME0019	417	417	9.5910	9.5910	0.9760	9.3608	0.9000	8.4247	0.8784
RME0031	162	162	1.2636	1.2636	1.0000	1.2636	0.9000	1.1372	0.9000
RME0033	165	165	4.2900	4.2900	1.0000	4.2900	0.9000	3.8610	0.9000
RME0050	512	512	13.3120	13.3120	0.9450	12.5798	0.9000	11.3219	0.8505
RME0051	91	91	0.7280	0.7280	1.0000	0.7280	0.9000	0.6552	0.9000
RME0104	212	212	1.0600	1.0600	0.9760	1.0346	0.9000	0.9311	0.8784
RME0119	205	205	4.7150	4.7150	0.9760	4.6018	0.9000	4.1417	0.8784
RME0121	214	214	5.5640	5.5640	0.9450	5.2580	0.9000	4.7322	0.8505
RME0151	179	179	5.0657	5.0657	1.0000	5.0657	0.9000	4.5591	0.9000
RME0164	372	372	1.9716	1.9716	1.0000	1.9716	0.9000	1.7744	0.9000
RME0167	1,600	1,600	8.8000	8.8000	0.9430	8.2984	0.9000	7.4686	0.8487
RME0168	90,538	90,538	307.8292	307.8292	0.9430	290.2829	0.9000	261.2546	0.8487
RME0171	28	28	0.7476	0.7476	1.0000	0.7476	0.9000	0.6728	0.8999
RME0173	2,676	2,676	17.1264	17.1264	1.0000	17.1264	0.9000	15.4138	0.9000
RME0178	557	557	4.4560	4.4560	0.9760	4.3491	0.9000	3.9142	0.8784
RME0180	3,133	3,133	8.7724	8.7724	1.0000	8.7724	0.9000	7.8952	0.9000
RME0182	1,030	1,030	1.0300	1.0300	1.0000	1.0300	0.9000	0.9270	0.9000
RME0194	34,286	34,286	116.5724	116.5724	0.9430	109.9278	0.9000	98.9350	0.8487
RME0198	6,440	6,440	6.4400	6.4400	1.0000	6.4400	0.9000	5.7960	0.9000
RME0204	637	637	11.5297	11.5297	0.9430	10.8725	0.9000	9.7853	0.8487
RME0209	490	490	4.5570	4.5570	1.0000	4.5570	0.9000	4.1013	0.9000
RME0215	383	383	24.5120	24.5120	1.0000	24.5120	0.9000	22.0608	0.9000
RME0216	503	503	3.2192	3.2192	1.0000	3.2192	0.9000	2.8973	0.9000
RME0219	65	65	4.1600	4.1600	1.0000	4.1600	0.9000	3.7440	0.9000
RME0222	4,507	4,507	3.1550	3.1550	1.0000	3.1550	0.9000	2.8395	0.9000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RME0224	3,714	3,714	11.8848	11.8848	1.0000	11.8848	0.9000	10.6963	0.9000
RME0225	9	9	0.1422	0.1422	1.0000	0.1422	0.9000	0.1280	0.9001
RME0226	9,295	9,295	29.7440	29.7440	1.0000	29.7440	0.9000	26.7696	0.9000
RME0247	3,417	3,417	29.3862	29.3862	1.0000	29.3862	0.9000	26.4476	0.9000
RME0248	1,161	1,161	5.9211	5.9211	1.0000	5.9211	0.9000	5.3290	0.9000
Total:	166,998	166,998	647.5461	647.5461	0.9585	620.6825	0.9000	558.6144	0.8632

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Table 95. Certified Program Participation and First-Year MCF Savings by Measure (Multifamily)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RMG0007	22,238	22,238	4,981.3120	4,981.3120	1.0000	4,981.3120	0.9000	4,483.1808	0.9000
RMG0009	19,536	19,536	861.5376	861.5376	1.0000	861.5376	0.9000	775.3838	0.9000
RMG0010	178	178	5,167.9630	5,166.4856	1.0000	5,166.4856	0.9000	4,649.8370	0.8997
RMG0011	114,376	114,376	5,764.5504	5,764.5504	1.0000	5,764.5504	0.9000	5,188.0954	0.9000
RMG0012	14,898	14,898	4,502.1756	4,502.1756	1.0000	4,502.1756	0.9000	4,051.9580	0.9000
RMG0014	5,889	5,889	5,106.3519	5,105.1741	0.9760	4,982.6499	0.9000	4,484.3849	0.8782
RMG0020	14,225	14,225	30,300.6725	30,300.6725	1.0000	30,300.6725	0.9000	27,270.6053	0.9000
RMG0021	110	110	399.5530	399.5530	1.0000	399.5530	0.9000	359.5977	0.9000
RMG0023	199	199	44.5959	44.5760	1.0000	44.5760	0.9000	40.1184	0.8996
RMG0030	855	855	1,308.0645	1,308.0645	1.0000	1,308.0645	0.9000	1,177.2581	0.9000
RMG0035	82,401	82,401	3,279.5707	3,279.5706	1.0000	3,279.5706	0.9000	2,951.6135	0.9000
RMG0037	2	2	2.0316	2.0316	1.0000	2.0316	0.9000	1.8284	0.9000
RMG0050	5,471	5,471	7,833.3778	7,833.3778	0.9450	7,402.5420	0.9000	6,662.2878	0.8505
RMG0051	1,633	1,633	2,338.1294	2,338.1294	1.0000	2,338.1294	0.9000	2,104.3165	0.9000
RMG0108	256	256	297.3184	297.3184	1.0000	297.3184	0.9000	267.5866	0.9000
RMG0119	650	650	563.6150	563.4850	0.9760	549.9614	0.9000	494.9652	0.8782
RMG0120	1,407	1,407	246.7878	246.6471	0.9760	240.7276	0.9000	216.6548	0.8779
RMG0121	100	100	834.3400	834.3400	1.0000	834.3400	0.9000	750.9060	0.9000
RMG0123	17,307	17,307	3,598.1253	3,598.1253	1.0000	3,598.1253	0.9000	3,238.3128	0.9000
RMG0131	9,390	9,390	523.9453	523.9453	1.0000	523.9453	0.9000	471.5507	0.9000
RMG0140	2	2	9.9174	9.9174	1.0000	9.9174	0.9000	8.9257	0.9000
RMG0141	3	3	8.2518	8.2518	1.0000	8.2518	0.9000	7.4266	0.9000
RMG0142	8	8	35.6088	35.6088	1.0000	35.6088	0.9000	32.0479	0.9000
RMG0145	12,748	12,748	3,082.4664	3,081.1916	1.0000	3,081.1916	0.9000	2,773.0724	0.8996
RMG0146	990	990	102.6630	102.5640	1.0000	102.5640	0.9000	92.3076	0.8991
RMG0149	432	432	606.0960	605.9232	0.9450	572.5974	0.9000	515.3377	0.8503

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RMG0152	34	34	83.5773	83.5773	1.0000	83.5773	0.9000	75.2195	0.9000
RMG0154	6,416	6,416	1,937.6320	1,936.9904	0.9760	1,890.5026	0.9000	1,701.4524	0.8781
RMG0168	4	4	5.6120	5.6104	0.9450	5.3018	0.9000	4.7716	0.8502
RMG0171	51,097	51,097	19,912.5009	19,907.3912	1.0000	19,907.3912	0.9000	17,916.6521	0.8998
RMG0172	301	301	52.7653	52.7653	0.9760	51.4989	0.9000	46.3490	0.8784
RMG0173	24	24	20.8056	20.8056	0.9760	20.3063	0.9000	18.2756	0.8784
RMG0174	60	60	84.1560	84.1560	0.9450	79.5274	0.9000	71.5747	0.8505
RMG0177	104	104	1,047.4672	1,047.4672	1.0000	1,047.4672	0.9000	942.7205	0.9000
RMG0178	306	306	3,293.3250	3,293.3250	1.0000	3,293.3250	0.9000	2,963.9925	0.9000
RMG0181	18	18	118.8108	118.8108	1.0000	118.8108	0.9000	106.9297	0.9000
RMG0184	843	843	1,229.3469	1,229.3469	1.0000	1,229.3469	0.9000	1,106.4122	0.9000
Total:	384,511	384,511	109,585.0201	109,574.7747	0.9940	108,915.4551	0.9000	98,023.9094	0.8947

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Table 96. Certified Lifetime MCF Savings by Measure (Multifamily)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RMG0007	4,483.1808	15.0000	67,247.7120
RMG0009	775.3838	15.0000	11,630.7576
RMG0010	4,649.8370	5.0000	23,249.1852
RMG0011	5,188.0954	2.0000	10,376.1907
RMG0012	4,051.9580	20.0000	81,039.1608
RMG0014	4,484.3849	10.0000	44,843.8493
RMG0020	27,270.6053	2.0000	54,541.2105
RMG0021	359.5977	2.0000	719.1954
RMG0023	40.1184	15.0000	601.7760
RMG0030	1,177.2581	20.0000	23,545.1610
RMG0035	2,951.6135	25.0000	73,790.3374
RMG0037	1.8284	9.0000	16.4560
RMG0050	6,662.2878	10.0000	66,622.8782
RMG0051	2,104.3165	10.0000	21,043.1646
RMG0108	267.5866	9.0000	2,408.2790
RMG0119	494.9652	10.0000	4,949.6522
RMG0120	216.6548	10.0000	2,166.5481
RMG0121	750.9060	15.0000	11,263.5900
RMG0123	3,238.3128	20.0000	64,766.2554
RMG0131	471.5507	2.0000	943.1015
RMG0140	8.9257	2.0000	17.8513
RMG0141	7.4266	2.0000	14.8532
RMG0142	32.0479	2.0000	64.0958
RMG0145	2,773.0724	15.0000	41,596.0866
RMG0146	92.3076	15.0000	1,384.6140
RMG0149	515.3377	10.0000	5,153.3768
RMG0152	75.2195	25.0000	1,880.4884
RMG0154	1,701.4524	10.0000	17,014.5237
RMG0168	4.7716	10.0000	47.7165
RMG0171	17,916.6521	20.0000	358,333.0416
RMG0172	46.3490	10.0000	463.4904
RMG0173	18.2756	10.0000	182.7564
RMG0174	71.5747	10.0000	715.7468
RMG0177	942.7205	15.0000	14,140.8072
RMG0178	2,963.9925	15.0000	44,459.8875
RMG0181	106.9297	15.0000	1,603.9458
RMG0184	1,106.4122	20.0000	22,128.2442
Total:	98,023.9094		1,074,965.9871

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Appendix K: Multifamily Income Qualified Program

Table 97 presents reported gross and certified net energy savings by fuel type and demand reduction for the Multifamily Income Qualified Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 97. Participation and Savings (Multifamily Income Qualified)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	192,504.9700	2,175,796.8214	225.4150	31,443.9337
Verified Net Participation and Savings	192,504.9700	2,147,145.3040	221.9787	31,402.5892
Verified Actual Lifetime Savings	NA	26,263,817.3696	NA	452,850.4316
Program Realization Rate	100.0000%	98.6832%	98.4756%	99.8685%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%	100.0046%
Lifetime Net Verified v. Net Reported Savings	NA	100.0000%	NA	101.3102%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Review

Cadmus found a conversion factor error between per-unit measure MCF savings reported by Consumers Energy and the therm values in the MEMD of 0.0001 MCF for gas savings measures RQG0016 and RQG0171 and a difference of 0.0004 for measure RQG0050. Cadmus used the corrected per-unit savings in the final net savings calculations. A furnace replacement measure, RQG0137, was claiming an incorrect measure of 2.5, where the MEMD claims a measure life of 15 years. The measure life for RQG0137 was updated to reflect the MEMD value.

During the custom review, one Job ID incorrectly claimed a 20-year measure life for wall insulation, where the MEMD claims a measure life of 25 years. The weighted measure life for custom savings measure, RQE0001, was updated to reflect this change. All other measure lives reported by Consumers Energy were correct, based on the EULs listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus reviewed gross and net adjustment factors and found no discrepancies. Table 98 presents verified per-unit savings, measure lives, and saving adjustment factors for all measures delivered through the 2017 Multifamily Income Qualified Program.

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Table 98. Verified Per-Unit Measure Characteristics (Multifamily Income Qualified)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RQE0001	IQ Multifamily Custom - Electric	38,150.2000	3.4900	0.0000	38,150.2000	3.4900	0.0000	15*	1	1
RQE0003	Common area -- LED exit signs (Retrofit Only)	201.0000	0.0230	0.0000	201.0000	0.0230	0.0000	15	1	1
RQE0031	Occupancy sensors under 500W	288.2500	0.0078	0.0000	288.2500	0.0078	0.0000	10	1	1
RQE0032	Occupancy sensors over 500W	720.6000	0.0196	0.0000	720.6000	0.0196	0.0000	10	1	1
RQE0033	LED downlight fixture	141.5000	0.0260	0.0000	141.5000	0.0260	0.0000	15	1	1
RQE0164	LED fixture - In Unit DI	44.0000	0.0053	0.0000	44.0000	0.0053	0.0000	15	1	1
RQE0166	LED lamp - 40W replacement - In Unit DI	19.3000	0.0023	0.0000	19.3000	0.0023	0.0000	15	0.943	1
RQE0167	LED lamp - 50- 80W replacement - Common	46.2000	0.0055	0.0000	46.2000	0.0055	0.0000	15	0.943	1
RQE0168	LED lamp - 60W replacement - In Unit DI	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15	0.943	1
RQE0171	LED lamp - Flood/PAR - Common	145.5000	0.0267	0.0000	145.5000	0.0267	0.0000	9	1	1
RQE0173	LED lamp - PAR - In Unit DI	54.0000	0.0064	0.0000	54.0000	0.0064	0.0000	15	1	1
RQE0180	LED candelabra lamp (3-5W) - In- Unit DI	27.0000	0.0010	0.0000	27.0000	0.0010	0.0000	12	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RQE0184	LED exit signs - DI	201.0000	0.0230	0.0000	201.0000	0.0230	0.0000	15	1	1
RQE0194	LED lamp - 60W replacement - In Unit DI	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15	0.943	1
RQE0197	Exterior HID to LED (Per Watt Reduced)	4.3190	0.0000	0.0000	4.3190	0.0000	0.0000	16	1	1
RQE0198	Exterior HID to LED (24/7) (Per Watt Reduced)	8.7600	0.0010	0.0000	8.7600	0.0010	0.0000	16	1	1
RQE0200	Exterior HID to Induction (24/7) (Per Watt Reduced)	8.7600	0.0010	0.0000	8.7600	0.0010	0.0000	16	1	1
RQE0204	LED lamp - Common & DI	98.8000	0.0181	0.0000	98.8000	0.0181	0.0000	9	0.943	1
RQE0209	4-Foot T12 to 4- Foot LED Tube Lights (common)	50.7000	0.0093	0.0000	50.7000	0.0093	0.0000	18	1	1
RQE0210	4-Foot T8 to 4- Foot LED Tube Lights (common)	33.4000	0.0061	0.0000	33.4000	0.0061	0.0000	18	1	1
RQE0216	LED Flood/PAR In- Unit DI	54.0000	0.0064	0.0000	54.0000	0.0064	0.0000	15	1	1
RQE0225	LED Globe - In Unit DI	27.0000	0.0032	0.0000	27.0000	0.0032	0.0000	15	1	1
RQE0228	Refrigerator - 15 cf -- Income Qualified DI	1,175.8000	0.1379	0.0000	1,175.8000	0.1379	0.0000	8.3	1	1
RQE0229	Refrigerator - 18 cf -- Income Qualified DI	1,175.8000	0.1379	0.0000	1,175.8000	0.1379	0.0000	8.3	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RQE0230	Refrigerator - 21 cf -- Income Qualified DI	1,175.8000	0.1379	0.0000	1,175.8000	0.1379	0.0000	8.3	1	1
RQE0254	ENERGY STAR Room AC >8,000BTU/hr	71.9000	0.1090	0.0000	71.9000	0.1090	0.0000	15	1	1
RQE0255	LED replacing CFL 50-79W Common	12.0000	0.0022	0.0000	12.0000	0.0022	0.0000	9	0.943	1
RQG0001	IQ Multifamily Custom - Gas	0.0000	0.0000	1,282.0114	0.0000	0.0000	1,282.0114	16.4544	1	1
RQG0007	Pipe wrap - Gas - DHW - In-Unit DI	0.0000	0.0000	0.2240	0.0000	0.0000	0.2240	15	1	1
RQG0011	Boiler tune-up	0.0000	0.0000	0.0506	0.0000	0.0000	0.0506	2	1	1
RQG0012	High-efficiency boiler - >90%	0.0000	0.0000	0.3049	0.0000	0.0000	0.3049	20	1	1
RQG0014	Low flow kitchen faucet aerators - Gas - In-Unit DI	0.0000	0.0000	0.8669	0.0000	0.0000	0.8669	10	0.976	1
RQG0016	Pipe wrap- hydronic	0.0000	0.0000	0.3897	0.0000	0.0000	0.3896*	20	1	1
RQG0018	Super high efficiency gas water heater >= 0.88%	0.0000	0.0000	30.0282	0.0000	0.0000	30.0282	13	1	1
RQG0020	Furnace tune-up 40,000 - 80,000 BTU	0.0000	0.0000	2.4731	0.0000	0.0000	2.4731	2	1	1
RQG0021	Furnace tune-up 80,001 - 120,000 BTU	0.0000	0.0000	4.9687	0.0000	0.0000	4.9687	2	1	1
RQG0030	Energy Star Doors	0.0000	0.0000	1.5806	0.0000	0.0000	1.5806	20	1	1
RQG0035	Energy Star Window	0.0000	0.0000	0.0412	0.0000	0.0000	0.0412	25	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RQG0050	Low flow showerhead - 1.5 gpm - DI	0.0000	0.0000	1.4322	0.0000	0.0000	1.4318*	10	0.945	1
RQG0051	Low flow showerhead - 1.5 gpm handheld - DI	0.0000	0.0000	1.4318	0.0000	0.0000	1.4318	10	1	1
RQG0108	Setback thermostat - moderate setback -- Prescriptive Gas or Combination	0.0000	0.0000	1.1460	0.0000	0.0000	1.1460	9	1	1
RQG0123	Pipe wrap - DHW - Gas - Common DI	0.0000	0.0000	0.2079	0.0000	0.0000	0.2079	20	1	1
RQG0124	Programmable thermostat - In-Unit DI	0.0000	0.0000	0.7957	0.0000	0.0000	0.7957	9	1	1
RQG0131	DHW boiler tune-up	0.0000	0.0000	0.0558	0.0000	0.0000	0.0558	2	1	1
RQG0137	Furnace replacement - 95% - In Unit	0.0000	0.0000	6.4204	0.0000	0.0000	6.4204	15*	1	1
RQG0141	Furnace tune-up (40-80 MBH) - Common	0.0000	0.0000	2.7732	0.0000	0.0000	2.7732	2	1	1
RQG0145	In-direct water Heater (e90% Eff)	0.0000	0.0000	0.2417	0.0000	0.0000	0.2417	15	1	1
RQG0154	Low flow bath faucet aerators 1.0gpm - Gas - DI	0.0000	0.0000	0.3019	0.0000	0.0000	0.3019	10	0.976	1
RQG0171	Pipe wrap - space heat - Common - DI	0.0000	0.0000	0.3897	0.0000	0.0000	0.3896*	20	1	1
RQG0173	High efficiency gas water heater - 0.67 EF - DI	0.0000	0.0000	2.0454	0.0000	0.0000	2.0454	13	1	1

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RQG0174	High efficiency furnace tune-up 40,000 - 80,000 BTU	0.0000	0.0000	2.2502	0.0000	0.0000	2.2502	2	1	1

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the Multifamily Income Qualified appendix

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Task 3: Documentation Review

Cadmus conducted the Multifamily Income Qualified Program documentation review in conjunction with the Multifamily Program. Table 90 documents reported and verified measure counts as well as reported and verified energy savings by fuel type, and demand reductions for the sample applications for the Multifamily Income Qualified Program. No discrepancies were found during the documentation review.

Task 4: Calculation of Certified Annual and Lifetime Savings

Cadmus calculated annual savings and lifetime savings. The following tables present verified program participation, energy savings and demand reduction by measure: Table 99 and Table 100 document kWh savings, Table 101 documents kW savings, and Table 102 and Table 103 document MCF savings.

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Table 99. Certified Program Participation and First-Year kWh Savings by Measure (Multifamily Income Qualified)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RQE0001	1	1	38,150.2000	38,150.2000	1.0000	38,150.2000	1.0000	38,150.2000	1.0000
RQE0003	31	31	6,231.0000	6,231.0000	1.0000	6,231.0000	1.0000	6,231.0000	1.0000
RQE0031	438	438	126,253.5000	126,253.5000	1.0000	126,253.5000	1.0000	126,253.5000	1.0000
RQE0032	10	10	7,206.0000	7,206.0000	1.0000	7,206.0000	1.0000	7,206.0000	1.0000
RQE0033	506	506	71,599.0000	71,599.0000	1.0000	71,599.0000	1.0000	71,599.0000	1.0000
RQE0164	128	128	5,632.0000	5,632.0000	1.0000	5,632.0000	1.0000	5,632.0000	1.0000
RQE0166	5	5	96.5000	96.5000	0.9430	90.9995	1.0000	90.9995	0.9430
RQE0167	136	136	6,283.2000	6,283.2000	0.9430	5,925.0576	1.0000	5,925.0576	0.9430
RQE0168	13,822	13,822	393,927.0000	393,927.0000	0.9430	371,473.1610	1.0000	371,473.1610	0.9430
RQE0171	10	10	1,455.0000	1,455.0000	1.0000	1,455.0000	1.0000	1,455.0000	1.0000
RQE0173	191	191	10,314.0000	10,314.0000	1.0000	10,314.0000	1.0000	10,314.0000	1.0000
RQE0180	156	156	4,212.0000	4,212.0000	1.0000	4,212.0000	1.0000	4,212.0000	1.0000
RQE0184	35	35	7,035.0000	7,035.0000	1.0000	7,035.0000	1.0000	7,035.0000	1.0000
RQE0194	3,415	3,415	97,327.5000	97,327.5000	0.9430	91,779.8325	1.0000	91,779.8325	0.9430
RQE0197	60,203	60,203	260,018.4414	260,018.4414	1.0000	260,018.4414	1.0000	260,018.4414	1.0000
RQE0198	12,696	12,696	111,216.9600	111,216.9600	1.0000	111,216.9600	1.0000	111,216.9600	1.0000
RQE0200	2,392	2,392	20,953.9200	20,953.9200	1.0000	20,953.9200	1.0000	20,953.9200	1.0000
RQE0204	50	50	4,940.0000	4,940.0000	0.9430	4,658.4200	1.0000	4,658.4200	0.9430
RQE0209	1,652	1,652	83,756.4000	83,756.4000	1.0000	83,756.4000	1.0000	83,756.4000	1.0000
RQE0210	150	150	5,010.0000	5,010.0000	1.0000	5,010.0000	1.0000	5,010.0000	1.0000
RQE0216	12	12	648.0000	648.0000	1.0000	648.0000	1.0000	648.0000	1.0000
RQE0225	1,237	1,237	33,399.0000	33,399.0000	1.0000	33,399.0000	1.0000	33,399.0000	1.0000
RQE0228	503	503	591,427.4000	591,427.4000	1.0000	591,427.4000	1.0000	591,427.4000	1.0000
RQE0229	120	120	141,096.0000	141,096.0000	1.0000	141,096.0000	1.0000	141,096.0000	1.0000
RQE0230	124	124	145,799.2000	145,799.2000	1.0000	145,799.2000	1.0000	145,799.2000	1.0000
RQE0254	24	24	1,725.6000	1,725.6000	1.0000	1,725.6000	1.0000	1,725.6000	1.0000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RQE0255	7	7	84.0000	84.0000	0.9430	79.2120	1.0000	79.2120	0.9430
Total:	98,054	98,054	2,175,796.8214	2,175,796.8214	0.9868	2,147,145.3040	1.0000	2,147,145.3040	0.9874

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Table 100. Certified Lifetime kWh Savings by Measure (Multifamily Income Qualified)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RQE0001	38,150.2000	15.0000	572,253.0000
RQE0003	6,231.0000	15.0000	93,465.0000
RQE0031	126,253.5000	10.0000	1,262,535.0000
RQE0032	7,206.0000	10.0000	72,060.0000
RQE0033	71,599.0000	15.0000	1,073,985.0000
RQE0164	5,632.0000	15.0000	84,480.0000
RQE0166	90.9995	15.0000	1,364.9925
RQE0167	5,925.0576	15.0000	88,875.8640
RQE0168	371,473.1610	15.0000	5,572,097.4150
RQE0171	1,455.0000	9.0000	13,095.0000
RQE0173	10,314.0000	15.0000	154,710.0000
RQE0180	4,212.0000	12.0000	50,544.0000
RQE0184	7,035.0000	15.0000	105,525.0000
RQE0194	91,779.8325	15.0000	1,376,697.4875
RQE0197	260,018.4414	16.0000	4,160,295.0626
RQE0198	111,216.9600	16.0000	1,779,471.3600
RQE0200	20,953.9200	16.0000	335,262.7200
RQE0204	4,658.4200	9.0000	41,925.7800
RQE0209	83,756.4000	18.0000	1,507,615.2000
RQE0210	5,010.0000	18.0000	90,180.0000
RQE0216	648.0000	15.0000	9,720.0000
RQE0225	33,399.0000	15.0000	500,985.0000
RQE0228	591,427.4000	8.3000	4,908,847.4200
RQE0229	141,096.0000	8.3000	1,171,096.8000
RQE0230	145,799.2000	8.3000	1,210,133.3600
RQE0254	1,725.6000	15.0000	25,884.0000
RQE0255	79.2120	9.0000	712.9080
Total:	2,147,145.3040		26,263,817.3696

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Table 101. Certified Program Participation and kW Savings by Measure (Multifamily Income Qualified)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RQE0001	1	1	3.4900	3.4900	1.0000	3.4900	1.0000	3.4900	1.0000
RQE0003	31	31	0.7130	0.7130	1.0000	0.7130	1.0000	0.7130	1.0000
RQE0031	438	438	3.4164	3.4164	1.0000	3.4164	1.0000	3.4164	1.0000
RQE0032	10	10	0.1960	0.1960	1.0000	0.1960	1.0000	0.1960	1.0000
RQE0033	506	506	13.1560	13.1560	1.0000	13.1560	1.0000	13.1560	1.0000
RQE0164	128	128	0.6784	0.6784	1.0000	0.6784	1.0000	0.6784	1.0000
RQE0166	5	5	0.0115	0.0115	0.9430	0.0108	1.0000	0.0108	0.9391
RQE0167	136	136	0.7480	0.7480	0.9430	0.7054	1.0000	0.7054	0.9430
RQE0168	13,822	13,822	46.9948	46.9948	0.9430	44.3161	1.0000	44.3161	0.9430
RQE0171	10	10	0.2670	0.2670	1.0000	0.2670	1.0000	0.2670	1.0000
RQE0173	191	191	1.2224	1.2224	1.0000	1.2224	1.0000	1.2224	1.0000
RQE0180	156	156	0.1560	0.1560	1.0000	0.1560	1.0000	0.1560	1.0000
RQE0184	35	35	0.8050	0.8050	1.0000	0.8050	1.0000	0.8050	1.0000
RQE0194	3,415	3,415	11.6110	11.6110	0.9430	10.9492	1.0000	10.9492	0.9430
RQE0198	12,696	12,696	12.6960	12.6960	1.0000	12.6960	1.0000	12.6960	1.0000
RQE0200	2,392	2,392	2.3920	2.3920	1.0000	2.3920	1.0000	2.3920	1.0000
RQE0204	50	50	0.9050	0.9050	0.9430	0.8534	1.0000	0.8534	0.9430
RQE0209	1,652	1,652	15.3636	15.3636	1.0000	15.3636	1.0000	15.3636	1.0000
RQE0210	150	150	0.9150	0.9150	1.0000	0.9150	1.0000	0.9150	1.0000
RQE0216	12	12	0.0768	0.0768	1.0000	0.0768	1.0000	0.0768	1.0000
RQE0225	1,237	1,237	3.9584	3.9584	1.0000	3.9584	1.0000	3.9584	1.0000
RQE0228	503	503	69.3637	69.3637	1.0000	69.3637	1.0000	69.3637	1.0000
RQE0229	120	120	16.5480	16.5480	1.0000	16.5480	1.0000	16.5480	1.0000
RQE0230	124	124	17.0996	17.0996	1.0000	17.0996	1.0000	17.0996	1.0000
RQE0254	24	24	2.6160	2.6160	1.0000	2.6160	1.0000	2.6160	1.0000

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Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RQE0255	7	7	0.0154	0.0154	0.9430	0.0145	1.0000	0.0145	0.9416
Total:	37,851	37,851	225.4150	225.4150	0.9848	221.9787	1.0000	221.9787	0.9854

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Table 102. Certified Program Participation and First-Year MCF Savings by Measure (Multifamily Income Qualified)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RQG0001	12	12	15,384.1369	15,384.1369	1.0000	15,384.1369	1.0000	15,384.1369	1.0000
RQG0007	8,950	8,950	2,004.8000	2,004.8000	1.0000	2,004.8000	1.0000	2,004.8000	1.0000
RQG0011	24,371	24,371	1,233.1726	1,233.1726	1.0000	1,233.1726	1.0000	1,233.1726	1.0000
RQG0012	5,868	5,868	1,789.1532	1,789.1532	1.0000	1,789.1532	1.0000	1,789.1532	1.0000
RQG0014	526	526	455.9894	455.9894	0.9760	445.0457	1.0000	445.0457	0.9760
RQG0016	575	575	224.0775	224.0200	1.0000	224.0200	1.0000	224.0200	0.9997
RQG0018	4	4	120.1128	120.1128	1.0000	120.1128	1.0000	120.1128	1.0000
RQG0020	901	901	2,228.2631	2,228.2631	1.0000	2,228.2631	1.0000	2,228.2631	1.0000
RQG0021	2	2	9.9374	9.9374	1.0000	9.9374	1.0000	9.9374	1.0000
RQG0030	775	775	1,224.9650	1,224.9650	1.0000	1,224.9650	1.0000	1,224.9650	1.0000
RQG0035	41,868	41,868	1,724.9443	1,724.9443	1.0000	1,724.9443	1.0000	1,724.9443	1.0000
RQG0050	329	307	471.1938	439.5626	0.9450	415.3867	1.0000	415.3867	0.8816
RQG0051	134	156	191.8612	223.3608	1.0000	223.3608	1.0000	223.3608	1.1642
RQG0108	79	79	90.5340	90.5340	1.0000	90.5340	1.0000	90.5340	1.0000
RQG0123	770	770	160.0830	160.0830	1.0000	160.0830	1.0000	160.0830	1.0000
RQG0124	165	165	131.2905	131.2905	1.0000	131.2905	1.0000	131.2905	1.0000
RQG0131	3,196	3,196	178.3368	178.3368	1.0000	178.3368	1.0000	178.3368	1.0000
RQG0137	55	55	353.1220	353.1220	1.0000	353.1220	1.0000	353.1220	1.0000
RQG0141	1	1	2.7732	2.7732	1.0000	2.7732	1.0000	2.7732	1.0000
RQG0145	3,088	3,088	746.3696	746.3696	1.0000	746.3696	1.0000	746.3696	1.0000
RQG0154	819	819	247.2561	247.2561	0.9760	241.3220	1.0000	241.3220	0.9760
RQG0171	1,017	1,017	396.3249	396.2232	1.0000	396.2232	1.0000	396.2232	0.9997
RQG0173	261	261	533.8494	533.8494	1.0000	533.8494	1.0000	533.8494	1.0000
RQG0174	685	685	1,541.3870	1,541.3870	1.0000	1,541.3870	1.0000	1,541.3870	1.0000
Total:	94,451	94,451	31,443.9337	31,443.6429	0.9987	31,402.5892	1.0000	31,402.5892	0.9991

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Table 103. Certified Lifetime MCF Savings by Measure (Multifamily Income Qualified)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RQG0001	15,384.1369	16.4544	253,136.7422
RQG0007	2,004.8000	15.0000	30,072.0000
RQG0011	1,233.1726	2.0000	2,466.3452
RQG0012	1,789.1532	20.0000	35,783.0640
RQG0014	445.0457	10.0000	4,450.4565
RQG0016	224.0200	20.0000	4,480.4000
RQG0018	120.1128	13.0000	1,561.4664
RQG0020	2,228.2631	2.0000	4,456.5262
RQG0021	9.9374	2.0000	19.8748
RQG0030	1,224.9650	20.0000	24,499.3000
RQG0035	1,724.9443	25.0000	43,123.6073
RQG0050	415.3867	10.0000	4,153.8668
RQG0051	223.3608	10.0000	2,233.6080
RQG0108	90.5340	9.0000	814.8060
RQG0123	160.0830	20.0000	3,201.6600
RQG0124	131.2905	9.0000	1,181.6145
RQG0131	178.3368	2.0000	356.6736
RQG0137	353.1220	15.0000	5,296.8300
RQG0141	2.7732	2.0000	5.5464
RQG0145	746.3696	15.0000	11,195.5440
RQG0154	241.3220	10.0000	2,413.2195
RQG0171	396.2232	20.0000	7,924.4640
RQG0173	533.8494	13.0000	6,940.0422
RQG0174	1,541.3870	2.0000	3,082.7740
Total:	31,402.5892		452,850.4316

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Appendix L: New Home Construction Program

Table 104 presents reported gross and certified net energy savings by fuel type and demand reductions for the New Home Construction Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 104. Participation and Savings (New Home Construction)

	Participation Total	Total kWh Savings	Total MCF Savings
Reported Gross Participation and Savings	1,011.0000	396,308.1969	16,214.8044
Verified Net Participation and Savings	1,011.0000	356,677.3772	14,593.3240
Verified Actual Lifetime Savings	NA	7,133,547.5442	291,866.4792
Program Realization Rate	100.0000%	90.0000%	90.0000%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%
Lifetime Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Review

Cadmus found no discrepancies between per-unit reported savings provided by Consumers Energy and per-unit verified savings reported in the MEMD. All measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus conducted a measure-level review of savings adjustment factors and found no discrepancies. Table 105 presents verified per-unit savings, measure lives, and saving adjustment factors for all measures delivered through the 2017 New Home Construction Program.

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Table 105. Verified Per-Unit Measure Characteristics (New Home Construction)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
RNC0001	New Construction Combination Savings	1.0362	0.0000	0.0393	1.0362	0.0000	0.0393	20	1	0.9
RNC0002	Gas Furnace/Boiler no AC - Custom	181.5000	0.0000	16.0000	181.5000	0.0000	16.0000	20	1	0.9
RNE0001	New Construction Electric Savings	0.5521	0.0000	0.0000	0.5521	0.0000	0.0000	20	1	0.9
RNE0013	ASHP/GSHP w AC - Custom	1256.0000	0.0000	0.0000	1256.0000	0.0000	0.0000	20	1	0.9
RNG0001	New Construction Gas Savings	0.0000	0.0000	0.0619	0.0000	0.0000	0.0619	20	1	0.9

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Task 3: Documentation Review

Cadmus selected and reviewed program documentation for a random sample of 62 participants from the Consumers Energy eTracker database, including invoices, applications, and any additional documentation available to validate the measure installation data. Table 106 documents reported and verified measure counts as well as reported and verified energy savings by fuel type, and demand reductions for the sample applications.

Table 106. Sample Participation and Savings by Measure (New Home Construction)

Consumers Energy Measure ID	Reported by EWR Provider				Verified			
	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF	Sample Participation	Sample Total kWh	Sample Total kW	Sample Total MCF
RNC0001	29	15,980.5988	17.6600	586.9871	29	15980.5988	17.6600	586.9871
RNE0001	15	7,254.8999	6.5400	0.0000	15	7254.8999	6.5400	0.0000
RNG0001	18	0.0000	0.0000	404.2935	18	0.0000	0.0000	404.2935
Sample Total	62	23,235.4987	24.2000	991.2806	62	23235.4987	24.2000	991.2806

Cadmus found no discrepancies between the Consumers Energy eTracker database and the supporting documentation. Table 107 provides the sample realization rates by fuel type and shows t-test statistics Cadmus used to analyze errors in the general sample.

Table 107. Sample Realization Rates and t-Statistic (New Home Construction)

	kWh	kW	MCF
Sample Realization Rate	100.00%	NA	100.00%
Standard Error	0.0000	NA	0.0000
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to Program Population?	No	No	No

Task 4: Calculation of Certified Annual and Lifetime Savings

Cadmus calculated annual and lifetime savings. The following tables present verified program participation and energy savings by measure: Table 108 and Table 109 document kWh savings, and Table 110 and Table 111 document MCF savings.

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Table 108. Certified Program Participation and First-Year kWh Savings by Measure (New Home Construction)

Consumers Energy Measure ID	Reported Participation*	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RNC0001	270,748.0000	498.0000	280,562.4977	280,562.4977	1.0000	280,562.4977	0.9000	252,506.2479	0.9000
RNC0002	2.0000	2.0000	363.0000	363.0000	1.0000	363.0000	0.9000	326.7000	0.9000
RNE0001	206,721.0000	215.0000	114,126.6992	114,126.6992	1.0000	114,126.6992	0.9000	102,714.0293	0.9000
RNE0013	1.0000	1.0000	1,256.0000	1,256.0000	1.0000	1,256.0000	0.9000	1,130.4000	0.9000
Total:	477,472.0000	716.0000	396,308.1969	396,308.1969	1.0000	396,308.1969	0.9000	356,677.3772	0.9000

*Reported participation includes square footage.

Table 109. Certified Lifetime kWh Savings by Measure (New Home Construction)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RNC0001	252,506.2479	20.0000	5,050,124.9586
RNC0002	326.7000	20.0000	6,534.0000
RNE0001	102,714.0293	20.0000	2,054,280.5856
RNE0013	1,130.4000	20.0000	22,608.0000
Total:	356,677.3772		7,133,547.5442

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Table 110. Certified Program Participation and First-Year MCF Savings by Measure (New Home Construction)

Consumers Energy Measure ID	Reported Participation*	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RNC0001	270,748.0000	498.0000	10,635.4963	10,635.4963	1.0000	10,635.4963	0.9000	9,571.9467	0.9000
RNC0002	2.0000	2.0000	32.0000	32.0000	1.0000	32.0000	0.9000	28.8000	0.9000
RNG0001	89,583.0000	295.0000	5,547.3081	5,547.3081	1.0000	5,547.3081	0.9000	4,992.5773	0.9000
Total:	360,333.0000	795.0000	16,214.8044	16,214.8044	1.0000	16,214.8044	0.9000	14,593.3240	0.9000

*Reported participation includes square footage.

Table 111. Certified Lifetime MCF Savings by Measure (New Home Construction)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
RNC0001	9,571.9467	20.0000	191,438.9334
RNC0002	28.8000	20.0000	576.0000
RNG0001	4,992.5773	20.0000	99,851.5458
Total:	14,593.3240		291,866.4792

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Appendix M: Residential Agriculture Program

Table 112 presents reported gross and certified net energy savings by fuel type and demand reduction for the Residential Agriculture Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 112. Participation and Savings (Residential Agriculture)

	Participation Total	Total kWh Savings	Total kW Savings
Reported Gross Participation and Savings	384,085.5000	577,315.1598	159.3759
Verified Net Participation and Savings	384,085.5000	507,687.2314	142.9674
Verified Actual Lifetime Savings	NA	7,105,491.3409	NA
Program Realization Rate	100.0000%	87.9394%	89.7045%
Annual Net Verified v. Net Reported Savings	NA	97.4980%	96.3267%
Lifetime Net Verified v. Net Reported Savings	NA	97.4153%	NA

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Analysis

Cadmus found no discrepancies between per-unit reported savings provided by Consumers Energy and per-unit verified savings reported in the MEMD. All measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

The Residential Agriculture program is used for famers that wish to participate in the Small Business Energy Solutions program but have a residential meter on their farm. Installation rates provided by Consumers Energy were out of date and updated for all measures in the Residential Agriculture program except for RAI0063, based on research conducted by EMI during Commercial and Industrial EM&V⁵. Table 113 presents verified per-unit savings, measure lives, and saving adjustment factors for all measures delivered through the 2017 Residential Agriculture Program.

⁵ EMI Consulting. *Impact Evaluation Results for the C&I Business Energy Efficiency Program: Program Year 2016*, April 2017.

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Table 113. Verified Per-Unit Measure Characteristics (Residential Agriculture)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors		
		kWh	kW	MCF	kWh	kW	MCF		Gross kWh	Gross kW	Net
RAI0001	Variable speed controller for vacuum pump	597.8000	0.1946	0.0000	597.8000	0.1946	0.0000	10	0.975*	0.985*	0.9
RAI0002	Variable speed controller on milk pump with existing milk pre-cooler	0.5840	0.0002	0.0000	0.5840	0.0002	0.0000	15	0.975*	0.985*	0.9
RAI0003	Variable speed controller on milk pump with new milk pre-cooler	1.1720	0.0004	0.0000	1.1720	0.0004	0.0000	15	0.975*	0.985*	0.9
RAI0011	Lighting power density	2.6690	0.0005	0.0000	2.6690	0.0005	0.0000	15	0.975*	0.985*	0.9
RAI0012	Scroll compressor for dairy refrigeration	0.1900	0.0001	0.0000	0.1900	0.0001	0.0000	15	0.975*	0.985*	0.9
RAI0013	Dairy refrigeration tune-up	0.0973	0.0000	0.0000	0.0973	0.0000	0.0000	5	0.975*	0.985*	0.9
RAI0021	Ag circulation, exhaust, or vent fans (36' to 47" fan blade diam)	625.2300	0.1980	0.0000	625.2300	0.1980	0.0000	7	0.975*	0.985*	0.9
RAI0022	Ag circulation, exhaust, or vent fans (48' to 71" fan blade diam)	1,122.3600	0.3560	0.0000	1,122.3600	0.3560	0.0000	7	0.975*	0.985*	0.9
RAI0026	Interior LED lighting (High Bay => 18 ft)	4.1600	0.0010	0.0000	4.1600	0.0010	0.0000	16	0.975*	0.985*	0.9
RAI0027	Exterior LED lighting retrofit	4.3190	0.0000	0.0000	4.3190	0.0000	0.0000	16	0.975*	0.985*	0.9
RAI0031	Lighting power density (Exterior)	4.3190	0.0000	0.0000	4.3190	0.0000	0.0000	12	0.975*	0.985*	0.9
RAI0033	Daylight sensor controls (Watts)	0.8010	0.0002	0.0000	0.8010	0.0002	0.0000	12	0.975*	0.985*	0.9

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Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors		
		kWh	kW	MCF	kWh	kW	MCF		Gross kWh	Gross kW	Net
RAI0034	Interior LED lighting (Low Bay < 18 ft)	2.6690	0.0005	0.0000	2.6690	0.0005	0.0000	18	0.975*	0.985*	0.9
RAI0036	Low-energy livestock waterer	1,596.0000	0.0000	0.0000	1,596.0000	0.0000	0.0000	10	0.975*	0.985*	0.9
RAI0038	Sprinkler to drip irrigation	185.0000	0.2160	0.0000	185.0000	0.2160	0.0000	15	0.975*	0.985*	0.9
RAI0039	Fan thermostat controller	1,586.0000	0.0000	0.0000	1,586.0000	0.0000	0.0000	15	0.975*	0.985*	0.9
RAI0042	Milk pre-cooler (heat exchanger, chiller savings)	1.2120	0.0004	0.0000	1.2120	0.0004	0.0000	15	0.975*	0.985*	0.9
RAI0044	VFD on well pumps	195.0000	0.2029	0.0000	195.0000	0.2029	0.0000	10	0.975*	0.985*	0.9
RAI0045	Lumens per Watt improvement per year	1.0000	0.0002	0.0000	1.0000	0.0002	0.0000	16	1.042*	1.514*	0.9
RAI0050	4-Foot T12 to 4-Foot LED tube lights	50.7000	0.0093	0.0000	50.7000	0.0093	0.0000	18	0.975*	0.985*	0.9
RAI0051	8-Foot T12 to Two 4-Foot LED tube lights	93.0000	0.0171	0.0000	93.0000	0.0171	0.0000	18	0.975*	0.985*	0.9
RAI0054	New linear LED tube fixture (Low Bay < 15 ft)	2.6690	0.0005	0.0000	2.6690	0.0005	0.0000	18	0.975*	0.985*	0.9
RAI0059	4-Foot T8 to 4-Foot LED tube lights	33.4000	0.0061	0.0000	33.4000	0.0061	0.0000	18	0.975*	0.985*	0.9
RAI0060	New linear LED tube fixture (High Bay => 15 ft)	4.1600	0.0010	0.0000	4.1600	0.0010	0.0000	16	0.975*	0.985*	0.9
RAI0063	LED grow lights	4.3800	0.0010	0.0000	4.3800	0.0010	0.0000	11	0.975	0.985	0.9

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the Residential Agriculture appendix

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Task 3: Documentation Review

Cadmus selected and reviewed program documentation for a random sample of 18 participants from the Consumers Energy eTracker database, including invoices, applications, and additional documentation available to validate the measure installation data. Table 114 documents reported and verified measure counts as well as reported and verified energy savings by fuel type, and demand reductions for the sample applications.

Table 114. Sample Participation and Savings by Measure (Residential Agriculture)

Consumers Energy Measure ID	Reported by EWR Provider			Verified		
	Participation	Total kWh	Total kW	Participation	Total kWh	Total kW
RAI0001	10	5,978.0000	1.9460	10	5,978.0000	1.9460
RAI0002	49,920	29,153.2800	9.9840	49,920	29,153.2800	9.9840
RAI0003	41,436	48,562.9920	16.5744	41,436	48,562.9920	16.5744
RAI0011	2,616	6,982.1040	1.3080	2,616	6,982.1040	1.3080
RAI0017	345	0.0000	0.0000	345	0.0000	0.0000
RAI0019	1	0.0000	0.0000	1	0.0000	0.0000
RAI0022	3	3,367.0800	1.0680	3	3,367.0800	1.0680
RAI0026	14,932	62,117.1200	14.9320	14,932	62,117.1200	14.9320
RAI0027	1,299	5,610.3810	0.0000	1,299	5,610.3810	0.0000
RAI0031	2,125	9,177.8750	0.0000	2,125	9,177.8750	0.0000
RAI0038	55	10,175.0000	11.8800	55	10,175.0000	11.8800
RAI0039	3	4,758.0000	0.0000	3	4,758.0000	0.0000
RAI0042	84,783	102,756.9960	33.9132	84,783	102,756.9960	33.9132
RAI0044	5	975.0000	1.0145	5	975.0000	1.0145
RAI0045	4,665	4,665.0000	0.7700	4,665	4,665.0000	0.7700
RAI0047	1	0.0000	0.0000	1	0.0000	0.0000
RAI0059	63	2,104.2000	0.3843	63	2,104.2000	0.3843
RAI0061	5,623	0.0000	0.0000	5,623	0.0000	0.0000
Sample Total	207,885	296,383.0280	93.7744	207,885	296,383.0280	93.7744

Cadmus found no discrepancies between the Consumers Energy eTracker database and the supporting documentation. Table 115 provides sample realization rates by fuel type, and shows t-test statistics Cadmus used to analyze errors in the general sample.

Table 115. Sample Realization Rates and t-Statistic (Residential Agriculture)

	kWh	kW	MCF
Sample Realization Rate	100.00%	100.00%	100.00%
Standard Error	0.0000	0.0000	0.0000
t-Statistic	NA	NA	NA
p-Value	NA	NA	NA
Apply to Program Population?	No	No	No

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Task 4: Calculation of Verified Annual and Lifetime Savings

Cadmus calculated annual savings and lifetime savings. The following tables present verified program participation, energy savings, and demand reductions by measure: Table 116 and Table 117 document kWh savings, and Table 118 documents kW savings.

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Table 116. Certified Program Participation and First-Year kWh Savings by Measure (Residential Agriculture)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RAI0001	20	20	11,956.0000	11,956.0000	0.9750	11,657.1000	0.9000	10,491.3900	0.8775
RAI0002	81,474	81,474	47,580.8160	47,580.8160	0.9750	46,391.2956	0.9000	41,752.1660	0.8775
RAI0003	41,436	41,436	48,562.9920	48,562.9920	0.9750	47,348.9172	0.9000	42,614.0255	0.8775
RAI0011	12,737	12,737	33,995.0530	33,995.0530	0.9750	33,145.1767	0.9000	29,830.6590	0.8775
RAI0012	49,937	49,937	9,488.0300	9,488.0300	0.9750	9,250.8293	0.9000	8,325.7463	0.8775
RAI0013	19,005	19,005	1,849.1378	1,849.1379	0.9750	1,802.9094	0.9000	1,622.6185	0.8775
RAI0021	5	5	3,126.1500	3,126.1500	0.9750	3,047.9963	0.9000	2,743.1966	0.8775
RAI0022	13	13	14,590.6800	14,590.6800	0.9750	14,225.9130	0.9000	12,803.3217	0.8775
RAI0026	16,972	16,972	70,603.5200	70,603.5200	0.9750	68,838.4320	0.9000	61,954.5888	0.8775
RAI0027	1,646	1,646	7,109.0740	7,109.0740	0.9750	6,931.3472	0.9000	6,238.2124	0.8775
RAI0031	3,800	3,800	16,412.2000	16,412.2000	0.9750	16,001.8950	0.9000	14,401.7055	0.8775
RAI0033	1,200	1,200	961.2000	961.2000	0.9750	937.1700	0.9000	843.4530	0.8775
RAI0034	1,552	1,552	4,142.2880	4,142.2880	0.9750	4,038.7308	0.9000	3,634.8577	0.8775
RAI0036	2	2	3,192.0000	3,192.0000	0.9750	3,112.2000	0.9000	2,800.9800	0.8775
RAI0038	55	55	10,175.0000	10,175.0000	0.9750	9,920.6250	0.9000	8,928.5625	0.8775
RAI0039	13	13	20,618.0000	20,618.0000	0.9750	20,102.5500	0.9000	18,092.2950	0.8775
RAI0042	109,363	109,363	132,547.9560	132,547.9560	0.9750	129,234.2571	0.9000	116,310.8314	0.8775
RAI0044	5	5	975.0000	975.0000	0.9750	950.6250	0.9000	855.5625	0.8775
RAI0045	18,129	18,129	18,129.0000	18,129.0000	1.0420	18,890.4180	0.9000	17,001.3762	0.9378
RAI0050	12	12	608.4000	608.4000	0.9750	593.1900	0.9000	533.8710	0.8775
RAI0051	34	34	3,162.0000	3,162.0000	0.9750	3,082.9500	0.9000	2,774.6550	0.8775
RAI0054	427	427	1,139.6630	1,139.6630	0.9750	1,111.1714	0.9000	1,000.0543	0.8775
RAI0059	63	63	2,104.2000	2,104.2000	0.9750	2,051.5950	0.9000	1,846.4355	0.8775
RAI0060	1,854	1,854	7,712.6400	7,712.6400	0.9750	7,519.8240	0.9000	6,767.8416	0.8775
RAI0063	24,332	24,332	106,574.1600	106,574.1600	0.9750	103,909.8060	0.9000	93,518.8254	0.8775
Total:	384,086	384,086	577,315.1598	577,315.1599	0.9777	564,096.9240	0.9000	507,687.2314	0.8799

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Table 117. Certified Lifetime kWh Savings by Measure (Residential Agriculture)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
RAI0001	10,491.3900	10.0000	104,913.9000
RAI0002	41,752.1660	15.0000	626,282.4906
RAI0003	42,614.0255	15.0000	639,210.3822
RAI0011	29,830.6590	15.0000	447,459.8851
RAI0012	8,325.7463	15.0000	124,886.1949
RAI0013	1,622.6185	5.0000	8,113.0923
RAI0021	2,743.1966	7.0000	19,202.3764
RAI0022	12,803.3217	7.0000	89,623.2519
RAI0026	61,954.5888	16.0000	991,273.4208
RAI0027	6,238.2124	16.0000	99,811.3990
RAI0031	14,401.7055	12.0000	172,820.4660
RAI0033	843.4530	12.0000	10,121.4360
RAI0034	3,634.8577	18.0000	65,427.4390
RAI0036	2,800.9800	10.0000	28,009.8000
RAI0038	8,928.5625	15.0000	133,928.4375
RAI0039	18,092.2950	15.0000	271,384.4250
RAI0042	116,310.8314	15.0000	1,744,662.4709
RAI0044	855.5625	10.0000	8,555.6250
RAI0045	17,001.3762	16.0000	272,022.0192
RAI0050	533.8710	18.0000	9,609.6780
RAI0051	2,774.6550	18.0000	49,943.7900
RAI0054	1,000.0543	18.0000	18,000.9771
RAI0059	1,846.4355	18.0000	33,235.8390
RAI0060	6,767.8416	16.0000	108,285.4656
RAI0063	93,518.8254	11.0000	1,028,707.0794
Total:	507,687.2314		7,105,491.3409

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Table 118. Certified Program Participation and kW Savings by Measure (Residential Agriculture)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
RAI0001	20	20	3.8920	3.8920	0.9850	3.8336	0.9000	3.4503	0.8865
RAI0002	81,474	81,474	16.2948	16.2948	0.9850	16.0504	0.9000	14.4453	0.8865
RAI0003	41,436	41,436	16.5744	16.5744	0.9850	16.3258	0.9000	14.6932	0.8865
RAI0011	12,737	12,737	6.3685	6.3685	0.9850	6.2730	0.9000	5.6457	0.8865
RAI0012	49,937	49,937	4.9937	4.9937	0.9850	4.9188	0.9000	4.4269	0.8865
RAI0021	5	5	0.9900	0.9900	0.9850	0.9752	0.9000	0.8776	0.8865
RAI0022	13	13	4.6280	4.6280	0.9850	4.5586	0.9000	4.1027	0.8865
RAI0026	16,972	16,972	16.9720	16.9720	0.9850	16.7174	0.9000	15.0457	0.8865
RAI0033	1,200	1,200	0.2400	0.2400	0.9850	0.2364	0.9000	0.2128	0.8865
RAI0034	1,552	1,552	0.7760	0.7760	0.9850	0.7644	0.9000	0.6879	0.8865
RAI0038	55	55	11.8800	11.8800	0.9850	11.7018	0.9000	10.5316	0.8865
RAI0042	109,363	109,363	43.7452	43.7452	0.9850	43.0890	0.9000	38.7801	0.8865
RAI0044	5	5	1.0145	1.0145	0.9850	0.9993	0.9000	0.8994	0.8865
RAI0045	18,129	18,129	3.5300	3.5300	1.5140	5.3444	0.9000	4.8100	1.3626
RAI0050	12	12	0.1116	0.1116	0.9850	0.1099	0.9000	0.0989	0.8865
RAI0051	34	34	0.5814	0.5814	0.9850	0.5727	0.9000	0.5154	0.8865
RAI0054	427	427	0.2135	0.2135	0.9850	0.2103	0.9000	0.1893	0.8865
RAI0059	63	63	0.3843	0.3843	0.9850	0.3785	0.9000	0.3407	0.8865
RAI0060	1,854	1,854	1.8540	1.8540	0.9850	1.8262	0.9000	1.6436	0.8865
RAI0063	24,332	24,332	24.3320	24.3320	0.9850	23.9670	0.9000	21.5703	0.8865
Total:	359,620	359,620	159.3759	159.3759	0.9850	158.8526	0.9000	142.9674	0.8970

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Appendix N: Think! Energy Program

Table 119 presents reported gross and certified net energy savings by fuel type and demand reductions for the Think! Energy Program. The realization rates reflect adjustments Cadmus made based on the certification tasks, applied ISRs, and NTG. The sections after the table outline changes Cadmus made to reported gross energy savings.

Table 119. Participation and Savings (Think! Energy)

	Participation Total	Total kWh Savings	Total kW Savings	Total MCF Savings
Reported Gross Participation and Savings	174,583.0000	1,953,591.0000	168.1572	96,984.0504
Verified Net Participation and Savings	174,583.0000	1,723,957.5060	151.3415	40,375.2277
Verified Actual Lifetime Savings	NA	24,493,283.1720	NA	403,752.2759
Program Realization Rate	100.0000%	88.2456%	90.0000%	41.6308%
Annual Net Verified v. Net Reported Savings	NA	100.0000%	100.0000%	99.9913%
Lifetime Net Verified v. Net Reported Savings	NA	100.0000%	NA	99.9913%

Task 1: Database Review

The Consumers Energy and implementer databases matched across all areas of inquiry: (a) the number of participants, (b) the quantities of installed measures, and (c) appropriate application of savings according to customer type. Cadmus also verified all measures were rebated in the 2017 program year.

Task 2a: Measure-Level Savings Analysis

Cadmus found a conversion factor error between per-unit measure MCF savings reported by Consumers Energy and the therm values maintained in the MEMD for gas savings measure REG0005 with a discrepancy of 0.0004 MCF. Cadmus used the corrected per-unit savings in the final net savings calculations. All measure lives reported by Consumers Energy were correct, based on the EUL listed in the MEMD.

Task 2b: Verification of Installation and Net Adjustment Factors

Cadmus reviewed gross and net adjustment factors and found no discrepancies. Table 120 presents reported and certified per-unit savings for all measures delivered through the 2017 Think! Energy Program.

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Table 120. Verified Per-Unit Measure Characteristics (Think! Energy)

Consumers Energy Measure ID	Measure Name	Reported Per-Unit Savings			Verified Per-Unit Savings			Verified Measure Life	Verified Adjustment Factors	
		kWh	kW	MCF	kWh	kW	MCF		Gross	Net
REE0005	LED night light	22.0000	0.0000	0.0000	22.0000	0.0000	0.0000	12.0000	0.9300	0.9000
REE0006	LED replacing A-line 60W	28.5000	0.0034	0.0000	28.5000	0.0034	0.0000	15.0000	1.0000	0.9000
REG0005	Low flow kitchen faucet aerators (1.5 GPM) - Gas	0.0000	0.0000	1.1984	0.0000	0.0000	1.1980*	10.0000	0.3900	0.9000
REG0008	Low flow showerheads - Education (1.5 GPM) - Gas	0.0000	0.0000	2.1038	0.0000	0.0000	2.1038	10.0000	0.5100	0.9000
REG0009	Low flow bath faucet aerators - Education (1.0 GPM) - Gas	0.0000	0.0000	0.4685	0.0000	0.0000	0.4685	10.0000	0.4400	0.9000
REG0010	Low flow bath faucet aerators - education (1.5 GPM) - Gas	0.0000	0.0000	0.2727	0.0000	0.0000	0.2727	10.0000	0.4400	0.9000

* Asterisk denotes change in verified per-unit savings, measure life, installation rate, or NTG value. Detailed analysis can be found in sections 2a and 2b of the Think! Energy appendix

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Task 3: Documentation Review

As the Think! Energy Program did not have customer-level program documents available for review, Cadmus did not conduct a documentation review of this program.

Task 4: Calculation of Certified Annual and Lifetime Savings

Cadmus calculated annual savings with lifetime savings. The following tables present verified program participation, energy savings and demand reduction by measure: Table 121 and Table 122 document kWh savings, Table 123 documents kW savings, and Table 124 and Table 125 document MCF savings.

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Table 121. Certified Program Participation and First-Year kWh Savings by Measure (Think! Energy)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kWh Savings (A)	Adjusted Reported Gross kWh Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kWh Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kWh Savings (F) = (D x E)	Realization Rate (G) = (F/A)
REE0005	24,729	24,729	544,038.0000	544,038.0000	0.9300	505,955.3400	0.9000	455,359.8060	0.8370
REE0006	49,458	49,458	1,409,553.0000	1,409,553.0000	1.0000	1,409,553.0000	0.9000	1,268,597.7000	0.9000
Total:	74,187	74,187	1,953,591.0000	1,953,591.0000	0.9650	1,915,508.3400	0.9000	1,723,957.5060	0.8685

Table 122. Certified Lifetime kWh Savings by Measure (Think! Energy)

Consumers Energy Measure ID	Verified Net kWh Savings (F) = (D x E)	Measure Life (H)	Lifetime kWh Savings (I) = (F x H)
REE0005	455,359.8060	12.0000	5,464,317.6720
REE0006	1,268,597.7000	15.0000	19,028,965.5000
Total:	1,723,957.5060		24,493,283.1720

Table 123. Certified Program Participation and kW Savings by Measure (Think! Energy)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross kW Savings (A)	Adjusted Reported Gross kW Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross kW Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net kW Savings (F) = (D x E)	Realization Rate (G) = (F/A)
REE0006	49,458	49,458	168.1572	168.1572	1.0000	168.1572	0.9000	151.3415	0.9000
Total:	49,458	49,458	168.1572	168.1572	1.0000	168.1572	0.9000	151.3415	0.9000

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Table 124. Certified Program Participation and First-Year MCF Savings by Measure (Think! Energy)

Consumers Energy Measure ID	Reported Participation	Verified Participation	Reported Gross MCF Savings (A)	Adjusted Reported Gross MCF Savings (B)	Verified Gross Adjustment Factor (C)	Verified Gross MCF Savings (D) = (B x C)	Verified NTG Adjustment Factor (E)	Verified Net MCF Savings (F) = (D x E)	Realization Rate (G) = (F/A)
REG0005	25,099	25,099	30,078.6416	30,068.6020	0.3900	11,726.7548	0.9000	10,554.0793	0.3509
REG0008	25,099	25,099	52,803.2762	52,803.2762	0.5100	26,929.6709	0.9000	24,236.7038	0.4590
REG0009	2,110	2,110	988.5350	988.5350	0.4400	434.9554	0.9000	391.4599	0.3960
REG0010	48,088	48,088	13,113.5976	13,113.5976	0.4400	5,769.9829	0.9000	5,192.9847	0.3960
Total:	100,396	100,396	96,984.0504	96,974.0108	0.4450	44,861.3640	0.9000	40,375.2277	0.4005

Table 125. Certified Lifetime MCF Savings by Measure (Think! Energy)

Consumers Energy Measure ID	Verified Net MCF Savings (F) = (D x E)	Measure Life (H)	Lifetime MCF Savings (I) = (F x H)
REG0005	10,554.0793	10.0000	105,540.7930
REG0008	24,236.7038	10.0000	242,367.0378
REG0009	391.4599	10.0000	3,914.5986
REG0010	5,192.9847	10.0000	51,929.8465
Total:	40,375.2277		403,752.2759

MICHIGAN PUBLIC SERVICE COMMISSION

Consumers Energy Company

Completed Consumers Energy EM&V Studies - Program Year 2017

Case No.: U-20028

Exhibit No.: A-8 (JAF-1)

Page: 1 of 1

Witness: JAForcillo

Date: May 2018

Sector	Report Name	Pages	Pages + Appendices
Residential	2017 Energy Savers Club - Swartz Creek Evaluation Report	22 pgs.	58 pgs.
Residential	2017 Energy Star Lighting Program Evaluation Report	40 pgs.	54 pgs.
Residential	2017 Think! Energy Program Evaluation Report	43 pgs.	60 pgs.
Residential	2017 Interval Web Portal Evaluation Report	41 pgs.	90 pgs.
Residential	2017 Pay My Way Evaluation Report	33 pgs.	48 pgs.
Residential	2017 Home Energy Analysis Evaluation Report	33 pgs.	38 pgs.
Residential	2017 Multifamily Evaluation Report	71 pgs.	89 pgs.
Residential	2017 Appliance Recycling Evaluation Report	44 pgs.	55 pgs.
Residential	2017 New Home Construction Evaluation Report	23 pgs.	28 pgs.
Residential	2017 HVAC Evaluation Report	33 pgs.	54 pgs.
Residential	2017 Home Performance with Energy Star Program Evaluation Report	24 pgs.	35 pgs.
Residential	2017 Insulation and Windows Program Evaluation Report	26 pgs.	26 pgs.
Residential	PY2017 Certification Report	19 pgs.	182 pgs.
Residential	2017 Energy Star Appliances Evaluation Report	67 pgs.	76 pgs.
C&I	2017 Certification Report	98 pgs.	279 pgs.
C&I	2017 Small Business Direct Install Process Evaluation Report	17 pgs.	33 pgs.
C&I	2017 Small Business Energy Efficiency Program Process Evaluation Report	29 pgs.	42 pgs.
C&I	2017 Small Business Assessment Process Evaluation Report	40 pgs.	78 pgs.
C&I	2017 Business Energy Efficiency Program Process Evaluation Report	78 pgs.	176 pgs.
C&I	2017 Business Efficiency Report Process Evaluation Report	49 pgs.	84 pgs.
C&I	2017 Small Business Assessment Impact Evaluation Report	23 pgs.	31 pgs.
C&I	2017 Business Smart Thermostat Evaluation Report	26 pgs.	26 pgs.
		879 pgs.	1642 pgs.

TECHNICAL TERMS AND ABBREVIATIONS (FOR ALL CUSTOMERS)
(Continued From Sheet No. A-29.00)

B. Company (Contd)

Customer Voltage Level 2 – Service supplied either directly from the Company's distribution system when the voltage is 25,000 Volts or greater but less than 120,000 Volts or from this system through a Company-owned substation where, from the exits of the substation, the distribution equipment for supplying service is owned and maintained by the customer. Portions of the distribution system supply Customer Voltage Level 2 service at a voltage lower than 25,000 Volts, these customers are grandfathered into Customer Voltage Level 2.

Customer Voltage Level 3 – Service supplied from the Company's distribution system and the voltage is 2,400 Volts or greater but less than 25,000 Volts.

Customer Voltage Level 4 – Service supplied from the Company's distribution system and the voltage is less than 2,400 Volts.

Cycling – Alteration of the operating schedule of a customer's electrical air conditioner, heat pump or other qualifying device.

Energy and Demand Registering Meter – A device that registers customer kilowatt-hour use, peak demand and the on-peak demand.

Energy Efficiency Plan Surcharge (EE) - The EE Surcharge is permitted pursuant to Section 89 of 2008 PA 295 and as amended in 2016 PA 342. Through the application of the EE Surcharge, the rates for distribution service are adjusted to allow for recovery of the cost of the energy waste reduction (EWR) requirements included in 2008 PA 295 and as amended in 2016 PA 342. (Annually, a reconciliation shall be conducted pursuant to Section 97 of 2008 PA 295 and as amended in 2016 PA 342.) The approved EE Surcharges are shown on Sheet ~~D-2.10~~ D-2.12.

Energy-Only Registering Meter – A device that registers customer kilowatt-hour use only.

Full Service Customer - A customer taking power supply and delivery service from the Company, even if on an irregular basis. With the exception of Wholesale Customers and Retail Open Access Customers, as defined in Rule E1.4(u) of the Company's Rate Book for Electric Service, customers are deemed to be Full Service Customers.

General Service Usage – Any use of electric energy that does not qualify for residential rates.

Hertz (Hz) – Cycle per second.

Horsepower (hp) – Unit of mechanical power equivalent to 746 watts of electrical power.

Industrial Usage for Emergency Electrical Procedures – Usage for application, other than those defined as residential or commercial, which qualify for a manufacturing industry code under the most current edition of the Standard Industrial Classification Manual and are associated with the manufacture of a product for sale including processing of a product from one form to another. It also includes usage for facilities directly associated with and on the same premises as the manufacturing business such as offices and warehouses.

Interval Data Meter – A device that registers customer kilowatt-hour use, peak demand, on-peak demand, and maximum demand.

Kilo (k) – Prefix meaning one thousand.

Kilowatt (kW) – Unit of electrical power representing rate of usage of energy, equivalent to about 1-1/3 Horsepower.

Kilowatt-hour (kWh) – Unit of electrical energy equivalent to the use of one Kilowatt for one hour.

Kilovolt-ampere (kVA) – Unit of apparent electrical power which at 100% Power Factor is equivalent to one Kilowatt.

(Continued on Sheet No. A-31.00)

(Continued From Sheet No. C-52.00)

C12. ENERGY EFFICIENCY (EE)

C12.1 Energy Efficiency Program – Electric

This rule implements the energy waste reduction (EWR) requirements of 2008 PA 295 and as amended in 2016 PA 342 in accordance with Orders issued by the Commission in Case No. U-15805. The monthly Energy Efficiency surcharges to be applied to each Rate Schedule are shown on Sheet No. ~~D-2.10~~ D-2.12 of this Rate Book *and shall be combined with an existing fixed or volumetric charge on each eligible Rate Schedule.*

- (1) For all customers on Residential Rate Schedules, the Energy Efficiency Program surcharge shall be combined with the Distribution Charge for both Full Service and ROA customers each month.*
- (2) For all other eligible metered Nonresidential customers, the Energy Efficiency Program surcharge shall be combined with the System Access charge for both Full Service and ROA customers each month.*
- (3) Unmetered Company-Owned lighting customers on Rate GUL shall have the Energy Efficiency Program surcharge combined with the monthly Fixture Charge per Luminaire each month.*

C12.2 Self-Directed Customer Plans

An eligible primary or secondary electric customer is exempt from the mandatory energy efficiency surcharge(s), with the exception of the surcharge funding low-income programs as well as review and evaluation costs, if the customer files and implements a self-directed energy efficiency plan.

A. Eligibility

- (1) Customers must have had an annual peak demand in the preceding year of at least 1 megawatt in the aggregate at all sites to be covered by the self-directed plan.
- (2) The customer and sites covered by an implemented self-directed plan are not eligible to participate in any energy efficiency program of the Company.

B. Requirements

- (1) A customer with a self-directed plan is required to pay the self-directed customer program surcharge. *It shall be added to the existing System Access Charge for both Full Service and ROA customers that qualify.*
- (2) In its Order dated December 4, 2008, in Case No. U-15800, the Commission stated “A self-direct energy optimization plan shall be considered complete, and the customer exempt from the Company’s energy optimization surcharge in the next billing cycle after the start date for the first action item in the customer’s self-direct energy optimization plan. This applies to a customer with a single site or several sites aggregated together. The plan, including the implementation schedule and expected energy savings, must be attested to as true and accurate by a knowledgeable official of the customer. Customers must comply with the statutory self-direct plan reporting requirements to retain the exemption from the surcharge.” Additional information on self-directed plans is available to customers in Attachment E of that Order and Attachments A, B & C from the Order dated August 25, 2011 in Case No. U-16563.*
- (3) *The self-directed plan shall provide for aggregate energy savings that for each year meet or exceed the energy waste reduction performance standards based on the electricity purchases in the previous year for the site or sites covered by the self-directed plan.
- (4) Incremental Energy Savings each year through 2021 are equivalent to 1.0% of total annual retail electricity sales in megawatt hours in the preceding year.

(Continued on Sheet No. C-52.20)

M.P.S.C. No. 13 - Electric
Consumers Energy Company

SURCHARGES

Rate Schedule	Renewable Energy Plan Surcharge (Case No. U-17301) Effective beginning the July 2014 Billing Month⁽⁴⁾⁽²⁾	Energy Efficiency Program Surcharge- (Case No. U-18261) Effective beginning the February 2018 Billing Month⁽⁴⁾	Energy Efficiency Self-Directed Customer Surcharge (Case No. U-18261) Effective beginning the February 2018 Billing Month^(2a)
Residential Rates	\$ 0.00/billing meter	\$ 0.002963 /kWh	NA
Rate GS, GSTU, and GSD ⁽¹⁾			
Tier 1: 0 – 1,250 kWh/mo.	\$ 0.00/billing meter	\$ 3.29 /billing meter	\$ 0.11 /billing meter
Tier 2: 1,251 – 5,000 kWh/mo.	0.00/billing meter	18.57 /billing meter	0.65 /billing meter
Tier 3: 5,001 – 30,000 kWh/mo.	0.00/billing meter	114.36 /billing meter	3.87 /billing meter
Tier 4: 30,001 – 50,000 kWh/mo.	0.00/billing meter	114.36 /billing meter	3.87 /billing meter
Tier 5: > 50,000 kWh/mo.	0.00/billing meter	114.36 /billing meter	3.87 /billing meter
Rate GP, GPD, GPTU and EIP ⁽¹⁾			
Tier 1: 0 – 5,000 kWh/mo.	\$ 0.00/billing meter	\$ 7.57 /billing meter	\$ 0.20 /billing meter
Tier 2: 5,001 – 10,000 kWh/mo.	0.00/billing meter	58.33 /billing meter	1.75 /billing meter
Tier 3: 10,001 – 30,000 kWh/mo.	0.00/billing meter	150.81 /billing meter	4.52 /billing meter
Tier 4: 30,001 – 50,000 kWh/mo.	0.00/billing meter	289.54 /billing meter	9.04 /billing meter
Tier 5: > 50,000 kWh/mo.	0.00/billing meter	1,532.17 /billing meter	43.62 /billing meter
Rate GSG-2	NA	NA ⁽⁴⁾	NA
Rate GML ⁽⁶⁾			
Tier 1: 0 – 1,250 kWh/mo.	\$ 0.00/billing meter	NA	NA
Tier 2: 1,251 – 5,000 kWh/mo.	0.00/billing meter	NA	NA
Tier 3: > 5,000 kWh/mo.	0.00/billing meter	NA	NA
Rate GUL ⁽⁶⁾⁽⁷⁾	0.00/luminaire	\$ 0.27 /fixture per month	NA
Rate GU-XL ⁽⁶⁾	0.00/luminaire	NA	NA
Rate GU			
Tier 1: 0 – 1,250 kWh/mo.	0.00/billed account	NA	NA
Tier 2: 1,251 – 5,000 kWh/mo.	0.00/billed account	NA	NA
Tier 3: > 5,000 kWh/mo.	0.00/billed account	NA	NA
Rate PA	NA	NA	NA
Rate ROA-R, ROA-S, ROA-P	NA	As in Delivery Rate Schedule	As in Delivery Rate Schedule

All Surcharges shall be applied on a monthly basis. The customer's consumption will be reviewed annually in the January bill month. Following the annual review, the customer may be subsequently moved to the Surcharge level for their applicable rate for the next billing period based on the customer's average consumption for the previous year. In situations where no historical consumption is available, the monthly Surcharge level will be based on the lowest consumption category for the secondary rate schedules or the lowest consumption category for primary rate schedules. No retroactive adjustment will be made due to the application of the REP ~~or EE~~ Surcharges associated with increases or decreases in consumption.

⁽¹⁾ Municipal Pumping customers shall be excluded from the Renewable Energy Plan Surcharge.

^(2a) An eligible customer who files and implements a self-directed plan in compliance with Rule C12 is required to pay the Energy Efficiency Self-Directed Program Surcharge.

⁽⁴⁾ An Energy Efficiency Program Surcharge amount may vary during specific months as authorized by the Michigan Public Service Commission. The Company will file a new tariff sheet to reflect any change in surcharges once the financial incentive recovery period has been completed.

⁽⁴⁾ Rate GSG-2 Customers are eligible to opt-in to the Energy Efficiency Electric Program Surcharge. A GSG-2 customer electing to participate in the Energy Efficiency Electric Program will be charged the GPD, Tier 5: > 50,000 kWh/mo rate per billing meter per month.

⁽⁴⁾⁽²⁾ A Renewable Energy Plan Surcharge will be in effect for the period of the September 2009 Bill Month through the August 2029 Bill Month.

The amount may vary during specific months as authorized by the Michigan Public Service Commission. Applicable cases include Case Nos. U-15805, U-16543, U-16581 and U-17301.

⁽⁶⁾ Customer-Owned lighting fixtures served on Rate GML, GUL and Rate GU-XL are eligible to opt-in to the Energy Efficiency Program Surcharge. A GML, GUL or GU-XL customer electing to participate in the Energy Efficiency Electric Program will be charged the applicable surcharge as shown for Rate GS, GSTU, and GSD or Rate GP, GPD, GPTU and EIP, as applicable, per participating account per month.

⁽⁷⁾ Rate Schedule GUL Company-Owned lighting fixtures shall pay the per fixture surcharge monthly as shown above.

Issued XXXX XX, 2018 by
Patti Poppe,
President and Chief Executive Officer,
Jackson, Michigan

Effective for bills rendered on and after
the Company's XXXX 2018 Billing Month

Issued under authority of the
Michigan Public Service Commission
dated XXXX XX, XXXX
in Case No. U-20028

M.P.S.C. No. 13 - Electric
Consumers Energy Company

SURCHARGES

<u>Rate Schedule</u>	<u>Energy Efficiency Program Surcharge (Case No. U-20028) Effective beginning the XXXX 2018 Billing Month⁽²⁾</u>		<u>Distribution, System Access or Fixture Charge per Rate Schedule</u>		<u>Total Distribution Charge⁽¹⁾</u>
Residential Rates	\$0.002963/kWh	+	\$0.050297/kWh ⁽⁴⁾	=	\$0.053260/kWh
					<u>Total System Access Charge⁽¹⁾</u>
Rate GS and GSTU					
Tier 1: 0-1250 kWh/mo.	\$4.17/billing meter	+	\$20.00/month ⁽⁵⁾	=	\$24.17/month
Tier 2: 1,251 – 5000 kWh/mo.	23.57/billing meter	+	\$20.00/month ⁽⁵⁾	=	43.57 /month
Tier 3: 5,001 – 30,000 kWh/mo.	145.15/billing meter	+	\$20.00/month ⁽⁵⁾	=	165.15/month
Tier 4: 30,001 – 50,000 kWh/mo.	145.15/billing meter	+	\$20.00/month ⁽⁵⁾	=	165.15/month
Tier 5: >50,000 kWh/mo.	145.15/billing meter	+	\$20.00/month ⁽⁵⁾	=	165.15/month
Rate GSD					
Tier 1: 0-1250 kWh/mo.	\$4.17/billing meter	+	\$30.00/month ⁽⁵⁾	=	\$34.17/month
Tier 2: 1,251 – 5000 kWh/mo.	23.57/billing meter	+	\$30.00/month ⁽⁵⁾	=	53.57/month
Tier 3: 5,001 – 30,000 kWh/mo.	145.15/billing meter	+	\$30.00/month ⁽⁵⁾	=	175.15/month
Tier 4: 30,001 – 50,000 kWh/mo.	145.15/billing meter	+	\$30.00/month ⁽⁵⁾	=	175.15/month
Tier 5: >50,000 kWh/mo.	145.15/billing meter	+	\$30.00/month ⁽⁵⁾	=	175.15/month
Rate GP					
Tier 1: 0-1250 kWh/mo.	\$5.26/billing meter	+	\$100.00/month ⁽⁵⁾	=	\$105.26/month
Tier 2: 1,251 – 5000 kWh/mo.	40.49/billing meter	+	\$100.00/month ⁽⁵⁾	=	140.49/month
Tier 3: 5,001 – 30,000 kWh/mo.	202.50/billing meter	+	\$100.00/month ⁽⁵⁾	=	302.50/month
Tier 4: 30,001 – 50,000 kWh/mo.	533.67/billing meter	+	\$100.00/month ⁽⁵⁾	=	633.67/month
Tier 5: >50,000 kWh/mo.	992.73/billing meter	+	\$100.00/month ⁽⁵⁾	=	1092.73/month
Rate GPD, GPTU, and EIP					
Tier 1: 0-1250 kWh/mo.	\$5.26/billing meter	+	\$200.00/month ⁽⁵⁾	=	\$205.26/month
Tier 2: 1,251 – 5000 kWh/mo.	40.49/billing meter	+	\$200.00/month ⁽⁵⁾	=	240.49/month
Tier 3: 5,001 – 30,000 kWh/mo.	202.50/billing meter	+	\$200.00/month ⁽⁵⁾	=	402.50/month
Tier 4: 30,001 – 50,000 kWh/mo.	533.67/billing meter	+	\$200.00/month ⁽⁵⁾	=	733.67/month
Tier 5: >50,000 kWh/mo.	992.73/billing meter	+	\$200.00/month ⁽⁵⁾	=	1192.73/month
Rate GSG-2 ⁽³⁾	NA		NA		NA
Rate GML ⁽³⁾	NA		NA		NA
Rate GUL ⁽⁷⁾					<u>Total Fixture Charge⁽¹⁾</u>
Company Owned	\$0.27/fixture per month	+	\$6.00/fixture per month ⁽⁶⁾	=	\$6.27/fixture per month
Customer Owned ⁽³⁾	NA		NA		NA
Rate GU-XL ⁽³⁾					NA
Company Owned	NA		NA		NA
Customer Owned	NA		NA		NA
Rate GU	NA		NA		NA
Rate PA	NA		NA		NA
Rate ROA-R, ROA-S, ROA-P	Same as Full Service Delivery Rate Schedule		Same as Full Service Delivery Rate Schedule		Same as Full Service Delivery Rate Schedule

All Surcharges shall be applied on a monthly basis. The customer's consumption will be reviewed annually in the January bill month. Following the annual review, the customer may be subsequently moved to the Surcharge level for their applicable rate for the next billing period based on the customer's average consumption for the previous year. In situations where no historical consumption is available, the Energy Efficiency Program Surcharge will be based on the lowest consumption category for the secondary Rate Schedules or the lowest consumption category for primary Rate Schedules. No retroactive adjustment will be made to the application of the Energy Efficiency Program Surcharge associated with increases or decreases in consumption.

⁽¹⁾ This charge will be shown on the monthly utility bill as calculated in Rule C12, Energy Efficiency.

⁽²⁾ An Energy Efficiency Program Surcharge amount may vary during specific months as authorized by the Michigan Public Service Commission. The Company will file a new tariff sheet to reflect any change in surcharges once the financial incentive recovery period has been completed.

⁽³⁾ Additional Rate Schedules can opt-in to the Energy Efficiency Program as described on the Delivery Charge of that rate.

⁽⁴⁾ Distribution Charge per Rate Schedule.

⁽⁵⁾ System Access Charge per Rate Schedule.

⁽⁶⁾ Fixture Charge per Luminaire per Rate Schedule.

⁽⁷⁾ Outdoor Area Lighting customer rate codes 1455 and 1460 shall be exempt from the Energy Efficiency Program Surcharge.

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

SURCHARGES

<u>Rate Schedule</u>	<u>Energy Efficiency Self-Directed Customer Surcharge (Case No. U-20028) Effective beginning the XXXX 2018 Billing Month⁽¹⁾</u>		<u>System Access Charge per Rate Schedule</u>		<u>Total System Access Charge</u>
<i>Rate GS and GSTU</i>					
Tier 1: 0-1250 kWh/mo.	\$0.11/billing meter	+	\$20.00/month	=	\$20.11/month
Tier 2: 1,251 – 5000 kWh/mo.	0.65/billing meter	+	\$20.00/month	=	20.65/month
Tier 3: 5,001 – 30,000 kWh/mo.	3.87/billing meter	+	\$20.00/month	=	23.87/month
Tier 4: 30,001 – 50,000 kWh/mo.	3.87/billing meter	+	\$20.00/month	=	23.87/month
Tier 5: >50,000 kWh/mo.	3.87/billing meter	+	\$20.00/month	=	23.87/month
<i>Rate GSD</i>					
Tier 1: 0-1250 kWh/mo.	\$0.11/billing meter	+	\$30.00/month	=	\$30.11/month
Tier 2: 1,251 – 5000 kWh/mo.	0.65/billing meter	+	\$30.00/month	=	30.65/month
Tier 3: 5,001 – 30,000 kWh/mo.	3.87/billing meter	+	\$30.00/month	=	33.87/month
Tier 4: 30,001 – 50,000 kWh/mo.	3.87/billing meter	+	\$30.00/month	=	33.87/month
Tier 5: >50,000 kWh/mo.	3.87/billing meter	+	\$30.00/month	=	33.87/month
<i>Rate GP</i>					
Tier 1: 0-1250 kWh/mo.	\$0.20/billing meter	+	\$100.00/month	=	\$100.20/month
Tier 2: 1,251 – 5000 kWh/mo.	1.75/billing meter	+	\$100.00/month	=	101.75/month
Tier 3: 5,001 – 30,000 kWh/mo.	4.52/billing meter	+	\$100.00/month	=	104.52/month
Tier 4: 30,001 – 50,000 kWh/mo.	9.04/billing meter	+	\$100.00/month	=	109.04/month
Tier 5: >50,000 kWh/mo.	43.62/billing meter	+	\$100.00/month	=	143.62/month
<i>Rate GPD, GPTU, and EIP</i>					
Tier 1: 0-1250 kWh/mo.	\$0.20/billing meter	+	\$200.00/month	=	\$200.20/month
Tier 2: 1,251 – 5000 kWh/mo.	1.75/billing meter	+	\$200.00/month	=	201.75/month
Tier 3: 5,001 – 30,000 kWh/mo.	4.52/billing meter	+	\$200.00/month	=	204.52/month
Tier 4: 30,001 – 50,000 kWh/mo.	9.04/billing meter	+	\$200.00/month	=	209.04/month
Tier 5: >50,000 kWh/mo.	43.62/billing meter	+	\$200.00/month	=	243.62/month
Rate GSG-2	NA		NA		NA
Rate GML	NA		NA		NA
Rate GUL	NA		NA		NA
Rate GU-XL	NA		NA		NA
Rate GU	NA		NA		NA
Rate PA	NA		NA		NA
Rate ROA-R, ROA-S, ROA-P	Same as Full Service Delivery Rate Schedule		Same as Full Service Delivery Rate Schedule		Same as Full Service Delivery Rate Schedule

All Surcharges shall be applied on a monthly basis. The customer's consumption will be reviewed annually in the January bill month. Following the annual review, the customer may be subsequently moved to the Surcharge level for their applicable rate for the next billing period based on the customer's average consumption for the previous year. In situations where no historical consumption is available, the Energy Efficiency Self-Directed Customer Surcharge will be based on the lowest consumption category for the secondary Rate Schedules or the lowest consumption category for primary Rate Schedules. No retroactive adjustment will be made to the application of the Energy Efficiency Self-Directed Customer Surcharge associated with increases or decreases in consumption.

⁽¹⁾An eligible customer who files and implements a self-directed plan in compliance with Rule C12 is required to pay the Energy Efficiency Self-Directed Program Surcharge.

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

GENERAL SERVICE SELF GENERATION RATE GSG-2
(Continued From Sheet No. D-42.00)

Nature of Service (Contd)

Where service is supplied at a nominal voltage equal to or greater than 2,400 volts and the Company elects to measure the service at a nominal voltage above 25,000 volts, 1% shall be deducted for billing purposes, from the demand and energy measurements thus made.

Where service is supplied at a nominal voltage equal to or greater than 2,400 volts and the Company elects to measure the service at a nominal voltage of less than 2,400 volts, 3% shall be added for billing purposes, to the demand and energy measurements thus made.

Where service is supplied at a nominal voltage less than 2,400 volts and the Company elects to measure the service at a nominal voltage equal to or greater than 2,400 volts, 3% shall be deducted for billing purposes from the energy measurements thus made.

There shall be no double billing of demand under the base rate and Rate GSG-2.

Monthly Rate

Standby Charges

Power Supply Standby Charges

For all standby energy supplied by the Company, the customer shall be responsible for the MISO Real-Time Locational Market Price (LMP) for the Company's load node (designated as "CONS.CETR" as of the date of this Rate Schedule), multiplied by the customer's consumption (kWh), plus the Market Settlement Fee of \$0.002/kWh. In addition capacity charges will be assessed monthly, calculated using the highest 15 minute kW demand associated with Standby Service occurring during the Company's On-Peak billing hours will be multiplied by the highest contracted capacity purchased by the Company in that month, plus allocated transmission and ancillaries. The capacity charges will be prorated based on the number of On-Peak days that Standby Service was used during the billing month.

A customer with a generator(s) nameplate rating more than 550 kW must provide written notice to the Company by December 1 if they desire standby service in the succeeding calendar months of June through September. Written notice shall be submitted on Company Form 500. If the customer fails to meet this written notice requirement, the LMP shall be increased by applying a 10% adder.

Delivery Standby Charges

System Access Charge:

Generator that does not meet or exceed load:	\$100.00	per generator installation per month
Generator that meets or exceeds load:	\$200.00	per generator installation per month

Charges for Customer Voltage Level 3 (CVL 3)

Capacity Charge:	\$ 4.21	per kW of Standby Demand
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Charges for Customer Voltage Level 2 (CVL 2)

Capacity Charge:	\$ 1.90	per kW of Standby Demand
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Charges for Customer Voltage Level 1 (CVL 1)

Capacity Charge:	\$ 1.06	per kW of Standby Demand
------------------	---------	--------------------------

This rate is subject to the Surcharges shown on Sheet Nos. D-2.00 through D-3.10 and the Power Plant Securitization Charges shown on Sheet No. D-5.10. *Customers who choose to participate in Energy Efficiency Program will have the Rate GPD Tier 5 Energy Efficiency Program Surcharge shown on Sheet No. D-2.12 added to the appropriate System Access Charge per billing meter per month.*

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

GENERAL SERVICE METERED LIGHTING RATE GML
(Continued From Sheet No. D-46.00)

Monthly Rate (Contd)

Secondary Delivery Charge

System Access Charge: \$10.00 per customer per month
Distribution Charge: \$0.065052 per kWh for all kWh

This rate is subject to the Surcharges shown on Sheet Nos. D-2.00 through D-3.10 and the Securitization Charges shown on Sheet Nos. D-5.00 and D-5.10. *Customers who choose to participate in Energy Efficiency Program will have the Rate GUL Company-Owned Energy Efficiency Program Surcharge shown on Sheet No. D-2.12 added to their System Access Charge per billing meter per month.*

Primary Power Supply Charge

Energy Charge:

Non-Capacity	Capacity	Total	
\$ 0.025022	\$ 0.000000	\$0.025022	per kWh for all kWh

This rate is subject to the Power Supply Cost Recovery (PSCR) Factor shown on Sheet No. D-4.00.

Primary Delivery Charge

System Access Charge: \$20.00 per customer per month
Distribution Charge: \$0.049217 per kWh for all kWh

This rate is subject to the Surcharges shown on Sheet Nos. D-2.00 through D-3.10 and the Securitization Charges shown on Sheet Nos. D-5.00 and D-5.10. *Customers who choose to participate in Energy Efficiency Program will have the Rate GUL Company-Owned Energy Efficiency Program Surcharge shown on Sheet No. D-2.12 added to their System Access Charge per billing meter per month.*

Net Metering Program

The Net Metering Program is available to any eligible customer as described in Rule C11., Net Metering Program, who desires to generate a portion or all of their own retail electricity requirements using a Renewable Energy Resource as defined in Rule C11.B, Net Metering Program.

A customer who participates in the Net Metering Program is subject to the provisions contained in Rule C11., Net Metering Program.

Green Generation Program

Customer contracts for participation in the Green Generation Program shall be available to any eligible customer as described in Rule C10.2, Green Generation Program.

A customer who participates in the Green Generation Program is subject to the provisions contained in Rule C10.2, Green Generation Program.

(Continued on Sheet No. D-48.00)

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

GENERAL SERVICE UNMETERED LIGHTING RATE GUL
(Continued From Sheet No. D-50.10)

Monthly Rate

The charge per luminaire per month shall be

Nominal Rating of Lamps (One Lamp per Luminaire) (1)

<u>Type of Luminaire</u>	<u>Watts Including Ballast (2)</u>			<u>Service Charge per Luminaire (4)</u>		<u>Total</u>	<u>Fixture Charge per Luminaire (4)</u>
	<u>Watts</u>	<u>Lumens</u>	<u>Non-Capacity</u>	<u>Capacity</u>			
Mercury Vapor (3)	100	128	3,500	\$7.71	\$0.00	\$7.71	\$6.00
Mercury Vapor (3)	175	209	7,500	12.59	0.00	12.59	6.00
Mercury Vapor (3)	250	281	10,000	16.93	0.00	16.93	6.00
Mercury Vapor (3)	400	458	20,000	27.59	0.00	27.59	6.00
Mercury Vapor (3)	700	770	35,000	46.39	0.00	46.39	6.00
Mercury Vapor (3)	1,000	1,080	50,000	65.07	0.00	65.07	6.00
High-Pressure Sodium (3)	70	83	5,000	5.00	0.00	5.00	6.00
High-Pressure Sodium	100	117	8,500	7.05	0.00	7.05	6.00
High-Pressure Sodium	150	171	14,000	10.30	0.00	10.30	6.00
High-Pressure Sodium (3)	200	247	20,000	14.88	0.00	14.88	6.00
High-Pressure Sodium	250	318	24,000	19.16	0.00	19.16	6.00
High-Pressure Sodium	400	480	45,000	28.92	0.00	28.92	6.00
Fluorescent (3)	380	470	20,000	28.32	0.00	28.32	6.00
Incandescent (3)	202	202	2,500	12.17	0.00	12.17	6.00
Incandescent (3)	305	305	4,000	18.37	0.00	18.37	6.00
Incandescent (3)	405	405	6,000	24.40	0.00	24.40	6.00
Incandescent (3)	690	690	10,000	41.57	0.00	41.57	6.00
Metal Halide	150	170	9,750	10.24	0.00	10.24	6.00
Metal Halide (3)	175	210	10,500	12.65	0.00	12.65	6.00
Metal Halide	250	290	15,500	17.47	0.00	17.47	6.00
Metal Halide	400	460	24,000	27.71	0.00	27.71	6.00

- (1) Ratings for fluorescent lighting apply to all lamps in one luminaire.
- (2) Watts including ballast used for monthly billing of the Power Supply Cost Recovery (PSCR) Factor, the Power Plant Securitization Charges and surcharges.
- (3) Rates apply to existing luminaires only and are not open to new business.
- (4) For ~~customers who own~~ *Customer-Owned* their lighting fixtures ~~and that~~ are assessed a Service Charge (but not a Fixture Charge), the charge per luminaire represents a 37.2% Power Supply Charge and a 62.8% Distribution Charge. ~~For customers who do not own their lighting fixtures and are assessed both a Service Charge and a Fixture Charge, the charge per luminaire represents a 21.8% Power Supply Charge and a 78.2% Distribution Charge.~~

For Company-Owned lighting fixtures that are assessed both a Service Charge and a Fixture Charge, the charge per luminaire represents a 21.8% Power Supply Charge and a 78.2% Distribution Charge.

For energy conservation purposes, customers may, at their option, elect to have any or all luminaires served under this rate disconnected for a period of six months or more. The charge per luminaire per month, for each disconnected luminaire, shall be 40% of the monthly rate set forth above. However, should any such disconnected luminaire be reconnected at the customer's request after having been disconnected for less than six months, the monthly rate set forth above shall apply to the period of disconnection. An \$8.00 per luminaire disconnect/reconnect charge shall be made at the time of disconnection except that when the estimated disconnect/reconnect cost is significantly higher than \$8.00, the estimated cost per luminaire shall be charged.

For 24-hour mercury-vapor service, the charge per luminaire shall be 125% of the foregoing rates.

(Continued on Sheet No. D-52.00)

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

GENERAL SERVICE UNMETERED LIGHTING RATE GUL
(Continued From Sheet No. D-51.00)

Monthly Rate: (Contd)

Green Generation Program:

Customer contracts for participation in the Green Generation Program shall be available to any eligible customer as described in Rule C10.2, Green Generation Program.

A customer who participates in the Green Generation Program is subject to the provisions contained in Rule C10.2, Green Generation Program.

General Terms, Surcharges, Power Supply Cost Recovery (PSCR) Factor and Power Plant Securitization Charges:

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00, Surcharges shown on Nos. D-2.00 through D-3.10, PSCR Factor shown on Sheet No. D-4.00 and the *Power Plant* Securitization Charges shown on Sheet No. D-5.10. *Customer-Owned Lighting customers who choose to participate in Energy Efficiency Program will have the Rate GUL Company-Owned Energy Efficiency Program Surcharge shown on Sheet No. D-2.12 added to their Service Charge per Luminaire per month.*

Due Date and Late Payment Charge:

The due date of the customer bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance, net of taxes, shall be assessed to any bill which is not paid on or before the due date shown thereon.

Special Terms and Conditions:

The Company reserves the right to make special contractual arrangements as to term or duration of contract, termination charges, contribution in aid of construction, annual charges or other special considerations when the customer requests service, equipment or facilities not normally provided under this rate.

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GENERAL UNMETERED EXPERIMENTAL LIGHTING RATE GU-XL
(Continued From Sheet No. D-54.01)

Facilities Policy (Contd)

Company-Owned Option (Contd)

- D. The Company will determine the type and size of all experimental lighting fixtures to be offered under this rate. The list of approved fixtures is subject to modification at the sole discretion of the Company to accommodate new product development and advances in technology. Upon customer request, the Company shall provide a list of experimental lighting available under this rate.
- E. The Company shall determine all associated equipment necessary to provide service under the Company-Owned Unmetered Experimental Lighting option.
- F. Any charges, deposits or contributions may be required in advance of commencement of construction.
- G. At the Company's discretion, any failed lighting fixtures may be converted to an equivalent LED at no cost to the customer if the customer agrees to the conversion. The replaced fixture will then be moved to General Unmetered Experimental Lighting Rate GU-XL upon completion of the installation.

Customer-Owned Option

If it is necessary for the Company to install distribution facilities to serve a customer-owned system, contributions and/or deposits for such additional facilities shall be calculated in accordance with the Company's general service line extension policy. Any charges, deposits or contributions may be required in advance of commencement of construction.

Monthly Rate

Power Supply Charges

Energy Charge:

Non-Capacity	Capacity	Total	
\$ 0.059553	\$ 0.000000	\$ 0.059553	per kWh for all kWh

This rate is subject to the Power Supply Cost Recovery (PSCR) Factor shown on Sheet No. D-4.00.

Delivery Charges Customer-Owned Option

Distribution Charge:	\$0.025336	per kWh for all kWh
<i>Fixture Charge per Luminaire:</i>	<i>\$0.00</i>	<i>per month</i>

Delivery Charges Company-Owned Option

Distribution Charge:	\$0.031076	per kWh for all kWh
Fixture Charge per Luminaire:	\$6.00	per month

This rate is subject to the Surcharges shown on Sheet Nos. D-2.00 through D-3.10 and the Securitization Charges shown on Sheet Nos. D-5.00 and D-5.10. *Customers previously assessed the Rate GUL Company-Owned Energy Efficiency Program Surcharge shown on Sheet No. D-2.12 will continue to be assessed the Rate GUL Company-Owned Energy Efficiency Program Surcharge. The surcharge shall be applied to their Fixture Charge per Luminaire per month on the Customer-Owned or Company-Owned Option of this Rate Schedule.*

General Terms

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00.

Due Date and Late Payment Charge

The due date of the customer bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance, net of taxes, shall be assessed to any bill which is not paid on or before the due date shown thereon.

Determination of Monthly Kilowatt-Hours and Burning Hours per Month Based on 4,200 Burning Hours per Year

The monthly kilowatt-hours shall be determined by multiplying the total capacity requirements in watts (including the lamps, ballasts, drivers, and control devices) times the monthly Burning Hours as defined below divided by 1,000. The customer shall not change the capacity requirements of the equipment owned by it without first notifying the Company in writing of such changes and the date that they shall be made, and modifying the lighting contract with the Company accordingly.

Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
457.8	382.2	369.6	306.6	264.6	226.8	252.0	298.2	336.0	399.0	432.6	474.6	4,200

Hours of Lighting

Unmetered Experimental Lighting shall be burning at all times when the natural general level of illumination is lower than about 3/4 footcandle, and under normal conditions this is approximately one-half hour after sunset until approximately one-half hour before sunrise. Lighting service will be supplied from dusk to dawn every night and all night on an operating schedule of approximately 4,200 hours per year.

(Continued on Sheet No. D-54.03)

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Case No.: U-20028
Hearing Date: 10-3-2018
Exhibit No.: A-10

Case No.: U-20028
Exhibit No.: A-10 (SCH-2)
Page: 1 of 7
Witness: SCHurd
Date: May 2018

M.P.S.C. No. 2 - Gas
Consumers Energy Company

Sheet No. D-1.10

SURCHARGE

Each Rate Schedule may be subject to Rule No. C8., Customer Attachment Program.

Rate Schedule	Energy Efficiency ⁽¹⁾ Program Surcharge (Case No. U- 18261 20028) Effective beginning the ⁽²⁾ February 2018 <u>XXXXXX 2018 Billing Month</u>	Energy Efficiency Large Gas Transportation Opt-Out Pilot Program Surcharge (Case No. U-16670) ⁽³⁾	Distribution or Transportation Charge per Mcf for all Mcf	Total Distribution Charge ⁽³⁾
Rate A	\$0.2238 /Mcf	+ NA	\$2.9594/Mcf	= \$3.1832/Mcf
Rate A-1	0.2238 /Mcf	+ NA	2.9594/Mcf	= 3.1832/Mcf
Rate GS-1	0.3331/Mcf	+ NA	2.4763/Mcf	= 2.8094/Mcf
Rate GS-2	0.3331Mcf	+ NA	2.0571 /Mcf	= 2.3902/Mcf
Rate GS-3				
0 – 100,000 / Year	0.3331/Mcf	+ NA	1.3132 /Mcf	= 1.6463/Mcf
> 100,000 / Year	0.0111/Mcf	+ NA	1.3132 /Mcf	= 1.3243/Mcf
Rate GL	NA	NA		
				Total Transportation Charge ⁽³⁾
Rate ST				
0 – 100,000 / Year	0.3331Mcf	+ NA	1.0070/Mcf	= 1.3401/Mcf
> 100,000 / Year	0.0111/Mcf	+ \$0.0018/Mcf	1.0070/Mcf	= 1.0181/Mcf
Rate LT				
0 – 100,000 / Year	0.3331/Mcf	+ NA	0.8213 /Mcf	= 1.1544 /Mcf
> 100,000 / Year	0.0111/Mcf	+ 0.0018/Mcf	0.8213/Mcf	= 0.8324/Mcf
Rate XLT				
0 – 100,000 / Year	0.3331/Mcf	+ NA	0.6930 /Mcf	= 1.0261/Mcf
> 100,000 / Year	0.0111/Mcf	+ 0.0018/Mcf	0.6930 /Mcf	= 0.7041/Mcf
Rate CC	Per applicable distribution Rate Schedule	NA		

⁽¹⁾ All surcharges shall be applied on a monthly basis. The customer's consumption will be reviewed annually in the January bill month. Following the annual review, the customer may be subsequently moved to the surcharge level for their applicable rate for the next billing period based on the customer's average consumption for the previous year. No retroactive adjustment will be made due to the application of EE surcharges associated with increases or decreases in consumption.

⁽²⁾ An Energy Efficiency Program Surcharge amount may vary during specific months as authorized by the Michigan Public Service Commission. The Company will file a new tariff sheet to reflect *any* change in surcharges once the financial incentive recovery period has been completed.

⁽³⁾ *The Energy Efficiency Program Surcharge and the Distribution Charge per Mcf for all Mcf for each rate will be combined and shown as this charge on the monthly utility bill for all customers.*

⁽³⁾ ~~Gas Transportation customers on Rate ST, LT or XLT using more than 100,000 Mcf per year may be eligible to opt-out of the Energy Efficiency program. Eligible customers who elect to opt-out of the Energy Efficiency program will pay the Energy Efficiency Large Gas Transportation Opt-Out Pilot Program surcharge per Mcf on a monthly basis. Eligibility is determined solely by the Company and is dependent upon terms and conditions of the Energy Efficiency Large Gas Transportation Customer Opt-Out Pilot Program as authorized in the April 17, 2012 order in Case No. U-16670.~~

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M.P.S.C. No. 2 - Gas
Consumers Energy Company

SURCHARGE

Each Rate Schedule may be subject to Rule No. C8., Customer Attachment Program.

Rate Schedule	Energy Efficiency Large Gas Transportation Opt-Out Pilot Program Surcharge (Case No. U-16670)		Transportation Charge per Mcf for all Mcf		Total Transportation Charge ⁽¹⁾
Rate A	NA		N/A		N/A
Rate A-1	NA		N/A		N/A
Rate GS-1	NA		N/A		N/A
Rate GS-2	NA		N/A		N/A
Rate GS-3					
0 – 100,000 / Year	NA		N/A		N/A
> 100,000 / Year	NA		N/A		N/A
Rate GL	NA				
Rate ST					
0 – 100,000 / Year	NA		N/A		N/A
> 100,000 / Year	\$0.0018/Mcf	+	\$1.0070/Mcf	=	\$1.0088/Mcf
Rate LT					
0 – 100,000 / Year	NA		N/A		N/A
> 100,000 / Year	0.0018/Mcf	+	\$0.8213/Mcf	=	\$0.8231/Mcf
Rate XLT					
0 – 100,000 / Year	NA		N/A		N/A
> 100,000 / Year	0.0018/Mcf	+	\$0.6930 /Mcf	=	\$0.6948/Mcf
Rate CC	NA				

Gas Transportation customers on Rate ST, LT or XLT using more than 100,000 Mcf per year may be eligible to opt-out of the Energy Efficiency program. Eligible customers who elect to opt-out of the Energy Efficiency program will pay the Energy Efficiency Large Gas Transportation Opt-Out Pilot Program surcharge per Mcf on a monthly basis. *This surcharge will be added to the Transportation charge for each applicable Rate Schedule.* Eligibility is determined solely by the Company and is dependent upon terms and conditions of the Energy Efficiency Large Gas Transportation Customer Opt-Out Pilot Program as authorized in the April 17, 2012 order in Case No. U-16670.

⁽¹⁾ *The Energy Efficiency Large Gas Transportation Opt-Out Pilot Program Surcharge and the Transportation Charge per Mcf for all Mcf will be combined for each rate and shown as this charge on the monthly utility bill for all customers.*

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M.P.S.C. No. 2 - Gas
Consumers Energy Company

RESIDENTIAL SERVICE RATE A
(Continued From Sheet No. D-8.00)

Monthly Rate (Contd)

Gas Cost Recovery Charge

The gas cost recovery factors are shown on Sheet No. D-2.00.

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10; ~~D-1.20 and~~ through D-1.30.

Minimum Charge

The minimum charge shall be the customer charge included in the rate.

Due Date and Late Payment Charge

The due date of the customer's bill shall be 21 days from the date of transmittal. A late payment charge of 2%, not compounded, of the portion of the bill, net of taxes, shall be assessed to any bill that is delinquent. A customer who participates in the Winter Protection Plan or who is 65 years of age or older and who has notified the Company the customer is 65 years of age or older, shall be exempt from a late payment charge as described in Rule B2., Consumer Standards and Billing Practices for Electric and Natural Gas Service, R 460.125, Late payment charges.

Term and Form of Contract

Service under this rate shall not require a written contract.

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M.P.S.C. No. 2 - Gas
Consumers Energy Company

MULTIFAMILY DWELLING SERVICE RATE A-1

Availability

Subject to any restrictions this rate is available to any multifamily dwelling installation containing more than two households served through a single meter and where, in the Company's opinion, it is impractical to provide gas service to each household through an individual meter. This rate is not available for multifamily dwellings containing two households served through a single meter.

Monthly Rate

Customer Charge

The charge per customer per month shall be the sum of the following charges:

\$11.75 per month, plus
\$0.0715 per Mcf of excess peak demand, plus

Distribution Charge

\$2.9594 per Mcf for all Mcf purchased.

Gas Cost Recovery Charge

The gas cost recovery factors are shown on Sheet No. D-2.00.

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10; ~~D-1.20~~ and ~~through~~ D-1.30.

Minimum Charge

The minimum charge shall be the customer charge included in the rate.

Due Date and Late Payment Charge

The due date of the customer's bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance outstanding, net of taxes, shall be assessed to any bill which is not paid in full on or before the due date shown thereon.

(Continued on Sheet No. D-10.00)

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M.P.S.C. No. 2 - Gas
Consumers Energy Company

Sheet No. D-11.00

GENERAL SERVICE RATE
(Rates GS-1, GS-2 and GS-3)

Availability

Subject to any restrictions, this rate is available to any customer desiring gas service for any Non-Residential usage which includes tourist homes, rooming houses, dormitories, nursing homes and similarly occupied buildings containing sleeping accommodations for more than six persons. Gas shall not be purchased under any other rate for any equipment or process which uses gas under this rate.

This rate is not available for residential usage or for resale purposes.

Monthly Rate

	<u>Service Category</u>		
	GS-1	GS-2	GS-3
Master Customer Charge	\$14.00/meter	\$49.00/meter	\$669.00/meter
Contiguous Customer Charge	14.00/meter	41.95/meter	53.00/meter
Distribution Charge	\$2.4763/Mcf	\$2.0571/Mcf	\$1.3132/Mcf

Selection of Service Category and Rates

Customers may choose the Service Category under which they take service, consistent with the provisions of Rules C4.1, Classes of Service, and C4.2, Choice of Rates. When the Customer is selecting its initial Service Category, the Company must advise them that the economic breakeven point between GS-1 and GS-2 is approximately 1,001 Mcf per year and the economic breakeven point between GS-2 and GS-3 is approximately 10,001 Mcf per year. After the initial selection is made, then it is the customer's responsibility to determine when it is appropriate to switch Service Categories, as permitted by Rule C4.2, Choice of Rates.

Gas Cost Recovery Charge

The gas cost recovery factors are shown on Sheet No. D-2.00.

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10, ~~D-1.20 and~~ through D-1.30.

Minimum Charge

The minimum charge shall be the customer charge included in the rate.

Due Date and Late Payment Charge

The due date of the customer's bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance outstanding, net of taxes, shall be assessed to any bill which is not paid in full on or before the due date shown thereon.

Term and Form of Contract

Service under this rate shall not require a written contract.

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M.P.S.C. No. 2 - Gas
Consumers Energy Company

GENERAL SERVICE OUTDOOR LIGHTING RATE GL
This Rate Is Not Open to New Business

Availability

Subject to any restrictions, this rate is available to any commercial or industrial customer for streetlighting or outdoor area lighting service for any system consisting of two or more gas luminaires where the Company has an existing gas distribution system.

Nature of Service

The customer shall furnish the necessary posts, luminaires and fixtures. The Company shall install this equipment and make all connections to its gas distribution system. The Company shall supply the gas, renew the mantles, clean the luminaires and paint all metal parts as needed; all other renewals and maintenance shall be paid for by the customer.

Monthly Rate

\$7.00 per luminaire having a rated consumption of 2.5 cubic feet or less per hour.

\$15.00 per luminaire having a rated consumption of more than 2.5 cubic feet but not more than 4.5 cubic feet per hour.

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10; ~~D-1.20 and through~~ D-1.30.

Due Date and Late Payment Charge

The due date of the customer's bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance outstanding, net of taxes, shall be assessed to any bill which is not paid in full on or before the due date shown thereon.

Term and Form of Contract

Minimum term of three years on written contract and year to year thereafter until terminated by mutual consent or upon three months' written notice given by either party.

Special Terms and Conditions

The Company reserves the right to make special contractual arrangements as to term or duration of contract, termination charges, contributions in aid of construction, monthly charges or other special consideration when the customer requests service, equipment or facilities not normally provided under this rate.

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M.P.S.C. No. 2 - Gas
Consumers Energy Company

Sheet No. E-14.00

TRANSPORTATION SERVICE RATE
(Rates ST, LT and XLT)
(Continued From Sheet No. E-13.00)

Monthly Rate (Contd)

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10; ~~D-1.20 and~~ *through* D-1.30.

Term and Form of Contract

All service under this rate shall require a written contract with a minimum term of one year and month-to-month thereafter which must be approved by an officer of the Company or a duly authorized agent before it shall be binding upon the Company. A customer is eligible to request a return to sales rates 12 months from the date that the customer commenced taking service under the Transportation Service Rate Schedule. A customer requesting a return to sales service must provide the Company with a minimum of 12 months written notice of the customer's intent to return to sales rates. For purpose of the notice requirement, notice must be delivered to and received by the Company. The burden is on the customer to establish that notice has been given. The Company reserves the right to deny return to sales rates subject to the Company's Rule C2, Controlled Service.

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TECHNICAL TERMS AND ABBREVIATIONS (FOR ALL CUSTOMERS)
(Continued From Sheet No. A-29.00)

B. Company (Contd)

Customer Voltage Level 2 – Service supplied either directly from the Company's distribution system when the voltage is 25,000 Volts or greater but less than 120,000 Volts or from this system through a Company-owned substation where, from the exits of the substation, the distribution equipment for supplying service is owned and maintained by the customer. Portions of the distribution system supply Customer Voltage Level 2 service at a voltage lower than 25,000 Volts, these customers are grandfathered into Customer Voltage Level 2.

Customer Voltage Level 3 – Service supplied from the Company's distribution system and the voltage is 2,400 Volts or greater but less than 25,000 Volts.

Customer Voltage Level 4 – Service supplied from the Company's distribution system and the voltage is less than 2,400 Volts.

Cycling – Alteration of the operating schedule of a customer's electrical air conditioner, heat pump or other qualifying device.

Energy and Demand Registering Meter – A device that registers customer kilowatt-hour use, peak demand and the on-peak demand.

Energy Efficiency Plan Surcharge (EE) - The EE Surcharge is permitted pursuant to Section 89 of 2008 PA 295 and as amended in 2016 PA 342. Through the application of the EE Surcharge, the rates for distribution service are adjusted to allow for recovery of the cost of the energy waste reduction (EWR) requirements included in 2008 PA 295 and as amended in 2016 PA 342. (Annually, a reconciliation shall be conducted pursuant to Section 97 of 2008 PA 295 and as amended in 2016 PA 342.) The approved EE Surcharges are shown on Sheet ~~D-2.10~~ D-2.12.

Energy-Only Registering Meter – A device that registers customer kilowatt-hour use only.

Full Service Customer - A customer taking power supply and delivery service from the Company, even if on an irregular basis. With the exception of Wholesale Customers and Retail Open Access Customers, as defined in Rule E1.4(u) of the Company's Rate Book for Electric Service, customers are deemed to be Full Service Customers.

General Service Usage – Any use of electric energy that does not qualify for residential rates.

Hertz (Hz) – Cycle per second.

Horsepower (hp) – Unit of mechanical power equivalent to 746 watts of electrical power.

Industrial Usage for Emergency Electrical Procedures – Usage for application, other than those defined as residential or commercial, which qualify for a manufacturing industry code under the most current edition of the Standard Industrial Classification Manual and are associated with the manufacture of a product for sale including processing of a product from one form to another. It also includes usage for facilities directly associated with and on the same premises as the manufacturing business such as offices and warehouses.

Interval Data Meter – A device that registers customer kilowatt-hour use, peak demand, on-peak demand, and maximum demand.

Kilo (k) – Prefix meaning one thousand.

Kilowatt (kW) – Unit of electrical power representing rate of usage of energy, equivalent to about 1-1/3 Horsepower.

Kilowatt-hour (kWh) – Unit of electrical energy equivalent to the use of one Kilowatt for one hour.

Kilovolt-ampere (kVA) – Unit of apparent electrical power which at 100% Power Factor is equivalent to one Kilowatt.

(Continued on Sheet No. A-31.00)

(Continued From Sheet No. C-52.00)

C12. ENERGY EFFICIENCY (EE)

C12.1 Energy Efficiency Program – Electric

This rule implements the energy waste reduction (EWR) requirements of 2008 PA 295 and as amended in 2016 PA 342 in accordance with Orders issued by the Commission in Case No. U-15805. The monthly Energy Efficiency surcharges to be applied to each Rate Schedule are shown on Sheet No. ~~D-2.10~~ D-2.12 of this Rate Book *and shall be combined with an existing fixed or volumetric charge on each eligible Rate Schedule.*

- (1) For all customers on Residential Rate Schedules, the Energy Efficiency Program surcharge shall be combined with the Distribution Charge for both Full Service and ROA customers each month.*
- (2) For all other eligible metered Nonresidential customers, the Energy Efficiency Program surcharge shall be combined with the System Access charge for both Full Service and ROA customers each month.*
- (3) Unmetered Company-Owned lighting customers on Rate GUL shall have the Energy Efficiency Program surcharge combined with the monthly Fixture Charge per Luminaire each month.*

C12.2 Self-Directed Customer Plans

An eligible primary or secondary electric customer is exempt from the mandatory energy efficiency surcharge(s), with the exception of the surcharge funding low-income programs as well as review and evaluation costs, if the customer files and implements a self-directed energy efficiency plan.

A. Eligibility

- (1) Customers must have had an annual peak demand in the preceding year of at least 1 megawatt in the aggregate at all sites to be covered by the self-directed plan.
- (2) The customer and sites covered by an implemented self-directed plan are not eligible to participate in any energy efficiency program of the Company.

B. Requirements

- (1) A customer with a self-directed plan is required to pay the self-directed customer program surcharge. *It shall be added to the existing System Access Charge for both Full Service and ROA customers that qualify.*
- (2) In its Order dated December 4, 2008, in Case No. U-15800, the Commission stated “A self-direct energy optimization plan shall be considered complete, and the customer exempt from the Company’s energy optimization surcharge in the next billing cycle after the start date for the first action item in the customer’s self-direct energy optimization plan. This applies to a customer with a single site or several sites aggregated together. The plan, including the implementation schedule and expected energy savings, must be attested to as true and accurate by a knowledgeable official of the customer. Customers must comply with the statutory self-direct plan reporting requirements to retain the exemption from the surcharge.” Additional information on self-directed plans is available to customers in Attachment E of that Order and Attachments A, B & C from the Order dated August 25, 2011 in Case No. U-16563.*
- (3) *The self-directed plan shall provide for aggregate energy savings that for each year meet or exceed the energy waste reduction performance standards based on the electricity purchases in the previous year for the site or sites covered by the self-directed plan.
- (4) Incremental Energy Savings each year through 2021 are equivalent to 1.0% of total annual retail electricity sales in megawatt hours in the preceding year.

(Continued on Sheet No. C-52.20)

M.P.S.C. No. 13 - Electric
Consumers Energy Company

SURCHARGES

Rate Schedule	Renewable Energy Plan Surcharge (Case No. U-17301) Effective beginning the July 2014 Billing Month⁽⁶⁾⁽²⁾	Energy Efficiency Program Surcharge- (Case No. U-18261) Effective beginning the February 2018 Billing Month⁽⁴⁾	Energy Efficiency Self-Directed Customer Surcharge (Case No. U-18261) Effective beginning the February 2018 Billing Month^(2a)
Residential Rates	\$ 0.00/billing meter	\$ 0.002963 /kWh	NA
Rate GS, GSTU, and GSD ⁽¹⁾			
Tier 1: 0 – 1,250 kWh/mo.	\$ 0.00/billing meter	\$ 3.29 /billing meter	\$ 0.11 /billing meter
Tier 2: 1,251 – 5,000 kWh/mo.	0.00/billing meter	18.57 /billing meter	0.65 /billing meter
Tier 3: 5,001 – 30,000 kWh/mo.	0.00/billing meter	114.36 /billing meter	3.87 /billing meter
Tier 4: 30,001 – 50,000 kWh/mo.	0.00/billing meter	114.36 /billing meter	3.87 /billing meter
Tier 5: > 50,000 kWh/mo.	0.00/billing meter	114.36 /billing meter	3.87 /billing meter
Rate GP, GPD, GPTU and EIP ⁽¹⁾			
Tier 1: 0 – 5,000 kWh/mo.	\$ 0.00/billing meter	\$ 7.57 /billing meter	\$ 0.20 /billing meter
Tier 2: 5,001 – 10,000 kWh/mo.	0.00/billing meter	58.33 /billing meter	1.75 /billing meter
Tier 3: 10,001 – 30,000 kWh/mo.	0.00/billing meter	150.81 /billing meter	4.52 /billing meter
Tier 4: 30,001 – 50,000 kWh/mo.	0.00/billing meter	289.54 /billing meter	9.04 /billing meter
Tier 5: > 50,000 kWh/mo.	0.00/billing meter	1,532.17 /billing meter	43.62 /billing meter
Rate GSG-2	NA	NA ⁽⁴⁾	NA
Rate GML ⁽⁶⁾			
Tier 1: 0 – 1,250 kWh/mo.	\$ 0.00/billing meter	NA	NA
Tier 2: 1,251 – 5,000 kWh/mo.	0.00/billing meter	NA	NA
Tier 3: > 5,000 kWh/mo.	0.00/billing meter	NA	NA
Rate GUL ⁽⁶⁾⁽⁷⁾	0.00/luminaire	\$ 0.27 /fixture per month	NA
Rate GU-XL ⁽⁶⁾	0.00/luminaire	NA	NA
Rate GU			
Tier 1: 0 – 1,250 kWh/mo.	0.00/billed account	NA	NA
Tier 2: 1,251 – 5,000 kWh/mo.	0.00/billed account	NA	NA
Tier 3: > 5,000 kWh/mo.	0.00/billed account	NA	NA
Rate PA	NA	NA	NA
Rate ROA-R, ROA-S, ROA-P	NA	As in Delivery Rate Schedule	As in Delivery Rate Schedule

All Surcharges shall be applied on a monthly basis. The customer's consumption will be reviewed annually in the January bill month. Following the annual review, the customer may be subsequently moved to the Surcharge level for their applicable rate for the next billing period based on the customer's average consumption for the previous year. In situations where no historical consumption is available, the monthly Surcharge level will be based on the lowest consumption category for the secondary rate schedules or the lowest consumption category for primary rate schedules. No retroactive adjustment will be made due to the application of the REP ~~or EE~~ Surcharges associated with increases or decreases in consumption.

⁽¹⁾ Municipal Pumping customers shall be excluded from the Renewable Energy Plan Surcharge.

^(2a) An eligible customer who files and implements a self-directed plan in compliance with Rule C12 is required to pay the Energy Efficiency Self-Directed Program Surcharge.

⁽⁴⁾ An Energy Efficiency Program Surcharge amount may vary during specific months as authorized by the Michigan Public Service Commission. The Company will file a new tariff sheet to reflect any change in surcharges once the financial incentive recovery period has been completed.

⁽⁶⁾ Rate GSG-2 Customers are eligible to opt-in to the Energy Efficiency Electric Program Surcharge. A GSG-2 customer electing to participate in the Energy Efficiency Electric Program will be charged the GPD, Tier 5: > 50,000 kWh/mo rate per billing meter per month.

⁽⁶⁾⁽²⁾ A Renewable Energy Plan Surcharge will be in effect for the period of the September 2009 Bill Month through the August 2029 Bill Month.

The amount may vary during specific months as authorized by the Michigan Public Service Commission. Applicable cases include Case Nos. U-15805, U-16543, U-16581 and U-17301.

⁽⁶⁾ Customer-Owned lighting fixtures served on Rate GML, GUL and Rate GU-XL are eligible to opt-in to the Energy Efficiency Program Surcharge. A GML, GUL or GU-XL customer electing to participate in the Energy Efficiency Electric Program will be charged the applicable surcharge as shown for Rate GS, GSTU, and GSD or Rate GP, GPD, GPTU and EIP, as applicable, per participating account per month.

⁽⁷⁾ Rate Schedule GUL Company-Owned lighting fixtures shall pay the per fixture surcharge monthly as shown above.

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

SURCHARGES

<u>Rate Schedule</u>	<u>Energy Efficiency Program Surcharge (Case No. U-20028) Effective beginning the January 2019 Billing Month⁽²⁾</u>		<u>Distribution, System Access or Fixture Charge per Rate Schedule</u>		<u>Total Distribution Charge⁽¹⁾</u>
Residential Rates	\$0.003101/kWh	+	\$0.050297/kWh ⁽⁴⁾	=	\$0.053398/kWh
Total System Access Charge⁽¹⁾					
Rate GS and GSTU					
Tier 1: 0-1250 kWh/mo.	\$4.47/billing meter	+	\$20.00/month ⁽⁵⁾	=	\$24.47/month
Tier 2: 1,251 – 5000 kWh/mo.	25.23/billing meter	+	\$20.00/month ⁽⁵⁾	=	45.23/month
Tier 3: 5,001 – 30,000 kWh/mo.	155.30/billing meter	+	\$20.00/month ⁽⁵⁾	=	175.30/month
Tier 4: 30,001 – 50,000 kWh/mo.	155.30/billing meter	+	\$20.00/month ⁽⁵⁾	=	175.30/month
Tier 5: >50,000 kWh/mo.	155.30/billing meter	+	\$20.00/month ⁽⁵⁾	=	175.30/month
Rate GSD					
Tier 1: 0-1250 kWh/mo.	\$4.47/billing meter	+	\$30.00/month ⁽⁵⁾	=	\$34.47/month
Tier 2: 1,251 – 5000 kWh/mo.	25.23/billing meter	+	\$30.00/month ⁽⁵⁾	=	55.23/month
Tier 3: 5,001 – 30,000 kWh/mo.	155.30/billing meter	+	\$30.00/month ⁽⁵⁾	=	185.30/month
Tier 4: 30,001 – 50,000 kWh/mo.	155.30/billing meter	+	\$30.00/month ⁽⁵⁾	=	185.30/month
Tier 5: >50,000 kWh/mo.	155.30/billing meter	+	\$30.00/month ⁽⁵⁾	=	185.30/month
Rate GP					
Tier 1: 0-1250 kWh/mo.	\$5.97/billing meter	+	\$100.00/month ⁽⁵⁾	=	\$105.97/month
Tier 2: 1,251 – 5000 kWh/mo.	45.93/billing meter	+	\$100.00/month ⁽⁵⁾	=	145.93/month
Tier 3: 5,001 – 30,000 kWh/mo.	216.51/billing meter	+	\$100.00/month ⁽⁵⁾	=	316.51/month
Tier 4: 30,001 – 50,000 kWh/mo.	560.51/billing meter	+	\$100.00/month ⁽⁵⁾	=	660.51/month
Tier 5: >50,000 kWh/mo.	1123.89/billing meter	+	\$100.00/month ⁽⁵⁾	=	1223.89/month
Rate GPD, GPTU, and EIP					
Tier 1: 0-1250 kWh/mo.	\$5.97/billing meter	+	\$200.00/month ⁽⁵⁾	=	\$205.97/month
Tier 2: 1,251 – 5000 kWh/mo.	45.93/billing meter	+	\$200.00/month ⁽⁵⁾	=	245.93/month
Tier 3: 5,001 – 30,000 kWh/mo.	216.51/billing meter	+	\$200.00/month ⁽⁵⁾	=	416.51/month
Tier 4: 30,001 – 50,000 kWh/mo.	560.51/billing meter	+	\$200.00/month ⁽⁵⁾	=	760.51/month
Tier 5: >50,000 kWh/mo.	1123.89/billing meter	+	\$200.00/month ⁽⁵⁾	=	1323.89/month
Rate GSG-2 ⁽³⁾	NA		NA		NA
Rate GML ⁽³⁾	NA		NA		NA
Rate GUL ⁽⁷⁾					Total Fixture Charge⁽¹⁾
Company Owned	\$0.27/fixture per month	+	\$6.00/fixture per month ⁽⁶⁾	=	\$6.27/fixture per month
Customer Owned ⁽³⁾	NA		NA		NA
Rate GU-XL ⁽³⁾					NA
Company Owned	NA		NA		NA
Customer Owned	NA		NA		NA
Rate GU	NA		NA		NA
Rate PA	NA		NA		NA
Rate ROA-R, ROA-S, ROA-P	Same as Full Service Delivery Rate Schedule		Same as Full Service Delivery Rate Schedule		Same as Full Service Delivery Rate Schedule

All Surcharges shall be applied on a monthly basis. The customer's consumption will be reviewed annually in the January bill month. Following the annual review, the customer may be subsequently moved to the Surcharge level for their applicable rate for the next billing period based on the customer's average consumption for the previous year. In situations where no historical consumption is available, the Energy Efficiency Program Surcharge will be based on the lowest consumption category for the secondary rate schedules or the lowest consumption category for primary rate schedules. No retroactive adjustment will be made to the application of the Energy Efficiency Program Surcharge associated with increases or decreases in consumption.

⁽¹⁾ This charge will be shown on the monthly utility bill as calculated in Rule C12, Energy Efficiency.

⁽²⁾ An Energy Efficiency Program Surcharge amount may vary during specific months as authorized by the Michigan Public Service Commission. The Company will file a new tariff sheet to reflect any change in surcharges once the financial incentive recovery period has been completed.

⁽³⁾ Additional Rate Schedules can opt-in to the Energy Efficiency Program as described on the Delivery Charge of that rate.

⁽⁴⁾ Distribution Charge per Rate Schedule.

⁽⁵⁾ System Access Charge per Rate Schedule.

⁽⁶⁾ Fixture Charge per Luminaire per Rate Schedule.

⁽⁷⁾ Outdoor Area Lighting customer rate codes 1455 and 1460 shall be exempt from the Energy Efficiency Program Surcharge.

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SURCHARGES

<i>Energy Efficiency Self-Directed Customer Surcharge (Case No. U-20028) Effective beginning the January 2019 Billing Month⁽¹⁾</i>		<i>System Access Charge per Rate Schedule</i>		<i>Total System Access Charge</i>	
<u>Rate Schedule</u>					
<i>Rate GS and GSTU</i>					
Tier 1: 0-1250 kWh/mo.	\$0.11/billing meter	+	\$20.00/month	=	\$20.11/month
Tier 2: 1,251 – 5000 kWh/mo.	0.65/billing meter	+	\$20.00/month	=	20.65/month
Tier 3: 5,001 – 30,000 kWh/mo.	3.87/billing meter	+	\$20.00/month	=	23.87/month
Tier 4: 30,001 – 50,000 kWh/mo.	3.87/billing meter	+	\$20.00/month	=	23.87/month
Tier 5: >50,000 kWh/mo.	3.87/billing meter	+	\$20.00/month	=	23.87/month
<i>Rate GSD</i>					
Tier 1: 0-1250 kWh/mo.	\$0.11/billing meter	+	\$30.00/month	=	\$30.11/month
Tier 2: 1,251 – 5000 kWh/mo.	0.65/billing meter	+	\$30.00/month	=	30.65/month
Tier 3: 5,001 – 30,000 kWh/mo.	3.87/billing meter	+	\$30.00/month	=	33.87/month
Tier 4: 30,001 – 50,000 kWh/mo.	3.87/billing meter	+	\$30.00/month	=	33.87/month
Tier 5: >50,000 kWh/mo.	3.87/billing meter	+	\$30.00/month	=	33.87/month
<i>Rate GP</i>					
Tier 1: 0-1250 kWh/mo.	\$0.20/billing meter	+	\$100.00/month	=	\$100.20/month
Tier 2: 1,251 – 5000 kWh/mo.	1.75/billing meter	+	\$100.00/month	=	101.75/month
Tier 3: 5,001 – 30,000 kWh/mo.	4.52/billing meter	+	\$100.00/month	=	104.52/month
Tier 4: 30,001 – 50,000 kWh/mo.	9.04/billing meter	+	\$100.00/month	=	109.04/month
Tier 5: >50,000 kWh/mo.	43.62/billing meter	+	\$100.00/month	=	143.62/month
<i>Rate GPD, GPTU, and EIP</i>					
Tier 1: 0-1250 kWh/mo.	\$0.20/billing meter	+	\$200.00/month	=	\$200.20/month
Tier 2: 1,251 – 5000 kWh/mo.	1.75/billing meter	+	\$200.00/month	=	201.75/month
Tier 3: 5,001 – 30,000 kWh/mo.	4.52/billing meter	+	\$200.00/month	=	204.52/month
Tier 4: 30,001 – 50,000 kWh/mo.	9.04/billing meter	+	\$200.00/month	=	209.04/month
Tier 5: >50,000 kWh/mo.	43.62/billing meter	+	\$200.00/month	=	243.62/month
Rate GSG-2	NA		NA		NA
Rate GML	NA		NA		NA
Rate GUL	NA		NA		NA
Rate GU-XL	NA		NA		NA
Rate GU	NA		NA		NA
Rate PA	NA		NA		NA
Rate ROA-R, ROA-S, ROA-P	Same as Full Service Delivery Rate Schedule		Same as Full Service Delivery Rate Schedule		Same as Full Service Delivery Rate Schedule

All Surcharges shall be applied on a monthly basis. The customer's consumption will be reviewed annually in the January bill month. Following the annual review, the customer may be subsequently moved to the Surcharge level for their applicable rate for the next billing period based on the customer's average consumption for the previous year. In situations where no historical consumption is available, the Energy Efficiency Self-Directed Customer Surcharge will be based on the lowest consumption category for the secondary rate schedules or the lowest consumption category for primary rate schedules. No retroactive adjustment will be made to the application of the Energy Efficiency Self-Directed Customer Surcharge associated with increases or decreases in consumption.

⁽¹⁾An eligible customer who files and implements a self-directed plan in compliance with Rule C12 is required to pay the Energy Efficiency Self-Directed Program Surcharge.

M.P.S.C. No. 13 - Electric
Consumers Energy Company

GENERAL SERVICE SELF GENERATION RATE GSG-2
(Continued From Sheet No. D-42.00)

Nature of Service (Contd)

Where service is supplied at a nominal voltage equal to or greater than 2,400 volts and the Company elects to measure the service at a nominal voltage above 25,000 volts, 1% shall be deducted for billing purposes, from the demand and energy measurements thus made.

Where service is supplied at a nominal voltage equal to or greater than 2,400 volts and the Company elects to measure the service at a nominal voltage of less than 2,400 volts, 3% shall be added for billing purposes, to the demand and energy measurements thus made.

Where service is supplied at a nominal voltage less than 2,400 volts and the Company elects to measure the service at a nominal voltage equal to or greater than 2,400 volts, 3% shall be deducted for billing purposes from the energy measurements thus made.

There shall be no double billing of demand under the base rate and Rate GSG-2.

Monthly Rate

Standby Charges

Power Supply Standby Charges

For all standby energy supplied by the Company, the customer shall be responsible for the MISO Real-Time Locational Market Price (LMP) for the Company's load node (designated as "CONS.CETR" as of the date of this Rate Schedule), multiplied by the customer's consumption (kWh), plus the Market Settlement Fee of \$0.002/kWh. In addition capacity charges will be assessed monthly, calculated using the highest 15 minute kW demand associated with Standby Service occurring during the Company's On-Peak billing hours will be multiplied by the highest contracted capacity purchased by the Company in that month, plus allocated transmission and ancillaries. The capacity charges will be prorated based on the number of On-Peak days that Standby Service was used during the billing month.

A customer with a generator(s) nameplate rating more than 550 kW must provide written notice to the Company by December 1 if they desire standby service in the succeeding calendar months of June through September. Written notice shall be submitted on Company Form 500. If the customer fails to meet this written notice requirement, the LMP shall be increased by applying a 10% adder.

Delivery Standby Charges

System Access Charge:

Generator that does not meet or exceed load:	\$100.00	per generator installation per month
Generator that meets or exceeds load:	\$200.00	per generator installation per month

Charges for Customer Voltage Level 3 (CVL 3)

Capacity Charge:	\$ 4.21	per kW of Standby Demand
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Charges for Customer Voltage Level 2 (CVL 2)

Capacity Charge:	\$ 1.90	per kW of Standby Demand
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Charges for Customer Voltage Level 1 (CVL 1)

Capacity Charge:	\$ 1.06	per kW of Standby Demand
------------------	---------	--------------------------

This rate is subject to the Surcharges shown on Sheet Nos. D-2.00 through D-3.10 and the Power Plant Securitization Charges shown on Sheet No. D-5.10. *Customers who choose to participate in Energy Efficiency Program will have the Rate GPD Tier 5 Energy Efficiency Program Surcharge shown on Sheet No. D-12 added to the appropriate System Access Charge per billing meter per month.*

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

GENERAL SERVICE METERED LIGHTING RATE GML
(Continued From Sheet No. D-46.00)

Monthly Rate (Contd)

Secondary Delivery Charge

System Access Charge: \$10.00 per customer per month
Distribution Charge: \$0.065052 per kWh for all kWh

This rate is subject to the Surcharges shown on Sheet Nos. D-2.00 through D-3.10 and the Securitization Charges shown on Sheet Nos. D-5.00 and D-5.10. *Customers who choose to participate in Energy Efficiency Program will have the Rate GUL Company-Owned Energy Efficiency Program Surcharge shown on Sheet No. D-2.12 added to their System Access Charge per billing meter per month.*

Primary Power Supply Charge

Energy Charge:

Non-Capacity	Capacity	Total	
\$ 0.025022	\$ 0.000000	\$0.025022	per kWh for all kWh

This rate is subject to the Power Supply Cost Recovery (PSCR) Factor shown on Sheet No. D-4.00.

Primary Delivery Charge

System Access Charge: \$20.00 per customer per month
Distribution Charge: \$0.049217 per kWh for all kWh

This rate is subject to the Surcharges shown on Sheet Nos. D-2.00 through D-3.10 and the Securitization Charges shown on Sheet Nos. D-5.00 and D-5.10. *Customers who choose to participate in Energy Efficiency Program will have the Rate GUL Company-Owned Energy Efficiency Program Surcharge shown on Sheet No. D-2.12 added to their System Access Charge per billing meter per month.*

Net Metering Program

The Net Metering Program is available to any eligible customer as described in Rule C11., Net Metering Program, who desires to generate a portion or all of their own retail electricity requirements using a Renewable Energy Resource as defined in Rule C11.B, Net Metering Program.

A customer who participates in the Net Metering Program is subject to the provisions contained in Rule C11., Net Metering Program.

Green Generation Program

Customer contracts for participation in the Green Generation Program shall be available to any eligible customer as described in Rule C10.2, Green Generation Program.

A customer who participates in the Green Generation Program is subject to the provisions contained in Rule C10.2, Green Generation Program.

(Continued on Sheet No. D-48.00)

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

GENERAL SERVICE UNMETERED LIGHTING RATE GUL
(Continued From Sheet No. D-50.10)

Monthly Rate

The charge per luminaire per month shall be

Type of Luminaire	Nominal Rating of Lamps (One Lamp per Luminaire) (1)				Service Charge per Luminaire (4)		Fixture Charge per Luminaire (4)
	Watts	Watts Including Ballast (2)	Lumens	Non-Capacity	Capacity	Total	
Mercury Vapor (3)	100	128	3,500	\$7.71	\$0.00	\$7.71	\$6.00
Mercury Vapor (3)	175	209	7,500	12.59	0.00	12.59	6.00
Mercury Vapor (3)	250	281	10,000	16.93	0.00	16.93	6.00
Mercury Vapor (3)	400	458	20,000	27.59	0.00	27.59	6.00
Mercury Vapor (3)	700	770	35,000	46.39	0.00	46.39	6.00
Mercury Vapor (3)	1,000	1,080	50,000	65.07	0.00	65.07	6.00
High-Pressure Sodium (3)	70	83	5,000	5.00	0.00	5.00	6.00
High-Pressure Sodium	100	117	8,500	7.05	0.00	7.05	6.00
High-Pressure Sodium	150	171	14,000	10.30	0.00	10.30	6.00
High-Pressure Sodium (3)	200	247	20,000	14.88	0.00	14.88	6.00
High-Pressure Sodium	250	318	24,000	19.16	0.00	19.16	6.00
High-Pressure Sodium	400	480	45,000	28.92	0.00	28.92	6.00
Fluorescent (3)	380	470	20,000	28.32	0.00	28.32	6.00
Incandescent (3)	202	202	2,500	12.17	0.00	12.17	6.00
Incandescent (3)	305	305	4,000	18.37	0.00	18.37	6.00
Incandescent (3)	405	405	6,000	24.40	0.00	24.40	6.00
Incandescent (3)	690	690	10,000	41.57	0.00	41.57	6.00
Metal Halide	150	170	9,750	10.24	0.00	10.24	6.00
Metal Halide (3)	175	210	10,500	12.65	0.00	12.65	6.00
Metal Halide	250	290	15,500	17.47	0.00	17.47	6.00
Metal Halide	400	460	24,000	27.71	0.00	27.71	6.00

- (1) Ratings for fluorescent lighting apply to all lamps in one luminaire.
- (2) Watts including ballast used for monthly billing of the Power Supply Cost Recovery (PSCR) Factor, the Power Plant Securitization Charges and surcharges.
- (3) Rates apply to existing luminaires only and are not open to new business.
- (4) For ~~customers who own~~ *Customer-Owned* their lighting fixtures ~~and that~~ are assessed a Service Charge (but not a Fixture Charge), the charge per luminaire represents a 37.2% Power Supply Charge and a 62.8% Distribution Charge. ~~For customers who do not own their lighting fixtures and are assessed both a Service Charge and a Fixture Charge, the charge per luminaire represents a 21.8% Power Supply Charge and a 78.2% Distribution Charge.~~

For Company-Owned lighting fixtures that are assessed both a Service Charge and a Fixture Charge, the charge per luminaire represents a 21.8% Power Supply Charge and a 78.2% Distribution Charge.

For energy conservation purposes, customers may, at their option, elect to have any or all luminaires served under this rate disconnected for a period of six months or more. The charge per luminaire per month, for each disconnected luminaire, shall be 40% of the monthly rate set forth above. However, should any such disconnected luminaire be reconnected at the customer's request after having been disconnected for less than six months, the monthly rate set forth above shall apply to the period of disconnection. An \$8.00 per luminaire disconnect/reconnect charge shall be made at the time of disconnection except that when the estimated disconnect/reconnect cost is significantly higher than \$8.00, the estimated cost per luminaire shall be charged.

For 24-hour mercury-vapor service, the charge per luminaire shall be 125% of the foregoing rates.

(Continued on Sheet No. D-52.00)

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

GENERAL SERVICE UNMETERED LIGHTING RATE GUL
(Continued From Sheet No. D-51.00)

Monthly Rate: (Contd)

Green Generation Program:

Customer contracts for participation in the Green Generation Program shall be available to any eligible customer as described in Rule C10.2, Green Generation Program.

A customer who participates in the Green Generation Program is subject to the provisions contained in Rule C10.2, Green Generation Program.

General Terms, Surcharges, Power Supply Cost Recovery (PSCR) Factor and Power Plant Securitization Charges:

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00, Surcharges shown on Nos. D-2.00 through D-3.10, PSCR Factor shown on Sheet No. D-4.00 and the *Power Plant* Securitization Charges shown on Sheet No. D-5.10. *Customer-Owned Lighting customers who choose to participate in Energy Efficiency Program will have the Rate GUL Company-Owned Energy Efficiency Program Surcharge shown on Sheet No. D-2.12 added to their Service Charge per Luminaire per month.*

Due Date and Late Payment Charge:

The due date of the customer bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance, net of taxes, shall be assessed to any bill which is not paid on or before the due date shown thereon.

Special Terms and Conditions:

The Company reserves the right to make special contractual arrangements as to term or duration of contract, termination charges, contribution in aid of construction, annual charges or other special considerations when the customer requests service, equipment or facilities not normally provided under this rate.

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M.P.S.C. No. 13 - Electric
Consumers Energy Company

Sheet No. D-54.02

GENERAL UNMETERED EXPERIMENTAL LIGHTING RATE GU-XL
(Continued From Sheet No. D-54.01)

Facilities Policy (Contd)

Company-Owned Option (Contd)

- D. The Company will determine the type and size of all experimental lighting fixtures to be offered under this rate. The list of approved fixtures is subject to modification at the sole discretion of the Company to accommodate new product development and advances in technology. Upon customer request, the Company shall provide a list of experimental lighting available under this rate.
- E. The Company shall determine all associated equipment necessary to provide service under the Company-Owned Unmetered Experimental Lighting option.
- F. Any charges, deposits or contributions may be required in advance of commencement of construction.
- G. At the Company's discretion, any failed lighting fixtures may be converted to an equivalent LED at no cost to the customer if the customer agrees to the conversion. The replaced fixture will then be moved to General Unmetered Experimental Lighting Rate GU-XL upon completion of the installation.

Customer-Owned Option

If it is necessary for the Company to install distribution facilities to serve a customer-owned system, contributions and/or deposits for such additional facilities shall be calculated in accordance with the Company's general service line extension policy. Any charges, deposits or contributions may be required in advance of commencement of construction.

Monthly Rate

Power Supply Charges

Energy Charge:

Non-Capacity	Capacity	Total	
\$ 0.059553	\$ 0.000000	\$ 0.059553	per kWh for all kWh

This rate is subject to the Power Supply Cost Recovery (PSCR) Factor shown on Sheet No. D-4.00.

Delivery Charges Customer-Owned Option

Distribution Charge:	\$0.025336	per kWh for all kWh
<i>Fixture Charge per Luminaire:</i>	<i>\$0.00</i>	<i>per month</i>

Delivery Charges Company-Owned Option

Distribution Charge:	\$0.031076	per kWh for all kWh
Fixture Charge per Luminaire:	\$6.00	per month

This rate is subject to the Surcharges shown on Sheet Nos. D-2.00 through D-3.10 and the Securitization Charges shown on Sheet Nos. D-5.00 and D-5.10. *Customers previously assessed the Rate GUL Company-Owned Energy Efficiency Program Surcharge shown on Sheet No. D-2.12 will continue to be assessed the Rate GUL Company-Owned Energy Efficiency Program Surcharge. The surcharge shall be applied to their Fixture Charge per Luminaire per month on the Customer-Owned or Company-Owned Option of this rate schedule.*

General Terms

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00.

Due Date and Late Payment Charge

The due date of the customer bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance, net of taxes, shall be assessed to any bill which is not paid on or before the due date shown thereon.

Determination of Monthly Kilowatt-Hours and Burning Hours per Month Based on 4,200 Burning Hours per Year

The monthly kilowatt-hours shall be determined by multiplying the total capacity requirements in watts (including the lamps, ballasts, drivers, and control devices) times the monthly Burning Hours as defined below divided by 1,000. The customer shall not change the capacity requirements of the equipment owned by it without first notifying the Company in writing of such changes and the date that they shall be made, and modifying the lighting contract with the Company accordingly.

Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
457.8	382.2	369.6	306.6	264.6	226.8	252.0	298.2	336.0	399.0	432.6	474.6	4,200

Hours of Lighting

Unmetered Experimental Lighting shall be burning at all times when the natural general level of illumination is lower than about 3/4 footcandle, and under normal conditions this is approximately one-half hour after sunset until approximately one-half hour before sunrise. Lighting service will be supplied from dusk to dawn every night and all night on an operating schedule of approximately 4,200 hours per year.

(Continued on Sheet No. D-54.03)

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SURCHARGE

Each Rate Schedule may be subject to Rule No. C8., Customer Attachment Program.

Rate Schedule	Energy Efficiency ⁽¹⁾ Program Surcharge (Case No. U- 18261 20028) Effective beginning the ⁽²⁾ February 2018 <u>January 2019 Billing Month</u>		Energy Efficiency Large Gas Transportation Opt-Out Pilot Program Surcharge (Case No. U-16670) ⁽³⁾		Distribution or Transportation Charge per Mcf for all Mcf		Total Distribution Charge ⁽³⁾	
Rate A	\$0.2238 0.2367/Mcf		+	NA		\$2.9594/Mcf	=	\$3.1961/Mcf
Rate A-1	0.2238 0.2367/Mcf		+	NA		2.9594/Mcf	=	3.1961/Mcf
Rate GS-1	0.3334 0.3496/Mcf		+	NA		2.4763/Mcf	=	2.8259/Mcf
Rate GS-2	0.3334 0.3496/Mcf		+	NA		2.0571 /Mcf	=	2.4067/Mcf
Rate GS-3								
0 – 100,000 / Year	0.3334 0.3496/Mcf		+	NA		1.3132 /Mcf	=	1.6628/Mcf
> 100,000 / Year	0.0114 0.0117/Mcf		+	NA		1.3132 /Mcf	=	1.3249/Mcf
Rate GL	NA			NA				
								Total Transportation Charge⁽³⁾
Rate ST								
0 – 100,000 / Year	0.3334 0.3496/Mcf		+	NA		1.0070/Mcf	=	1.3566/Mcf
> 100,000 / Year	0.0114 0.0117/Mcf		+	\$0.0018 /Mcf		1.0070/Mcf	=	1.0187/Mcf
Rate LT								
0 – 100,000 / Year	0.3334 0.3496/Mcf		+	NA		0.8213 /Mcf	=	1.1709 /Mcf
> 100,000 / Year	0.0114 0.0117/Mcf		+	0.0018 /Mcf		0.8213/Mcf	=	0.8330/Mcf
Rate XLT								
0 – 100,000 / Year	0.3334 0.3496/Mcf		+	NA		0.6930 /Mcf	=	1.0426/Mcf
> 100,000 / Year	0.0114 0.0117/Mcf		+	0.0018 /Mcf		0.6930 /Mcf	=	0.7047/Mcf
Rate CC	Per applicable distribution Rate Schedule			NA				

⁽¹⁾ All surcharges shall be applied on a monthly basis. The customer's consumption will be reviewed annually in the January bill month. Following the annual review, the customer may be subsequently moved to the surcharge level for their applicable rate for the next billing period based on the customer's average consumption for the previous year. No retroactive adjustment will be made due to the application of EE surcharges associated with increases or decreases in consumption.

⁽²⁾ An Energy Efficiency Program Surcharge amount may vary during specific months as authorized by the Michigan Public Service Commission. The Company will file a new tariff sheet to reflect *any* change in surcharges once the financial incentive recovery period has been completed.

⁽³⁾ *The Energy Efficiency Program Surcharge and the Distribution Charge per Mcf for all Mcf for each rate will be combined and shown as this charge on the monthly utility bill for all customers.*

~~⁽³⁾ Gas Transportation customers on Rate ST, LT or XLT using more than 100,000 Mcf per year may be eligible to opt-out of the Energy Efficiency program. Eligible customers who elect to opt-out of the Energy Efficiency program will pay the Energy Efficiency Large Gas Transportation Opt-Out Pilot Program surcharge per Mcf on a monthly basis. Eligibility is determined solely by the Company and is dependent upon terms and conditions of the Energy Efficiency Large Gas Transportation Customer Opt-Out Pilot Program as authorized in the April 17, 2012 order in Case No. U-16670.~~

M.P.S.C. No. 2 - Gas
Consumers Energy Company

SURCHARGE

Each Rate Schedule may be subject to Rule No. C8., Customer Attachment Program.

Rate Schedule	Energy Efficiency Large Gas Transportation Opt-Out Pilot Program Surcharge (Case No. U-16670)		Transportation Charge per Mcf for all Mcf		Total Transportation Charge ⁽¹⁾
Rate A	NA		N/A		N/A
Rate A-1	NA		N/A		N/A
Rate GS-1	NA		N/A		N/A
Rate GS-2	NA		N/A		N/A
Rate GS-3					
0 – 100,000 / Year	NA		N/A		N/A
> 100,000 / Year	NA		N/A		N/A
Rate GL	NA				
Rate ST					
0 – 100,000 / Year	NA		N/A		N/A
> 100,000 / Year	\$0.0018/Mcf	+	\$1.0070/Mcf	=	\$1.0088/Mcf
Rate LT					
0 – 100,000 / Year	NA		N/A		N/A
> 100,000 / Year	0.0018/Mcf	+	\$0.8213/Mcf	=	\$0.8231/Mcf
Rate XLT					
0 – 100,000 / Year	NA		N/A		N/A
> 100,000 / Year	0.0018/Mcf	+	\$0.6930 /Mcf	=	\$0.6948/Mcf
Rate CC	NA				

Gas Transportation customers on Rate ST, LT or XLT using more than 100,000 Mcf per year may be eligible to opt-out of the Energy Efficiency program. Eligible customers who elect to opt-out of the Energy Efficiency program will pay the Energy Efficiency Large Gas Transportation Opt-Out Pilot Program surcharge per Mcf on a monthly basis. *This surcharge will be added to the Transportation charge for each applicable Rate Schedule.* Eligibility is determined solely by the Company and is dependent upon terms and conditions of the Energy Efficiency Large Gas Transportation Customer Opt-Out Pilot Program as authorized in the April 17, 2012 order in Case No. U-16670.

⁽¹⁾ *The Energy Efficiency Large Gas Transportation Opt-Out Pilot Program Surcharge and the Transportation Charge per Mcf for all Mcf will be combined for each rate and shown as this charge on the monthly utility bill for all customers.*

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M.P.S.C. No. 2 - Gas
Consumers Energy Company

RESIDENTIAL SERVICE RATE A
(Continued From Sheet No. D-8.00)

Monthly Rate (Contd)

Gas Cost Recovery Charge

The gas cost recovery factors are shown on Sheet No. D-2.00.

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10; ~~D-1.20 and~~ through D-1.30.

Minimum Charge

The minimum charge shall be the customer charge included in the rate.

Due Date and Late Payment Charge

The due date of the customer's bill shall be 21 days from the date of transmittal. A late payment charge of 2%, not compounded, of the portion of the bill, net of taxes, shall be assessed to any bill that is delinquent. A customer who participates in the Winter Protection Plan or who is 65 years of age or older and who has notified the Company the customer is 65 years of age or older, shall be exempt from a late payment charge as described in Rule B2., Consumer Standards and Billing Practices for Electric and Natural Gas Service, R 460.125, Late payment charges.

Term and Form of Contract

Service under this rate shall not require a written contract.

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M.P.S.C. No. 2 - Gas
Consumers Energy Company

MULTIFAMILY DWELLING SERVICE RATE A-1

Availability

Subject to any restrictions this rate is available to any multifamily dwelling installation containing more than two households served through a single meter and where, in the Company's opinion, it is impractical to provide gas service to each household through an individual meter. This rate is not available for multifamily dwellings containing two households served through a single meter.

Monthly Rate

Customer Charge

The charge per customer per month shall be the sum of the following charges:

\$11.75 per month, plus
\$0.0715 per Mcf of excess peak demand, plus

Distribution Charge

\$2.9594 per Mcf for all Mcf purchased.

Gas Cost Recovery Charge

The gas cost recovery factors are shown on Sheet No. D-2.00.

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10; ~~D-1.20~~ and ~~through~~ D-1.30.

Minimum Charge

The minimum charge shall be the customer charge included in the rate.

Due Date and Late Payment Charge

The due date of the customer's bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance outstanding, net of taxes, shall be assessed to any bill which is not paid in full on or before the due date shown thereon.

(Continued on Sheet No. D-10.00)

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M.P.S.C. No. 2 - Gas
Consumers Energy Company

**GENERAL SERVICE RATE
(Rates GS-1, GS-2 and GS-3)**

Availability

Subject to any restrictions, this rate is available to any customer desiring gas service for any Non-Residential usage which includes tourist homes, rooming houses, dormitories, nursing homes and similarly occupied buildings containing sleeping accommodations for more than six persons. Gas shall not be purchased under any other rate for any equipment or process which uses gas under this rate.

This rate is not available for residential usage or for resale purposes.

Monthly Rate

	<u>Service Category</u>		
	GS-1	GS-2	GS-3
Master Customer Charge	\$14.00/meter	\$49.00/meter	\$669.00/meter
Contiguous Customer Charge	14.00/meter	41.95/meter	53.00/meter
Distribution Charge	\$2.4763/Mcf	\$2.0571/Mcf	\$1.3132/Mcf

Selection of Service Category and Rates

Customers may choose the Service Category under which they take service, consistent with the provisions of Rules C4.1, Classes of Service, and C4.2, Choice of Rates. When the Customer is selecting its initial Service Category, the Company must advise them that the economic breakeven point between GS-1 and GS-2 is approximately 1,001 Mcf per year and the economic breakeven point between GS-2 and GS-3 is approximately 10,001 Mcf per year. After the initial selection is made, then it is the customer's responsibility to determine when it is appropriate to switch Service Categories, as permitted by Rule C4.2, Choice of Rates.

Gas Cost Recovery Charge

The gas cost recovery factors are shown on Sheet No. D-2.00.

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10, ~~D-1.20 and~~ through D-1.30.

Minimum Charge

The minimum charge shall be the customer charge included in the rate.

Due Date and Late Payment Charge

The due date of the customer's bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance outstanding, net of taxes, shall be assessed to any bill which is not paid in full on or before the due date shown thereon.

Term and Form of Contract

Service under this rate shall not require a written contract.

Issued XXXX XX, 2018 by
Patti Poppe,
President and Chief Executive Officer,
Jackson, Michigan

Effective for bills rendered on and after
the Company's January 2019 Billing Month

Issued under authority of the
Michigan Public Service Commission
dated XXXX XX, XXXX
in Case No. U-20028

M.P.S.C. No. 2 - Gas
Consumers Energy Company

GENERAL SERVICE OUTDOOR LIGHTING RATE GL
This Rate Is Not Open to New Business

Availability

Subject to any restrictions, this rate is available to any commercial or industrial customer for streetlighting or outdoor area lighting service for any system consisting of two or more gas luminaires where the Company has an existing gas distribution system.

Nature of Service

The customer shall furnish the necessary posts, luminaires and fixtures. The Company shall install this equipment and make all connections to its gas distribution system. The Company shall supply the gas, renew the mantles, clean the luminaires and paint all metal parts as needed; all other renewals and maintenance shall be paid for by the customer.

Monthly Rate

\$7.00 per luminaire having a rated consumption of 2.5 cubic feet or less per hour.

\$15.00 per luminaire having a rated consumption of more than 2.5 cubic feet but not more than 4.5 cubic feet per hour.

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10; ~~D-1.20 and~~ through D-1.30.

Due Date and Late Payment Charge

The due date of the customer's bill shall be 21 days from the date of mailing. A late payment charge of 2% of the unpaid balance outstanding, net of taxes, shall be assessed to any bill which is not paid in full on or before the due date shown thereon.

Term and Form of Contract

Minimum term of three years on written contract and year to year thereafter until terminated by mutual consent or upon three months' written notice given by either party.

Special Terms and Conditions

The Company reserves the right to make special contractual arrangements as to term or duration of contract, termination charges, contributions in aid of construction, monthly charges or other special consideration when the customer requests service, equipment or facilities not normally provided under this rate.

Issued XXXX XX, 2018 by
Patti Poppe,
President and Chief Executive Officer,
Jackson, Michigan

Effective for bills rendered on and after
the Company's January 2019 Billing Month

Issued under authority of the
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dated XXXX XX, XXXX
in Case No. U-20028

M.P.S.C. No. 2 - Gas
Consumers Energy Company

Sheet No. E-14.00

TRANSPORTATION SERVICE RATE
(Rates ST, LT and XLT)
(Continued From Sheet No. E-13.00)

Monthly Rate (Contd)

General Terms and Surcharges

This rate is subject to all general terms and conditions shown on Sheet No. D-1.00 and surcharges shown on Sheet Nos. D-1.10; ~~D-1.20 and~~ through D-1.30.

Term and Form of Contract

All service under this rate shall require a written contract with a minimum term of one year and month-to-month thereafter which must be approved by an officer of the Company or a duly authorized agent before it shall be binding upon the Company. A customer is eligible to request a return to sales rates 12 months from the date that the customer commenced taking service under the Transportation Service Rate Schedule. A customer requesting a return to sales service must provide the Company with a minimum of 12 months written notice of the customer's intent to return to sales rates. For purpose of the notice requirement, notice must be delivered to and received by the Company. The burden is on the customer to establish that notice has been given. The Company reserves the right to deny return to sales rates subject to the Company's Rule C2, Controlled Service.

Issued XXXX XX, 2018 by
Patti Poppe,
President and Chief Executive Officer,
Jackson, Michigan

Effective for bills rendered on and after
the Company's January 2019 Billing Month

Issued under authority of the
Michigan Public Service Commission
dated XXXX XX, XXXX
in Case No. U-20028



Evaluator Certification of Consumers Energy's Commercial and Industrial Reported Savings Program Year 2017

May 4, 2018

FINAL
REPORT



Presented To:

Joseph Forcillo
Director of Evaluation, Measurement, & Verification
Clean Energy Products
Consumers Energy Company
One Energy Plaza
Jackson, MI 49201



Presented By:

Lisa Perry
Project Director
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83 Columbia St. Suite 400
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CERTIFICATION LETTER

May 4, 2018

Consumers Energy Company
1 Energy Plaza
Jackson, MI 49201-2357

RE: PY2017 Verification of Net Savings of the Consumers Energy Commercial & Industrial Energy Efficiency Programs

This document reports the verified net electric energy, electric demand, and natural gas savings for the Consumers Energy Commercial and Industrial (C&I) Energy Efficiency Programs for Program Year 2017. The verification of net savings was conducted by the independent certification team led by EMI Consulting. The objective of this verification was to review the accuracy of the electric energy (kWh), electric demand (kW), and natural gas (Mcf) savings of the 2017 C&I programs offered by Consumers Energy. As indicated in the attached report, the EMI Consulting team hereby verifies the following:

- **Verified net electric energy savings of 336,014,872 kWh** for all Consumers Energy C&I programs for Program Year 2017, and **verified net lifetime savings of 4,902,679,309 kWh.**
- **Verified net electric demand savings of 46,956 kW** for all Consumers Energy C&I programs for Program Year 2017.
- **Verified net natural gas savings of 1,376,927 Mcf** for all Consumers Energy C&I programs for Program Year 2017, and **verified net lifetime savings of 23,852,887 Mcf.**

Sincerely,



Jeremy Kraft
Director of Consulting and Analysis

1. OVERVIEW

This report documents the energy savings certification of the Commercial and Industrial (C&I) Energy Efficiency (EE) Programs administered by Consumers Energy for Program Year 2017. This certification was conducted in February through May of 2018 by the independent certification team led by EMI Consulting as part of a comprehensive evaluation effort covering all of the Consumers Energy C&I programs.

1.1 Objectives and Scope

The purpose of the savings certification was to review the Program Year 2017 reported gross electric energy (kWh), electric demand (kW), and natural gas (Mcf) savings tracked by Consumers Energy and its implementation contractors for the C&I energy efficiency programs and initiatives. This certification also assesses electric energy (kWh) and natural gas (Mcf) lifetime savings.

Throughout this report, most certification results are presented at the C&I program level, though some results are presented at the subprogram level where appropriate. The C&I programs and subprograms covered by this certification effort include the following:

1. Business Energy Efficiency Program
 - a. Business Energy Efficiency Program – Prescriptive
 - b. Business Energy Efficiency Program – Custom
 - c. C&I Request for Proposals
 - d. New Construction Program (Whole Building and Major Renovation)
 - e. Midstream Program
2. Small Business Energy Efficiency Program
 - a. Direct Install Program
 - b. Small Business Core Program
 - c. Residential Lighting Carryover
 - d. Online Marketplace
 - e. Small Business Assessment Programs (Small Business Assessments and Outreach Consultations)
3. C&I Multifamily Program¹

¹ The C&I Multifamily Program includes measures installed in commercial applications for multifamily buildings. The savings associated with the residential measures in multifamily buildings are included with the 2017 Residential Certification Report.

In conjunction with Consumers Energy and the statewide Energy Waste Reduction Collaborative, the EMI Consulting team conducted the following tasks to certify Program Year 2017 savings:

1. Verify that the per-unit savings values for each measure entered by Consumers Energy in the program tracking database, eTracker, match those included in the Michigan Energy Measures Database (MEMD) or other relevant supporting documentation.
2. Review a sample of project applications to check for systematic transcription errors affecting program/initiative savings.
3. Verify the calculation of the claimed savings (reported gross savings) in the Consumers Energy eTracker database.
4. Apply appropriate adjustment factors, derived from separate impact evaluations, to the verified savings results.
5. Verify that the measure life values for each measure entered by Consumers Energy in the program tracking database, eTracker, match those included in the Michigan Energy Measures Database (MEMD) or other relevant supporting documentation and calculate lifetime savings.

To certify net savings, the certification team first completed Tasks 1 and 3 to estimate “adjusted reported gross savings,” which are equal to Consumers Energy’s reported savings after adjusting for any misapplication of deemed savings values or miscalculation of energy savings. The certification team completes Task 2 as part of the annual impact evaluations and applies those results during the certification review. To complete Task 4, the certification team applied two adjustment factors to the adjusted reported gross savings, including: (1) verified gross savings adjustment factors, and (2) net-to-gross adjustment factors. The verified gross savings adjustment factors incorporate installation rates and, where applicable, engineering adjustment factors derived from previous program evaluations. The net-to-gross adjustment factor was a constant 0.900 across all programs as mandated by a recent Michigan Public Service Commission (MPSC) ruling, with the exception of the Residential Lighting Carryover Program, which has a net-to-gross adjustment factor of 0.820.² These adjustment factors are discussed in more detail in the next chapter.

² Michigan Public Service Commission, Case No. U-17138.

Chapter 1 Overview

1.2 Summary of Certified Savings

Table 1-1 summarizes the verified annual electric energy (kWh) savings for each program. As shown, for the 2017 program year, the certification team derived total annual verified net electric energy savings of 336,014,872 kWh across all programs, resulting in an overall kWh savings realization rate of 0.874. Over three-quarters of total annual verified net electric energy savings (78.89% or 265,086,991 kWh) resulted from the Business Energy Efficiency Program; 20.20% (67,876,973 kWh) resulted from the Small Business Energy Efficiency Program; 0.91% (3,050,908 kWh) arose from the C&I Multifamily Program. Additionally, for the 2017 program year, the certification team derived total verified net lifetime electric energy savings of 4,902,679,309 kWh across all programs.

Table 1-2 summarizes the verified annual electric demand (kW) savings for each program. For the 2017 program year, the certification team derived total annual verified net electric demand savings of 46,956 kW across all programs resulting in an overall kW savings realization rate of 0.875. The Business Energy Efficiency Program represented the greatest proportion of total annual electric demand savings (78.53% or 36,875 kW), followed by the Small Business Energy Efficiency Program (20.91% or 9,820 kW) and the C&I Multifamily Program (0.55% or 260 kW).

Table 1-3 summarizes the verified annual natural gas (Mcf) savings for each program. For the 2017 program year, the certification team derived total annual verified net gas savings of 1,376,927 Mcf across all programs, resulting in an overall gas realization rate of 0.963. The Business Energy Efficiency Program accounted for the greatest proportion of annual verified net gas savings (96.84%) with 1,333,393 Mcf. Next was the C&I Multifamily Program with 2.04% of verified net gas savings (28,092 Mcf); the Small Business Energy Efficiency Program accounted for 1.12% of verified net gas savings (15,442 Mcf). Additionally, for the 2017 program year, the certification team derived total verified net lifetime natural gas savings of 23,852,887 Mcf across all programs.

Table 1-4, Table 1-5, and Table 1-6 each present the reported net savings, verified net savings, and percent of reported net savings verified through the PY2017 certification process for electric energy, electric demand, and natural gas, respectively. Table 1-4 shows no major deviations for reported-to-verified annual net electric energy (kWh) savings, with 99.93% of reported net savings being verified. Table 1-5 shows no notable reported-to-verified deviations for demand (kW) savings, where 96.13% of reported net savings were verified. Table 1-6 also shows no notable reported-to-verified net deviations for gas (Mcf) savings, with 100.05% of reported net savings verified. These tables are provided below, and the remainder of this report provides additional detail on the savings certification methods and results.

2017 C&I Certification Report

Table 1-1. PY2017 Certified Annual Electric Energy (kWh) Savings by Program

Program	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2016 Verified Gross kWh Savings Adjustment Factor ^a	2017 Verified Gross kWh Savings	Deemed kWh NTG Adjustment Factor ^b	2017 Verified Annual Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net Lifetime kWh Savings
	[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^c
Business Energy Efficiency Program ^d	300,051,039	300,097,089	0.981	294,541,101	0.900	265,086,991	0.883	3,962,577,987
Small Business Energy Efficiency Program ^e	80,831,278	80,831,049	0.948	76,616,063	0.886	67,876,973	0.840	897,637,936
C&I Multifamily Program	3,417,842	3,419,457	0.991	3,389,898	0.900	3,050,908	0.893	42,463,386
TOTAL	384,300,158	384,347,595	0.975	374,547,063	0.897	336,014,872	0.874	4,902,679,309

Columns may not sum to total due to rounding.

a) Note that the verified gross adjustment factors were derived from prior-year impact evaluations (see Section 2.4).

b) The net-to-gross adjustment factor was deemed at 0.900 for all programs/initiatives by the MPSC, except for the Residential Lighting Carryover Program, which had a net-to-gross adjustment factor of 0.820.

c) The lifetime savings are equal to the annual savings multiplied by the measure life for each measure.

d) The Business Energy Efficiency Program is comprised of the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and the Midstream Program.

e) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Core, Small Business Assessment, and Small Business Outreach Consultation Programs.

Chapter 1 Overview

Table 1-2. PY2017 Certified Electric Demand (kW) Savings by Program

Program	2017 Reported Gross kW Savings [A]	2017 Adjusted Reported Gross kW Savings [B]	2016 Verified Gross kW Savings Adjustment Factor ^a [C]	2017 Verified Gross kW Savings [D] = [B x C]	Deemed kW NTG Adjustment Factor ^b [E]	2017 Verified Annual Net kW Savings [F] = [D x E]	2017 kW Realization Rate [G] = [F / A]
Business Energy Efficiency Program ^d	41,957	40,004	1.024	40,973	0.900	36,875	0.879
Small Business Energy Efficiency Program ^e	11,407	11,401	0.976	11,131	0.882	9,820	0.861
C&I Multifamily Program	292	293	0.985	289	0.900	260	0.890
TOTAL	53,657	51,698	1.013	52,392	0.897	46,956	0.875

Columns may not sum to total due to rounding.

a) Note that the verified gross adjustment factors were derived from prior-year impact evaluations (see Section 2.4).

b) The net-to-gross adjustment factor was deemed at 0.900 for all programs/initiatives by the MPSC, except for the Residential Lighting Carryover, which had a net-to-gross adjustment factor of 0.820.

c) The Business Energy Efficiency Program is comprised of the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and the Midstream Program.

d) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Core, Small Business Assessment, and Small Business Outreach Consultation Programs.

Table 1-3. PY2017 Certified Natural Gas (Mcf) Savings by Program

Program	2017 Reported Gross Mcf Savings [A]	2017 Adjusted Reported Gross Mcf Savings [B]	2016 Verified Gross Mcf Savings Adjustment Factor ^a [C]	2017 Verified Gross Mcf Savings [D] = [B x C]	Deemed Mcf NTG Adjustment Factor ^b [E]	2017 Verified Annual Net Mcf Savings [F] = [D x E]	2017 Mcf Realization Rate [G] = [F / A]	2017 Verified Net Lifetime Mcf Savings [H] = [F x Measure Life] ^c
Business Energy Efficiency Program ^d	1,381,138	1,375,469	1.077	1,481,548	0.900	1,333,393	0.965	23,239,789
Small Business Energy Efficiency Program ^e	17,255	17,254	0.994	17,158	0.900	15,442	0.895	209,709
C&I Multifamily Program	31,832	31,234	0.999	31,213	0.900	28,092	0.883	403,388
TOTAL	1,430,224	1,423,957	1.074	1,529,919	0.900	1,376,927	0.963	23,852,887

Columns may not sum to total due to rounding.

a) Note that the verified gross adjustment factors were derived from prior-year impact evaluations (see Section 2.4).

b) The net-to-gross adjustment factor was deemed at 0.900 for all programs/initiatives by the MPSC, except for the Residential Lighting Carryover Program, which had a net-to-gross adjustment factor of 0.820.

c) The lifetime savings are equal to the annual savings multiplied by the measure life for each measure.

d) The Business Energy Efficiency Program is comprised of the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and the Midstream Program.

e) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Core, Small Business Assessment, and Small Business Outreach Consultation Programs.

Chapter 1 Overview

Table 1-4. 2017 Percent of Reported Net kWh Savings Verified

Program/Initiative	2017 Reported Net Annual kWh	2017 Verified Net Annual kWh	2017 Percent of Reported Net Annual kWh Savings Verified
Business Energy Efficiency Program ^a	265,054,829	265,086,991	100.01%
Small Business Energy Efficiency Program ^b	68,156,256	67,876,973	99.59%
C&I Multifamily Program	3,049,752	3,050,908	100.04%
TOTAL	336,260,837	336,014,872	99.93%

Columns may not sum to total due to rounding.

- a) The Business Energy Efficiency Program is comprised of the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and the Midstream Program.
- b) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Core, Small Business Assessment, and Small Business Outreach Consultation Programs.

Table 1-5. 2017 Percent of Reported Net kW Savings Verified

Program/Initiative	2017 Reported Net Annual kW Savings	2017 Verified Net kW Savings	2017 Percent of Reported Net Annual kW Savings Verified
Business Energy Efficiency Program ^a	38,614	36,875	95.50%
Small Business Energy Efficiency Program ^b	9,973	9,820	98.47%
C&I Multifamily Program	259	260	100.38%
TOTAL	48,846	46,956	96.13%

Columns may not sum to total due to rounding.

- a) The Business Energy Efficiency Program is comprised of the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and the Midstream Program.
- b) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Core, Small Business Assessment, and Small Business Outreach Consultation Programs.

2017 C&I Certification Report

Table 1-6. Percent of Reported Net Mcf Savings Verified

Program/Initiative	2017 Reported Net Annual Mcf Savings	2017 Verified Net Annual Mcf Savings	2017 Percent of Reported Net Annual Mcf
Business Energy Efficiency Program ^a	1,332,192	1,333,393	100.09%
Small Business Energy Efficiency Program ^b	15,443	15,442	100.00%
C&I Multifamily Program	28,630	28,092	98.12%
TOTAL	1,376,265	1,376,927	100.05%

Columns may not sum to total due to rounding.

- a) The Business Energy Efficiency Program is comprised of the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and the Midstream Programs.
- b) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Core, Small Business Assessment, and Small Business Outreach Consultation Programs.

In addition to these programs funded through the EE surcharge, qualifying customers had the choice to opt out of paying the EE surcharge and implement their own energy efficiency projects. A summary of the reported savings for these “self-direct” projects is provided in Table 1-7. The savings numbers were provided by Consumers Energy and were not reviewed as part of this certification process.

Table 1-7. 2017 Savings from Self-Direct Projects

Program	2017 Reported Gross MWh Savings
Self-Direct Projects	5,019

Measure Life and Lifetime Savings

At the request of the MPSC, the certification team calculated lifetime savings and the weighted-average measure life for each program. To do so, the certification team verified that appropriate measure life values from the MEMD were used for each prescriptive measure.³ Table 1-8 summarizes the lifetime kWh and Mcf savings for each program and provides the weighted-average measure life by fuel type, where each project’s measure life is weighted by project net first-year savings.

³ For measures where MEMD or workpaper values were not available, eTracker values were used.

Chapter 1 Overview

Table 1-8. Lifetime Savings and Weighted-Average Measure Life

Program	2017 Verified Net Lifetime kWh Savings	2017 Verified Net Lifetime Mcf Savings	Average kWh Measure Life (in Years) ^a	Average Mcf Measure Life (In Years) ^a
Business Energy Efficiency Program ^b	3,962,577,987	23,239,789	12.83	10.47
Small Business Energy Efficiency Program ^c	897,637,936	209,709	13.22	11.40
C&I Multifamily Program	42,463,386	403,388	13.92	14.36
TOTAL	4,902,679,309	23,852,887	12.92	10.58

Columns may not sum to total due to rounding.

- a) Weighted-average measure life values computed using each project's net first-year savings as the weights.
- b) The Business Energy Efficiency Program is comprised of the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and Midstream programs.
- c) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Assessment, Small Business Core, and Small Business Outreach Consultation.

2. METHODOLOGY

The certification team conducted the following tasks as part of this certification:

1. Verify that the per-unit savings values for each measure entered by Consumers Energy match those included in the MEMD or other relevant supporting documentation.⁴
2. Review a sample of project applications to check for systematic transcription errors affecting program/initiative savings.
3. Verify the calculation of the claimed savings (reported gross savings) in the Consumers Energy tracking database.
4. Apply appropriate adjustment factors derived from separate impact evaluations to the verified savings results.
5. Verify that the measure life values for each measure entered by Consumers Energy in the program tracking database, (known as eTracker), match those included in the Michigan Energy Measures Database (MEMD) or other relevant supporting documentation, and calculate lifetime savings.

Details on each of these tasks are discussed below.

2.1 Compare Per-unit Savings Values in Program Tracking Database with MEMD

The first task in the certification process involved comparing the reported per-unit savings value of each measure found in the Consumers Energy program-tracking database (known as eTracker) with the values contained in the MEMD or workpapers (which are developed for measures not yet incorporated into the MEMD). This was not a sampling effort and instead entailed a line-by-line assessment of all records contained in eTracker, for each measure for each program. The database included records for all measures installed through the following energy efficiency programs and subprograms:

1. Business Energy Efficiency Program
 - a. Business Energy Efficiency Program – Prescriptive
 - b. Business Energy Efficiency Program – Custom
 - c. C&I Request for Proposals
 - d. New Construction Program (Whole Building and Major Renovation)
 - e. Midstream Program
2. Small Business Energy Efficiency Program

⁴ The certification team's verification of several measure savings values required the use of workpapers because the measures were not yet incorporated into the MEMD. The specific workpapers are highlighted later in the report when presenting measure level results.

Chapter 2 Methodology

- a. Direct Install Program
 - b. Small Business Core Program
 - c. Residential Lighting Carryover
 - d. Online Marketplace
 - e. Small Business Assessment
 - f. Small Business Outreach Consultation
3. C&I Multifamily Program

The certification team verified all savings values for all the measures to the accuracy of four significant digits to the right of the decimal place. However, results in some tables throughout this report are rounded to the nearest whole number to allow tables to fit on the printed page.

2.2 Review of Project Applications for Transcription Errors

To assess the accuracy of the information transferred from project applications to the Consumers Energy tracking database (eTracker), the certification team compared the tracking data with the information contained on the original applications for a sample of projects. The certification team conducted this application review for the Business Energy Efficiency, Small Business Energy Efficiency, and C&I Multifamily Programs; however, results are summarized by subprograms, where applicable, because of differences in the available application materials, the program implementers, and the application processes. The certification team conducted and summarized the application review for the following:

- Business Energy Efficiency Program (includes Business Energy Efficiency – Prescriptive, Business Energy Efficiency – Custom, and Business Energy Efficiency – Major Renovation)
- New Construction – Whole Building Program
- Midstream Program
- Request for Proposal Program
- Direct Install Program
- Small Business Core Program
- Small Business Assessment and Outreach Consultation Programs
- C&I Multifamily Program

No paper records were available for the Residential Lighting Carryover or Online Marketplace, as these programs do not operate on the same paper application process as the other programs, so the application review was not conducted for these initiatives. This was expected by the evaluation team and is consistent with past years.

The certification team reviewed each application to confirm that customer- and measure-level information was transferred correctly to the tracking database. Fields certified at the customer level included project identifier, account number, customer name, address, city, zip code, phone, and customer type (electric only, gas only, or combination). At the measure level, the certification team checked applications for accuracy to ensure the correct measure type and measure quantities were transferred to the tracking databases.

For the document review, sampling was used with the goal of attaining a 90% level of confidence at the 10% level of relative precision at the program/subprogram level. Table 2-1 shows the total number of applications reviewed for each program/subprogram.

Table 2-1. Application Review Sample Sizes by Program/Subprogram

Program/Subprogram	Sample Size
Business Energy Efficiency	70
New Construction*	20
Midstream*	59
Request for Proposal*	10
Direct Install	70
Small Business Core	70
Small Business Assessment & Outreach Consultation	70
C&I Multifamily	70

* The evaluation team reviewed all available applications from completed projects in these three programs.

The samples were drawn to develop a reliable estimate of the proportion of applications that contained an error either in the customer contact information or the information on installed measures. To draw the sample, the certification team randomly selected projects from each program's database.⁵ The certification team then obtained an electronic copy of each application to conduct the certification review.

The results of the documentation reviews are provided for informational purposes only, and adjustments resulting from any variances found during the reviews are not applied to the certified savings. Differences in quantity installed or any issues related to energy savings are derived from the more rigorous impact evaluations. Thus, applying an adjustment factor derived from the application review along with the verified gross savings adjustment factors would effectively "double-count" the adjustment. As such, the results of the application review are provided herein to be consistent with past years' reports, but the results were not applied to savings in any way.⁶ The results of the application reviews are provided in Appendix C.

⁵ The evaluation team conducted a simple random selection without stratification.

⁶ For program years 2009 and 2010, adjustments based on the results of the document review process were applied to program savings because gross savings adjustment factors derived from the rigorous annual program evaluations were not yet applied in the certification process. Beginning in PY2010, gross savings adjustment factors were applied to certification results and adjustments from the document reviews were no longer incorporated to eliminate potential double counting.

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2.3 Calculate Adjusted Reported Gross Savings

The third task in the certification process involved replicating the calculations used to derive reported gross savings for each measure for each program, based on the information from Task 1. These calculations result in the adjusted reported gross savings.

For measures installed through the C&I Multifamily Program, C&I Request for Proposals, Midstream Program, Direct Install Program, Residential Lighting Carryover, and Small Business Assessment Programs (including Small Business Assessments and Outreach Consultations), this calculation simply involved multiplying the installed quantity by the verified MEMD or workpaper per-unit savings value from Task 1, because all measures installed under these subprograms used deemed savings. Most measures installed through the Business Energy Efficiency – Prescriptive and New Construction – Major Renovation Programs used the same method; however, several measures use performance or efficiency adjustments to compute the final energy savings (these measures are discussed in more detail in Chapter 3 of this report).

For any custom measure (e.g., Business Solution – Custom, New Construction – Whole Building, and Small Business Core Program measures, which are based on project-specific, individualized energy savings calculations), the certification team assumed the adjusted reported gross savings for each measure were the same as the reported gross savings. This approach has been taken since the PY2012 certification, to avoid the potential threat of double counting errors. That is, an error that would be captured as a difference between this year's reported gross savings and adjusted reported gross savings in the certification process could also be captured in next year's verified gross savings adjustment factor derived through the program evaluations.⁷ Thus, to avoid this potential double counting, the certification team no longer recalculates the individualized measure savings using the energy savings equations for Small Business Core Program measures, but instead, considers the adjusted reported gross savings to be the same as the reported gross savings for the purposes of certification. This approach is also more consistent with the treatment of other programs in the certification process (e.g., Business Energy Efficiency – Custom), where the information needed to recalculate savings is not contained in the tracking data, and the actual savings estimates are verified through the annual evaluations. In general, the rule is that if the computation can be reproduced based on the information present in the tracking data, it is included as part of the certification process; if not, it is not included because it is captured through the annual evaluations.

2.4 Application of Adjustment Factors

Following Task 3, the certification team applied two adjustment factors to derive verified net savings: (1) the verified gross savings adjustment factor, and (2) the net-to-gross adjustment factor. In accordance with the decision of the MPSC Energy Waste Reduction Collaborative (formerly named EO Collaborative under PA 295), the verified gross savings

⁷ The phrase "...could also be captured..." was used instead of "...would also be captured..." because the evaluations are conducted using statistical sampling methods while the entire population of measures is assessed through this certification process. However, this does not detract from the basic argument and double counting is still the concern.

adjustment factors are derived from previous years' impact evaluations, while the net-to-gross adjustment factors are a constant 0.900 across all measures except the Residential Lighting Carryover Program (see discussion below).

The first adjustment factor, the *verified gross savings adjustment factor*, incorporates the installation adjustment factors and, where applicable, engineering adjustment factors for each program resulting from previous years' program evaluations.

The *installation adjustment factors* account for issues such as, but not limited to:

- Incented measures that were not installed
- Measures that were installed but later removed
- Measures that were improperly installed or no longer operable
- Measures that did not match those identified in the EE provider's tracking system
- Measures that were installed but were not eligible according to program guidelines

The *engineering adjustment factors* take into account factors such as:

- Incorrect assumptions used to estimate project impacts (e.g. coincidence factor, baseline specifications, operating characteristics, operating hours, efficiency performance specifications, capacity, and load)
- Errors in the algorithm used to estimate reported impacts

The derivation of the verified gross adjustment factors differs for custom and prescriptive measures. For measures with custom calculated savings, the verified gross savings adjustment factors incorporate the program level installation adjustment factors and engineering adjustment factors; for prescriptive measures, the measure savings are all deemed in the MEMD and only installation adjustment factors are required (i.e. no engineering adjustments are applied). Thus, for prescriptive measures, the verified gross savings adjustment factors are the same as the installation adjustment factors derived from the impact evaluations; for custom measures, the verified gross savings adjustment factors are equal to the installation adjustment factors times the engineering adjustment factors.

Gross adjustment factors differ by measure and are applied at the measure level before aggregating results to the program level.⁸ Table 2-2 shows the average gross kWh, kW, Mcf, and net-to-gross adjustment factors used in this Program Year 2017 certification.

⁸ Gross adjustment factors are estimated at the subprogram level for subprograms more disaggregate than the programs included in this report. Each measure is assigned the gross adjustment factor based on the subprogram it is part of.

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Table 2-2. PY2017 Average Gross kWh, kW, Mcf and Net-to-Gross Adjustment Factors ^a

Program	Gross kWh Adjustment Factor	Gross kW Adjustment Factor	Gross Mcf Adjustment Factor	kWh NTG Adjustment Factor ^b	kW NTG Adjustment Factor ^b	Mcf NTG Adjustment Factor ^b
Business Energy Efficiency Program	0.981	1.024	1.077	0.900	0.900	0.900
Small Business Energy Efficiency Program	0.948	0.976	0.994	0.886	0.882	0.900
C&I Multifamily Program	0.991	0.985	0.999	0.900	0.900	0.900

- a) The adjustment factors shown in this table are average adjustment factors. Gross adjustment factors vary by measure or subprogram, and measures within the same program often have different gross adjustment factors based on specific impact evaluation findings from prior years.
- b) The average net-to-gross adjustment factor varies for the Small Business Energy Efficiency program because it includes the Residential Lighting Carryover Program, which uses a net-to-gross adjustment of 0.820, and the savings attributed to this program vary across kWh, kW, and Mcf.

The impact evaluation sources for the gross adjustment factors are shown in Table 2-3.

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Table 2-3. PY2017 Gross Adjustment Factor Impact Evaluation Sources⁹

Subprogram	Source
Business Energy Efficiency – Prescriptive	EMI Consulting. <i>Impact Evaluation Results for the C&I Business Energy Efficiency Program: Program Year 2016</i> , April 2017.
Business Energy Efficiency – Custom	EMI Consulting. <i>Impact Evaluation Results for the C&I Business Energy Efficiency Program: Program Year 2016</i> , April 2017.
New Construction (Major Renovation and Whole Building)	EMI Consulting. <i>Impact Evaluation Results for the C&I Business Energy Efficiency Program: Program Year 2016</i> , April 2017.
Direct Install	EMI Consulting. <i>Consumers Energy 2012 Small Business Solutions Impact Evaluation Results</i> , June 2013.
Small Business Core	EMI Consulting. <i>2015 Small Business Solutions Impact Evaluation Results</i> , January 2017.
Small Business Assessments ^(a)	EMI Consulting. <i>Impact Evaluation Results for the Small Business Assessment Program: Program Year 2016</i> , April 2017.
Residential Carryover	The Cadmus Group. <i>Consumers Energy 2011 Evaluation Activity and Summary Report</i> , May 2012. The Cadmus Group. <i>Consumers Energy Lighting Evaluation: Installation Rate Adjustment Presentation</i> , June 2013. NMR, Cadmus, Navigant. <i>Michigan CFL Net-to-Gross Advisory Panel Final Report</i> , April 2014.
C&I Multifamily	NMR, Cadmus Navigant. <i>Michigan CFL Net-to-Gross Advisory Panel Final Report</i> , April 2015. The Cadmus Group. <i>Consumers Energy 2015 Multifamily Site Visit Report</i> , March 2017.

a) Small Business Assessments includes the Small Business Assessments Program and Small Business Outreach Consultations

For each measure, j , in each program, i , the appropriate verified gross savings adjustment factors were applied to 2017 adjusted reported gross savings to derive 2017 verified gross savings in accordance with the following:

$$= \frac{2017 \text{ Verified Gross Savings}_{i,j}}{2017 \text{ Adjusted Reported Gross Savings}_{i,j} \times \text{Verified Gross Savings Adjustment Factor}_{i,j}}$$

The second adjustment factor applied to these certification results was the net-to-gross adjustment factor. For this 2017 certification effort, the net-to-gross adjustment factor was a

⁹ The Request for Proposals, Midstream, and Marketplace programs were new and had not yet been evaluated in 2017, so gross adjustment factors were set to 1.000 for those programs.

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constant 0.900 across all programs except the Residential Lighting Carryover Program (which received a net-to-gross adjustment of 0.820), as mandated by a recent MPSC ruling.¹⁰ The deemed net-to-gross adjustment factor was applied to verified gross savings to derive verified net savings:

$$\begin{aligned} & 2017 \text{ Verified Net Savings}_{i,j} \\ &= 2017 \text{ Verified Gross Savings}_{i,j} \times \text{Deemed NTG Adjustment Factor}_{i,j} \end{aligned}$$

The final 2017 realization rates are equal to the 2017 verified net savings divided by the 2017 reported gross savings:

$$2017 \text{ Realization Rate}_{i,j} = \frac{2017 \text{ Verified Net Savings}_{i,j}}{2017 \text{ Reported Gross Savings}_{i,j}}$$

All calculations were conducted at the measure level and then aggregated to the program or subprogram level for reporting purposes.

2.5 Verify Measure Life Values and Calculate Lifetime Savings Values

The certification team also certified lifetime savings values. This task in the certification process involved comparing the reported measure life value of each measure found in the Consumers Energy program-tracking database (eTracker) with the values contained in the MEMD or other relevant supporting documentation. This was not a sampling effort and instead entailed a line-by-line assessment of each record contained in eTracker for each measure. For each measure, j , in each program, i , the verified measure lives were multiplied by the annual verified net savings to calculate verified net lifetime savings:

$$\begin{aligned} & 2017 \text{ Lifetime Verified Net Savings}_{i,j} \\ &= 2017 \text{ Annual Verified Net Savings}_{i,j} \times \text{Verified Measure Life}_{i,j} \end{aligned}$$

¹⁰ Michigan Public Service Commission, Case No. U-17138.

3. SUMMARY OF SAVINGS VARIANCES

This section summarizes the results of the independent certification of adjusted reported gross savings as compared to reported gross savings, focusing on variances found associated with per-unit savings. All calculations were conducted using per-unit and total savings values rounded to four decimal places;¹¹ adjustment factors are rounded to three decimal places.

3.1 Certification of Per-unit Savings

This step of the certification process involved comparing the reported per-unit electric energy (kWh), electric demand (kW), and natural gas (Mcf) savings values for each prescriptive measure contained in the program tracking databases to the appropriate deemed savings values from the master non-weather sensitive MEMD,¹² the weather-sensitive-weighted MEMD results,¹³ or other supporting documentation (i.e., measure workpapers). All custom projects installed under the Business Energy Efficiency and New Construction – Whole Building Programs, and most lighting measures installed under Small Business Core Program, are calculated individually based on the operational characteristic of each project installation and are captured under impact evaluation efforts, so an assessment of per-unit savings for these are precluded.

The following sections summarize variances found for the measures using MEMD or workpaper savings values for the Business Energy Efficiency Program, Small Business Energy Efficiency Program, and the C&I Multifamily Program, respectively. Because some measures were installed across multiple subprograms and results may vary between subprograms, tabular results also indicate which installations of the measure by subprogram were associated with the variance, where applicable.

Business Energy Efficiency Program

The results presented in this section of the report document variances found by the certification team that are associated with the prescriptive measures installed through the PY2017 Business Energy Efficiency Program. Most prescriptive measures installed through the Business Energy Efficiency Program fall into two main types: (1) measures that use

¹¹ Rounding to four decimal places can result in very small variances when comparing the reported gross and adjusted reported gross savings. This is because it appears different data is rounded at different steps when computing the reported savings values in the tracking data. For example, some rounding seems to have occurred at three decimal places and some at four decimal places during intermediate calculation steps; some values were not rounded at all until the final value was computed. Even in aggregate, the net impacts of these rounding issues are quite small and the resulting variances are not discussed in this certification report. Instead, the focus is placed on ensuring that the correct MEMD/weather-sensitive-weighted values were used in the tracking data and that systematic computation errors were not committed.

¹² mi_master_measure_database_2017_122716_548820_7.xlsx

¹³ For Business Energy Efficiency: Q4 2017 – Master Measures Business Solutions_2018.2.2.xlsx; for Small Business Energy Efficiency: Q4 2017 – Master Measures Small Business DI_2018.2.2.xlsx; for C&I Multifamily: Q4 2017 – Master Measures CI MF_2018.2.2.xlsx

Chapter 3 Summary of Savings Variances

deemed savings values obtained from the master MEMD, or (2) weather-sensitive-weighted measures that rely on savings values taken from the weather-sensitive-weighted MEMD.¹⁴ However, in some cases, prescriptive measures were not contained in the MEMD, and instead workpaper savings values were used.¹⁵ In addition, some measures use performance or size adjustments and require additional computations to verify savings – these are discussed later in this section of the report.

Table 3-1 summarizes these variances for electric energy (kWh) savings, Table 3-2 summarizes the variances detected by the certification team for electric demand (kW), and Table 3-3 summarizes the variances detected by the certification team for natural gas (Mcf) savings.

Details of all measures installed under the Business Energy Efficiency Program are included in Appendix A.

¹⁴ Though nearly all measures used deemed savings, several measures also had additional performance savings adjustments.

¹⁵ More specifically, for the Business Energy Efficiency Program, savings values were sourced from the following workpapers: High Bay LED Tubes 012417, FES-L6B (revised)_LED_Lighting_Residential_Mich_010615 LED PAR Updates_0642015, 2017 EO 3&4LampKitWorkpaper_053017_LP, 2017ComboKitWorkpaper, FES-L31-Commercial_LED_Tubes

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Table 3-1. PY2017 Business Energy Efficiency Program Per-Unit Electric Energy (kWh) Savings Variances

Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kWh – MEMD	Effect on Reported kWh	Variance Description
New Construction – Major Renovation	HVAC Controls	CHC0075	Enhanced Ventilation Control – Air Conditioning and Natural Gas Heat (Consumers	Tons	180	284.645	-2529.9	CE claimed 298.7000 kWh per unit. Verified per unit kWh is 284.6450.
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0052	Process Steam Pipe Insulation – Conditioned (Gas)	Linear Feet	18	4.871	87.678	CE claimed 0.0000 kWh per unit. Verified per unit kWh is 4.8710.
Business Energy Efficiency Prescriptive	Lamp Removal	CLE0082	T8 or T12 2 or 3-Foot Lamp Removal	Lamps Removed	294	66.0275	-6.615	CE claimed 66.0500 kWh per unit. Verified per unit kWh is 66.0275.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0083	4-Foot T5 to One (1) 4-Foot LED Tube Light	Units	4511	15.6	-451.1	CE claimed 15.7000 kWh per unit. Verified per unit kWh is 15.6000.
New Construction – Major Renovation	Variable Frequency Drives	CME0006	VFD for Process Pumping <= 50 HP	HP	1250.5	1082.1685	0.0001	kWh rounding difference.
Business Energy Efficiency Prescriptive	Variable Frequency Drives	CME0006	VFD for Process Pumping <= 50 HP	HP	887	1082.1685	0.0001	kWh rounding difference.

Chapter 3 Summary of Savings Variances

Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kWh – MEMD	Effect on Reported kWh	Variance Description
New Construction – Major Renovation	Variable Frequency Drives	CME0014	EC Motors	HP	157.88	1348	-4.4484	CE has three instances where kW savings were not rounded to correct decimal place and one instance for kWh.
Business Energy Efficiency Prescriptive	Other	CSG0027	BOC (Gas Customer)	Units	6	23534.5	23534.5	One customer received both gas and electric savings and CE only claimed gas savings.
Midstream	Midstream	CPE0003	LED A-Series	Units	29759	70.725	-148.795	CE claimed 70.7300 kWh per unit. Verified per unit kWh is 70.7250.
Midstream	Midstream	CPE0004	LED Candelabra and Globe	Units	1228	45.025	-6.14	CE claimed 45.0300 kWh per unit. Verified per unit kWh is 45.0250.
TOTAL							20475.1789	

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Table 3-2. PY2017 Business Energy Efficiency Program Per-Unit Electric Demand (kW) Savings Variances

Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
Business Energy Efficiency Prescriptive	Lighting Retrofit Fixtures	CFE0009	Neon to LED Sign Lighting Retrofit (Commercial Hours)	Watts Removed	22363	0.0005	-2.2363	CE claimed 0.0006 kW per unit. Verified per unit kW is 0.0005.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CFE0010	LED Replacing Incandescent Candelabra and Globe	Units	1882	0.0149	-6.0224	CE claimed 0.0181 kW per unit. Verified per unit kW is 0.0149.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CFE0011	LED Replacing Incandescent BR-Series	Units	5047	0.0267	-29.2726	CE claimed 0.0325 kW per unit. Verified per unit kW is 0.0267.
Business Energy Efficiency Prescriptive	T8 Fluorescent	CFE0012	8-foot T12 to Two (2) 4-ft HP/RW T8	Units	712	0.0074	-1.1392	CE claimed 0.0090 kW per unit. Verified per unit kW is 0.0074.
Business Energy Efficiency Prescriptive	Lighting Retrofit Fixtures	CFE0015	T12 to T5 Fluorescent Retrofit	Watts Removed	132	0.0005	-0.0132	CE claimed 0.0006 kW per unit. Verified per unit kW is 0.0005.
Business Energy Efficiency Prescriptive	Lighting Retrofit Fixtures	CFE0018	New Linear LED Tube Fixture (Low Bay < 15 ft)	Watts Removed	113342	0.0005	-11.3342	CE claimed 0.0006 kW per unit. Verified per unit kW is 0.0005.

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Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
New Construction – Major Renovation	HVAC Controls	CHC0075	Enhanced Ventilation Control – Air Conditioning and Natural Gas Heat (Consumers	Tons	180	0.0334	-0.378	CE claimed 0.0355 kW per unit. Verified per unit kW is 0.0334.
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0052	Process Steam Pipe Insulation – Conditioned (Gas)	Linear Feet	18	0.0011	0.0198	CE claimed 0.0000 kW per unit. Verified per unit kW is 0.0011.
Business Energy Efficiency Prescriptive	HP or RW Fluorescent	CLE0009	4-foot Standard T8 to Reduced Wattage T8 (lamp only)	Units	11504	0.002	-4.6016	CE claimed 0.0024 kW per unit. Verified per unit kW is 0.0020.
Business Energy Efficiency Prescriptive	HP or RW Fluorescent	CLE0027	High Performance or Reduced Wattage T8: HP 4-foot lamp and ballast upgrade	Units	572	0.0039	-0.4576	CE claimed 0.0047 kW per unit. Verified per unit kW is 0.0039.
Business Energy Efficiency Prescriptive	Lamp Removal	CLE0030	Lamp Removal: Remove 4-foot T12 fluorescent lamp (with T8 ballast retrofit)	Lamps Removed	50000	0.0243	-265	CE claimed 0.0296 kW per unit. Verified per unit kW is 0.0243.

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Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
Business Energy Efficiency Prescriptive	T8 Fluorescent	CLE0046	8-FT T12HO to 2 4-FT T8HP	Units	80	0.0162	-0.28	CE claimed 0.0197 kW per unit. Verified per unit kW is 0.0162.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0053	LED A-Series Replacing Incandescent A-Series	Units	12498	0.0181	-48.7422	CE claimed 0.0220 kW per unit. Verified per unit kW is 0.0181.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0054	LED MR16 Replacing Halogen MR16	Units	691	0.007	-1.0365	CE claimed 0.0085 kW per unit. Verified per unit kW is 0.0070.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0055	LED Par Replacing Halogen Par	Units	8496	0.0267	-49.2768	CE claimed 0.0325 kW per unit. Verified per unit kW is 0.0267.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0056	2-Foot T12 to 2-Foot LED Tube Light	Units	420	0.0076	-0.672	CE claimed 0.0092 kW per unit. Verified per unit kW is 0.0076.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0057	2-Foot T8 to 2-Foot LED Tube Light	Units	4274	0.0042	-3.8466	CE claimed 0.0051 kW per unit. Verified per unit kW is 0.0042.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0058	4-Foot T12 to 4-Foot LED Tube Lights	Units	46684	0.0093	-93.368	CE claimed 0.0113 kW per unit. Verified per unit kW is 0.0093.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0059	4-Foot T8 to 4-Foot LED Tube Lights	Units	390859	0.0061	-508.1167	CE claimed 0.0074 kW per unit. Verified per unit kW is 0.0061.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0060	8-Foot T12 to Two 4-Foot LED Tube Lights	Units	8159	0.0171	-30.1883	CE claimed 0.0208 kW per unit. Verified per unit kW is 0.0171.

Chapter 3 Summary of Savings Variances

Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0062	8-Foot T8 to Two 4-Foot LED Tube Lights	Units	12193	0.0103	-26.8246	CE claimed 0.0125 kW per unit. Verified per unit kW is 0.0103.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0068	Interior LED Lighting (Low Bay < 18 ft)	Watts Removed	4198735.8	0.0005	-419.8735	CE claimed 0.0006 kW per unit. Verified per unit kW savings is 0.0005 and CE incorrectly rounded.
Business Energy Efficiency Prescriptive	Lamp Removal	CLE0082	T8 or T12 2 or 3-Foot Lamp Removal	Lamps Removed	294	0.022	-1.4112	CE claimed 0.0268 kW per unit. Verified per unit kW is 0.0220.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0083	4-Foot T5 to One (1) 4-Foot LED Tube Light	Units	4511	0.0029	-2.7066	CE claimed 0.0035 kW per unit. Verified per unit kW is 0.0029.
Business Energy Efficiency Prescriptive	LED or Induction Fixtures	CLE0084	LED Lamps Replacing CFL	Units	6556	0.0022	-3.278	CE claimed 0.0027 kW per unit. Verified per unit kW is 0.0022.
New Construction – Major Renovation	Variable Frequency Drives	CME0014	EC Motors	HP	157.88	0.122	-0.0004	CE has three instances where kW savings were not rounded to correct decimal place and one instance for kWh.
New Construction – Major Renovation	Variable Frequency Drives	CME0058	VFD for CW HVAC Pumps – Fixed Speed (54 hz or less)*Bypass	Units	7.5	0.1646	-0.003	CE claimed 0.1650 kW per unit. Verified per unit kW is 0.1646.

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Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
New Construction – Major Renovation	Variable Frequency Drives	CME0059	VFD for CW HVAC Pumps – Fixed Speed (54 hz or less)*Throttled	Units	7.5	0.1646	-0.003	CE claimed 0.1650 kW per unit. Verified per unit kW is 0.1646.
Business Energy Efficiency Prescriptive	Variable Frequency Drives	CME0059	VFD for CW HVAC Pumps – Fixed Speed (54 hz or less)*Throttled	Units	10	0.1646	-0.004	CE claimed 0.1650 kW per unit. Verified per unit kW is 0.1646.
Business Energy Efficiency Prescriptive	Variable Frequency Drives	CME0060	VFD for HW HVAC Pumps – Fixed Speed (54 hz or less)*Bypass	Units	73	0.1646	-0.0292	CE claimed 0.1650 kW per unit. Verified per unit kW is 0.1646.
New Construction – Major Renovation	Variable Frequency Drives	CME0061	VFD for HW HVAC Pumps – Fixed Speed (54 hz or less)*Throttled	Units	7.5	0.1646	-0.003	CE claimed 0.1650 kW per unit. Verified per unit kW is 0.1646.
Business Energy Efficiency Prescriptive	Variable Frequency Drives	CME0061	VFD for HW HVAC Pumps – Fixed Speed (54 hz or less)*Throttled	Units	7.5	0.1646	-0.003	CE claimed 0.1650 kW per unit. Verified per unit kW is 0.1646.
New Construction – Major Renovation	Other	CSE0017	Lighting Power Density	Watts Removed	4712961.5	0.0005	-471.2959	CE claimed 0.0006 kW per unit. Verified per unit kW savings is 0.0005 and CE incorrectly rounded.

Chapter 3 Summary of Savings Variances

Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
New Construction – Major Renovation	Other	CSE0110	Low-Energy Livestock Waterer	Units	28	0	-6.3	MEMD has 0 kW savings but CE claimed savings for one project.
Business Energy Efficiency Prescriptive	Other	CSG0027	BOC (Gas Customer)	Units	6	2.6866	2.6866	One customer received both gas and electric savings and CE only claimed gas savings. CE claimed 152.3772 MCF per unit. Verified per unit MCF is 152.3336.
TOTAL							-1985.0112	

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Table 3-3. PY2017 Business Energy Efficiency Program Per-Unit Natural Gas (Mcf) Savings Variances

Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit Mcf – MEMD	Effect on Reported Mcf	Variance Description
New Construction – Major Renovation	Compressed Air	CAG0006	Air Compressor Waste Heat Recovery	HP	50	4.0207	-0.055	CE claimed 4.0218 MCF per unit. Verified per unit MCF is 4.0207.
Business Energy Efficiency Prescriptive	Compressed Air	CAG0006	Air Compressor Waste Heat Recovery	HP	956.7	4.0207	-1.0524	CE claimed 4.0218 MCF per unit. Verified per unit MCF is 4.0207.
Business Energy Efficiency Prescriptive	HVAC Controls	CHC0012	Guestroom Energy Management Control – Combination Customer	Units	176	5.9414	-0.2992	CE claimed 5.9431 MCF per unit. Verified per unit MCF is 5.9414.
New Construction – Major Renovation	HVAC Controls	CHC0075	Enhanced Ventilation Control – Air Conditioning and Natural Gas Heat (Consumers)	Tons	180	9.115	756.9	CE claimed 4.9100 MCF per unit. Verified per unit MCF is 9.1150.
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0052	Process Steam Pipe Insulation – Conditioned (Gas)	Linear Feet	18	0.1659	-0.0018	CE claimed 0.1660 MCF per unit. Verified per unit MCF is 0.1659.
Business Energy Efficiency Prescriptive	Steam Traps	CHG0102	Leaking Steam Trap Repair or Replacement -- Special Incentive	Units	806	29.0252	-6.6898	CE claimed 29.0335 MCF per unit. Verified per unit MCF is 29.0252.
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0215	Steam Condensate Space Heating	Linear Feet	590	0.487	-0.059	CE claimed 0.4871 MCF per unit. Verified per unit MCF is 0.4870.

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Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit Mcf – MEMD	Effect on Reported Mcf	Variance Description
Business Energy Efficiency Prescriptive	HVAC Controls	CHG0233	Combination Boiler Oxygen Trim Control and Linkageless Boiler Controls (Process)	MBH	66950	0.01	-6212.96	CE claimed 0.1028 MCF per unit. Verified per unit MCF is 0.0100.
Business Energy Efficiency Prescriptive	Kitchen and Refrigeration	CSC0028	Reach-In Refrigerated Case Door; Medium Temp – Combination Customers	Linear Feet	20	4.8554	-0.028	CE claimed 4.8568 MCF per unit. Verified per unit MCF is 4.8554.
Business Energy Efficiency Prescriptive	Other	CSC0042	BOC (Combo Customer)	Units	12	152.3336	-0.5232	CE claimed 152.3772 MCF per unit. Verified per unit MCF is 152.3336.
Business Energy Efficiency Prescriptive	Other	CSG0001	Ozone Generation System	Pounds	3370	4.0996	-3.707	CE claimed 4.1007 MCF per unit. Verified per unit MCF is 4.0996.
New Construction – Major Renovation	Other	CSG0003	Truck Loading Dock Leveler Ramp Seals	Units	3	25.5188	-0.0219	CE claimed 25.5261 MCF per unit. Verified per unit MCF is 25.5188.
Business Energy Efficiency Prescriptive	Kitchen and Refrigeration	CSG0008	Commercial Conveyor Oven (<=25 Conveyor Width)	Units	4	71.3942	-0.082	CE claimed 71.4147 MCF per unit. Verified per unit MCF is 71.3942.
Business Energy Efficiency Prescriptive	Kitchen and Refrigeration	CSG0010	Flexible Batch Broilers	Units	1	113.0814	-0.0324	CE claimed 113.1138 MCF per unit. Verified per unit MCF is 113.0814.

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Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit Mcf – MEMD	Effect on Reported Mcf	Variance Description
Business Energy Efficiency Prescriptive	Other	CSG0027	BOC (Gas Customer)	Units	6	152.3336	-0.2616	One customer received both gas and electric savings and CE only claimed gas savings. CE claimed 152.3772 MCF per unit. Verified per unit MCF is 152.3336.
Business Energy Efficiency Prescriptive	Other	CSG0051	Greenhouse Infrared Film replacing double layer with double layer	Square Feet	1642894	0.0132	-164.2894	CE claimed 0.0133 MCF per unit. Verified per unit MCF is 0.0132.
Business Energy Efficiency Prescriptive	Kitchen and Refrigeration	CSG0053	EnergyStar Steam Cookers – 5 or 6 Pan; Gas	Units	1	198.1116	-0.0568	CE claimed 198.1684 MCF per unit. Verified per unit MCF is 198.1116.
Business Energy Efficiency Prescriptive	Kitchen and Refrigeration	CSG0054	Gas Dishwasher	Units	1	10.3244	-0.003	CE claimed 10.3274 MCF per unit. Verified per unit MCF is 10.3244.
C&I Request for Proposals	C & I RFP	CSG0086	Process Energy Recovery: MA113b – 3 Shift RTO (Recuperative/Regenerative Thermal	CFM	116948	1.7833	-11.6948	CE claimed 1.7834 MCF per unit. Verified per unit MCF is 1.7833.

Chapter 3 Summary of Savings Variances

Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit Mcf – MEMD	Effect on Reported Mcf	Variance Description
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0001	Pipe Wrap – Hydronic Space Heating	Linear Feet	1566.2	0.3896	-0.1566	CE claimed 0.3897 MCF per unit. Verified per unit MCF is 0.3896.
New Construction – Major Renovation	C&I Waterheating	CWG0003	Gas Water Heater <= 80 gal	Units	4	3.0243	-0.0032	CE claimed 3.0251 MCF per unit. Verified per unit MCF is 3.0243.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0003	Gas Water Heater <= 80 gal	Units	3	3.0243	-0.0024	CE claimed 3.0251 MCF per unit. Verified per unit MCF is 3.0243.
New Construction – Major Renovation	C&I Waterheating	CWG0004	Gas tankless water heater	Units	9	16.2278	-0.0414	CE claimed 16.2324 MCF per unit. Verified per unit MCF is 16.2278.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0004	Gas tankless water heater	Units	5	16.2278	-0.023	CE claimed 16.2324 MCF per unit. Verified per unit MCF is 16.2278.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0013	Pipe Wrap – Steam Space Heating	Linear Feet	579	1.461	-0.2316	CE claimed 1.4614 MCF per unit. Verified per unit MCF is 1.4610.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0015	High Eff Domestic Water Heater (90%)	MBH	32474	0.2417	-3.2474	CE claimed 0.2418 MCF per unit. Verified per unit MCF is 0.2417.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0023	Pipe Wrap – Domestic Hot Water – unconditioned space (120F)	Linear Feet	784.6	0.2409	0.0001	MCF rounding difference.

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Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit Mcf – MEMD	Effect on Reported Mcf	Variance Description
New Construction – Major Renovation	C&I Waterheating	CWG0024	Gas Water Heater <= 80 gal	Units	1	6.3194	-0.0018	CE claimed 6.3212 MCF per unit. Verified per unit MCF is 6.3194.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0024	Gas Water Heater <= 80 gal	Units	3	6.3194	-0.0054	CE claimed 6.3212 MCF per unit. Verified per unit MCF is 6.3194.
New Construction – Major Renovation	C&I Waterheating	CWG0029	Gas Water Heater > 80 gal	MBH	1169	0.1501	-0.1169	CE claimed 0.1502 MCF per unit. Verified per unit MCF is 0.1501.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0029	Gas Water Heater > 80 gal	MBH	5342	0.1501	-0.5342	CE claimed 0.1502 MCF per unit. Verified per unit MCF is 0.1501.
TOTAL							-5649.2811	

Chapter 3 Summary of Savings Variances

While the majority of Business Energy Efficiency Program prescriptive measures used master MEMD, weather-sensitive-weighted MEMD, or workpaper savings values, savings calculations for some other measures relied on additional adjustments to account for size or performance of the measure installed. The certification team recalculated savings using the appropriate equations to ensure the correct measure savings were reported; we did not assess the other variables in the equations as they are assessed through the periodic impact evaluations.

Performance adjustments were used for some measures to account for efficiency levels that differ from that of the equipment used to determine the baseline or deemed savings value in the MEMD. The formula used to calculate total savings for measures receiving a performance adjustment of additional kWh or kW per ton reduction is:

$$Sav_t = Q \times Sav_d + Q \times \left[\left(\frac{Eff - Eff_b}{PI} \right) \times Sav_i \right]$$

where:

Sav_t = Calculated annual kWh/kW savings

Q = Quantity of units installed

Sav_d = Deemed annual kWh/kW savings

Eff = Efficiency of installed measure

Eff_b = Efficiency of baseline measure

PI = Performance Increment (the unit at which the additional performance savings are applied)

Sav_i = Incremental annual performance kWh/kW savings

The measures using this methodology are shown in Table 3-4:

Table 3-4. Business Energy Efficiency Program Measures with Additional Performance Savings

Measure Code	Measure Description
CHC0072	EG Programmable Thermostat
CHE0012	Air-cooled Chiller – 1.04 kW/ton IPLV
CHE0012	Air-cooled Chiller – 1.04 kW/ton IPLV
CHE0145	Air and Water-Cooled Chiller Tune-up (20-149 Tons)
CHE0146	Air and Water-Cooled Chiller Tune-up (150+ Tons)

Table 3-5 shows the variances found by the certification team associated with electric energy (kWh) savings. Table 3-6 shows the variances associated with electric demand (kW) for these measures.

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Table 3-5. PY2017 Business Energy Efficiency Program Variances for Measures with Additional kWh Performance Savings

Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Effect on Reported kWh	Variance Description
Business Energy Efficiency Prescriptive	HVAC Controls	CHC0072	EG Programmable Thermostat	Units	16	25142.727	Difference in kWh performance adjustment.
New Construction – Major Renovation	Chiller	CHE0012	Air-cooled Chiller – 1.04 kW/ton IPLV	Tons	759.54	52.0227	Difference in kWh performance adjustment
Business Energy Efficiency Prescriptive	Chiller	CHE0012	Air-cooled Chiller – 1.04 kW/ton IPLV	Tons	3714.4	-82.1671	Difference in kWh performance adjustment.
Business Energy Efficiency Prescriptive	Chiller	CHE0145	Air and Water-Cooled Chiller Tune-up (20-149 Tons)	Units	1	154.1227	Difference in kWh performance adjustment.
Business Energy Efficiency Prescriptive	Chiller	CHE0146	Air and Water-Cooled Chiller Tune-up (150+ Tons)	Units	2	308.2454	Difference in kWh performance adjustment.
TOTAL						25574.9507	

Chapter 3 Summary of Savings Variances

Table 3-6. PY2017 Business Energy Efficiency Program Variances for Measures with Additional kW Performance Savings

Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Effect on Reported kW	Variance Description
Business Energy Efficiency Prescriptive	HVAC Controls	CHC0072	EG Programmable Thermostat	Units	16	45.1353	Difference in kW performance adjustment.
New Construction – Major Renovation	Chiller	CHE0012	Air-cooled Chiller – 1.04 kW/ton IPLV	Tons	759.54	0.0153	Difference in kW performance adjustment.
Business Energy Efficiency Prescriptive	Chiller	CHE0012	Air-cooled Chiller – 1.04 kW/ton IPLV	Tons	3714.4	-0.0241	Difference in kW performance adjustment.
Business Energy Efficiency Prescriptive	Chiller	CHE0145	Air and Water-Cooled Chiller Tune-up (20-149 Tons)	Units	1	0.0104	Difference in kW performance adjustment.
Business Energy Efficiency Prescriptive	Chiller	CHE0146	Air and Water-Cooled Chiller Tune-up (150+ Tons)	Units	2	-12.8292	Difference in kW performance adjustment.
TOTAL						32.3077	

The formula used to calculate total savings for measures receiving a performance adjustment associated with kBTU/h or MBH is:

$$Sav_t = Q \times (Eff - Eff_b) \times Sav_i$$

where:

Sav_t = Calculated annual Mcf savings

Q = Quantity of units installed

Eff = Efficiency of installed measure

Eff_b = Efficiency of baseline measure

Sav_i = Incremental annual performance Mcf savings

The measures using this methodology are shown in Table 3-7:

Table 3-7. Business Energy Efficiency Program Measures with Additional Efficiency Savings

Measure Code	Measure Description
CHG0005	Boiler Modulating Burner Control 10 to 1 or 5 to 1 turn-down (retrofit)
CHG0023	Boiler Tune-up Level 1 (>=110 and 500 kbtu/h)
CHG0024	Boiler Tune-up Level 2 (>=500 and
CHG0025	Boiler Tune-up Level 3 (>=1200 kbtu/h)
CHG0028	Level 6 – Process Boiler Tune-up (>= 1200 MBH)
CHG0029	Process Boiler Tune-up Level 5 (>= 500 and
CHG0225	Level 8 – Process Burner Tune-up (500-1199 MBH)
CHG0231	GO Web Based Programmable Thermostat
CWG0016	Level 10 – Domestic Water Heater Tune-up (199-499 MBH)
CWG0017	Level 11 – Domestic Water Heater Tune-up (500-1999 MBH)
CWG0019	Level 12 – Domestic Water Heater Tune-up (>= 1200 MBH)

Table 3-8 shows the variances found by the certification team associated with gas energy (Mcf) performance savings.

Chapter 3 Summary of Savings Variances

Table 3-8. PY2017 Business Energy Efficiency Program Variances for Measures with Additional Mcf Performance Savings

Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Effect on Reported Mcf	Variance Description
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0005	Boiler Modulating Burner Control 10 to 1 or 5 to 1 turn-down (retrofit)	Units	39794	-3.7087	Difference in MCF performance adjustment.
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0023	Boiler Tune-up Level 1 (≥ 110 and 500 kbtu/h)	Units	42	-0.0003	MCF rounding difference.
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0024	Boiler Tune-up Level 2 (≥ 500)	Units	85	-0.0016	Difference in MCF performance adjustment.
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0025	Boiler Tune-up Level 3 (≥ 1200 kbtu/h)	Units	188	-0.005	Difference in MCF performance adjustment.
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0028	Level 6 – Process Boiler Tune-up (≥ 1200 MBH)	Units	35	-3.1079	Difference in MCF performance adjustment.
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0029	Process Boiler Tune-up Level 5 (≥ 500)	Units	5	-0.444	Difference in MCF performance adjustment.

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Subprogram	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Effect on Reported Mcf	Variance Description
Business Energy Efficiency Prescriptive	Boilers and Boiler Controls	CHG0225	Level 8 – Process Burner Tune-up (500-1199 MBH)	Units	1	-0.0438	Difference in MCF performance adjustment.
Business Energy Efficiency Prescriptive	HVAC Controls	CHG0231	GO Web Based Programmable Thermostat	Units	119	-8.5443	Difference in MCF performance adjustment.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0016	Level 10 – Domestic Water Heater Tune-up (199-499 MBH)	Units	26	-1.4532	Difference in MCF performance adjustment.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0017	Level 11 – Domestic Water Heater Tune-up (500-1999 MBH)	Units	25	-1.397	Difference in MCF performance adjustment.
Business Energy Efficiency Prescriptive	C&I Waterheating	CWG0019	Level 12 – Domestic Water Heater Tune-up (>= 1200 MBH)	Units	3	-0.1677	Difference in MCF performance adjustment.
TOTAL						-18.8735	

Chapter 3 Summary of Savings Variances

Small Business Energy Efficiency

The results presented in this section of the report summarize variances found by the certification team associated with the PY2017 Small Business Energy Efficiency Program. The measures installed through the Small Business Energy Efficiency Program fall into two categories: (1) measures that use deemed savings values obtained from the master non-weather sensitive MEMD, or (2) weather-sensitive-weighted measures that rely on savings values taken from the weather-sensitive-weighted MEMD.

As discussed earlier, lighting measures installed through the Small Business Core Program are not assessed here as they rely on project-specific calculations to derive energy savings, which are covered as part of the annual impact evaluations. Table 3-9 summarizes the variances for electric energy (kWh) savings, Table 3-10 summarizes the variances detected by the certification team for electric demand (kW), and Table 3-11 summarizes the variances for gas energy (Mcf) savings for this program.

Appendix A includes the complete listing of all measures installed through the Small Business Energy Efficiency Program in PY2017.

Table 3-9. PY2017 Small Business Energy Efficiency Program Per-Unit Electric Energy (kWh) Savings Variances

Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kWh – MEMD	Effect on Reported kWh	Variance Description
Direct Install	Direct Install – Hospitality	CDE0090	3.5 W LED Candelabra	Units	12961	75.4	-0.0005	kWh rounding difference.
Direct Install	Direct Install – Hospitality	CDE0102	LED Lighting – 9.5 W LED Lamps Replacing Incandescent Lights	Units	35238	98.8	-0.0023	kWh rounding differences.
Direct Install	Direct Install – Hospitality	CDE0111	SB Hosp – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	Units	161	165.1798	-0.0078	CE claimed 165.1798 kWh per unit. Verified per unit savings is 165.1799 and CE incorrectly rounded.
Direct Install	Direct Install – Hospitality	CDE0112	SB Hosp – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	Units	523	165.1798	-0.0282	CE claimed 70.3 kWh per unit. Verified per unit savings is 70.2832 and CE incorrectly rounded.
Small Business Assessment	Direct Install Lighting	CDE0116	SBA – 3.5 W LED Candelabra	Units	758	75.4	0.0001	kWh rounding difference.
Small Business Assessment	Direct Install Lighting	CDE0118	SBA – 9.5 W LED Lamps Replacing Incandescent Lights	Units	3002	98.8	-0.0001	kWh rounding difference.
Small Business Assessment	Direct Install Non-lighting	CDE0121	SBA – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	Units	55	165.1798	-0.0004	kWh rounding difference.

Chapter 3 Summary of Savings Variances

Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kWh – MEMD	Effect on Reported kWh	Variance Description
Small Business Assessment	Direct Install Non-lighting	CDE0122	SBA – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	Units	117	165.1798	-0.0016	kWh rounding differences.
Direct Install	Direct Install – Hospitality	CDE0210	SB Hosp – 1L 4' LED Tube Replacing T8 1L 4' Lamp	Units	56277	33.4	-0.0007	kWh rounding difference.
Direct Install	Direct Install – Hospitality	CDE0213	LED Globe	Units	2952	85.7	0.0001	kWh rounding difference.
Direct Install	Direct Install – Hospitality	CDE0250	SB Hosp – Electric Pipe Wrap – 140F DHW (unconditioned space)	Linear Feet	14	90.39	-0.0001	kWh rounding difference.
Online Marketplace	Direct Install Lighting	CDE0257	Online Marketplace 9W A19 LED (60W equiv) 4000K	Units	245	98.8	0.0001	kWh rounding difference.
Online Marketplace	Direct Install Lighting	CDE0260	Online Marketplace – 15W A19 LED (100W equiv) 2700K	Units	140	160.1	0.0001	kWh rounding difference.
Online Marketplace	Direct Install Lighting	CDE0261	Online Marketplace – 15W A19 LED (100W equiv) 4000K	Units	144	160.1	-0.0001	kWh rounding difference.
Online Marketplace	Direct Install Non-lighting	CDE0273	Online Marketplace – Promo Kit	Units	58143	70.2832	-976.9024	CE claimed 70.3 kWh per unit.

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Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kWh – MEMD	Effect on Reported kWh	Variance Description
Direct Install	Direct Install – Hospitality	CDG0025	Pipe Wrap – 140F DHW (conditioned space)	Linear Feet	330	4.206	748.668	12 customers received both gas and electric savings and CE only claimed gas savings.
TOTAL							-228.2758	

Chapter 3 Summary of Savings Variances

Table 3-10. PY2017 Small Business Energy Efficiency Program Per-Unit Electric Demand (kW) Savings Variances

Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
Direct Install	Direct Install – Hospitality	CDE0090	3.5 W LED Candelabra	Units	12961	0.0139	-0.0051	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Direct Install	Direct Install – Hospitality	CDE0102	LED Lighting – 9.5 W LED Lamps Replacing Incandescent Lights	Units	35238	0.0181	0.0039	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Direct Install	Direct Install – Hospitality	CDE0103	LED Lighting – 6 W LED Lamps Replacing Incandescent Lights	Units	442	0.0181	-0.0019	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Direct Install	Direct Install – Hospitality	CDE0111	SB Hosp – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	Units	161	0.0189	-0.0039	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Direct Install	Direct Install – Hospitality	CDE0112	SB Hosp – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	Units	523	0.0189	-0.0071	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Direct Install	Direct Install – Hospitality	CDE0113	SB Hosp – Electric Pipe Wrap – 140F DHW (conditioned space)	Linear Feet	146	0.0097	0.0012	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Small Business Assessment	Direct Install Lighting	CDE0116	SBA – 3.5 W LED Candelabra	Units	758	0.0139	0.001	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Small Business Assessment	Direct Install Lighting	CDE0118	SBA – 9.5 W LED Lamps Replacing Incandescent Lights	Units	3002	0.0181	0.0046	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.

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Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
Small Business Assessment	Direct Install Lighting	CDE0119	SBA – 6 W LED Lamps Replacing Incandescent Lights	Units	83	0.0181	0.0002	kW rounding difference.
Small Business Assessment	Direct Install Non-lighting	CDE0121	SBA – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	Units	55	0.0189	-0.0002	kWh rounding difference. kW rounding difference.
Small Business Assessment	Direct Install Non-lighting	CDE0122	SBA – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	Units	117	0.0189	-0.0008	kWh rounding differences. kW rounding difference.
Small Business Assessment	Direct Install Lighting	CDE0124	SBA – 14 W CFL Replacing 60 W Globe Inc	Units	6	0.0189	0.0004	kW rounding difference.
Small Business Assessment	Direct Install Lighting	CDE0126	SBA – LED Globe	Units	714	0.0158	0.0032	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Direct Install	Direct Install – Hospitality	CDE0210	SB Hosp – 1L 4' LED Tube Replacing T8 1L 4' Lamp	Units	56277	0.0061	-0.0119	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Direct Install	Direct Install – Hospitality	CDE0213	LED Globe	Units	2952	0.0158	0.0052	kWh rounding difference. CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Small Business Assessment	Direct Install Non-lighting	CDE0226	Energy Efficiency Kits (2-bulb)	Units	2113	0.0124	0.0032	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Direct Install	Direct Install – Hospitality	CDE0239	Hospitality – Low Flow Showerhead – 1.5 gpm (Consumers Energy Electric Customers	Units	6	0.0803	-0.0002	kW rounding difference.

Chapter 3 Summary of Savings Variances

Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
Small Business Assessment	Direct Install Non-lighting	CDE0242	Energy Efficiency Kit (3-bulb)	Units	3180	0.0208	-0.305	CE claimed 0.0209 kW per unit. Verified per unit kW savings is 0.0208 and CE incorrectly rounded.
Direct Install	Direct Install – Hospitality	CDE0247	SB Hosp – LED A-series replacing CFL A-series	Units	995	0.0022	0.0002	kW rounding difference.
Direct Install	Direct Install – Hospitality	CDE0250	SB Hosp – Electric Pipe Wrap – 140F DHW (unconditioned space)	Linear Feet	14	0.0103	-0.0008	kW rounding difference.
Direct Install	Direct Install Lighting	CDE0252	LED Lamp Replacing CFL PAR/BR/R Lamp	Units	236	0.0022	-0.0018	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Direct Install	Direct Install Lighting	CDE0253	LED A-series replacing CFL A-series	Units	271	0.0022	0.0004	kW rounding difference.
Online Marketplace	Direct Install Lighting	CDE0254	Online Marketplace – 6W A19 LED (40W equiv) 2700K	Units	103	0.0113	0.0009	kW rounding difference.
Online Marketplace	Direct Install Lighting	CDE0255	Online Marketplace – 6W A19 LED (40W equiv) 4000K	Units	15	0.0113	0.0005	kW rounding difference.
Online Marketplace	Direct Install Lighting	CDE0256	Online Marketplace – 9W A19 LED (60W equiv) 2700K	Units	519	0.0181	-0.0041	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Online Marketplace	Direct Install Lighting	CDE0257	Online Marketplace – 9W A19 LED (60W equiv) 4000K	Units	245	0.0181	-0.0015	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Online Marketplace	Direct Install Lighting	CDE0258	Online Marketplace – 11W A19 LED (75W equiv) 2700K	Units	105	0.0181	-0.0005	kW rounding difference.

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Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
Online Marketplace	Direct Install Lighting	CDE0259	Online Marketplace – 11W A19 LED (75W equiv) 4000K	Units	43	0.0181	-0.0007	kW rounding difference.
Online Marketplace	Direct Install Lighting	CDE0260	Online Marketplace – 15W A19 LED (100W equiv) 2700K	Units	140	0.0294	-0.002	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Online Marketplace	Direct Install Lighting	CDE0261	Online Marketplace – 15W A19 LED (100W equiv) 4000K	Units	144	0.0294	0.0006	kW rounding difference.
Online Marketplace	Direct Install Lighting	CDE0262	Online Marketplace – 5W Candelabra LED (40W equiv) 2700K	Units	108	0.0139	-0.0008	kW rounding difference.
Online Marketplace	Direct Install Lighting	CDE0263	Online Marketplace – 6W Globe LED (40W equiv) 2700K	Units	60	0.0158	-0.001	CE rounded some project-level kW savings to 1 digit instead of to 4 digits resulting in small variances across many projects.
Online Marketplace	Direct Install Lighting	CDE0264	Online Marketplace – 15W PAR 38 LED Flood (90W equiv) 3000K	Units	14	0.0267	0.0008	kW rounding difference.
Online Marketplace	Direct Install Lighting	CDE0265	Online Marketplace – 17W PAR 38 LED Flood (90W equiv) 4100K	Units	16	0.0267	0.0002	kW rounding difference.
Online Marketplace	Direct Install Non-lighting	CDE0270	Online Marketplace – Tier 2 Advanced Power Strip (TrickleStar unit)	Units	9	0.0213	0.0027	CE claimed 0.0210 kW per unit. Verified per unit kW is 0.0213.
Online Marketplace	Direct Install Non-lighting	CDE0271	Online Marketplace – Tier 2 Advanced Power Strip (Embertec unit)	Units	3	0.0213	0.0009	CE claimed 0.0210 kW per unit. Verified per unit kW is 0.0213.
Online Marketplace	Direct Install Non-lighting	CDE0273	Online Marketplace – Promo Kit	Units	58143	0.0129	-5.8143	CE claimed 0.0130 kW per unit. Verified per unit kW is 0.0129.

Chapter 3 Summary of Savings Variances

Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
Direct Install	Direct Install Non-lighting	CDE0274	Tier 2 – Smart Power Strip	Units	56	0.0213	-1.2152	CE claimed 0.0430 kW per unit. Verified per unit kW is 0.0213.
Direct Install	Direct Install – Hospitality	CDG0025	Pipe Wrap – 140F DHW (conditioned space)	Linear Feet	330	0.0029	0.5162	12 customers received both gas and electric savings and CE only claimed gas savings.
TOTAL							-6.8325	

Table 3-11. PY2017 Small Business Energy Efficiency Program Per-Unit Gas (Mcf) Savings Variances

Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit Mcf – MEMD	Effect on Reported Mcf	Variance Description
Direct Install	Direct Install – Hospitality	CDG0025	Pipe Wrap – 140F DHW (conditioned space)	Linear Feet	330	0.1493	-0.0254	12 customers received both gas and electric savings and CE only claimed gas savings. CE claimed 5 different per unit MCF values resulting in small variances across projects.
Direct Install	Direct Install – Hospitality	CDG0026	Pre-rinse Sprayers < 1.6 gpm	Units	106	5.844	-0.2764	CE claimed 3 different per unit MCF values resulting in small variances across projects.
Direct Install	Direct Install – Hospitality	CDG0028	Low-Flow Faucet Aerators < 1.5gpm (Kitchen)	Units	410	0.6724	-0.0664	CE claimed 7 different per unit MCF values resulting in small variances across projects.
Direct Install	Direct Install – Hospitality	CDG0029	Low-flow Faucet Aerators < 1.5 gpm	Units	1505	0.6724	-0.3848	CE claimed 8 different per unit MCF values resulting in small variances across projects.
Small Business Assessment	Direct Install Non-lighting	CDG0109	SBA – Gas Pre-rinse Sprayers / < 1.6 gpm	Units	12	5.844	-0.0204	CE claimed 5.8457 MCF per unit. Verified per unit MCF is 5.8440.
Small Business Assessment	Direct Install Non-lighting	CDG0110	SBA – Gas Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	Units	99	0.6724	-0.0126	CE claimed 5 different per unit MCF values resulting in small variances across projects.
Small Business Assessment	Direct Install Non-lighting	CDG0111	SBA – Gas Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	Units	158	0.6724	-0.0222	CE claimed 5 different per unit MCF values resulting in small variances across projects.

Chapter 3 Summary of Savings Variances

Program	Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit Mcf – MEMD	Effect on Reported Mcf	Variance Description
Direct Install	Direct Install – Hospitality	CDG0123	Hospitality – Low Flow Showerhead – 1.5 gpm (Consumers Energy Natural Gas Custom	Units	63	2.8636	0.0136	CE claimed 4 different per unit MCF values resulting in small variances across projects.
Direct Install	Direct Install – Hospitality	CDG0124	SB Hosp – Gas Pipe Wrap – 140F DHW (unconditioned space)	Linear Feet	5	0.3398	-0.001	CE claimed 0.3400 MCF per unit. Verified per unit MCF is 0.3398.
TOTAL							-0.7956	

C&I Multifamily Program

The results presented in this section of the report summarize variances found by the certification team associated with the PY2017 C&I Multifamily Program. All measures installed through the C&I Multifamily Program used deemed savings values obtained from the master MEMD or the weather-sensitive-weighted MEMD. As a note, these savings only include measures installed in commercial applications; residential multifamily savings are verified separately as part of the residential portfolio.

Table 3-12 summarizes the variances for electric energy (kWh) savings, Table 3-13 summarizes the variances detected by the certification team for electric demand (kW), and Table 3-14 summarizes the variances for gas energy (Mcf) savings for this program.

Appendix A includes the complete listing of all measures installed through the C&I Multifamily Program in PY2017.

Chapter 3 Summary of Savings Variances

Table 3-12. PY2017 C&I Multifamily Program Per-Unit Electric Energy (kWh) Savings Variances

Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kWh – MEMD	Effect on Reported kWh	Variance Description
C&I Multifamily	CTE0190	Exterior HID to LED (Per Watt Reduced)	Watts Removed	225959.87	4.319	0.0001	kWh rounding difference.
C&I Multifamily	CTG0052	Pipe Wrap – DHW – Common – DI	Linear Feet	6993	4.206	1615.104	One customer received both gas and electric savings and CE only claimed gas savings.
TOTAL						1615.1041	

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Table 3-13. PY2017 C&I Multifamily Program Per-Unit Electric Demand (kW) Savings Variances

Measure Category	Measure Code	Measure Description	Units	Install Quantity	Per Unit kW – MEMD	Effect on Reported kW	Variance Description
C&I Multifamily	CTE0205	8-Foot T12 to One 8-Foot LED Tube Light (common)	Units	4	0.035	0.0144	CE claimed 0.0314 kW per unit. Verified per unit kW is 0.0350.
C&I Multifamily	CTG0052	Pipe Wrap – DHW – Common – DI	Linear Feet	6993	0.0029	1.1136	One customer received both gas and electric savings and CE only claimed gas savings.
TOTAL						1.128	

Chapter 3 Summary of Savings Variances

Table 3-14. PY2017 C&I Multifamily Program Per-Unit Gas (Mcf) Savings Variances

Program	Measure Code	Measure Description	Units	Install Quantity	Per Unit Mcf – MEMD	Effect on Reported Mcf	Variance Description
C&I Multifamily	CTG0007	Pipe Wrap – Gas – DHW – In-Unit – DI	Linear Feet	8088	0.224	-0.8088	CE claimed 0.2241 MCF per unit. Verified per unit MCF is 0.2240.
C&I Multifamily	CTG0010	Steam Traps	Units	123	29.0252	-1.0209	CE claimed 29.0335 MCF per unit. Verified per unit MCF is 29.0252.
C&I Multifamily	CTG0014	DI – 1.5 gpm Kitchen Aerator – Gas (Com)	Units	225	0.8669	-0.045	CE claimed 0.8671 MCF per unit. Verified per unit MCF is 0.8669.
C&I Multifamily	CTG0016	Pipe Wrap-Hydronic	Linear Feet	40	0.3896	-0.004	CE claimed 0.3897 MCF per unit. Verified per unit MCF is 0.3896.
C&I Multifamily	CTG0019	Instant Hot Water Heater – Gas – Common	Units	1	16.2278	-0.0046	CE claimed 16.2324 MCF per unit. Verified per unit MCF is 16.2278.
C&I Multifamily	CTG0039	Pipe Wrap – Space Heat – Common – DI	Linear Feet	31217	0.3896	-3.1217	CE claimed 0.3897 MCF per unit. Verified per unit MCF is 0.3896.
C&I Multifamily	CTG0050	DI – 1.5 gpm Showerhead – Gas (Com)	Units	40	2.8636	-0.032	CE claimed 2.8644 MCF per unit. Verified per unit MCF is 2.8636.
C&I Multifamily	CTG0051	DI – 1.5 gpm Showerhead – Handheld – Gas (Com)	Units	352	2.8636	-0.2816	CE claimed 2.8644 MCF per unit. Verified per unit MCF is 2.8636.
C&I Multifamily	CTG0052	Pipe Wrap – DHW – Common – DI	Linear Feet	6993	0.1493	-0.6993	CE claimed 0.1494 MCF per unit. Verified per unit MCF is 0.1493.
C&I Multifamily	CTG0122	DHW Boiler Tune-up	MBH	10598.4	0	-591.3907	CE claimed 0.0558 MCF per unit. Verified per unit MCF is 0.0000.

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Program	Measure Code	Measure Description	Units	Install Quantity	Per Unit Mcf – MEMD	Effect on Reported Mcf	Variance Description
C&I Multifamily	CTG0131	In-Direct Water Heater (e90% Eff)	MBH	3799	0.2417	-0.3799	CE claimed 0.2418 MCF per unit. Verified per unit MCF is 0.2417.
C&I Multifamily	CTG0132	In-Direct Water Heater (84-90% Eff)	MBH	500	0.1036	-0.05	CE claimed 0.1037 MCF per unit. Verified per unit MCF is 0.1036.
C&I Multifamily	CTG0141	Low Flow Bath Faucet Aerators 1.0gpm – Gas – DI	Units	359	0.3019	-0.0359	CE claimed 0.3020 MCF per unit. Verified per unit MCF is 0.3019.
C&I Multifamily	CTG0155	DI – Low-Flow Showerhead – Common – 1.5gpm – Gas (com)	Units	87	1.4026	-0.0348	CE claimed 1.4030 MCF per unit. Verified per unit MCF is 1.4026.
TOTAL						-597.9092	

4. CERTIFIED SAVINGS

This section of the report summarizes the certified savings values at the end use (Business Energy Efficiency Program) or measure level (Small Business Energy Efficiency and C&I Multifamily Programs). Results for the Business Energy Efficiency Program are presented at the end use level for the sake of brevity and clarity due to the relatively large number of individual measures installed under these programs, though all measure-level results are provided in Appendix B.

In each of the tables in this section, results are presented showing the reported gross savings (Column A) that represent the program database (eTracker) values, the certification team's calculated savings, or the adjusted gross savings; using the appropriate deemed savings values (Column B); application of the appropriate gross savings adjustment factors (Columns C and D); application of the appropriate net-to-gross adjustment factors (Column E); resulting in verified net savings (Column F). Column G presents the realization rate, which is the relationship of verified net savings (Column F) to reported gross savings in the program database (Column A). Finally, Column H shows the verified net lifetime savings.

All calculations were conducted using savings values rounded to four decimal places and adjustment factors are rounded to three decimal places. Though rounding was used for all computations, the savings results in this section are rounded to the nearest whole number to conserve space in the tables.

Business Energy Efficiency Program

Table 4-1, Table 4-2, Table 4-3 present the certified annual savings for electric energy (kWh), electric demand (kW), and gas savings (Mcf), respectively, for the Program Year 2017 Business Energy Efficiency Program by end use category.

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Table 4-1. PY2017 Business Energy Efficiency Program – Annual Electric Energy (kWh) Certified Savings by Measure End Use Category ^{a,b}

End Use Category	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2016 Verified Gross kWh Adjustment Factor ^c	2017 Verified Gross kWh Savings	Deemed Net-to- Gross Adjustment Factor ^d	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net Lifetime kWh Savings
	[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^e
BLDG Envelope	261,799	261,799	0.975	255,254	0.900	229,728	0.878	945,732
Boilers & Boiler Controls	0	88	0.975	85	0.900	77		1,539
Building Automation Systems	1,808,854	1,808,854	0.975	1,763,633	0.900	1,587,269	0.878	22,843,445
Building Envelope & Insulation	5,443	5,443	0.975	5,307	0.900	4,776	0.878	143,277
C&I Waterheating	9,018	9,018	0.975	8,793	0.900	7,913	0.878	118,699
Chiller	4,949,475	4,949,907	0.975	4,826,160	0.900	4,343,544	0.879	84,478,708
Commercial Laundry	884	884	0.975	862	0.900	776	0.878	5,430
Compressed Air	14,440,182	14,440,182	0.975	14,079,178	0.900	12,671,260	0.878	133,915,811
Custom	45,239,470	45,239,470	0.967	45,811,577	0.900	41,230,420	0.856	649,093,952
DCV & Economizers	786,118	786,118	0.975	766,465	0.900	689,818	0.878	10,347,276
Energy Management Systems	5,023,710	5,023,710	0.975	4,898,117	0.900	4,408,306	0.878	66,124,583
Energy Recovery	-72,182	-72,182	0.975	-70,378	0.900	-63,340	0.877	-950,098
Exit Signs	197,784	197,784	0.975	192,839	0.900	173,555	0.878	2,603,332
Furnaces & Heaters	338,992	338,992	0.975	330,517	0.900	297,465	0.877	4,461,981
Heating	44,274	44,274	0.975	43,167	0.900	38,850	0.878	582,757
HP or RW Fluorescent	135,162	135,162	0.975	131,783	0.900	118,605	0.878	698,931
HVAC Controls	16,397,262	16,419,875	0.975	16,009,378	0.900	14,408,440	1.848	201,211,422
Ice Machines	16,369	16,369	0.975	15,960	0.900	14,364	0.878	129,274
Kitchen & Refrigeration	8,811,922	8,811,922	0.975	8,591,624	0.900	7,732,462	0.878	113,983,770

Chapter 4 Certified Savings

End Use Category	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2016 Verified Gross kWh Adjustment Factor ^c	2017 Verified Gross kWh Savings	Deemed Net-to- Gross Adjustment Factor ^d	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net Lifetime kWh Savings
	[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^e
Lamp Removal	3,992,065	3,992,058	0.975	3,892,257	0.900	3,503,031	0.877	52,545,465
LED or Induction Fixtures	139,471,730	139,471,279	0.975	135,984,497	0.900	122,386,047	0.877	1,899,572,215
Lighting Controls	5,805,997	5,805,997	0.981	5,791,961	0.900	5,212,765	0.883	80,753,760
Lighting Retrofit Fixtures	3,172,838	3,172,838	0.975	3,093,517	0.900	2,784,165	0.878	44,805,987
Midstream	2,672,897	2,672,742	1.000	2,672,742	0.900	2,405,468	0.900	21,250,065
New Construction	1,196,429	1,196,429	1.000	1,196,429	0.900	1,076,786	0.900	17,228,579
Occupancy Sensors & Controls	5,727,582	5,727,582	0.975	5,584,393	0.900	5,025,954	0.878	49,538,071
Other	22,827,764	22,851,298	0.977	22,295,518	0.900	20,065,966	0.879	297,122,594
Room AC / PTAC	2,002,936	2,002,936	0.975	1,952,863	0.900	1,757,576	0.878	26,363,645
T8 Fluorescent	35,806	35,806	0.975	34,910	0.900	31,419	0.878	471,291
T8/T5 Fixture	1,962,226	1,962,226	0.975	1,913,171	0.900	1,721,854	0.878	20,662,242
Unitary/Split HVAC	294,108	294,108	0.975	286,755	0.900	258,080	0.878	3,871,195
Variable Frequency Drives	12,494,126	12,494,122	0.975	12,181,769	0.900	10,963,592	0.877	157,653,060
TOTAL	300,051,039	300,097,089	0.981	294,541,101	0.900	265,086,991	0.883	3,962,577,987

Columns may not sum to total due to rounding.

a) The Business Energy Efficiency Program is comprised of the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and Midstream programs.

b) This table presents results by end use because of the relatively large number of measures installed under the program. Measure level results are presented in Appendix B.

c) Note that the verified gross adjustment factors were derived from the prior year's impact evaluations (see Section 2.4).

d) The net-to-gross adjustment factor was deemed at 0.900 for all programs by the MPSC.

e) The lifetime savings are equal to the annual savings multiplied by the measure life for each measure.

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Table 4-2. PY2017 Business Energy Efficiency Program— Electric Demand (kW) Certified Savings by Measure End Use Category ^{a,b}

End Use Category	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2016 Verified Gross kW Adjustment Factor ^c	2017 Verified Gross kW Savings	Deemed Net-to- Gross Adjustment Factor ^d	2017 Verified Net kW Savings	2017 kW Realization Rate
	[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
BLDG Envelope	27	27	0.985	27	0.900	24	0.886
Building Automation Systems	177	177	0.985	174	0.900	157	0.886
C&I Waterheating	2	2	0.985	2	0.900	2	0.886
Chiller	1,450	1,437	0.985	1,415	0.900	1,274	0.789
Commercial Laundry	0	0	0.985	0	0.900	0	0.886
Compressed Air	2,018	2,018	0.985	1,988	0.900	1,789	0.887
Custom	4,978	4,978	1.298	6,461	0.900	5,815	1.006
Energy Management Systems	5	5	0.985	5	0.900	4	0.886
Energy Recovery	-17	-17	0.985	-16	0.900	-15	0.887
Exit Signs	23	23	0.985	22	0.900	20	0.887
Furnaces and Heaters	76	76	0.985	75	0.900	68	0.887
HP or RW Fluorescent	30	25	0.985	25	0.900	22	0.737
HVAC Controls	331	375	0.985	370	0.900	333	0.878
Ice Machines	2	2	0.985	2	0.900	1	0.887
Kitchen & Refrigeration	526	526	0.985	518	0.900	466	0.886
Lamp Removal	1,598	1,331	0.985	1,311	0.900	1,180	0.781
LED or Induction Fixtures	21,873	20,650	0.985	20,340	0.900	18,306	0.787
Lighting Controls	237	237	0.989	235	0.900	212	0.892
Lighting Retrofit Fixtures	752	739	0.985	728	0.900	655	0.813
Midstream	492	492	1.000	492	0.900	443	0.900

Chapter 4 Certified Savings

End Use Category	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2016 Verified Gross kW Adjustment Factor ^c	2017 Verified Gross kW Savings	Deemed Net-to- Gross Adjustment Factor ^d	2017 Verified Net kW Savings	2017 kW Realization Rate
	[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
Occupancy Sensors & Controls	183	183	0.985	180	0.900	162	0.886
Other	4,261	3,786	0.986	3,730	0.900	3,357	0.848
Room AC / PTAC	263	263	0.985	260	0.900	234	0.886
T8 Fluorescent	8	7	0.985	6	0.900	6	0.729
T8/T5 Fixture	472	472	0.985	465	0.900	418	0.887
Unitary/Split HVAC	204	204	0.985	201	0.900	181	0.886
Variable Frequency Drives	1,987	1,987	0.985	1,957	0.900	1,762	0.886
TOTAL	41,957	40,004	1.024	40,973	0.900	36,875	0.879

Columns may not sum to total due to rounding.

- The Business Energy Efficiency Program is comprised of the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and Midstream programs.
- This table presents results by end use because of the relatively large number of measures installed under the program. Measure level results are presented in Appendix B.
- Note that the verified gross adjustment factors were derived from the prior year's impact evaluations (see Section 2.4).
- The net-to-gross adjustment factor was deemed at 0.900 for all programs by the MPSC.

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Table 4-3. PY2017 Business Energy Efficiency Program – Annual Natural Gas (Mcf) Certified Savings by Measure End Use Category ^{a,b}

End Use Category	2017 Reported Gross Mcf Savings	2017 Adjusted Reported Gross Mcf Savings	2016 Verified Gross Mcf Adjustment Factor ^c	2017 Verified Gross Mcf Savings	Deemed Net-to- Gross Adjustment Factor ^d	2017 Verified Net Mcf Savings	2017 Mcf Realization Rate	2017 Verified Net Mcf Savings Including PIM Bonus
	[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Bonus Factor] ^e
BLDG Envelope	2,403	2,403	0.967	2,323	0.900	2,091	0.870	62,734
Boilers & Boiler Controls	169,216	169,209	0.967	163,625	0.900	147,262	0.870	1,226,753
Building Automation Systems	153,975	153,975	0.967	148,894	0.900	134,004	0.870	2,010,067
Building Envelope & Insulation	10,499	10,499	0.967	10,153	0.900	9,137	0.870	274,124
C & I RFP	400,316	400,304	0.967	387,094	0.900	348,384	0.870	6,234,948
C&I Waterheating	12,696	12,688	0.967	12,270	0.900	11,043	0.870	150,019
Compressed Air	4,049	4,048	0.967	3,914	0.900	3,523	0.870	52,840
Custom	338,599	338,599	1.414	478,774	0.900	430,896	1.074	9,899,022
DCV & Economizers	68,818	68,818	0.967	66,547	0.900	59,892	0.870	898,383
Energy Recovery	3,330	3,330	0.967	3,220	0.900	2,898	0.870	43,465
Furnaces & Heaters	18,926	18,926	0.967	18,302	0.900	16,472	0.870	233,676
Heating	149	149	0.967	144	0.900	129	0.870	1,942
HVAC & Heating Equipment	2,064	2,064	0.967	1,996	0.900	1,796	0.870	35,922
HVAC Controls	69,582	64,117	0.967	62,001	0.900	55,801	0.867	996,328
Kitchen & Refrigeration	3,469	3,469	0.967	3,355	0.900	3,019	0.870	43,430

Chapter 4 Certified Savings

End Use Category	2017 Reported Gross Mcf Savings	2017 Adjusted Reported Gross Mcf Savings	2016 Verified Gross Mcf Adjustment Factor ^c	2017 Verified Gross Mcf Savings	Deemed Net-to- Gross Adjustment Factor ^d	2017 Verified Net Mcf Savings	2017 Mcf Realization Rate	2017 Verified Net Mcf Savings Including PIM Bonus
	[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Bonus Factor] ^e
NEW CONSTRUCTION	897	897	1.000	897	0.900	807	0.900	12,918
Other	63,542	63,373	0.970	61,373	0.900	55,235	0.873	549,735
Steam Traps	38,059	38,052	0.967	36,796	0.900	33,117	0.870	165,583
Swimming Pool	1,981	1,981	0.967	1,916	0.900	1,724	0.870	24,691
Variable Frequency Drives	18,569	18,569	0.967	17,956	0.900	16,160	0.870	323,208
TOTAL	1,381,138	1,375,469	1.074	1,481,548	0.900	1,333,393	0.065	23,239,789

Columns may not sum to total due to rounding.

a) The Business Energy Efficiency Program is comprised off the Business Energy Efficiency – Custom, Business Energy Efficiency – Prescriptive, C&I Request for Proposals, New Construction projects, and Midstream programs.

b) This table presents results by end use because of the relatively large number of measures installed under the program. Measure level results are presented in Appendix B.

c) Note that the verified gross adjustment factors were derived from the prior year's impact evaluations (see Section 2.4).

d) The net-to-gross adjustment factor was deemed at 0.900 for all programs by the MPSC.

e) The lifetime savings are equal to the annual savings multiplied by the measure life for each measure

Small Business Energy Efficiency Program

Table 4-4, Table 4-5, and Table 4-6 present the certified annual savings for electric energy (kWh), electric demand (kW), and gas savings (Mcf), respectively, for the PY2017 Small Business Energy Efficiency Program by measure.

Chapter 4 Certified Savings

Table 4-4. PY2017 Small Business Energy Efficiency Program Annual Electric Energy (kWh) Certified Savings by Measure ^a

Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^b	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDC0058	Programmable Thermostats – Combination Customers	5,226	5,226	0.993	5,189	0.900	4,670	0.894	42,034
CDE0006	Pre Rinse Sprayers – < 1.6 gpm	32,108	32,108	0.924	29,668	0.900	26,701	0.832	133,505
CDE0045	LED Lighting – 11 W LED Flood Lamp	4,212,455	4,212,455	0.924	3,892,308	0.900	3,503,078	0.832	52,546,164
CDE0058	Programmable Thermostats	3,122	3,122	0.993	3,100	0.900	2,790	0.894	25,110
CDE0090	3.5 W LED Candelabra	977,259	977,259	0.924	902,988	0.900	812,689	0.832	7,314,200
CDE0101	LED Exit Sign	267,531	267,531	0.924	247,199	0.900	222,479	0.832	3,337,182
CDE0102	LED Lighting – 9.5 W LED Lamps Replacing Incandescent Lights	3,481,514	3,481,514	0.924	3,216,919	0.900	2,895,227	0.832	26,057,046
CDE0103	LED Lighting – 6 W LED Lamps Replacing Incandescent Lights	43,670	43,670	0.924	40,351	0.900	36,316	0.832	326,841

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^b	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDE0111	SB Hosp – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	26,594	26,594	0.924	24,573	0.900	22,116	0.832	221,155
CDE0112	SB Hosp – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	86,389	86,389	0.924	79,823	0.900	71,841	0.832	718,411
CDE0113	SB Hosp – Electric Pipe Wrap – 140F DHW (conditioned space)	2,054	2,054	0.924	1,898	0.900	1,708	0.832	34,166
CDE0210	SB Hosp – 1L 4' LED Tube Replacing T8 1L 4' Lamp	1,879,652	1,879,652	0.924	1,736,798	0.900	1,563,118	0.832	28,136,132
CDE0211	SB Hosp – Beverage Vending Machine Controllers	6,400	6,400	0.924	5,914	0.900	5,322	0.832	53,222
CDE0213	LED Globe	252,986	252,986	0.934	236,289	0.900	212,660	0.841	1,913,943
CDE0239	Hospitality – Low Flow Showerhead – 1.5 gpm (Consumers Energy Electric Customers)	4,218	4,218	0.924	3,897	0.900	3,508	0.832	35,077

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^b	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDE0246	SB Hosp – LED Replacing CFL PAR/BR/R Lamp	3,696	3,696	0.924	3,415	0.900	3,074	0.832	27,662
CDE0247	SB Hosp – LED A-series replacing CFL A-series	11,940	11,940	0.924	11,033	0.900	9,929	0.832	89,364
CDE0248	SB Hosp – LED Candelabra replacing CFL	230	230	0.924	212	0.900	191	0.832	1,718
CDE0249	SB Hosp – LED Globe replacing CFL	2,168	2,168	0.924	2,003	0.900	1,803	0.832	16,225
CDE0250	SB Hosp – Electric Pipe Wrap – 140F DHW (unconditioned space)	1,265	1,265	0.924	1,169	0.900	1,052	0.832	21,047
CDE0252	LED Lamp Replacing CFL PAR/BR/R Lamp	2,832	2,832	0.924	2,617	0.900	2,355	0.832	21,196
CDE0253	LED A-series replacing CFL A-series	3,252	3,252	0.924	3,005	0.900	2,704	0.832	24,339
CDE0274	Tier 2 – Smart Power Strip	19,796	19,796	0.924	18,292	0.900	16,462	0.832	148,161
CDE0254	Online Marketplace – 6W A19 LED (40W equiv) 2700K	6,324	6,324	1.000	6,324	0.900	5,692	0.900	34,151

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^b	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDE0255	Online Marketplace – 6W A19 LED (40W equiv) 4000K	921	921	1.000	921	0.900	829	0.900	4,973
CDE0256	Online Marketplace – 9W A19 LED (60W equiv) 2700K	51,277	51,277	1.000	51,277	0.900	46,149	0.900	415,345
CDE0257	Online Marketplace – 9W A19 LED (60W equiv) 4000K	24,206	24,206	1.000	24,206	0.900	21,785	0.900	196,069
CDE0258	Online Marketplace – 11W A19 LED (75W equiv) 2700K	10,374	10,374	1.000	10,374	0.900	9,337	0.900	84,029
CDE0259	Online Marketplace – 11W A19 LED (75W equiv) 4000K	4,248	4,248	1.000	4,248	0.900	3,824	0.900	34,412
CDE0260	Online Marketplace – 15W A19 LED (100W equiv) 2700K	22,414	22,414	1.000	22,414	0.900	20,173	0.900	181,553
CDE0261	Online Marketplace – 15W A19 LED (100W equiv) 4000K	23,054	23,054	1.000	23,054	0.900	20,749	0.900	186,741
CDE0262	Online Marketplace – 5W Candelabra LED (40W equiv) 2700K	8,143	8,143	1.000	8,143	0.900	7,329	0.900	65,960

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^b	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDE0263	Online Marketplace – 6W Globe LED (40W equiv) 2700K	5,142	5,142	1.000	5,142	0.900	4,628	0.900	41,650
CDE0264	Online Marketplace – 15W PAR 38 LED Flood (90W equiv) 3000K	2,037	2,037	1.000	2,037	0.900	1,833	0.900	16,500
CDE0265	Online Marketplace – 17W PAR 38 LED Flood (90W equiv) 4100K	2,328	2,328	1.000	2,328	0.900	2,095	0.900	18,857
CDE0266	Online Marketplace – 11W BR30D LED Flood (65W equiv) 2700K	52,214	52,214	1.000	52,214	0.900	46,992	0.900	704,882
CDE0267	Online Marketplace – 11W BR30D LED Flood (65W equiv) 4000K	15,424	15,424	1.000	15,424	0.900	13,881	0.900	208,217
CDE0268	Online Marketplace – Red LED Exit Sign	1,407	1,407	1.000	1,407	0.900	1,266	0.900	18,995
CDE0269	Online Marketplace – Red Exit Sign LED Retrofit Kit	402	402	1.000	402	0.900	362	0.900	5,427

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^b	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDE0270	Online Marketplace – Tier 2 Advanced Power Strip (TrickleStar unit)	3,182	3,182	1.000	3,182	0.900	2,863	0.900	25,770
CDE0271	Online Marketplace – Tier 2 Advanced Power Strip (Embertec unit)	1,061	1,061	1.000	1,061	0.900	954	0.900	8,590
CDE0273	Online Marketplace – Promo Kit	4,087,453	4,086,476	1.000	4,086,476	0.900	3,677,828	0.900	33,100,456
CDE0204	LED Globe	23,139	23,139	1.000	23,139	0.820	18,974	0.820	170,766
CDE0207	LED Candelabra	235,248	235,248	1.000	235,248	0.820	192,903	0.820	1,736,130
CDE0208	LED Bulb Replacing A-Line 43W	10,214,636	10,214,636	1.000	10,214,636	0.820	8,376,001	0.820	75,384,011
CDE0209	LED Flood PAR	2,077,886	2,077,886	1.000	2,077,886	0.820	1,703,866	0.820	15,334,795
CDE0225	LED Replacing A-Line 72W halogen	447,319	447,319	1.000	447,319	0.820	366,802	0.820	3,301,217
CDE0238	LED Fixtures Downlight	371,862	371,862	1.000	371,862	0.820	304,927	0.820	4,573,903
CDE0240	LED Bulb Replacing A-Line 29W	98,460	98,460	1.000	98,460	0.820	80,737	0.820	1,211,058
CDE0114	SBA – Electric Pre-rinse Sprayers / < 1.6 gpm	1,396	1,396	0.960	1,340	0.900	1,206	0.864	6,031

Chapter 4 Certified Savings

Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^b	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDE0115	SBA – 11 W LED Flood	347,949	347,949	0.960	334,031	0.900	300,628	0.864	4,509,413
CDE0116	SBA – 3.5 W LED Candelabra	57,153	57,153	0.960	54,867	0.900	49,380	0.864	444,423
CDE0117	SBA – LED Exit Sign	16,482	16,482	0.960	15,823	0.900	14,240	0.864	213,607
CDE0118	SBA – 9.5 W LED Lamps Replacing Incandescent Lights	296,598	296,598	0.960	284,734	0.900	256,260	0.864	2,306,343
CDE0119	SBA – 6 W LED Lamps Replacing Incandescent Lights	8,200	8,200	0.960	7,872	0.900	7,085	0.864	63,766
CDE0121	SBA – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	9,085	9,085	0.960	8,721	0.900	7,849	0.864	78,493
CDE0122	SBA – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	19,326	19,326	0.960	18,553	0.900	16,698	0.864	166,977
CDE0124	SBA – 14 W CFL Replacing 60 W Globe Inc	618	618	0.960	593	0.900	534	0.864	1,068
CDE0126	SBA – LED Globe	61,190	61,190	0.960	58,742	0.900	52,868	0.864	475,812
CDE0226	Energy Efficiency Kits (2-bulb)	151,080	151,080	1.000	151,080	0.900	135,972	0.900	1,087,772

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^b	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDE0242	Energy Efficiency Kit (3-bulb)	374,286	374,286	1.000	374,286	0.900	336,857	0.900	2,694,859
CDE0051	CFL Bulb – Screw-in	4,711	4,711	0.934	4,400	0.900	3,960	0.841	7,920
CDE0053	Specialty CFL	1,369	1,369	0.934	1,278	0.900	1,150	0.841	2,301
CDE0054	T8s and U-Tube T8 Lamps	95,177	95,177	0.934	88,896	0.900	80,006	0.841	960,073
CDE0059	Anti-sweat Heater Control	2,246,901	2,246,901	0.934	2,098,606	0.900	1,888,745	0.841	28,331,175
CDE0080	ECM Case Motor	62,624	62,624	0.934	58,491	0.900	52,642	0.841	789,626
CDE0081	ECM Walk-in Cooler and Freezer Motor	7,070,700	7,070,700	0.934	6,604,034	0.900	5,943,630	0.841	89,154,456
CDE0082	Custom Occupancy Sensor	5,267	5,267	0.934	4,920	0.900	4,428	0.841	44,277
CDE0085	Evaporator Fan Motor Controls on ECM motors	543,840	543,840	0.934	507,947	0.900	457,152	0.841	2,285,760
CDE0105	Daylight Controls	64,931	64,931	0.934	60,645	0.900	54,581	0.841	654,967
CDE0106	Occ Sensors	31,063	31,063	0.934	29,013	0.900	26,112	0.841	261,117
CDE0107	LED Exit Signs	124,401	124,401	0.934	116,190	0.900	104,571	0.841	1,568,568
CDE0108	LEDs	17,447,411	17,447,411	0.934	16,295,882	0.900	14,666,294	0.841	219,994,406
CDE0200	Miscellaneous Lighting	687	687	0.934	641	0.900	577	0.841	8,659
CDE0201	Fixture Removal	209,412	209,412	0.934	195,591	0.900	176,032	0.841	2,112,380

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^b	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDE0212	Screw-In LEDs	374,312	374,312	0.934	349,607	0.900	314,647	0.841	2,831,819
CDE0215	T8s and U-Tube T8 Lamps	20,650	20,650	0.934	19,287	0.900	17,359	0.841	208,303
CDE0216	T5 Lamps	1,347	1,347	0.934	1,258	0.900	1,132	0.841	13,585
CDE0217	Custom LED	130,961	130,961	0.934	122,317	0.900	110,085	0.841	1,651,281
CDE0221	LED Exit Signs	15,070	15,070	0.934	14,075	0.900	12,668	0.841	190,013
CDE0222	LEDs	18,340,511	18,340,511	0.934	17,130,037	0.900	15,417,034	0.841	231,255,505
CDE0224	Fixture Removal	1,195,404	1,195,404	0.934	1,116,507	0.900	1,004,856	0.841	12,058,276
CDE0231	LED Lamps Replacing CFL	1,608	1,608	0.934	1,502	0.900	1,352	0.841	12,165
CDE0234	Custom Interior LED	1,733,865	1,733,865	0.934	1,619,430	0.900	1,457,487	0.841	26,234,764
CDE0235	Custom Exterior LED	613,226	613,226	0.934	572,753	0.900	515,477	0.841	6,185,729
CDE0236	Custom Interior T8/T5	35,204	35,204	0.934	32,880	0.900	29,592	0.841	443,882
CDE0237	Custom Exterior T8/T5	749	749	0.934	699	0.900	629	0.841	7,553
TOTAL		80,831,278	80,831,049	0.948	76,616,063	0.886	67,876,973	0.840	897,637,936

Columns may not sum to total due to rounding.

- a) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Core, Small Business Assessment, and Small Business Outreach Consultation programs.
- b) Note that the verified gross adjustment factors were derived from the prior year's impact evaluations (see Section 2.4).
- c) The net-to-gross adjustment factor was deemed at 0.900 for all programs/initiatives by the MPSC, except the Residential Lighting Carryover Program.
- d) The lifetime savings are equal to the annual savings multiplied by the measure life for each measure.

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Table 4-5. PY2017 Small Business Energy Efficiency Program Annual Electric Demand (kW) Certified Savings by Measure ^a

Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^b	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CDE0006	Pre Rinse Sprayers – < 1.6	3	3	0.924	2	0.900	2	0.832
CDE0045	LED Lighting – 11 W LED Flood Lamp	774	774	0.924	715	0.900	644	0.832
CDE0090	3.5 W LED Candelabra	180	180	0.924	166	0.900	150	0.832
CDE0101	LED Exit Sign	31	31	0.924	28	0.900	25	0.832
CDE0102	LED Lighting – 9.5 W LED Lamps Replacing Incandescent Lights	638	638	0.924	589	0.900	530	0.832
CDE0103	LED Lighting – 6 W LED Lamps Replacing Incandescent Lights	8	8	0.924	7	0.900	7	0.831
CDE0111	SB Hosp – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	3	3	0.924	3	0.900	3	0.831
CDE0112	SB Hosp – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	10	10	0.924	9	0.900	8	0.831
CDE0113	SB Hosp – Electric Pipe Wrap – 140F DHW (conditioned space)	1	1	0.924	1	0.900	1	0.832
CDE0210	SB Hosp – 1L 4' LED Tube Replacing T8 1L 4' Lamp	343	343	0.924	317	0.900	285	0.832

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Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^b	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CDE0211	SB Hosp – Beverage Vending Machine Controllers	0	0	0.924	0	0.900	0	0.832
CDE0213	LED Globe	47	47	0.981	46	0.900	41	0.883
CDE0239	Hospitality – Low Flow Showerhead – 1.5 gpm	0	0	0.924	0	0.900	0	0.831
CDE0246	SB Hosp – LED Replacing CFL PAR/BR/R Lamp	1	1	0.924	1	0.900	1	0.832
CDE0247	SB Hosp – LED A-series replacing CFL A-series	2	2	0.924	2	0.900	2	0.832
CDE0248	SB Hosp – LED Candelabra replacing CFL	0	0	0.924	0	0.900	0	0.833
CDE0249	SB Hosp – LED Globe replacing CFL	0	0	0.924	0	0.900	0	0.832
CDE0250	SB Hosp – Electric Pipe Wrap – 140F DHW (unconditioned space)	0	0	0.924	0	0.900	0	0.827
CDE0252	LED Lamp Replacing CFL PAR/BR/R Lamp	1	1	0.924	0	0.900	0	0.829
CDE0253	LED A-series replacing CFL A-series	1	1	0.924	1	0.900	0	0.832
CDE0274	Tier 2 Smart Powerstrip	2	1	0.924	1	0.900	1	0.412
CDE0254	Online Marketplace – 6W A19 LED (40W equiv) 2700K	1	1	1.000	1	0.900	1	0.901

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Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^b	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CDE0255	Online Marketplace – 6W A19 LED (40W equiv) 4000K	0	0	1.000	0	0.900	0	0.903
CDE0256	Online Marketplace – 9W A19 LED (60W equiv) 2700K	9	9	1.000	9	0.900	8	0.900
CDE0257	Online Marketplace – 9W A19 LED (60W equiv) 4000K	4	4	1.000	4	0.900	4	0.900
CDE0258	Online Marketplace – 11W A19 LED (75W equiv) 2700K	2	2	1.000	2	0.900	2	0.900
CDE0259	Online Marketplace – 11W A19 LED (75W equiv) 4000K	1	1	1.000	1	0.900	1	0.899
CDE0260	Online Marketplace – 15W A19 LED (100W equiv) 2700K	4	4	1.000	4	0.900	4	0.900
CDE0261	Online Marketplace – 15W A19 LED (100W equiv) 4000K	4	4	1.000	4	0.900	4	0.900
CDE0262	Online Marketplace – 5W Candelabra LED (40W equiv) 2700K	2	2	1.000	2	0.900	1	0.900

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Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^b	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CDE0263	Online Marketplace – 6W Globe LED (40W equiv) 2700K	1	1	1.000	1	0.900	1	0.899
CDE0264	Online Marketplace – 15W PAR 38 LED Flood (90W equiv) 3000K	0	0	1.000	0	0.900	0	0.902
CDE0265	Online Marketplace – 17W PAR 38 LED Flood (90W equiv) 4100K	0	0	1.000	0	0.900	0	0.900
CDE0266	Online Marketplace – 11W BR30D LED Flood (65W equiv) 2700K	10	10	1.000	10	0.900	9	0.900
CDE0267	Online Marketplace – 11W BR30D LED Flood (65W equiv) 4000K	3	3	1.000	3	0.900	3	0.900
CDE0268	Online Marketplace – Red LED Exit Sign	0	0	1.000	0	0.900	0	0.900
CDE0269	Online Marketplace – Red Exit Sign LED Retrofit Kit	0	0	1.000	0	0.900	0	0.900
CDE0270	Online Marketplace – Tier 2 Advanced Power Strip (TrickleStar unit)	0	0	1.000	0	0.900	0	0.913
CDE0271	Online Marketplace – Tier 2 Advanced Power Strip (Embertec unit)	0	0	1.000	0	0.900	0	0.913

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Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^b	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CDE0273	Online Marketplace – Promo Kit	756	750	1.000	750	0.900	675	0.893
CDE0204	LED Globe	4	4	1.000	4	0.820	3	0.820
CDE0207	LED Candelabra	43	43	1.000	43	0.820	36	0.820
CDE0208	LED Bulb Replacing A-Line 43W	1,871	1,871	1.000	1,871	0.820	1,534	0.820
CDE0209	LED Flood PAR	381	381	1.000	381	0.820	313	0.820
CDE0225	LED Replacing A-Line 72W halogen	82	82	1.000	82	0.820	67	0.820
CDE0238	LED Fixtures Downlight	68	68	1.000	68	0.820	56	0.820
CDE0240	LED Bulb Replacing A-Line 29W	18	18	1.000	18	0.820	15	0.820
CDE0114	SBA – Electric Pre-rinse Sprayers / < 1.6 gpm	0	0	0.960	0	0.900	0	0.865
CDE0115	SBA – 11 W LED Flood	64	64	0.960	61	0.900	55	0.864
CDE0116	SBA – 3.5 W LED Candelabra	11	11	0.960	10	0.900	9	0.864
CDE0117	SBA – LED Exit Sign	2	2	0.960	2	0.900	2	0.864
CDE0118	SBA – 9.5 W LED Lamps Replacing Incandescent	54	54	0.960	52	0.900	47	0.864
CDE0119	SBA – 6 W LED Lamps Replacing Incandescent	2	2	0.960	1	0.900	1	0.864

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Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^b	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CDE0121	SBA – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	1	1	0.960	1	0.900	1	0.864
CDE0122	SBA – Electric Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	2	2	0.960	2	0.900	2	0.864
CDE0124	SBA – 14 W CFL Replacing 60 W Globe Inc	0	0	0.960	0	0.900	0	0.867
CDE0126	SBA – LED Globe	11	11	0.960	11	0.900	10	0.864
CDE0226	Energy Efficiency Kits (2-bulb)	26	26	1.000	26	0.900	24	0.900
CDE0242	Energy Efficiency Kit (3-bulb)	66	66	1.000	66	0.900	60	0.896
CDE0051	CFL Bulb – Screw-in	0	0	0.981	0	0.900	0	0.883
CDE0053	Specialty CFL	0	0	0.981	0	0.900	0	0.883
CDE0054	T8s and U-Tube T8 Lamps	21	21	0.981	21	0.900	19	0.883
CDE0080	ECM Case Motor	6	6	0.981	6	0.900	6	0.883
CDE0081	ECM Walk-in Cooler and Freezer Motor	725	725	0.981	712	0.900	640	0.883
CDE0082	Custom Occupancy Sensor	2	2	0.981	2	0.900	2	0.883
CDE0085	Evaporator Fan Motor Controls on ECM motors	56	56	0.981	55	0.900	50	0.883

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Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^b	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^c	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CDE0105	Daylight Controls	0	0	0.981	0	0.900	0	0.883
CDE0106	Occ Sensors	3	3	0.981	3	0.900	3	0.883
CDE0107	LED Exit Signs	14	14	0.981	14	0.900	13	0.883
CDE0108	LEDs	2,880	2,880	0.981	2,825	0.900	2,543	0.883
CDE0200	Miscellaneous Lighting	0	0	0.981	0	0.900	0	0.883
CDE0201	Fixture Removal	24	24	0.981	24	0.900	22	0.883
CDE0212	Screw-In LEDs	35	35	0.981	35	0.900	31	0.883
CDE0215	T8s and U-Tube T8 Lamps	0	0	0.981	0	0.900	0	0.883
CDE0217	Custom LED	25	25	0.981	24	0.900	22	0.883
CDE0222	LEDs	617	617	0.981	606	0.900	545	0.883
CDE0224	Fixture Removal	2	2	0.981	2	0.900	1	0.883
CDE0231	LED Lamps Replacing CFL	0	0	0.981	0	0.900	0	0.883
CDE0234	Custom Interior LED	1,437	1,437	0.981	1,410	0.900	1,269	0.883
CDE0236	Custom Interior T8/T5	5	5	0.981	5	0.900	4	0.883
TOTAL		11,407	11,401	0.976	11,131	0.882	9,820	0.861

Columns may not sum to total due to rounding. Some savings values round to 0, but are still presented as there are savings associated with that measure.

a) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Core, Small Business Assessment, and Small Business Outreach Consultation programs.

b) Note that the verified gross adjustment factors were derived from the prior year's impact evaluations (see Section 2.4).

c) The net-to-gross adjustment factor was deemed at 0.900 for all programs/initiatives by the MPSC, except the Residential Lighting Carryover Program.

d) The lifetime savings are equal to the annual savings multiplied by the measure life for each measure.

Chapter 4 Certified Savings

Table 4-6. PY2017 Small Business Energy Efficiency Program Annual Natural Gas (Mcf) Certified Savings by Measure ^a

Measure Code	Measure Description	2017 Reported Gross Mcf Savings	2017 Adjusted Reported Gross Mcf Savings	2015 Verified Gross Mcf Adjustment Factor ^b	2017 Verified Gross Mcf Savings	Deemed NTG Adjustment Factor ^c	2017 Verified Net Mcf Savings	2017 Mcf Realization Rate	2017 Verified Net Mcf Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
CDC0058	Programmable Thermostats – Combination Customers	700	700	0.993	696	0.900	626	0.894	5,634
CDG0025	Pipe Wrap – 140F DHW (conditioned space)	49	49	0.966	48	0.900	43	0.869	857
CDG0026	Pre-rinse Sprayers < 1.6 gpm	620	619	0.966	598	0.900	539	0.869	2,693
CDG0028	Low-Flow Faucet Aerators < 1.5gpm (Kitchen)	276	276	0.966	266	0.900	240	0.869	2,397
CDG0029	Low-flow Faucet Aerators < 1.5 gpm	1,012	1,012	0.966	978	0.900	880	0.869	8,798
CDG0058	Programmable Thermostat – Gas Customers	985	985	0.993	978	0.900	881	0.894	7,925
CDG0123	Hospitality – Low Flow Showerhead – 1.5 gpm (Consumers Energy Natural Gas Custom	180	180	0.966	174	0.900	157	0.870	1,568
CDG0124	SB Hosp – Gas Pipe Wrap – 140F DHW	2	2	0.966	2	0.900	1	0.869	30

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Measure Code	Measure Description	2017 Reported Gross Mcf Savings	2017 Adjusted Reported Gross Mcf Savings	2015 Verified Gross Mcf Adjustment Factor ^b	2017 Verified Gross Mcf Savings	Deemed NTG Adjustment Factor ^c	2017 Verified Net Mcf Savings	2017 Mcf Realization Rate	2017 Verified Net Mcf Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^d
	(unconditioned space)								
CDG0126	Smart Thermostat (Manual to Smart)	2,101	2,101	1.000	2,101	0.900	1,891	0.900	28,361
CDG0127	Smart Thermostat (Programmable to Smart)	11,086	11,086	1.000	11,086	0.900	9,978	0.900	149,666
CDG0109	SBA – Gas Pre-rinse Sprayers / < 1.6 gpm	70	70	0.952	67	0.900	60	0.857	300
CDG0110	SBA – Gas Low-Flow Faucet Aerators / < 1.5 pgm (Kitchen)	67	67	0.952	63	0.900	57	0.857	570
CDG0111	SBA – Gas Low-Flow Faucet Aerators / < 1.5 pgm (Bath)	106	106	0.952	101	0.900	91	0.857	910
Total		17,255	17,254	0.994	17,158	0.900	15,442	0.895	209,709

Columns may not sum to total due to rounding. Some savings values round to 0, but are still presented as there are savings associated with that measure.

a) The Small Business Energy Efficiency Program is comprised of the Direct Install, Online Marketplace, Residential Lighting Carryover, Small Business Core, Small Business Assessment, and Small Business Outreach Consultation programs.

b) Note that the verified gross adjustment factors were derived from the prior year's impact evaluations (see Section 2.4).

c) The net-to-gross adjustment factor was deemed at 0.900 for all programs/initiatives by the MPSC, except the Residential Lighting Carryover Program.

d) The lifetime savings are equal to the annual savings multiplied by the measure life for each measure.

Chapter 4 Certified Savings

C&I Multifamily Program

Table 4-7, Table 4-8, and Table 4-9 present the certified annual savings for electric energy (kWh), electric demand (kW), and gas savings (Mcf), respectively, for the PY2017 C&I Multifamily Program by measure. As a note, these savings only include measures installed in commercial applications; residential multifamily savings are verified separately as part of the residential portfolio.

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Table 4-7. PY2017 C&I Multifamily Program Annual Electric Energy (kWh) Certified Savings by Measure

Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^a	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^c
CCE0001	C&I Multifamily Custom – Electric	850,221	850,221	1.000	850,221	0.900	765,199	0.900	8,417,185
CTE0003	Common Area – LED Exit Signs (Retrofit Only)	26,733	26,733	1.000	26,733	0.900	24,060	0.900	360,896
CTE0019	DI – 1.5 gpm Kitchen Aerator – Electric (Com)	404	404	0.976	394	0.900	355	0.878	3,549
CTE0031	Occupancy Sensors under 500 W	97,140	97,140	1.000	97,140	0.900	87,426	0.900	874,262
CTE0033	LED Downlight Fixture	163,291	163,291	1.000	163,291	0.900	146,962	0.900	2,204,429
CTE0051	DI – 1.5 gpm Showerhead – Handheld – Electric (Com)	1,304	1,304	1.000	1,304	0.900	1,174	0.900	11,736
CTE0135	Air Conditioner – <5.4 Tons (1 ph) – 14 SEER	1,929	1,929	1.000	1,929	0.900	1,736	0.900	26,044
CTE0145	DI – LED Candelabra Lamp (3-5W) – 24/7 operation (Com)	2,964	2,964	1.000	2,964	0.900	2,668	0.900	24,008
CTE0146	DI – LED Candelabra Lamp (3-5W) (Com)	11,160	11,160	1.000	11,160	0.900	10,044	0.900	90,396

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^a	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^c
CTE0153	HPT8 replacing T12 – per lamp – Common	1,139	1,139	1.000	1,139	0.900	1,025	0.900	15,382
CTE0155	LED Candelabra Lamp (3-5W) – Common	7,936	7,936	1.000	7,936	0.900	7,142	0.900	64,282
CTE0157	LED Fixture – In Unit	4,004	4,004	1.000	4,004	0.900	3,604	0.900	54,054
CTE0159	LED Lamp – 40W Replacement – In Unit	965	965	0.943	910	0.900	819	0.849	12,285
CTE0160	LED Lamp – 50-80W Replacement – Common	35,582	35,582	0.943	33,554	0.900	30,199	0.849	452,982
CTE0161	LED Lamp – 60W Replacement – In Unit (Com)	97,043	97,043	0.943	91,511	0.900	82,360	0.849	1,235,400
CTE0163	LED Lamp – 80-100W	6,724	6,724	0.943	6,341	0.900	5,707	0.849	51,361
CTE0164	LED Lamp – Flood/PAR – Common	32,592	32,592	1.000	32,592	0.900	29,333	0.900	263,995
CTE0165	LED Lamp – MR16 – Common	1,029	1,029	1.000	1,029	0.900	926	0.900	8,332
CTE0166	LED Lamp – PAR – In Unit	16,254	16,254	1.000	16,254	0.900	14,629	0.900	219,429
CTE0171	VFD – Pump	13,774	13,774	0.976	13,443	0.900	12,099	0.878	120,991

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^a	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^c
CTE0172	Low Flow Bath Faucet Aerators 1.0gpm – Electric – DI	350	350	0.976	342	0.900	307	0.878	3,074
CTE0174	DI – LED Candelabra Lamp (3-5W) – In Unit (Com)	7,916	7,916	1.000	7,916	0.900	7,124	0.900	106,863
CTE0176	LED Candelabra Lamp (3-5W) – In-Unit	1,350	1,350	1.000	1,350	0.900	1,215	0.900	14,580
CTE0178	DI – LED Exit Sign (Com)	3,417	3,417	1.000	3,417	0.900	3,075	0.900	46,130
CTE0190	Exterior HID to LED (Per Watt Reduced)	975,921	975,921	1.000	975,921	0.900	878,329	0.900	14,053,258
CTE0191	Exterior HID to LED (24/7) (Per Watt Reduced)	110,026	110,026	1.000	110,026	0.900	99,023	0.900	1,584,369
CTE0192	Exterior HID to Induction (Per Watt Reduced)	24,795	24,795	1.000	24,795	0.900	22,316	0.900	267,790
CTE0196	LED Lamp – In-Unit – DI – (com)	150,993	150,993	0.943	142,386	0.900	128,148	0.849	1,922,216
CTE0197	LED Lamp – Common – DI – (com)	220,423	220,423	0.943	207,859	0.900	187,073	0.849	1,683,655

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^a	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^c
CTE0200	2-Foot T12 to 2-Foot LED Tube Light (common)	499	499	1.000	499	0.900	449	0.900	8,087
CTE0201	2-Foot T8 to 2-Foot LED Tube Light (common)	8,073	8,073	1.000	8,073	0.900	7,266	0.900	130,783
CTE0202	4-Foot T12 to 4-Foot LED Tube Lights (common)	23,880	23,880	1.000	23,880	0.900	21,492	0.900	386,851
CTE0203	4-Foot T8 to 4-Foot LED Tube Lights (common)	29,425	29,425	1.000	29,425	0.900	26,483	0.900	476,691
CTE0205	8-Foot T12 to One 8-Foot LED Tube Light (common)	384	384	1.000	384	0.900	346	0.900	6,221
CTE0209	DI – LED BR30 Flood In-Unit (Com)	10,962	10,962	1.000	10,962	0.900	9,866	0.900	147,987
CTE0210	DI – LED BR30 Flood Common 24/7 (Com)	54,382	54,382	1.000	54,382	0.900	48,944	0.900	440,495
CTE0217	DI – LED Globe – Common Area	2,143	2,143	1.000	2,143	0.900	1,928	0.900	17,354
CTE0218	LED Globe – Common Area	514	514	1.000	514	0.900	463	0.900	4,165

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Measure Code	Measure Description	2017 Reported Gross kWh Savings	2017 Adjusted Reported Gross kWh Savings	2015 Verified Gross kWh Adjustment Factor ^a	2017 Verified Gross kWh Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net kWh Savings	2017 kWh Realization Rate	2017 Verified Net kWh Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^c
CTE0220	DI – LED Globe – In Unit	60,129	60,129	1.000	60,129	0.900	54,116	0.900	811,742
CTE0236	NC – LED Lamp – 60W Replacement – In Unit (Com)	727	727	0.943	685	0.900	617	0.849	9,252
CTE0238	NC – LED Lamp – PAR – In Unit	11,192	11,192	1.000	11,192	0.900	10,072	0.900	151,085
CTE0240	DI – Pipe Wrap – Electric DHW – Common	260,626	260,626	1.000	260,626	0.900	234,563	0.900	4,691,270
CTE0241	DI – Pipe Wrap – Electric DHW – In unit	52,110	52,110	1.000	52,110	0.900	46,899	0.900	703,485
CTE0242	Energy Star Room AC >8000BTU/hr	144	144	1.000	144	0.900	129	0.900	1,941
CTE0248	Refrigerator – 15 cf – Direct Install (Com)	35,274	35,274	1.000	35,274	0.900	31,747	0.900	253,973
TOTAL		3,417,842	3,419,457	0.991	3,389,898	0.900	3,050,908	0.893	42,463,386

Columns may not sum to total due to rounding.

a) Note that the verified gross adjustment factors were derived from the prior year's impact evaluations (see Section 2.4).

b) The net-to-gross adjustment factor was deemed at 0.900 for all programs/initiatives by the MPSC.

c) The lifetime savings are equal to the annual savings multiplied by the measure life for each measure.

Chapter 4 Certified Savings

Table 4-8. PY2017 C&I Multifamily Program Annual Electric Demand (kW) Certified Savings by Measure

Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^a	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CCE0001	C&I Multifamily Custom – Electric	68	68	1.000	68	0.900	61	0.900
CTE0003	Common Area – LED Exit Signs (Retrofit Only)	3	3	1.000	3	0.900	3	0.900
CTE0019	DI – 1.5 gpm Kitchen Aerator – Electric (Com)	0	0	0.976	0	0.900	0	0.878
CTE0031	Occupancy Sensors under 500 W	3	3	1.000	3	0.900	2	0.900
CTE0033	LED Downlight Fixture	30	30	1.000	30	0.900	27	0.900
CTE0051	DI – 1.5 gpm Showerhead – Handheld – Electric (Com)	0	0	1.000	0	0.900	0	0.900
CTE0135	Air Conditioner – <5.4 Tons (1 ph) – 14 SEER	0	0	1.000	0	0.900	0	0.900
CTE0145	DI – LED Candelabra Lamp (3-5W) – 24/7 operation (Com)	0	0	1.000	0	0.900	0	0.900
CTE0153	HPT8 replacing T12 – per lamp – Common	0	0	1.000	0	0.900	0	0.900
CTE0157	LED Fixture – In Unit	0	0	1.000	0	0.900	0	0.900
CTE0159	LED Lamp – 40W Replacement – In Unit	0	0	0.943	0	0.900	0	0.849

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Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^a	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CTE0160	LED Lamp – 50-80W Replacement – Common	4	4	0.943	4	0.900	4	0.849
CTE0161	LED Lamp – 60W Replacement – In Unit (Com)	12	12	0.943	11	0.900	10	0.849
CTE0163	LED Lamp – 80-100W	1	1	0.943	1	0.900	1	0.849
CTE0164	LED Lamp – Flood/PAR – Common	6	6	1.000	6	0.900	5	0.900
CTE0165	LED Lamp – MR16 – Common	0	0	1.000	0	0.900	0	0.900
CTE0166	LED Lamp – PAR – In Unit	2	2	1.000	2	0.900	2	0.900
CTE0171	VFD – Pump	1	1	0.976	1	0.900	1	0.878
CTE0172	Low Flow Bath Faucet Aerators 1.0gpm – Electric – DI	0	0	0.976	0	0.900	0	0.878
CTE0174	DI – LED Candelabra Lamp (3-5W) – In Unit (Com)	1	1	1.000	1	0.900	1	0.900
CTE0176	LED Candelabra Lamp (3-5W) – In-Unit	0	0	1.000	0	0.900	0	0.900
CTE0178	DI – LED Exit Sign (Com)	0	0	1.000	0	0.900	0	0.900
CTE0191	Exterior HID to LED (24/7) (Per Watt Reduced)	13	13	1.000	13	0.900	11	0.900

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Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^a	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CTE0196	LED Lamp – In-Unit – DI – (com)	18	18	0.943	17	0.900	15	0.849
CTE0197	LED Lamp – Common – DI – (com)	40	40	0.943	38	0.900	34	0.849
CTE0200	2-Foot T12 to 2-Foot LED Tube Light (common)	0	0	1.000	0	0.900	0	0.900
CTE0201	2-Foot T8 to 2-Foot LED Tube Light (common)	1	1	1.000	1	0.900	1	0.900
CTE0202	4-Foot T12 to 4-Foot LED Tube Lights (common)	4	4	1.000	4	0.900	4	0.900
CTE0203	4-Foot T8 to 4-Foot LED Tube Lights (common)	5	5	1.000	5	0.900	5	0.900
CTE0205	8-Foot T12 to One 8-Foot LED Tube Light (common)	0	0	1.000	0	0.900	0	1.003
CTE0209	DI – LED BR30 Flood In-Unit (Com)	1	1	1.000	1	0.900	1	0.900
CTE0210	DI – LED BR30 Flood Common 24/7 (Com)	6	6	1.000	6	0.900	6	0.900
CTE0217	DI – LED Globe – Common Area	0	0	1.000	0	0.900	0	0.900
CTE0218	LED Globe – Common Area	0	0	1.000	0	0.900	0	0.900
CTE0220	DI – LED Globe – In Unit	7	7	1.000	7	0.900	6	0.900

2017 C&I Certification Report

Measure Code	Measure Description	2017 Reported Gross kW Savings	2017 Adjusted Reported Gross kW Savings	2015 Verified Gross kW Adjustment Factor ^a	2017 Verified Gross kW Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net kW Savings	2017 kW Realization Rate
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]
CTE0236	NC – LED Lamp – 60W Replacement – In Unit (Com)	0	0	0.943	0	0.900	0	0.849
CTE0238	NC – LED Lamp – PAR – In Unit	1	1	1.000	1	0.900	1	0.900
CTE0240	DI – Pipe Wrap – Electric DHW – Common	50	50	1.000	50	0.900	45	0.900
CTE0241	DI – Pipe Wrap – Electric DHW – In unit	6	6	1.000	6	0.900	5	0.900
CTE0242	Energy Star Room AC >8000BTU/hr	0	0	1.000	0	0.900	0	0.900
CTE0248	Refrigerator – 15 cf – Direct Install (Com)	4	4	1.000	4	0.900	4	0.900
TOTAL		292	293	0.985	289	0.900	260	0.890

Columns may not sum to total due to rounding. Some savings round to 0 but are included in this table as there are savings associated with the measure.

a) Note that the verified gross adjustment factors were derived from the prior year's impact evaluations (see Section 2.4).

b) The net-to-gross adjustment factor was deemed at 0.900 for all programs/initiatives by the MPSC.

Chapter 4 Certified Savings

Table 4-9. PY2017 C&I Multifamily Program Annual Natural Gas (Mcf) Certified Savings by Measure

Measure Code	Measure Description	2017 Reported Gross Mcf Savings	2017 Adjusted Reported Gross Mcf Savings	2015 Verified Gross Mcf Adjustment Factor ^a	2017 Verified Gross Mcf Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net Mcf Savings	2017 Mcf Realization Rate	2017 Verified Net Mcf Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^c
CTG0007	Pipe Wrap – Gas – DHW – In-Unit – DI	1,813	1,812	1.000	1,812	0.900	1,631	0.900	24,458
CTG0010	Steam Traps	3,571	3,570	1.000	3,570	0.900	3,213	0.900	16,065
CTG0011	Space Heating Boiler Tune-up	1,551	1,551	1.000	1,551	0.900	1,396	0.900	2,791
CTG0014	DI – 1.5 gpm Kitchen Aerator – Gas (Com)	195	195	0.976	190	0.900	171	0.878	1,713
CTG0016	Pipe Wrap-Hydronic	16	16	1.000	16	0.900	14	0.900	281
CTG0019	Instant Hot Water Heater – Gas – Common	16	16	1.000	16	0.900	15	0.900	292
CTG0020	Furnace Tune-up 40000 – 80000 BTU	2,997	2,997	1.000	2,997	0.900	2,697	0.900	5,394
CTG0021	Furnace Tune-up 80001 – 120000 BTU	42	42	1.000	42	0.900	38	0.900	76
CTG0035	Energy Star Window	1,297	1,297	1.000	1,297	0.900	1,167	0.900	29,179
CTG0039	Pipe Wrap – Space Heat – Common – DI	12,165	12,162	1.000	12,162	0.900	10,946	0.900	218,919

2017 C&I Certification Report

Measure Code	Measure Description	2017 Reported Gross Mcf Savings	2017 Adjusted Reported Gross Mcf Savings	2015 Verified Gross Mcf Adjustment Factor ^a	2017 Verified Gross Mcf Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net Mcf Savings	2017 Mcf Realization Rate	2017 Verified Net Mcf Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^c
CTG0046	High Efficiency Boiler Replacement > 90% Eff	1,747	1,747	1.000	1,747	0.900	1,573	0.900	23,590
CTG0050	DI – 1.5 gpm Showerhead – Gas (Com)	115	115	0.945	108	0.900	97	0.850	974
CTG0051	DI – 1.5 gpm Showerhead – Handheld – Gas (Com)	1,008	1,008	1.000	1,008	0.900	907	0.900	9,072
CTG0052	Pipe Wrap – DHW – Common – DI	1,045	1,044	1.000	1,044	0.900	940	0.899	18,793
CTG0122	DHW Boiler Tune-up	591	0	1.000	0	0.900	0	0.000	0
CTG0126	Furnace Replacement – 95% – In Unit	1,158	1,158	1.000	1,158	0.900	1,042	0.900	15,634
CTG0131	In-Direct Water Heater (e90% Eff)	919	918	1.000	918	0.900	826	0.900	12,396
CTG0132	In-Direct Water Heater (84-90% Eff)	52	52	1.000	52	0.900	47	0.899	699
CTG0141	Low Flow Bath Faucet Aerators 1.0gpm – Gas – DI	108	108	0.976	106	0.900	95	0.878	952

Chapter 4 Certified Savings

Measure Code	Measure Description	2017 Reported Gross Mcf Savings	2017 Adjusted Reported Gross Mcf Savings	2015 Verified Gross Mcf Adjustment Factor ^a	2017 Verified Gross Mcf Savings	Deemed Net-to-Gross Adjustment Factor ^b	2017 Verified Net Mcf Savings	2017 Mcf Realization Rate	2017 Verified Net Mcf Lifetime Savings
		[A]	[B]	[C]	[D] = [B x C]	[E]	[F] = [D x E]	[G] = [F / A]	[H] = [F x Measure Life] ^c
CTG0155	DI – Low-Flow Showerhead – Common – 1.5gpm – Gas (com)	122	122	0.945	115	0.900	104	0.850	1,038
CTG0159	Roof Insulation (Com) – Gas Heat	474	474	1.000	474	0.900	426	0.900	10,656
CTG0161	NC – Low Flow Bath Faucet Aerator – Prescriptive Gas	8	8	0.976	8	0.900	7	0.878	74
CTG0167	NC – Furnace Replacement – 95% – In Unit	402	402	1.000	402	0.900	362	0.900	5,424
CTG0175	NC – Large High Efficiency Gas Water Heater (Com)	420	420	1.000	420	0.900	378	0.900	4,919
TOTAL		31,832	31,234	0.999	31,213	0.900	28,092	0.883	403,388

Columns may not sum to total due to rounding.

a) Note that the verified gross adjustment factors were derived from the prior year's impact evaluations (see Section 2.4).

b) The net-to-gross adjustment factor was deemed at 0.900 for all programs/initiatives by the MPSC.

c) The lifetime savings are equal to the annual savings multiplied by the measure life for each measure.

2017 C&I Certification Report

Case No.:	U-20028
Hearing Date:	10-3-2018
Exhibit No.:	A-14

MICHIGAN PUBLIC SERVICE COMMISSION

Consumers Energy Company

Case No.: U-20028

Exhibit No.: A-14 (SL-1)

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Witness: SLykhytska

Date: May 2018

EWR Electric Cumulative Over (Under) Recovery (By Class and Total)

<u>Line</u>	<u>(a)</u> <u>Description</u>	<u>(b)</u> <u>Residential</u>	<u>(c)</u> <u>C&I</u>	<u>(d)</u> <u>Total</u>
<u>Annual Summary</u>				
1	Surcharge Revenue	\$ 30,554,249	\$ 49,505,103	\$ 80,059,352
2	Program Expenses	\$ 36,982,029	\$ 76,624,362	\$ 113,606,391
3	2009 - 2014 Low-Income Accounting Adjustment (1)	\$ 1,956,934	\$ (1,956,934)	\$ -
4	Annual Transfer of Low-Income Funding	\$ 2,426,145	\$ (2,426,145)	\$ -
5	Change in Over (Under) Recovery	\$ (2,044,701)	\$ (31,502,338)	\$ (33,547,039)
<u>Program Over/(Under) Recovery</u>				
6	Over (Under) Recovery Beginning Balance	\$ 3,175,634	\$ 7,926,811	\$ 11,102,445
7	Prior Year Carrying Charges	29,476	72,007	101,483
8	Change in Balance	(2,044,701)	(31,502,338)	(33,547,039)
9	Over (Under) Recovery Ending Balance	\$ 1,160,409	\$ (23,503,520)	\$ (22,343,111)
<u>Carrying Charges</u>				
10	Carrying Charges, Cumulative	\$ 35,452	\$ (40,236)	\$ (4,784)
11	Cumulative Over (Under) Recovery	\$ 1,195,861	\$ (23,543,756)	\$ (22,347,895)
12	Annual Interest Rate	1.18%	1.18%	1.18%

Notes:

(1) The low-income accounting adjustment refunded to Residential customers is \$1,886,825. \$70,109 difference is due to a timing of billing and it will be eliminated in future billing periods. The cumulative difference is \$55,928.

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20028
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Date: May 2018

EWR Electric Cumulative Over (Under) Recovery (Residential by Month)

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
<u>Line</u>	<u>Description</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Total</u>	<u>Source</u>
<u>Residential</u>															
1	Surcharge Revenue	\$ 3,074,113	\$ 2,528,280	\$ 2,363,757	\$ 2,281,255	\$ 2,103,873	\$ 2,406,032	\$ 2,916,215	\$ 2,963,237	\$ 2,518,925	\$ 2,432,817	\$ 2,284,363	\$ 2,681,382	\$ 30,554,249	Per Books
2	Program Expenses	\$ 2,948,867	\$ 2,826,459	\$ 3,128,654	\$ 2,535,794	\$ 2,959,455	\$ 3,685,699	\$ 2,607,520	\$ 2,242,608	\$ 2,632,620	\$ 3,047,689	\$ 3,190,221	\$ 5,176,443	\$ 36,982,029	Per Books
3	2009 - 2014 Low-Income Accounting Adjustment	\$ 165,447	\$ 168,849	\$ 165,166	\$ 162,617	\$ 163,720	\$ 161,867	\$ 161,941	\$ 162,542	\$ 161,370	\$ 160,543	\$ 162,668	\$ 160,204	\$ 1,956,934	Per Books
4	Annual Transfer of Low-Income Funding	\$ 143,185	\$ 115,374	\$ 135,227	\$ 172,540	\$ 173,954	\$ 198,113	\$ 180,136	\$ 121,152	\$ 215,124	\$ 202,605	\$ 306,474	\$ 462,261	\$ 2,426,145	
5	Change in Over (Under) Recovery	\$ 433,878	\$ (13,956)	\$ (464,504)	\$ 80,618	\$ (517,908)	\$ (919,687)	\$ 650,772	\$ 1,004,323	\$ 262,799	\$ (251,724)	\$ (436,716)	\$ (1,872,596)	\$ (2,044,701)	Line 1 - Line 2 + Line 3 + Line 4
<u>Program Over/(Under) Recovery</u>															
6	Over (Under) Recovery Beg. Bal.	\$ 3,175,634	\$ 3,638,988	\$ 3,625,032	\$ 3,160,528	\$ 3,241,146	\$ 2,723,238	\$ 1,803,551	\$ 2,454,323	\$ 3,458,646	\$ 3,721,445	\$ 3,469,721	\$ 3,033,005		Line 9 Prior Month/Year
7	Prior Year Carrying Charges	29,476													Prior Year Ending
8	Change in Balance	433,878	(13,956)	(464,504)	80,618	(517,908)	(919,687)	650,772	1,004,323	262,799	(251,724)	(436,716)	(1,872,596)		Line 5
9	Over (Under) Recovery Ending Bal.	\$ 3,638,988	\$ 3,625,032	\$ 3,160,528	\$ 3,241,146	\$ 2,723,238	\$ 1,803,551	\$ 2,454,323	\$ 3,458,646	\$ 3,721,445	\$ 3,469,721	\$ 3,033,005	\$ 1,160,409		Line 6 + Line 7 + Line 8
10	Over (Under) Recovery Average Bal.	\$ 3,422,049	\$ 3,632,010	\$ 3,392,780	\$ 3,200,837	\$ 2,982,192	\$ 2,263,395	\$ 2,128,937	\$ 2,956,485	\$ 3,590,046	\$ 3,595,583	\$ 3,251,363	\$ 2,096,707		Line 6 + Line 7 + (Line 8 / 2)
<u>Carrying Charges</u>															
11	Carrying Charges, Monthly	\$ 2,659	\$ 2,637	\$ 2,477	\$ 2,743	\$ 2,710	\$ 2,090	\$ 2,256	\$ 3,272	\$ 4,146	\$ 4,109	\$ 3,661	\$ 2,692		Line 10 x Line 15
12	Carrying Charges, Cumulative	\$ 2,659	\$ 5,296	\$ 7,773	\$ 10,516	\$ 13,226	\$ 15,316	\$ 17,572	\$ 20,844	\$ 24,990	\$ 29,099	\$ 32,760	\$ 35,452	\$ 35,452	Cumulative Line 11
13	Cumulative Over (Under) Recovery	\$ 3,641,647	\$ 3,630,328	\$ 3,168,301	\$ 3,251,662	\$ 2,736,464	\$ 1,818,867	\$ 2,471,895	\$ 3,479,490	\$ 3,746,435	\$ 3,498,820	\$ 3,065,765	\$ 1,195,861	\$ 1,195,861	Line 9 + Line 12
14	Annual Interest Rate	0.9324%	0.8714%	0.8761%	1.0286%	1.0902%	1.1083%	1.2714%	1.3280%	1.3857%	1.3713%	1.3514%	1.5403%	1.1798%	Treasury
15	Monthly Interest Rate	0.0777%	0.0726%	0.0730%	0.0857%	0.0909%	0.0924%	0.1060%	0.1107%	0.1155%	0.1143%	0.1126%	0.1284%		Line 14/ 12

EWR Electric Cumulative Over (Under) Recovery (C&I by Month)

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
Line	Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Source
<u>C&I</u>															
1	Surcharge Revenue	\$ 3,314,830	\$ 3,381,951	\$ 3,308,451	\$ 3,256,164	\$ 3,278,114	\$ 3,244,340	\$ 3,243,360	\$ 5,305,506	\$ 5,296,780	\$ 5,272,058	\$ 5,342,155	\$ 5,261,394	\$ 49,505,103	Per Books
2	Program Expenses	\$ 3,588,098	\$ 2,765,241	\$ 5,864,281	\$ 5,165,347	\$ 4,447,696	\$ 6,199,722	\$ 4,022,809	\$ 4,737,824	\$ 8,752,610	\$ 7,546,348	\$ 11,156,653	\$ 12,377,733	\$ 76,624,362	Per Books
3	2009-2014 Low-Income Accounting Adjustment	\$ (165,447)	\$ (168,849)	\$ (165,166)	\$ (162,617)	\$ (163,720)	\$ (161,867)	\$ (161,941)	\$ (162,542)	\$ (161,370)	\$ (160,543)	\$ (162,668)	\$ (160,204)	\$ (1,956,934)	Per Books
4	Annual Transfer of Low-Income Funding	\$ (143,185)	\$ (115,374)	\$ (135,227)	\$ (172,540)	\$ (173,954)	\$ (198,113)	\$ (180,136)	\$ (121,152)	\$ (215,124)	\$ (202,605)	\$ (306,474)	\$ (462,261)	\$ (2,426,145)	
5	Change in Over (Under) Recovery	\$ (581,900)	\$ 332,487	\$ (2,856,223)	\$ (2,244,340)	\$ (1,507,256)	\$ (3,315,362)	\$ (1,121,526)	\$ 283,988	\$ (3,832,324)	\$ (2,637,438)	\$ (6,283,640)	\$ (7,738,804)	\$ (31,502,338)	Line 1 - Line 2 + Line 3 + Line 4
6	Program Over/(Under) Recovery														
7	Over (Under) Recovery Beg. Bal.	\$ 7,926,811	\$ 7,416,918	\$ 7,749,405	\$ 4,893,182	\$ 2,648,842	\$ 1,141,586	\$ (2,173,776)	\$ (3,295,302)	\$ (3,011,314)	\$ (6,843,638)	\$ (9,481,076)	\$ (15,764,716)		Line 9 Prior Month/Year
8	Prior Year Carrying Charges	72,007	-	-	-	-	-	-	-	-	-	-	-	-	Prior Year Ending
9	Change in Balance	(581,900)	332,487	(2,856,223)	(2,244,340)	(1,507,256)	(3,315,362)	(1,121,526)	283,988	(3,832,324)	(2,637,438)	(6,283,640)	(7,738,804)		Line 5
10	Over (Under) Recovery Ending Bal.	\$ 7,416,918	\$ 7,749,405	\$ 4,893,182	\$ 2,648,842	\$ 1,141,586	\$ (2,173,776)	\$ (3,295,302)	\$ (3,011,314)	\$ (6,843,638)	\$ (9,481,076)	\$ (15,764,716)	\$ (23,503,520)		Line 6 + Line 7 + Line 8
10	Over (Under) Recovery Average Bal.	\$ 7,707,868	\$ 7,583,162	\$ 6,321,294	\$ 3,771,012	\$ 1,895,214	\$ (516,095)	\$ (2,734,539)	\$ (3,153,308)	\$ (4,927,476)	\$ (6,162,357)	\$ (12,622,896)	\$ (19,634,118)		Line 6 + Line 7 + (Line 8 / 2)
<u>Carrying Charges</u>															
11	Carrying Charges, Monthly	\$ 5,989	\$ 5,507	\$ 4,615	\$ 3,232	\$ 1,722	\$ (477)	\$ (2,897)	\$ (3,490)	\$ (5,690)	\$ (9,328)	\$ (14,215)	\$ (25,204)		Line 10 x Line 15
12	Carrying Charges, Cumulative	\$ 5,989	\$ 11,496	\$ 16,111	\$ 19,343	\$ 21,065	\$ 20,588	\$ 17,691	\$ 14,201	\$ 8,511	\$ (817)	\$ (15,032)	\$ (40,236)	\$ (40,236)	Cumulative Line 11
13	Cumulative Over (Under) Recovery	\$ 7,422,907	\$ 7,760,901	\$ 4,909,293	\$ 2,668,185	\$ 1,162,651	\$ (2,153,188)	\$ (3,277,611)	\$ (2,997,113)	\$ (6,835,127)	\$ (9,481,893)	\$ (15,779,748)	\$ (23,543,756)	\$ (23,543,756)	Line 9 + Line 12
14	Annual Interest Rate	0.9324%	0.8714%	0.8761%	1.0286%	1.0902%	1.1083%	1.2714%	1.3280%	1.3857%	1.3713%	1.3514%	1.5403%	1.1798%	Treasury
15	Monthly Interest Rate	0.0777%	0.0726%	0.0730%	0.0857%	0.0909%	0.0924%	0.1060%	0.1107%	0.1155%	0.1143%	0.1126%	0.1284%		Line 14/ 12

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20028
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EWR Electric Cumulative Over (Under) Recovery (Total by Month)

<u>Line</u>	<u>(a)</u> <u>Description</u>	<u>(b)</u> <u>Jan</u>	<u>(c)</u> <u>Feb</u>	<u>(d)</u> <u>Mar</u>	<u>(e)</u> <u>Apr</u>	<u>(f)</u> <u>May</u>	<u>(g)</u> <u>Jun</u>	<u>(h)</u> <u>Jul</u>	<u>(i)</u> <u>Aug</u>	<u>(j)</u> <u>Sep</u>	<u>(k)</u> <u>Oct</u>	<u>(l)</u> <u>Nov</u>	<u>(m)</u> <u>Dec</u>	<u>(n)</u> <u>Total</u>
<u>Grand Total</u>														
1	Surcharge Revenue	\$ 6,388,943	\$ 5,910,231	\$ 5,672,208	\$ 5,537,419	\$ 5,381,987	\$ 5,650,372	\$ 6,159,575	\$ 8,268,743	\$ 7,815,705	\$ 7,704,875	\$ 7,626,518	\$ 7,942,776	\$ 80,059,352
2	Program Expenses	\$ 6,536,965	\$ 5,591,700	\$ 8,992,935	\$ 7,701,141	\$ 7,407,151	\$ 9,885,421	\$ 6,630,329	\$ 6,980,432	\$ 11,385,230	\$ 10,594,037	\$ 14,346,874	\$ 17,554,176	\$ 113,606,391
3	2009 - 2014 Low-Income Accounting Adjustment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
4	Annual Transfer of Low-Income Funding	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
5	Change in Over (Under) Recovery	\$ (148,022)	\$ 318,531	\$ (3,320,727)	\$ (2,163,722)	\$ (2,025,164)	\$ (4,235,049)	\$ (470,754)	\$ 1,288,311	\$ (3,569,525)	\$ (2,889,162)	\$ (6,720,356)	\$ (9,611,400)	\$ (33,547,039)
<u>Program Over/(Under) Recovery</u>														
6	Over (Under) Recovery Beg.Bal.	\$ 11,102,445	\$ 11,055,906	\$ 11,374,437	\$ 8,053,710	\$ 5,889,988	\$ 3,864,824	\$ (370,225)	\$ (840,979)	\$ 447,332	\$ (3,122,193)	\$ (6,011,355)	\$ (12,731,711)	
7	Prior Year Carrying Charges	101,483	-	-	-	-	-	-	-	-	-	-	-	
8	Change in Balance	(148,022)	318,531	(3,320,727)	(2,163,722)	(2,025,164)	(4,235,049)	(470,754)	1,288,311	(3,569,525)	(2,889,162)	(6,720,356)	(9,611,400)	
9	Over (Under) Recovery Ending Bal.	\$ 11,055,906	\$ 11,374,437	\$ 8,053,710	\$ 5,889,988	\$ 3,864,824	\$ (370,225)	\$ (840,979)	\$ 447,332	\$ (3,122,193)	\$ (6,011,355)	\$ (12,731,711)	\$ (22,343,111)	
10	Over (Under) Recovery Average Bal.	\$ 11,129,917	\$ 11,215,172	\$ 9,714,074	\$ 6,971,849	\$ 4,877,406	\$ 1,747,300	\$ (605,602)	\$ (196,824)	\$ (1,337,431)	\$ (4,566,774)	\$ (9,371,533)	\$ (17,537,411)	
<u>Carrying Charges</u>														
11	Carrying Charges, Monthly	\$ 8,648	\$ 8,144	\$ 7,092	\$ 5,975	\$ 4,432	\$ 1,613	\$ (641)	\$ (218)	\$ (1,544)	\$ (5,219)	\$ (10,554)	\$ (22,512)	
12	Carrying Charges, Cumulative	\$ 8,648	\$ 16,792	\$ 23,884	\$ 29,859	\$ 34,291	\$ 35,904	\$ 35,263	\$ 35,045	\$ 33,501	\$ 28,282	\$ 17,728	\$ (4,784)	\$ (4,784)
13	Cumulative Over (Under) Recovery	\$ 11,064,554	\$ 11,391,229	\$ 8,077,594	\$ 5,919,847	\$ 3,899,115	\$ (334,321)	\$ (805,716)	\$ 482,377	\$ (3,088,692)	\$ (5,983,073)	\$ (12,713,983)	\$ (22,347,895)	\$ (22,347,895)
14	Annual Interest Rate	0.9324%	0.8714%	0.8761%	1.0286%	1.0902%	1.1083%	1.2714%	1.3280%	1.3857%	1.3713%	1.3514%	1.5403%	1.1798%
15	Monthly Interest Rate	0.0777%	0.0726%	0.0730%	0.0857%	0.0909%	0.0924%	0.1060%	0.1107%	0.1155%	0.1143%	0.1126%	0.1284%	

MICHIGAN PUBLIC SERVICE COMMISSION

Consumers Energy Company

Case No.: U-20028

Exhibit No.: A-15 (SL-2)

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Witness: SLykhytska

Date: May 2018

EWR Gas Cumulative Over (Under) Recovery (By Class and Total)

<u>Line</u>	<u>Description</u>	(a) <u>Residential</u>	(b) <u>C&I</u>	(c) <u>Total</u>
<u>Annual Summary</u>				
1	Surcharge Revenue	\$ 25,810,031	\$ 12,152,483	\$ 37,962,514
2	Program Expenses	\$ 33,947,057	\$ 19,079,200	\$ 53,026,257
3	2009 - 2014 Low-Income Accounting Adjustment (1)	\$ 3,615,709	\$ (3,615,709)	\$ -
4	Annual Transfer of Low-Income Funding	\$ 2,863,876	\$ (2,863,876)	\$ -
5	Change in Over (Under) Recovery	\$ (1,657,441)	\$ (13,406,302)	\$ (15,063,743)
<u>Program Over/(Under) Recovery</u>				
6	Over (Under) Recovery Beginning Balance	\$ (4,825,340)	\$ 3,559,470	\$ (1,265,870)
7	Prior Year Carrying Charges	(1,132)	59,724	58,592
8	Change in Balance	(1,657,441)	(13,406,302)	(15,063,743)
9	Over (Under) Recovery Ending Balance	\$ (6,483,913)	\$ (9,787,108)	\$ (16,271,021)
<u>Carrying Charges</u>				
10	Carrying Charges, Cumulative	\$ (16,872)	\$ (717)	\$ (17,589)
11	Cumulative Over (Under) Recovery	\$ (6,500,785)	\$ (9,787,825)	\$ (16,288,610)
12	Annual Interest Rate	1.18%	1.18%	1.18%

Notes:

(1) The low-income accounting adjustment refunded to Residential customers is \$3,517,722. \$97,987 difference is due to a timing of billing and it will be eliminated in future billing periods. The cumulative difference is \$26,278.

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

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Date: May 2018

EWR Gas Cumulative Over (Under) Recovery (Residential by Month)

Line	(a) Description	(b) Jan	(c) Feb	(d) Mar	(e) Apr	(f) May	(g) Jun	(h) Jul	(i) Aug	(j) Sep	(k) Oct	(l) Nov	(m) Dec	(n) Total	(o) Source
<u>Residential</u>															
1	Surcharge Revenue	\$ 4,883,718	\$ 4,096,809	\$ 3,476,310	\$ 2,781,326	\$ 1,561,389	\$ 801,815	\$ 515,530	\$ 503,983	\$ 599,137	\$ 663,932	\$ 2,057,048	\$ 3,869,034	\$ 25,810,031	Per Books
2	Program Expenses	\$ 2,543,541	\$ 2,292,855	\$ 2,809,134	\$ 2,143,935	\$ 2,361,094	\$ 2,980,494	\$ 2,230,326	\$ 2,339,538	\$ 3,205,763	\$ 2,595,660	\$ 3,109,451	\$ 5,335,266	\$ 33,947,057	Per Books
3	2009 - 2014 Low-Income Accounting Adjustment	\$ 631,237	\$ 564,137	\$ 464,575	\$ 411,454	\$ 224,223	\$ 155,118	\$ 107,236	\$ 100,327	\$ 112,858	\$ 121,034	\$ 256,849	\$ 466,661	\$ 3,615,709	Per Books
4	Annual Transfer of Low-Income Funding	\$ 139,865	\$ 191,649	\$ 257,675	\$ 236,641	\$ 205,677	\$ 237,051	\$ 221,787	\$ 217,478	\$ 274,825	\$ 204,741	\$ 262,638	\$ 413,849	\$ 2,863,876	
5	Change in Over (Under) Recovery	\$ 3,111,279	\$ 2,559,740	\$ 1,389,426	\$ 1,285,486	\$ (369,805)	\$ (1,786,510)	\$ (1,385,773)	\$ (1,517,750)	\$ (2,218,943)	\$ (1,605,953)	\$ (532,916)	\$ (585,722)	\$ (1,657,441)	Line 1 - Line 2 + Line 3 + Line 4
<u>Program Over/(Under) Recovery</u>															
6	Over (Under) Recovery Beg.Bal.	\$ (4,825,340)	\$ (1,715,193)	\$ 844,547	\$ 2,233,973	\$ 3,519,459	\$ 3,149,654	\$ 1,363,144	\$ (22,629)	\$ (1,540,379)	\$ (3,759,322)	\$ (5,365,275)	\$ (5,898,191)		Line 9 Prior Month/Year
7	Prior Year Carrying Charges	(1,132)	-	-	-	-	-	-	-	-	-	-	-	-	Prior Year Ending
8	Change in Balance	3,111,279	2,559,740	1,389,426	1,285,486	(369,805)	(1,786,510)	(1,385,773)	(1,517,750)	(2,218,943)	(1,605,953)	(532,916)	(585,722)		Line 5
9	Over (Under) Recovery Ending Bal.	\$ (1,715,193)	\$ 844,547	\$ 2,233,973	\$ 3,519,459	\$ 3,149,654	\$ 1,363,144	\$ (22,629)	\$ (1,540,379)	\$ (3,759,322)	\$ (5,365,275)	\$ (5,898,191)	\$ (6,483,913)		Line 6 + Line 7 + Line 8
10	Over (Under) Recovery Average Bal.	\$ (3,270,833)	\$ (435,323)	\$ 1,539,260	\$ 2,876,716	\$ 3,334,557	\$ 2,256,399	\$ 670,258	\$ (781,504)	\$ (2,649,851)	\$ (4,562,299)	\$ (5,631,733)	\$ (6,191,052)		Line 6 + Line 7 + (Line 8 / 2)
<u>Carrying Charges</u>															
11	Carrying Charges, Monthly	\$ (2,541)	\$ (316)	\$ 1,124	\$ 2,465	\$ 3,031	\$ 2,085	\$ 710	\$ (865)	\$ (3,061)	\$ (5,215)	\$ (6,341)	\$ (7,949)		Line 10 x Line 15
12	Carrying Charges, Cumulative	\$ (2,541)	\$ (2,857)	\$ (1,733)	\$ 732	\$ 3,763	\$ 5,848	\$ 6,558	\$ 5,693	\$ 2,632	\$ (2,583)	\$ (8,924)	\$ (16,872)	\$ (16,872)	Cumulative Line 11
13	Cumulative Over (Under) Recovery	\$ (1,717,734)	\$ 841,690	\$ 2,232,240	\$ 3,520,191	\$ 3,153,417	\$ 1,368,992	\$ (16,071)	\$ (1,534,686)	\$ (3,756,690)	\$ (5,367,858)	\$ (5,907,115)	\$ (6,500,785)	\$ (6,500,785)	Line 9 + Line 12
14	Annual Interest Rate	0.9324%	0.8714%	0.8761%	1.0286%	1.0902%	1.1083%	1.2714%	1.3280%	1.3857%	1.3713%	1.3514%	1.5403%	1.1798%	Treasury
15	Monthly Interest Rate	0.0777%	0.0726%	0.0730%	0.0857%	0.0909%	0.0924%	0.1060%	0.1107%	0.1155%	0.1143%	0.1126%	0.1284%		Line 14/ 12

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Case No.: U-20028
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EW R Gas Cumulative Over (Under) Recovery (C&I by Month)

Line	(a) Description	(b) Jan	(c) Feb	(d) Mar	(e) Apr	(f) May	(g) Jun	(h) Jul	(i) Aug	(j) Sep	(k) Oct	(l) Nov	(m) Dec	(n) Total	(o) Source
<u>C&I</u>															
1	Surcharge Revenue	\$ 1,851,154	\$ 1,636,213	\$ 1,354,433	\$ 1,199,187	\$ 654,036	\$ 451,267	\$ 314,208	\$ 415,613	\$ 530,840	\$ 538,225	\$ 1,138,295	\$ 2,069,012	\$ 12,152,483	Per Books
2	Program Expenses	\$ 690,771	\$ 573,844	\$ 961,485	\$ 1,329,616	\$ 637,951	\$ 807,817	\$ 1,523,565	\$ 388,472	\$ 1,760,890	\$ 2,259,158	\$ 3,682,377	\$ 4,463,254	\$ 19,079,200	Per Books
3	2009 - 2014 Low-Income Accounting Adjustment	\$ (631,237)	\$ (564,137)	\$ (464,575)	\$ (411,454)	\$ (224,223)	\$ (155,118)	\$ (107,236)	\$ (100,327)	\$ (112,858)	\$ (121,034)	\$ (256,849)	\$ (466,661)	\$ (3,615,709)	Per Books
4	Annual Transfer of Low-Income Funding	<u>\$ (139,865)</u>	<u>\$ (191,649)</u>	<u>\$ (257,675)</u>	<u>\$ (236,641)</u>	<u>\$ (205,677)</u>	<u>\$ (237,051)</u>	<u>\$ (221,787)</u>	<u>\$ (217,478)</u>	<u>\$ (274,825)</u>	<u>\$ (204,741)</u>	<u>\$ (262,638)</u>	<u>\$ (413,849)</u>	<u>\$ (2,863,876)</u>	
5	Change in Over (Under) Recovery	\$ 389,281	\$ 306,583	\$ (329,302)	\$ (778,524)	\$ (413,815)	\$ (748,719)	\$ (1,538,380)	\$ (290,664)	\$ (1,617,733)	\$ (2,046,708)	\$ (3,063,569)	\$ (3,274,752)	\$ (13,406,302)	Line 1 - Line 2 + Line 3 + Line 4
<u>Program Over/(Under) Recovery</u>															
6	Over (Under) Recovery Beg.Bal.	\$ 3,559,470	\$ 4,008,475	\$ 4,315,058	\$ 3,985,756	\$ 3,207,232	\$ 2,793,417	\$ 2,044,698	\$ 506,318	\$ 215,654	\$ (1,402,079)	\$ (3,448,787)	\$ (6,512,356)		Line 9 Prior Month/Year
7	Prior Year Carrying Charges	\$ 59,724	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	Prior Year Ending
8	Change in Balance	<u>\$ 389,281</u>	<u>\$ 306,583</u>	<u>\$ (329,302)</u>	<u>\$ (778,524)</u>	<u>\$ (413,815)</u>	<u>\$ (748,719)</u>	<u>\$ (1,538,380)</u>	<u>\$ (290,664)</u>	<u>\$ (1,617,733)</u>	<u>\$ (2,046,708)</u>	<u>\$ (3,063,569)</u>	<u>\$ (3,274,752)</u>		Line 5
9	Over (Under) Recovery Ending Bal.	\$ 4,008,475	\$ 4,315,058	\$ 3,985,756	\$ 3,207,232	\$ 2,793,417	\$ 2,044,698	\$ 506,318	\$ 215,654	\$ (1,402,079)	\$ (3,448,787)	\$ (6,512,356)	\$ (9,787,108)		Line 6 + Line 7 + Line 8
10	Over (Under) Recovery Average Bal.	\$ 3,813,835	\$ 4,161,767	\$ 4,150,407	\$ 3,596,494	\$ 3,000,325	\$ 2,419,058	\$ 1,275,508	\$ 360,986	\$ (593,213)	\$ (2,425,433)	\$ (4,980,572)	\$ (8,149,732)		Line 6 + Line 7 + (Line 8 / 2)
<u>Carrying Charges</u>															
11	Carrying Charges, Monthly	\$ 2,963	\$ 3,021	\$ 3,030	\$ 3,082	\$ 2,727	\$ 2,235	\$ 1,352	\$ 400	\$ (685)	\$ (2,772)	\$ (5,608)	\$ (10,462)		Line 10 x Line 15
12	Carrying Charges, Cumulative	\$ 2,963	\$ 5,984	\$ 9,014	\$ 12,096	\$ 14,823	\$ 17,058	\$ 18,410	\$ 18,810	\$ 18,125	\$ 15,353	\$ 9,745	\$ (717)	\$ (717)	Cumulative Line 11
13	Cumulative Over (Under) Recovery	\$ 4,011,438	\$ 4,321,042	\$ 3,994,770	\$ 3,219,328	\$ 2,808,240	\$ 2,061,756	\$ 524,728	\$ 234,464	\$ (1,383,954)	\$ (3,433,434)	\$ (6,502,611)	\$ (9,787,825)	\$ (9,787,825)	Line 9 + Line 12
14	Annual Interest Rate	0.9324%	0.8714%	0.8761%	1.0286%	1.0902%	1.1083%	1.2714%	1.3280%	1.3857%	1.3713%	1.3514%	1.5403%	1.1798%	Treasury
15	Monthly Interest Rate	0.0777%	0.0726%	0.0730%	0.0857%	0.0909%	0.0924%	0.1060%	0.1107%	0.1155%	0.1143%	0.1126%	0.1284%		Line 14/ 12

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

EWR Gas Cumulative Over (Under) Recovery (Total by Month)

Case No.: U-20028
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Witness: SLYKHYTSKA
Date: May 2018

Line	(a) Description	(b) Jan	(c) Feb	(d) Mar	(e) Apr	(f) May	(g) Jun	(h) Jul	(i) Aug	(j) Sep	(k) Oct	(l) Nov	(m) Dec	(n) Total
Grand Total														
1	Surcharge Revenue	\$ 6,734,872	\$ 5,733,022	\$ 4,830,743	\$ 3,980,513	\$ 2,215,425	\$ 1,253,082	\$ 829,738	\$ 919,596	\$ 1,129,977	\$ 1,202,157	\$ 3,195,343	\$ 5,938,046	\$ 37,962,514
2	Program Expenses	\$ 3,234,312	\$ 2,866,699	\$ 3,770,619	\$ 3,473,551	\$ 2,999,045	\$ 3,788,311	\$ 3,753,891	\$ 2,728,010	\$ 4,966,653	\$ 4,854,818	\$ 6,791,828	\$ 9,798,520	\$ 53,026,257
3	2009 - 2014 Low-Income Accounting Adjustment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
4	Annual Transfer of Low-Income Funding	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
5	Change in Over (Under) Recovery	\$ 3,500,560	\$ 2,866,323	\$ 1,060,124	\$ 506,962	\$ (783,620)	\$ (2,535,229)	\$ (2,924,153)	\$ (1,808,414)	\$ (3,836,676)	\$ (3,652,661)	\$ (3,596,485)	\$ (3,860,474)	\$ (15,063,743)
Program Over/(Under) Recovery														
6	Over (Under) Recovery Beg.Bal.	\$ (1,265,870)	\$ 2,293,282	\$ 5,159,605	\$ 6,219,729	\$ 6,726,691	\$ 5,943,071	\$ 3,407,842	\$ 483,689	\$ (1,324,725)	\$ (5,161,401)	\$ (8,814,062)	\$ (12,410,547)	
7	Prior Year Carrying Charges	58,592	-	-	-	-	-	-	-	-	-	-	-	
8	Change in Balance	3,500,560	2,866,323	1,060,124	506,962	(783,620)	(2,535,229)	(2,924,153)	(1,808,414)	(3,836,676)	(3,652,661)	(3,596,485)	(3,860,474)	
9	Over (Under) Recovery Ending Bal.	\$ 2,293,282	\$ 5,159,605	\$ 6,219,729	\$ 6,726,691	\$ 5,943,071	\$ 3,407,842	\$ 483,689	\$ (1,324,725)	\$ (5,161,401)	\$ (8,814,062)	\$ (12,410,547)	\$ (16,271,021)	
10	Over (Under) Recovery Average Bal.	\$ 543,002	\$ 3,726,444	\$ 5,689,667	\$ 6,473,210	\$ 6,334,881	\$ 4,675,457	\$ 1,945,766	\$ (420,518)	\$ (3,243,063)	\$ (6,987,732)	\$ (10,612,305)	\$ (14,340,784)	
Carrying Charges														
11	Carrying Charges, Monthly	\$ 422	\$ 2,705	\$ 4,154	\$ 5,547	\$ 5,758	\$ 4,320	\$ 2,062	\$ (465)	\$ (3,746)	\$ (7,987)	\$ (11,949)	\$ (18,410)	
12	Carrying Charges, Cumulative	\$ 422	\$ 3,127	\$ 7,281	\$ 12,828	\$ 18,586	\$ 22,906	\$ 24,968	\$ 24,503	\$ 20,757	\$ 12,770	\$ 821	\$ (17,589)	\$ (17,589)
13	Cumulative Over (Under) Recovery	\$ 2,293,704	\$ 5,162,732	\$ 6,227,010	\$ 6,739,519	\$ 5,961,657	\$ 3,430,748	\$ 508,657	\$ (1,300,222)	\$ (5,140,644)	\$ (8,801,292)	\$ (12,409,726)	\$ (16,288,610)	\$ (16,288,610)
14	Annual Interest Rate	0.9324%	0.8714%	0.8761%	1.0286%	1.0902%	1.1083%	1.2714%	1.3280%	1.3857%	1.3713%	1.3514%	1.5403%	1.1798%
15	Monthly Interest Rate	0.0777%	0.0726%	0.0730%	0.0857%	0.0909%	0.0924%	0.1060%	0.1107%	0.1155%	0.1143%	0.1126%	0.1284%	

Case No.:	U-20028
Hearing Date:	10-3-2018
Exhibit No.:	A-16

MICHIGAN PUBLIC SERVICE COMMISSION

Consumers Energy Company

Case No.: U-20028

Exhibit No.: A-16 (SL-3)

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Witness: SLykhytska

Date: May 2018

2015 EWR Incentive Cumulative (Over)/Under Recovery

Month	Year	Current Month Collection	Prior Month Cumulative (Over)/Under Collection
(a)	(b)	(c)	(d)
2015 EWR Incentive Regulatory Asset Balance			16,936,702
1 January	2017	(2,000,045)	14,936,657
2 February	2017	(1,804,898)	13,131,759
3 March	2017	(1,634,368)	11,497,391
4 April	2017	(1,489,196)	10,008,195
5 May	2017	(1,200,318)	8,807,877
6 June	2017	(1,099,552)	7,708,325
7 July	2017	(1,115,721)	6,592,604
8 August	2017	(1,108,738)	5,483,866
9 September	2017	(1,055,462)	4,428,404
10 October	2017	(1,051,462)	3,376,942
11 November	2017	(1,284,482)	2,092,459
12 December	2017	(1,677,429)	415,031
13 January	2018	(15,265)	399,765
14 February	2018	(1,254)	398,511
15 March	2018	(381)	398,130
16 April	2018	(145)	397,985
			(16,538,717)

Consumers Energy Company

Date: May 2018

Month	Year	Current Month Collection	Prior Month Cumulative (Over)/Under Collection
(a)	(b)	(c)	(d)
2015 EWR Incentive Regulatory Asset Balance			11,173,217
1 January	2017	(1,003,949)	10,169,268
2 February	2017	(950,693)	9,218,575
3 March	2017	(914,686)	8,303,889
4 April	2017	(893,829)	7,410,060
5 May	2017	(869,513)	6,540,547
6 June	2017	(910,802)	5,629,746
7 July	2017	(991,544)	4,638,201
8 August	2017	(995,785)	3,642,416
9 September	2017	(922,344)	2,720,072
10 October	2017	(906,359)	1,813,713
11 November	2017	(890,311)	923,402
12 December	2017	(943,841)	(20,439)
13 January	2018	(7,643)	(28,082)
14 February	2018	(512)	(28,594)
15 March	2018	70	(28,524)
16 April	2018	(63)	(28,587)
(11,201,804)			

MICHIGAN PUBLIC SERVICE COMMISSIONConsumers Energy Company

Case No.: U-20028

Exhibit No.: A-16 (SL-3)

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Witness: SLykhyska

Date: May 2018

2015 EWR Gas Incentive Cumulative (Over)/Under Recovery

Month	Year	Current Month Collection	Prior Month Cumulative (Over)/Under Collection
(a)	(b)	(c)	(d)
2015 EWR Incentive Regulatory Asset Balance			5,763,485
1 January	2017	(996,096)	4,767,389
2 February	2017	(854,205)	3,913,184
3 March	2017	(719,682)	3,193,502
4 April	2017	(595,367)	2,598,135
5 May	2017	(330,805)	2,267,330
6 June	2017	(188,750)	2,078,580
7 July	2017	(124,177)	1,954,402
8 August	2017	(112,953)	1,841,449
9 September	2017	(133,118)	1,708,331
10 October	2017	(145,103)	1,563,228
11 November	2017	(394,171)	1,169,057
12 December	2017	(733,588)	435,469
13 January	2018	(7,622)	427,847
14 February	2018	(742)	427,105
15 March	2018	(451)	426,654
16 April	2018	(82)	426,572
			(5,336,913)

Self-Direct Option for Large Business Customers

Overview

A total of seven large electric customers chose to opt out of participating in Consumers Energy Company's ("Consumers Energy" or the "Company") energy efficiency programs and, instead, self-direct their own energy efficiency projects. These customers were required to design and submit plans to achieve energy savings equal to or greater than the statutory requirements.

Eligibility Requirements

To be eligible for the self-direct option, a customer was required to have a single account with greater than one megawatt (MW) of demand or an aggregation of several accounts with greater than five MWs of demand.

Customer Enrollment

One, one-month open enrollment period was held for plan year 2017 starting June 15, 2016. Eligible customers were notified with an on-bill message, and existing self-direct customers with expiring plans were mailed information in May, 2016. The plan application form and other useful self-direct program information was posted on the Michigan Public Service Commission and Company websites.

Energy Savings

Participating customers submitted self-direct plans totaling 5,019 MWh in electric savings for 2017. This total was counted towards Consumers Energy's overall portfolio savings goals.

2017 Self-Direct Program Planned Savings

Projected savings from measures to be implemented under a self-directed plan (cumulative summary of planned savings):

	Number of Customer Plans Participating	Approximate Number of Accounts (sites)	2017 Minimum Saving MWh	2017 Planned Saving MWh	2017 Annual Based Usage MWh
2017 Planned Savings	7	233	4,718	4,629	471,777

Full Terminations*

Company Number	Number of Sites Terminated	Termination Approval Date	2017 Minimum Savings MWh	2017 Planned Saving MWh
#1	1	2/21/2017	187	187

* Terminations effective 12/31/17 do not change 2017 savings.

Partial Terminations

Company Number	Number of Sites Terminated	Termination Approval Date	2017 Minimum Savings MWh	2017 Planned Saving MWh	2017 Amended Minimum Saving MWh	2017 Amended Plan Saving MWh
NONE						

Amended Planned Savings*

Company	Number of Customers Participating	Approximate Number of Accounts (sites)	2017 Minimum Saving MWh	2017 Planned Saving MWh	2017 Annual Based Usage MWh
NONE					

* Terminations effective 12/31/17 do not change 2017 values. Savings are annual as reported on amended plans.

2017 Annual Report Results

Customer-prepared annual progress reports of implemented energy savings covering year 2017 are summarized in the tables below. Seven reports were required from customers on March 1, 2018, covering year 2017. Of these reports; one report was deficient, one report was not submitted by customer who terminated early in 2017.

a.) Total Implemented Savings

Plan Year	Number of Annual Reports	Minimum Savings MWh	Planned Savings MWh	Reported Savings MWh
2017	5	4,141	4,629	5,019

b.) 2017 Implemented Savings that are below the minimum standard

Customer Number	Minimum Savings MWh	Reported Savings MWh

c.) 2017 Unreported Savings

Customer Number	2017 Minimum Savings MWh	Cause
#1	390	Deficient report
#2	187	Customer terminated – did not submit

MICHIGAN PUBLIC SERVICE COMMISSIONConsumers Energy Company**EWR Electric Investment**

Case No.: U-20028

Exhibit No.: A-18 (JPS-1)

Page: 1 of 1

Witness: JPSchwartz

Date: May 2018

Case No.: U-20028
Hearing Date: 10-3-2018
Exhibit No.: A-18

	(a)	(b)	(c)	(e)
<u>Line</u>	<u>Description</u>	<u>Residential</u>	<u>C&I</u>	<u>Total</u>
<u>Investment Summary</u>				
1	Program Investments	\$ 30,622,997	\$ 66,614,259	\$ 97,237,256
2	Administration (allocated)	\$ 2,763,345	\$ 4,414,403	\$ 7,177,748
3	Education & Awareness (allocated)	\$ 1,320,367	\$ 2,109,255	\$ 3,429,622
4	Evaluation, Measurement and Verification (allocated)	\$ 1,781,766	\$ 2,846,345	\$ 4,628,111
5	Database (allocated)	\$ 388,671	\$ 620,897	\$ 1,009,568
6	Total Electric Investments	<u>\$ 36,877,147</u>	<u>\$ 76,605,158</u>	<u>\$ 113,482,306</u>

MICHIGAN PUBLIC SERVICE COMMISSIONConsumers Energy Company**EWR Gas Investment**

Case No.: U-20028

Exhibit No.: A-19 (JPS-2)

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Witness: JPSchwartz

Date: May 2018

Case No.: U-20028
Hearing Date: 10-3-2018
Exhibit No.: A-19

<u>Line</u>	<u>(a)</u> <u>Description</u>	<u>(b)</u> <u>Residential</u>	<u>(c)</u> <u>C&I</u>	<u>(e)</u> <u>Total</u>
<u>Investment Summary</u>				
1	Program Investments	\$ 29,220,320	\$ 17,703,534	\$ 46,923,854
2	Administration (allocated)	\$ 1,850,037	\$ 570,830	\$ 2,420,867
3	Education & Awareness (allocated)	\$ 1,237,661	\$ 381,922	\$ 1,619,583
4	Evaluation, Measurement and Verification (allocated)	\$ 1,192,878	\$ 368,063	\$ 1,560,941
5	Database (allocated)	\$ 260,212	\$ 80,289	\$ 340,501
6	Total Gas Investments	<u>\$ 33,761,109</u>	<u>\$ 19,104,637</u>	<u>\$ 52,865,746</u>

MICHIGAN PUBLIC SERVICE COMMISSION

Consumers Energy Company

Case No.: U-20028

Exhibit No.: A-20 (JPS-3)

Page: 1 of 1

Witness: JPSchwanitz

Date: May 2018

Case No.:	U-20028
Hearing Date:	10-3-2018
Exhibit No.:	A-20

EWR Carry Over Funding

	(a)	(b)	(c)	(d)
<u>Line</u>	<u>Description</u>	<u>2016 Actual</u>	<u>2016 Plan U-17771</u>	<u>Variance (Carry Over)</u>
<u>2016 Investment Summary</u>				
1	Residential Electric Investment	\$ 35,938,748	\$ 36,010,487	\$ 71,739
2	Residential Gas Investment	\$ 32,547,826	\$ 32,575,052	\$ 27,226
3	C&I Electric Investment	\$ 41,277,184	\$ 41,337,460	\$ 60,277
4	C&I Gas Investment	\$ 11,719,743	\$ 12,367,199	\$ 647,456
5	Total Investment	<u>\$ 121,483,500</u>	<u>\$ 122,290,198</u>	<u>\$ 806,698</u>
<u>2017 Investment Summary</u>				
		<u>2017 Actual</u>	<u>2017 Plan U-17771</u>	<u>Variance (Carry Over)</u>
6	Residential Electric Investment	\$ 36,877,147	\$ 37,280,570	\$ 403,423
7	Residential Gas Investment	\$ 33,761,109	\$ 34,729,612	\$ 968,503
8	C&I Electric Investment	\$ 76,605,158	\$ 76,721,709	\$ 116,551
9	C&I Gas Investment	\$ 19,104,637	\$ 19,105,822	\$ 1,185
10	Total Investment	<u>\$ 166,348,052</u>	<u>\$ 167,837,714</u>	<u>\$ 1,489,662</u>
<u>Total Investment Summary</u>				
		<u>2 Year Actual Total</u>	<u>2 Year Plan Total</u>	<u>Variance (Carry Over)</u>
11	Residential Electric Investment	\$ 72,815,895	\$ 73,291,057	\$ 475,162
12	Residential Gas Investment	\$ 66,308,935	\$ 67,304,664	\$ 995,730
13	C&I Electric Investment	\$ 117,882,342	\$ 118,059,169	\$ 176,828
14	C&I Gas Investment	\$ 30,824,380	\$ 31,473,021	\$ 648,641
15	Total Investment	<u>\$ 287,831,551</u>	<u>\$ 290,127,912</u>	<u>\$ 2,296,361</u>

MICHIGAN PUBLIC SERVICE COMMISSION

Consumers Energy Company

Case No.: U-20028
Hearing Date: 10-3-2018
Exhibit No.: A-21

Case No.: U-20028
Exhibit No.: A-21 (JPS-4)
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Witness: JPSchwanitz
Date: May 2018

EWR Financial Incentive Calculation

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
Line	Description	Less 2016 Trailing Costs	January	February	March	April	May	June	July	August	September	October	November	December	Plus 2017 Trailing Cost	Total
Investment Summary (by month)																
1	Electric Investments	\$ (51,090)	\$ 6,536,161	\$ 5,591,517	\$ 8,995,495	\$ 7,711,562	\$ 7,394,170	\$ 9,885,421	\$ 6,630,329	\$ 6,980,432	\$ 11,385,230	\$ 10,594,037	\$ 14,346,874	\$ 17,554,176	\$ (72,009)	\$ 113,482,306
2	Gas Investments	\$ (20,484)	\$ 3,234,411	\$ 2,866,026	\$ 3,771,628	\$ 3,459,561	\$ 3,012,026	\$ 3,788,311	\$ 3,753,891	\$ 2,728,010	\$ 4,966,653	\$ 4,854,818	\$ 6,791,828	\$ 9,798,521	\$ (139,453)	\$ 52,865,746
3	Total Investments	<u>\$ (71,574)</u>	<u>\$ 9,770,572</u>	<u>\$ 8,457,543</u>	<u>\$ 12,767,123</u>	<u>\$ 11,171,123</u>	<u>\$ 10,406,196</u>	<u>\$ 13,673,732</u>	<u>\$ 10,384,219</u>	<u>\$ 9,708,442</u>	<u>\$ 16,351,883</u>	<u>\$ 15,448,855</u>	<u>\$ 21,138,702</u>	<u>\$ 27,352,696</u>	<u>\$ (211,461)</u>	<u>\$ 166,348,052</u>
Financial Incentive Summary (% of Investment)																
4	Electric Incentive @ 15% (prorated 19 days of April)	\$ (7,664)	\$ 980,424	\$ 838,728	\$ 1,349,324	\$ 732,598	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,893,411
5	Electric Incentive @ 20% (prorated 11 days of April)	\$ -	\$ -	\$ -	\$ -	\$ 565,515	\$ 1,478,834	\$ 1,977,084	\$ 1,326,066	\$ 1,396,086	\$ 2,277,046	\$ 2,118,807	\$ 2,869,375	\$ 3,510,835	\$ (14,402)	\$ 17,505,247
6	Total Electric Incentive	<u>\$ (7,664)</u>	<u>\$ 980,424</u>	<u>\$ 838,728</u>	<u>\$ 1,349,324</u>	<u>\$ 1,298,113</u>	<u>\$ 1,478,834</u>	<u>\$ 1,977,084</u>	<u>\$ 1,326,066</u>	<u>\$ 1,396,086</u>	<u>\$ 2,277,046</u>	<u>\$ 2,118,807</u>	<u>\$ 2,869,375</u>	<u>\$ 3,510,835</u>	<u>\$ (14,402)</u>	<u>\$ 21,398,658</u>
7	Gas Incentive @ 15% (prorated 19 days of April)	\$ (3,073)	\$ 485,162	\$ 429,904	\$ 565,744	\$ 328,658	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,806,396
8	Gas Incentive @ 20% (prorated 11 days of April)	\$ -	\$ -	\$ -	\$ -	\$ 253,701	\$ 602,405	\$ 757,662	\$ 750,778	\$ 545,602	\$ 993,331	\$ 970,964	\$ 1,358,366	\$ 1,959,704	\$ (27,891)	\$ 8,164,622
9	Total Gas Incentive	<u>\$ (3,073)</u>	<u>\$ 485,162</u>	<u>\$ 429,904</u>	<u>\$ 565,744</u>	<u>\$ 582,360</u>	<u>\$ 602,405</u>	<u>\$ 757,662</u>	<u>\$ 750,778</u>	<u>\$ 545,602</u>	<u>\$ 993,331</u>	<u>\$ 970,964</u>	<u>\$ 1,358,366</u>	<u>\$ 1,959,704</u>	<u>\$ (27,891)</u>	<u>\$ 9,971,017</u>
10	Total Incentive	<u>\$ (10,736)</u>	<u>\$ 1,465,586</u>	<u>\$ 1,268,631</u>	<u>\$ 1,915,068</u>	<u>\$ 1,880,472</u>	<u>\$ 2,081,239</u>	<u>\$ 2,734,746</u>	<u>\$ 2,076,844</u>	<u>\$ 1,941,688</u>	<u>\$ 3,270,377</u>	<u>\$ 3,089,771</u>	<u>\$ 4,227,740</u>	<u>\$ 5,470,539</u>	<u>\$ (42,292)</u>	<u>\$ 31,369,675</u>

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Consumers Energy Company

Case No.: U-20028
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Calculation of Energy Waste Reduction Plan Component Surcharges

Line No.	(a) <u>Customer Group</u>	(b) Charge <u>Basis</u>	(c)	(d)
			U-18261 Monthly EWR Plan Component <u>Surcharge, Current</u>	U-20028 Monthly EWR Plan Component <u>Surcharge, Proposed</u>
1	Residential	(\$/kWh)	\$0.002724	\$0.002724
2	Small Secondary (0 to 1,250 kWhs per month)	(\$/mo)	3.00	3.88
3	Medium Secondary (1,251 to 5,000 kWhs per month)	(\$/mo)	16.92	21.92
4	Large Secondary (above 5,000 kWhs per month)	(\$/mo)	104.25	135.04
5	Small Primary (0 to 5,000 kWhs per month)	(\$/mo)	6.97	4.66
6	Small Medium Primary (5,001 to 10,000 kWhs per month)	(\$/mo)	53.64	35.80
7	Medium Primary (10,001 to 30,000 kWhs per month)	(\$/mo)	138.67	190.36
8	Large Medium Primary (30,001 to 50,000 kWhs per month)	(\$/mo)	266.44	510.57
9	Large Primary (above 50,000 kWhs per month)	(\$/mo)	1,409.98	870.54
10	Lighting	Fixt	0.27	0.27

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Electric EWR Surcharge Incentive Component
 Calculated Without Interest and Collected over 12 Months

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 Exhibit No.: A-23 (SAS-2)
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<u>Line</u>	<u>Description</u>	<u>Low-Income Cost Responsibility (1)</u> (\$)	<u>Proration Factor (2)</u>	<u>Surcharge Obligation (3)</u> (\$)	<u>Customer Group Surcharge Annual Determinants (4)</u> (kWh or Cust.) (5)	<u>Monthly Electric EWR Surcharge Incentive Component</u> (per kWh or Cust.) (5)
	(a)	(b)	(c)	(d)	(e)	(f)
1	Residential	\$1,137,909	0.3047	\$ 6,511,772	12,249,888,000	\$ 0.000532
2	Small Secondary	156,286	0.0419	\$ 894,358	1,731,243	\$ 0.52
3	Medium Secondary	274,130	0.0734	\$ 1,568,730	537,873	\$ 2.92
4	Large Secondary	988,291	0.2646	\$ 5,655,571	315,787	\$ 17.91
5	Small Primary	1,112	0.0003	\$ 6,361	5,431	\$ 1.17
6	Sm. Med. Primary	3,453	0.0009	\$ 19,759	2,191	\$ 9.02
7	Medium Primary	22,142	0.0059	\$ 126,708	5,444	\$ 23.27
8	Lg. Med. Primary	35,792	0.0096	\$ 204,824	4,605	\$ 44.48
9	Large Primary	<u>1,115,229</u>	<u>0.2986</u>	<u>\$ 6,381,988</u>	28,404	\$ 224.69
10	Total	\$3,734,342	1.0000	\$ 21,370,071 (6)		

(1) Case No. U-18261, WP-SAS-4, Year 2017

(2) Proration factor developed per customer group share (col. b, lines 1-9) of total (col. b, line 10).

(3) Customer group surcharge obligation based on customer group share (col. c, lines 1-9) of total obligation (col. d, line 10).

(4) Case No U-18261 WP-SAS-6, WP-SAS-7, WP-SAS-8

(5) Residential group surcharge on a \$/kWh basis, while C&I customer surcharge on a \$/customer meter basis.

(6) Surcharge obligation of \$21,398,658 per Exhibit A-20 (JPS-3) less 2015 Over-Recovery of \$28,587.26 per Exhibit A-16 (SL-3), pg 2

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20028
Exhibit No.: A-24 (SAS-3)
Page: 1 of 1
Witness: SASmith
Date: May 2018

Gas EWR Surcharge Incentive Component
Calculated Without Interest and Collected over 12 Months

<u>Line</u>	<u>Description</u>	<u>Low-Income Cost Responsibility (1)</u> (b)	<u>Proration Factor (2)</u> (c)	<u>Surcharge Obligation (3)</u> (d)	<u>Customer Group Surcharge Annual Determinants (4)</u> (e)	<u>Monthly Gas EWR Surcharge Incentive Component</u> (f)
	(a)	(b)	(c)	(d)	(e)	(f)
1	Residential	\$4,537,411	0.6180	\$ 6,425,270	159,624,000	\$ 0.0403
2	Small C&I (< 100,000 Mcf)	2,748,236	0.3743	\$ 3,891,681	87,267,723	\$ 0.0446
4	Large C&I (> 100,000 Mcf)	<u>56,945</u>	<u>0.0078</u>	<u>\$ 80,638</u>	54,347,162	\$ 0.0015
5	Total	\$7,342,593	1.0000	\$ 10,397,589 (5)		

(1) Case No. U-18261, WP-SAS-4, Year 2017

(2) Proration factor developed per customer group share (col. b, lines 1-3) of total (col. b, line 4).

(3) Customer group surcharge obligation based on customer group share (col. c, lines 1-3) of total obligation (col. d, line 4).

(4) Case No U-18261, WP-SAS-13

(5) Surcharge obligation of \$9,971,017 per Exhibit A-20 (JPS-3) plus 2015 Under-Recovery of \$426,572.24 per Exhibit A-16 (SL-3), pg 3