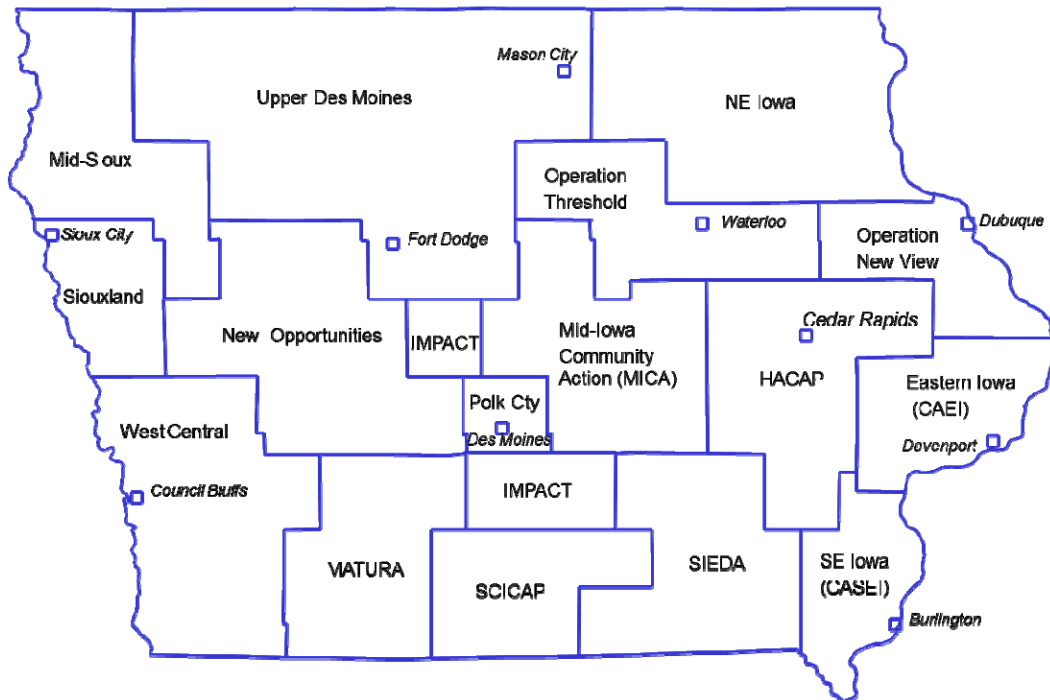


# REPORT ON THE IMPACTS AND COSTS OF THE IOWA LOW-INCOME WEATHERIZATION PROGRAM -- Calendar Year 2020

October 5, 2021

## Iowa Local Weatherization Agencies



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Calendar Year 2020**

**October 5, 2021**

**Prepared for the  
Iowa Statewide Low-Income Collaborative**

**by**

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## EXECUTIVE SUMMARY

This report summarizes the state and utility low-income weatherization program activity for low-income dwellings weatherized to completion in Iowa during calendar year 2020 through the Iowa Weatherization Assistance Program. The report includes state, utility, and agency summaries of spending and impacts by measure, end-use, and fuel type. The base data consists of statewide program tracking databases of spending and measure installations maintained by the Iowa Division of Community Action Agencies. Fuel consumption histories were provided by the three co-funding utilities, including by Black Hills Energy, Interstate Power and Light Company, and MidAmerican Energy.

We estimated energy and coincident demand impacts for the program participants by using algorithms developed as part of the study of the calendar year 2007 program<sup>1</sup>. The estimated impacts were adjusted using billing analysis of the program clients.

## PROGRAM COSTS AND IMPACTS

The WAP program spent \$9,220,424 for materials, labor, and support while installing measures in 579 dwellings during calendar year (CY) 2020. Funding decreased by 37.7% from the prior year while completions declined by 47.0%. Federal and state funding accounted for 77.5% of overall expenditures while utilities funded the remaining 22.5%.

The major measures installed by the program were essentially unchanged from the previous year. The program expenditures for materials, labor, and support averaged \$15,925 compared to \$13,553 in the prior year (a 17.5% increase). The increased expenditures were largely attributed to new COVID 19 related expenditures -- costs would have increased by 5.6% absent the COVID 19 related expenditures.

First-year savings totaled 102,440 therms; 388,770 kWh electricity; 18,570 gallons of propane; and 292 gallons of fuel oil. First-year peak demand savings totaled 1,099 therms, 104 kW summer demand, and 118 kW winter demand.

Electricity savings averaged 671 kWh for 579 dwellings with electricity impacts. The program saved an average of 227 therms of natural gas for 452 dwellings with gas impacts. In addition, the program

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<sup>1</sup> Dalhoff Associates, LLC. Report on the Impacts and Costs of the Iowa Low-Income Weatherization Program – Calendar Year 2007, October 15, 2008.

delivered first-year savings of 254 gallons of propane in 73 dwellings with propane impacts, and 146 gallons of fuel oil in 2 dwellings with fuel oil impacts.

First-year client energy cost savings totaled \$142,425, averaging \$246 per housing unit.

	Electricity (kWh and kW)			Natural Gas (therms)			Propane (gals)	Fuel Oil (gals)
	Overall	DCAA	Utility	Overall	DCAA	Utility	DCAA	DCAA
<b>Energy</b>	388,770	168,710	220,060	102,440	39,080	63,360	18,570	292
<b>Summer Demand</b>	104	43	60	NA	NA	NA	NA	NA
<b>Winter Demand</b>	118	51	67	1,099	412	687	NA	NA

**Average Impacts<sup>1</sup> per Dwelling (for those receiving measures with a given fuel type)**

	Electricity (kWh)			Natural Gas (therms)			Propane (gals)	Fuel Oil (gals)
	Overall	DCAA	Utility	Overall	DCAA	Utility	DCAA	DCAA
<b>Energy</b>	671	293	575	227	87	187	254	146
<b>Summer Demand</b>	0.179	0.075	0.157	NA	NA	NA	NA	NA
<b>Winter Demand</b>	0.204	0.089	0.174	2.4	0.9	2.0	NA	NA

**Expenditures and First Year Client Fuel Bill Savings**

Totals	Overall	DCAA	Utility	Averages	Overall	DCAA	Utility
<b>Expenditures<sup>2</sup></b>	\$9,220,424	\$7,145,395	\$2,075,029	<b>Expenditures</b>	\$15,925	\$12,341	\$4,738
<b>Client Fuel Savings</b>	\$142,425	\$73,451	\$68,974	<b>Client Fuel Savings</b>	\$246	\$127	\$157

<sup>1</sup> Average impacts are for dwellings that received the measures, and so the averages of the Utility and DCAA will not total to the statewide average

<sup>2</sup> Measure expenditures, excludes utility admin expenses

## UTILITY EXPENDITURES AND IMPACTS

Three major investor-owned gas and electric utilities co-fund the low-income weatherization program in Iowa. These utilities, which include Alliant-IPL, MidAmerican Energy, and Black Hills Energy, contributed \$2,075,029, accounting for 22.5% of total program expenditures. The utility expenditures averaged \$4,738 for the 438 dwellings that received utility-funded measures.

Utility-funded measures saved a total of 220,060 kWh, averaging of 575 kWh of electricity for the 383 dwellings with utility-funded electricity measures. Utility funded measures also saved a total of 63,360 therms, averaging 187 therms for the 339 dwellings with utility-funded natural gas measures. Utility-funded measures reduced peak electricity demand by 60 kW in the summer and 67 kW in the winter, and provided 687 peak-day therms of gas savings. Utility-funded measures accounted for 57% of program electricity savings and 62% of program gas savings.

Utility-funded measures yielded first-year client bill savings of \$68,974, averaging \$157 per dwelling that received utility-funded efficiency measures. Electricity bill savings averaged \$66 per household for



utility-funded electricity measures. Gas bill savings averaged \$129 for those with utility-funded gas measures.

## FUEL CONSUMPTION ANALYSIS RESULTS

Natural gas savings for single family site-built dwellings averaged 224 therms  $\pm$  36 at 90% confidence. This represents a 22.7% savings  $\pm$  3.2% at 90% confidence for natural gas measures. Mobile home savings averaged 189 therms  $\pm$  107 at 90% confidence, equating to a 20.2% savings  $\pm$  10.8%.

Electricity savings averaged 2,492 kWh  $\pm$  3,639 for fifteen dwellings in our analysis with electric main heat (12.3% savings), and 617 kWh  $\pm$  637 (6.4% savings) for 258 dwellings in our analysis that are heated with other fuels.

The observed impacts were used to adjust energy savings that had been previously estimated for each unit. The unit-specific energy savings for natural gas savings were estimated using measure-specific algorithms developed for the CY 2007 program, and then adjusted based upon a billing analysis of the weatherization clients. Electricity savings were estimated for all dwellings using measure-specific algorithms developed from savings of the 2005 and 2006 program. The algorithms were subsequently updated using a billing analysis of electricity impacts of the 2012 and 2013 programs. These measure-specific algorithms allow for custom estimates of impacts for each housing unit.

The observed unit-specific impacts from the billing analyses were compared to the unit-specific estimated impacts, providing a ratio of observed to estimated impacts. These ratios were used to adjust the estimated impacts of every unit.

## CHANGES IN PROGRAM DELIVERY AND REPORTING

There were no significant changes in major shell and heating system measure delivery as compared to the previous year. Water heater replacements were funded by DCAA only during this period whereas in the past the utilities would fund some installations of this measure. Heat pump water heaters and ac replacements were added during the year though few were installed.

The COVID 19 pandemic triggered a pause in the program during the middle of 2020. Upon startup, additional costs for personal protective equipment (PPE) and support costs pertaining to the pandemic were added. Pandemic-related impacts to program implementation are discussed in a new sub-section entitled Program Impacts Related to COVID 19 at the end of Section 1 of the report.

The weatherization agency New View ceased operations on 10-1-2020.

Agency impact tables have been included in this report in Section 4 entitled Spending and Impact Profiles by Agency. Summary impacts and spending are provided for each weatherization agency.

## **Organization of the Report**

Section 1: Summary of Program Impacts and Expenditures, provides the overall findings of the study, and relates these to prior year results. In addition, it provides broad summaries of impacts and costs for the agencies.

Section 2: Fuel Consumption Analysis and Assessment of Agency-Level Savings Adjustment Factors, details the methodology and results of the fuel consumption analysis. A standard comparison-adjusted pre/post weather-normalization methodology was used to assess impacts.

Section 3: Detailed Spending and Impact Profiles by Funding Entity provides detailed result tables for the overall program, state funding, and for each of the three funding utilities. These tables include counts of installations and totals and average energy savings, demand impacts, and program expenditures by measure.

Section 4: Spending and Impact Profiles by Agency provides aggregate totals of installations, spending, and energy and demand impacts.

Appendix A provides a characterization of households and dwellings weatherized during 2020.

Appendix B provides tabular data of selected charts in Section 1 of the report.

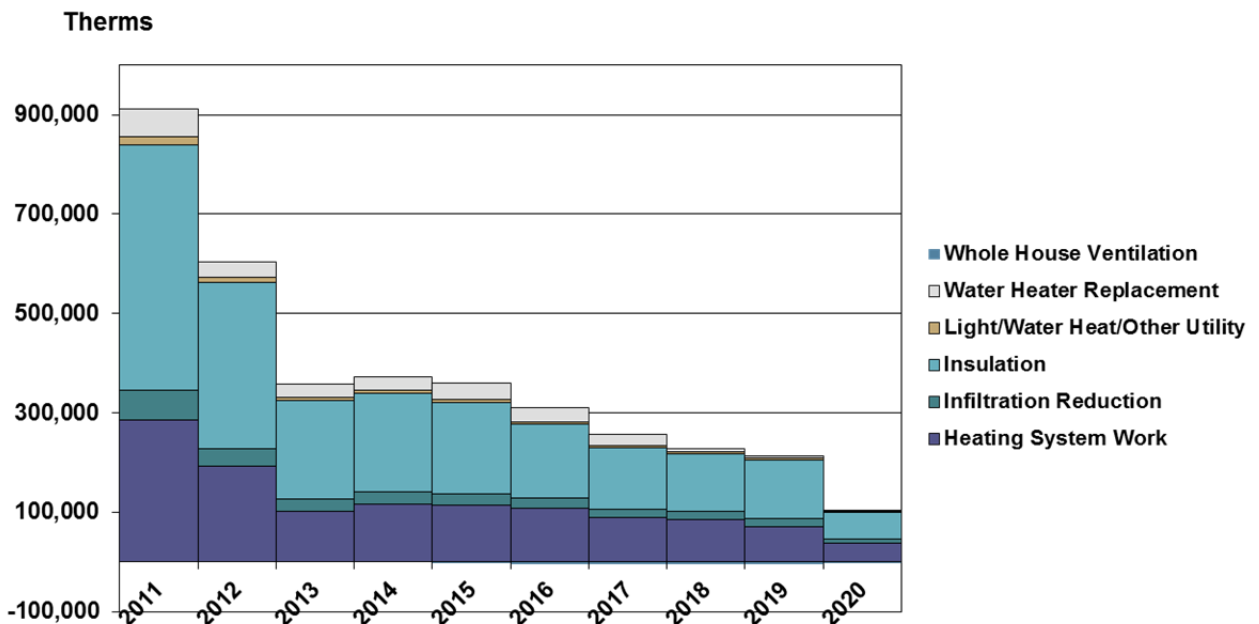
## 1. SUMMARY OF PROGRAM IMPACTS AND EXPENDITURES

This section begins with impacts and expenditures for the overall program, followed by results attributed to utility funding. Various agency-level results and measure-specific results are presented in the final part.

### PROGRAM SAVINGS AND EXPENDITURES

A total of 579 dwelling units were weatherized to completion during calendar year (CY) 2020, compared to 1,092 in the prior program year. First-year savings totaled 102,439 therms; 388,770 kWh electricity; 18,570 gallons of propane; and 292 gallons of fuel oil. First-year peak demand savings totaled 1,099 peak-day therms, 104 kW summer demand, and 118 kW winter demand.

First year natural gas savings are shown for the past ten years, by major measure groups in Figure 1.1 (historical data is listed in Appendix B as Fig 1.1).



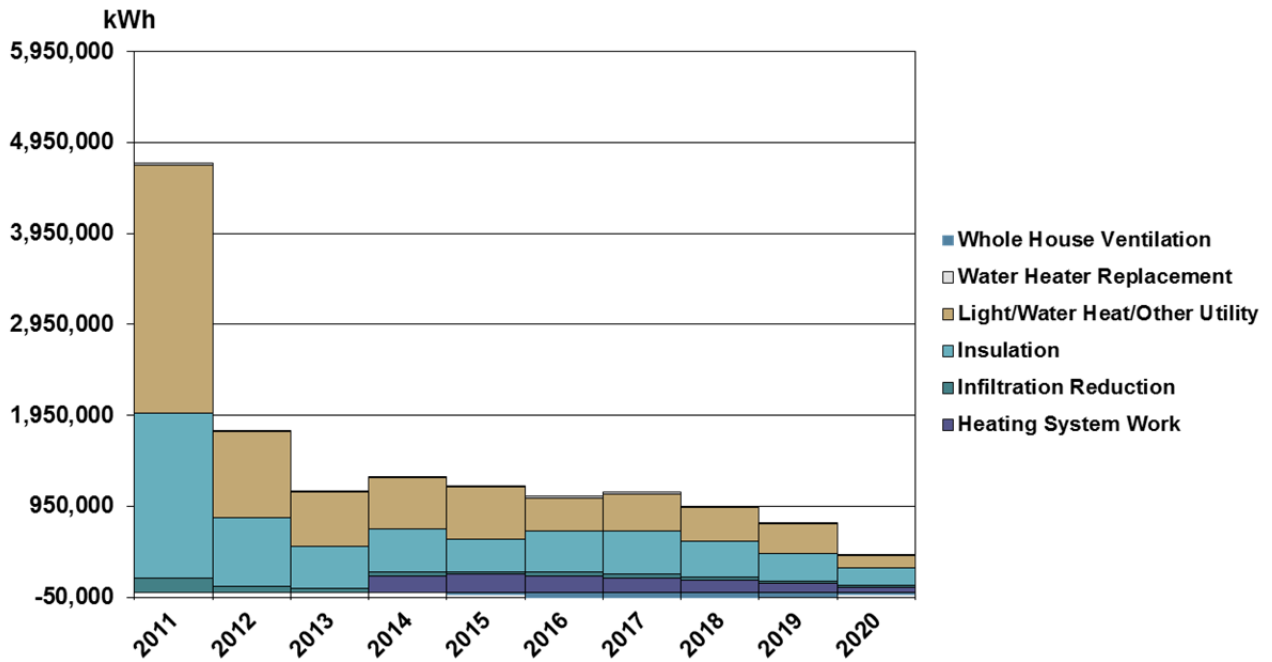
**Figure 1.1 First Year Energy Savings (therms) – Program**

Taken together, insulation, infiltration reduction, and heating system replacement work accounted for 98% of gas savings (Table 1.1). Note that the portion of infiltration reduction savings (7.0% of gas savings) shown here is attributed to weather-stripping and leak sealing -- the bulk of air leakage savings are allocated to dense packed wall and cavity insulation and are included in insulation savings shown for those measures.

**Table 1.1 Gas Measure Savings by Major Measure Category**

Measure Group	Savings (therms)	Percentage
Heating System Work	38,370	37.5%
Infiltration Reduction	7,148	7.0%
Insulation	54,818	53.5%
Light/Water Heat/Other Utility	1,605	1.6%
Water Heater Replacement	2,323	2.3%
Whole House Ventilation	-1,824	-1.8%

Electricity savings totaled 356,629 kWh for the program overall (Figure 1.2).



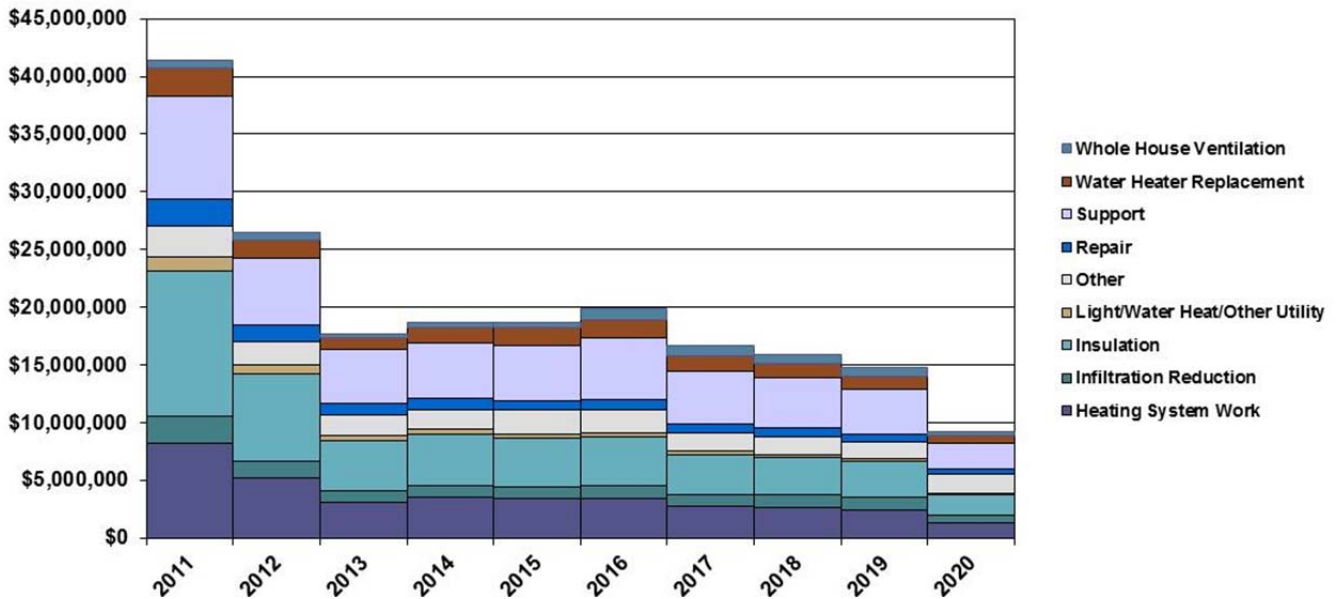
**Figure 1.2 First Year Energy Savings (kWh) – Program**

Insulation measures were credited with 50% of electricity savings (including all cooling savings and heating savings for homes with electric heat). Lighting, electric water heating measures, and refrigerator and freezer replacements and removals accounted for 35% (Table 1.2, historical data is listed in Appendix B as Fig 1.2).

**Table 1.2 Electricity Savings by Major Measure Category**

Measure Group	Savings (kWh)	Pct
Heating System Work	61,845	15.9%
Infiltration Reduction	22,005	5.7%
Insulation	192,872	49.6%
Light/Water Heat/Other Utility	127,057	32.7%
Water Heater Replacement	10,546	2.7%
Whole House Ventilation	-25,555	-6.6%

Program expenditures for materials, labor, and support totaled \$9,220,424, decreasing by 37.7 percent from \$14,799,777 spent in the prior year's program (see Figure 1.3).



**Figure 1.3 Overall Program Expenditures**

Expenditures by major measure groups are shown in Table 1.3 (historical data is listed in Appendix B as Fig 1.3). Spending for efficiency measures, including infiltration reduction, insulation, lighting and water heater efficiency measures, accounts for 27.4% of expenditures. Heating system work (replacements, repairs, and tune-ups) and water heater replacements are installed for efficiency and/or health and safety; taken together these account for 21.3% of expenditures. Program support, which provides for agency overhead and administration, accounts for 24.5% of expenditures. The remainder of costs including repairs, whole house ventilation, and health and safety measures which together total 26.8%.

**Table 1.3 Expenditures by Major Measure Category**

Measure Group	Expenditures	Percentage
Heating System Work	\$1,343,847	14.6%
Infiltration Reduction	\$589,000	6.4%
Insulation	\$1,845,872	20.0%
Light/Water Heat/Other Utility	\$87,199	0.9%
Other	\$1,692,941	18.4%
Repair	\$370,264	4.0%
Support	\$2,261,937	24.5%
Water Heater Replacement	\$622,692	6.8%
Whole House Ventilation	\$406,672	4.4%

The nominal average household expenditures for materials, labor, and support across all dwellings weatherized in 2020 increased by 17.5% to \$15,925 (Figure 1.4, historical data is listed in Appendix B as Fig 1.4). The increased expenditures were largely attributed to new COVID 19 related expenditures --

costs would have increased by 5.6% absent the COVID 19 related expenditures: COVID 19 -related impacts are discussed more extensively in the subsection entitled Program Impacts Related to COVID 19 at the end of this section of the report.

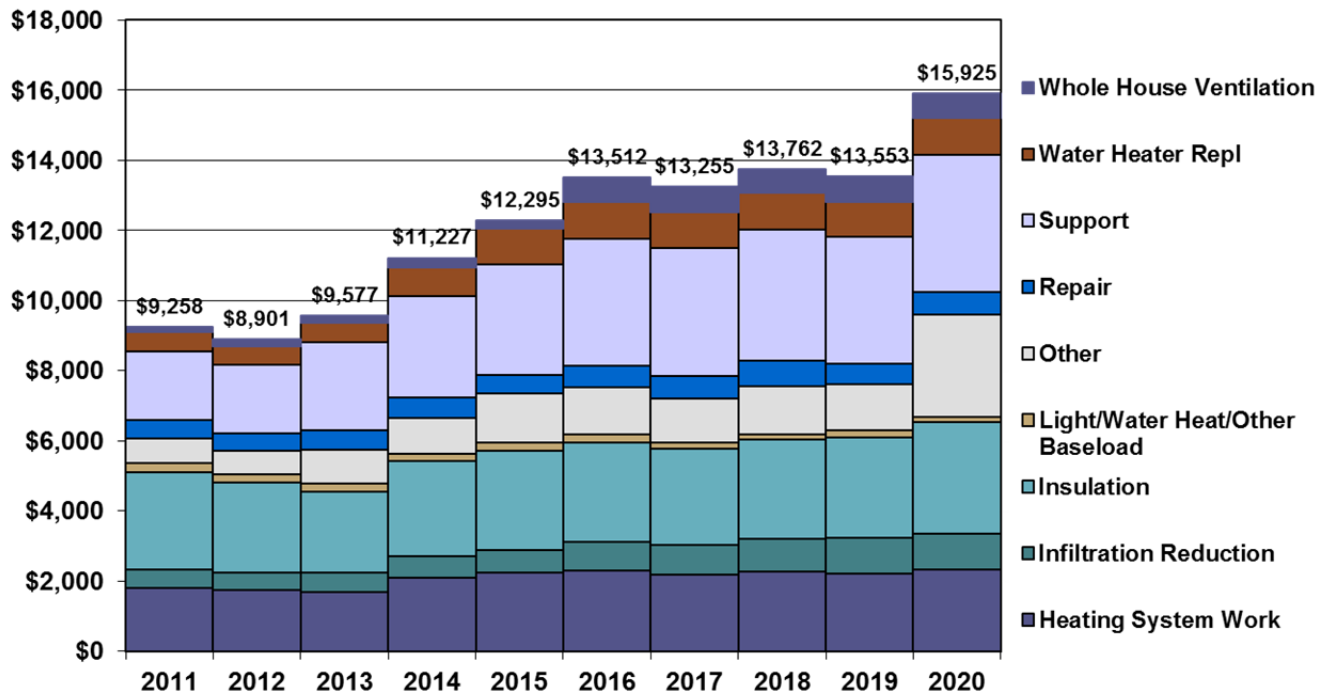
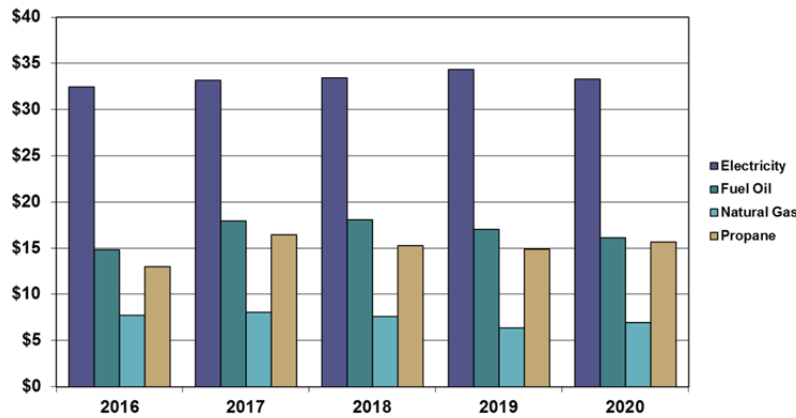


Figure 1.4 Average Program Expenditures per Housing Unit

CLIENT ENERGY BILL SAVINGS BY FUEL TYPE AND END-USE

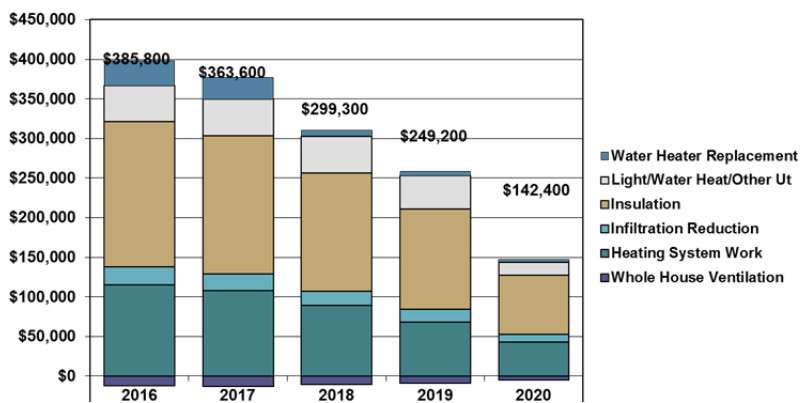
Fuel prices were taken from the Department of Energy’s Energy Information Agency (EIA) state monthly average prices for electricity and natural gas, and seasonal fuel costs for propane and fuel oil (Figure 1.5). The savings for each measure are allocated by month so that the estimated bill savings reflect the seasonal fluctuations in fuel prices. State taxes are included in the fuel costs. The prices of gas and electricity are restricted to the variable cost of an additional kWh or therm, i.e., the monthly fixed account costs are removed. Electricity prices declined by 3.2% and fuel oil prices declined by 5.6% year

over year. Natural gas and propane prices increased by 8.5% and 5.3%, respectively.



**Figure 1.5 Average Fuel Cost per MBtu (Nominal Dollars)**

The nominal first year client energy bill savings totaled \$142,400 (Figure 1.6, historical data is listed in Appendix B as Fig 1.6).



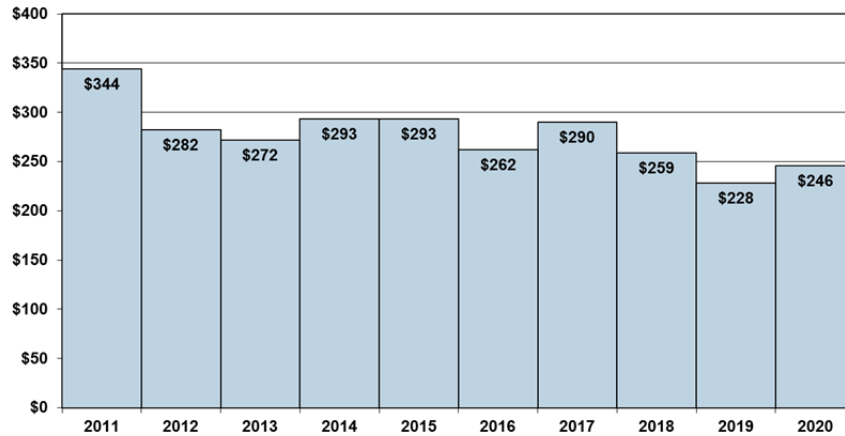
**Figure 1.6 First Year Client Fuel Cost Savings (Nominal Dollars)**

Excluding the additional costs from whole house ventilation, the savings for insulation, infiltration reduction, and heating system work accounted for 89% of client bill savings while lighting, water heating measures, and refrigeration measures accounted for 8% of client bill savings (Table 1.4, historical data is listed in Appendix B as Fig 1.6).

**Table 1.4 First Year Client Fuel Cost Savings (Nominal Dollars)**

Measure Group	Bill Savings	Pct
Whole House Ventilation	-\$5,077	-3.6%
Heating System Work	\$43,177	30.3%
Infiltration Reduction	\$9,303	6.5%
Insulation	\$75,201	52.8%
Light/Water Heat/Other Ut	\$16,230	11.4%
Water Heater Replacement	\$3,591	2.5%

First-year client fuel bill savings averaged \$246 (Figure 1.7), increasing 7.7% from \$228 in the previous year. The increase is driven largely by increases in gas and propane fuel prices.



**Figure 1.7 Average Annual Client Fuel Bill Savings per Housing Unit**

Natural gas savings provided 50% of client bill savings, electricity accounted for 31%, propane accounted for 19%, and fuel oil provided less than 1%.

Approximately 51% of client bill savings are attributable to the heating impacts of shell measures (insulation and infiltration reduction), and 26% was due to heating system work. Taken together, heating impacts from shell improvements and heating system measures accounted for 77% of total client bill savings. Cooling savings accounted for another 9% of client bill savings, and lighting, refrigeration, and water heater measures accounted for 14%.

Table 1.5 provides a breakdown of first year energy and bill savings, and expenditures by housing type and main heat fuel. Expenditures for site built single family units averaged over \$16,386 over all fuel types, and provided \$256 in first-year bill savings per unit. Savings averaged \$220 for gas-heated units, \$457 for propane heated units, \$375 for fuel oil heated units (only 2 units), and \$267 for electrically-heated units.

Expenditures for mobile homes averaged \$12,954 overall and provided first-year client bill savings of \$178. Savings for gas-heated units averaged \$165, propane-heated mobile homes saved \$288 per unit (only 5 cases), and electrically-heated mobile homes save \$171 (only 2 cases).

Expenditures for multi-family units heated with gas averaged \$10,451 and had first-year client bill savings of \$151. Gas-heated multifamily units saved \$153 and electrically-heated multi-family unit saved \$143 (only four units).



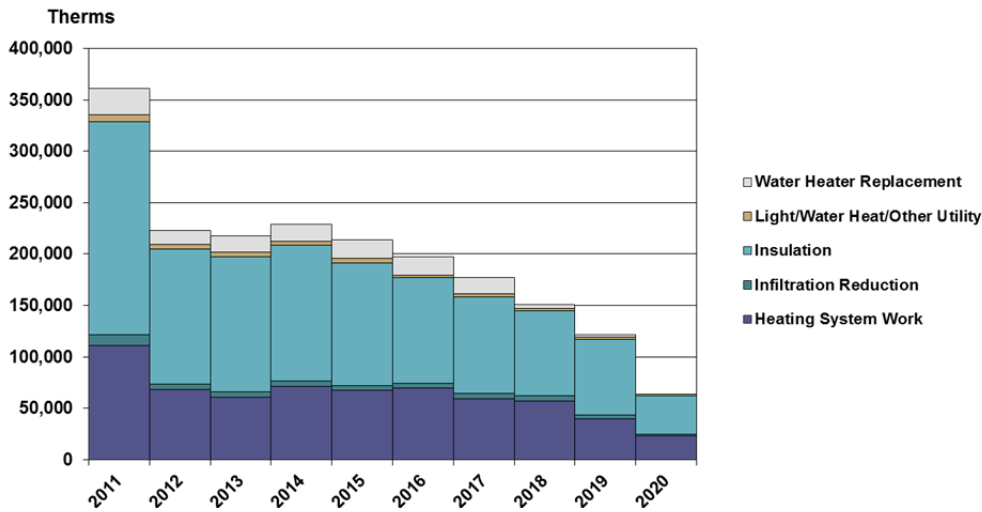
**Table 1.5 First Year Energy and Bill Savings, and Expenditures by Housing Type and Main Heat Fuel**

	Number of Units	Main Heat		Electricity		Expenditures	Total Bill Savings
		Savings (therms, gals)	Bill Savings (\$)	Savings (kWh)	Bill Savings (\$)		
<b>Site Built Single Family</b>	<b>512</b>		<b>\$176</b>		<b>\$80</b>	<b>\$16,386</b>	<b>\$256</b>
Gas	396	233	\$161	499	\$58	\$16,782	\$220
Propane	68	260	\$374	716	\$83	\$15,618	\$457
Fuel Oil	2	146	\$326	432	\$50	\$12,944	\$375
Electricity	46	-	-	2,484	\$267	\$14,260	\$267
<b>Mobile Home</b>	<b>48</b>		<b>\$140</b>		<b>\$38</b>	<b>\$12,954</b>	<b>\$178</b>
Gas	41	194	\$134	274	\$31	\$13,284	\$165
Propane	5	173	\$249	342	\$39	\$13,230	\$288
Fuel Oil	-	-	-	-	-	-	\$0
Electricity	2	-	-	1,561	\$171	\$5,512	\$171
<b>Multi-Family</b>	<b>20</b>		<b>\$84</b>		<b>\$67</b>	<b>\$10,451</b>	<b>\$151</b>
Gas	16	151	\$105	410	\$48	\$11,536	\$153
Propane	-	-	-	-	-	-	\$0
Fuel Oil	-	-	-	-	-	-	\$0
Electricity	4	-	-	1,339	\$143	\$6,110	\$143

**UTILITY SAVINGS AND EXPENDITURES**

The utilities funded measures in 438 dwelling units, which was 55.4% of the previous year. First year savings totaled 63,360 therms and 220,060 kWh. These measures reached 76% of all units weatherized by the program, and accounted for 57% of electricity savings and 62% of gas savings.

Figure 1.8 provides a ten year history of gas savings attained by utility-funded measures (Figure 1.8, historical data in Appendix B listed as Fig 1.8).



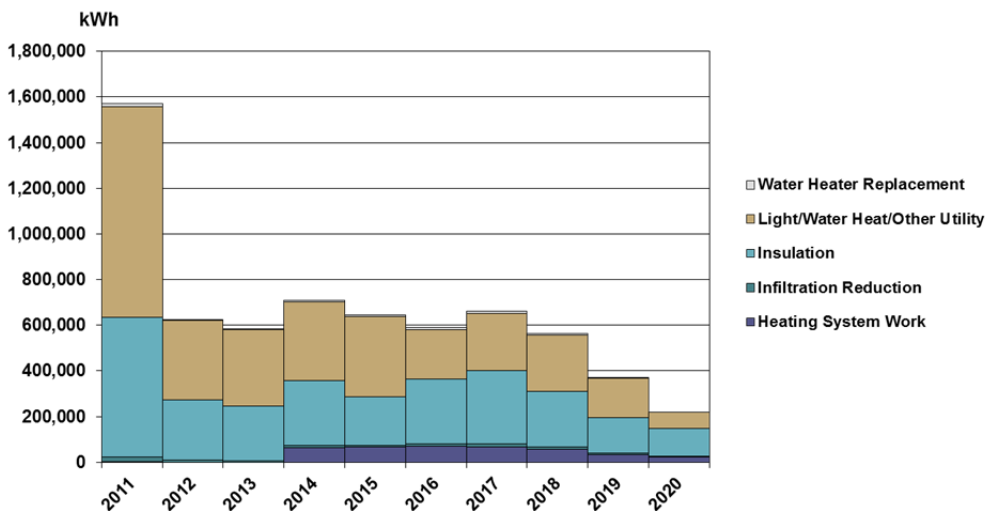
**Figure 1.8 First Year Energy Savings (therms) – Utility only**

Utility expenditures on gas measures (Table 1.6) were largely directed at insulation (59% of savings) and heating system work (36%).

**Table 1.6 First Year Energy Savings (therms) by Measure Group – Utility only**

Measure Group	Savings (therms)	Percentage
Heating System Work	23,032	36.4%
Infiltration Reduction	1,783	2.8%
Insulation	37,505	59.2%
Light/Water Heat/Other Utility	1,035	1.6%

The ten year history of electricity measure savings are shown in Figure 1.9 (historical data is provided in Appendix B listed as Fig 1.9).

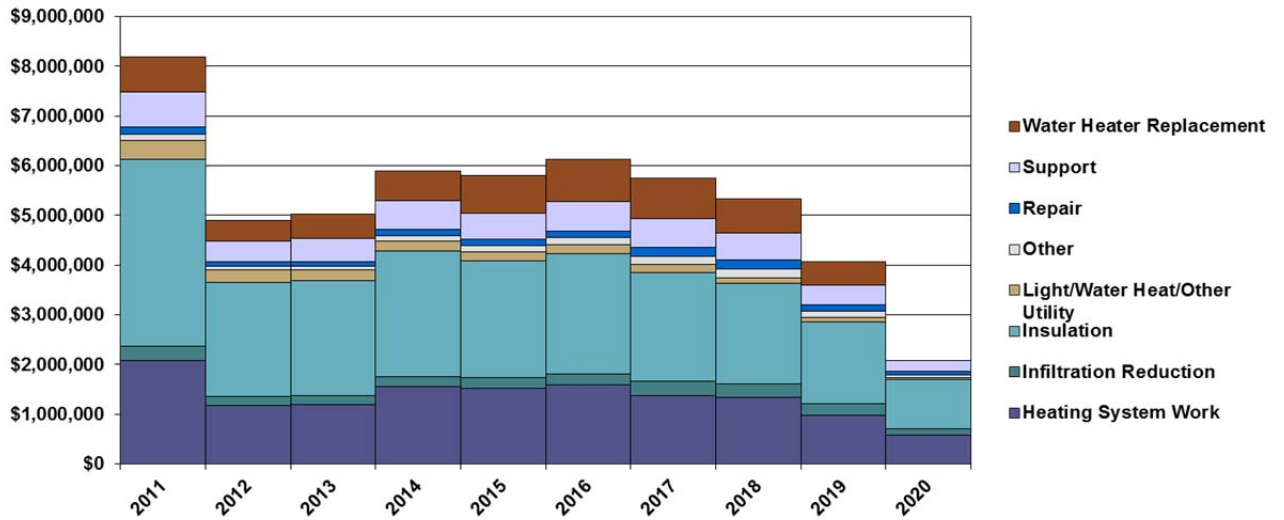


**Figure 1.9 First Year Energy Savings (kWh) – Utility only**

The electricity savings attributed to insulation include cooling savings and heating savings in units with electric main heat; these accounted for 54% of electricity savings. Another 34% of electricity savings were due to lighting, refrigerator replacements or removals (Table 1.7).

**Table 1.7 First Year Energy Savings (kWh) by Measure Group – Utility only**

Measure Group	Savings (kWh)	Pct
Heating System Work	22,538	10.2%
Infiltration Reduction	4,910	2.2%
Insulation	118,784	54.0%
Light/Water Heat/Other Utility	73,832	33.6%
Water Heater Replacement	0	0.0%



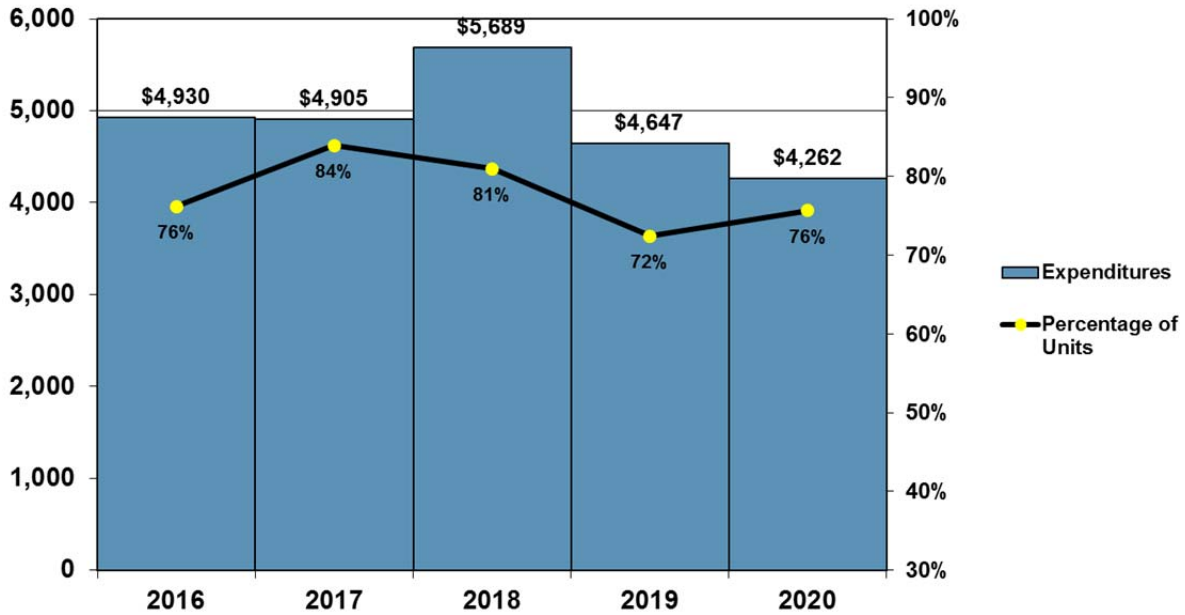
**Figure 1.10 Utility Expenditures**

The utilities spent \$2,075,029 for program measures, labor, and support. This was 51% of the previous year (Figure 1.10, Table 1.8, historical data in Appendix B listed as Fig 1.10). Utility expenditures accounted for 22.5% of the total low-income program expenditures.

**Table 1.8 Expenditures by Measure Group – Utility only**

Measure Group	Expenditures	Percentage
Heating System Work	\$580,579	28.0%
Infiltration Reduction	\$118,461	5.7%
Insulation	\$992,074	47.8%
Light/Water Heat/Other Utility	\$48,313	2.3%
Other	\$52,738	2.5%
Repair	\$74,552	3.6%
Support	\$208,312	10.0%

In addition, the utilities spent \$67,546 on program administration. Utility expenditures totaled \$2,142,575 including spending on program measures, labor, support, and administration.



**Figure 1.11 Average Utility Spending on Efficiency Measures (excludes Support and Administration), and Percentage of Homes Receiving Utility-Funded Measures with Impacts**

Figure 1.11 provides the average utility funding for efficiency measures (excludes support and administration) and percentages of dwellings with utility funding for the past five years. The utilities installed measures in 76% of units. The utilities expenditures averaged \$4,262 on units that received utility-funded efficiency measures.

Table 1.9 provides details of utility expenditures and the percentage of units weatherized by the program for each utility.

**Table 1.9 Utility Expenditures for Measures, Labor, and Support, and Counts of Units with Impacts**

Utility	Total Expenditures		Counts of Dwellings With Energy Impacts			
	Excluding Program Support	With Program Support	Electric Impacts	Pct of Prg	Gas Impacts	Pct of Prg
Alliant IPL	\$ 872,900	\$ 966,300	216	37.3%	134	29.6%
Black Hills Corp	\$ 128,900	\$ 141,100			31	6.9%
MidAmerican	\$ 864,900	\$ 967,600	167	28.8%	174	38.5%
<b>Total Utilities</b>	<b>\$ 1,866,700</b>	<b>\$ 2,075,000</b>	<b>383</b>	<b>66.1%</b>	<b>339</b>	<b>75.0%</b>

The savings and client bill savings for utility-funded measures are summarized by utility in Table 1.10.

**Table 1.10 First Year Fuel and Client Bill Savings Impacts from Utility-Funded Measures**

Utility	First Yr Fuel Savings		Summer Demand Savings		Winter Demand Savings		First Year Fuel Cost Savings	
	(kWh)	Pct of Prg	(kW)	Pct of Prg	(kW)	Pct of Prg		Pct of Prg
<b>Electricity</b>								
Alliant IPL	130,340	33.5%	30	33.2%	42	35.6%	\$ 14,840	33.6%
MidAmerican	89,570	23.0%	30	24.9%	25	20.8%	\$ 10,280	23.3%
Total Electric Utilities	220,060	56.6%	60	58.1%	67	56.4%	\$ 25,140	56.9%
<b>Gas</b>					<b>Peak Day</b>			
	<b>Therms</b>				<b>Therms</b>			
Alliant IPL	25,670	25.1%			280	25.5%	\$ 17,750	25.0%
Black Hills Corp	5,830	5.7%			63	5.7%	\$ 4,040	5.7%
MidAmerican	31,850	31.1%			344	31.3%	\$ 22,050	31.1%
Total Gas Utilities	63,360	61.8%			687	62.5%	\$ 43,840	61.8%

Utility-funded measures yielded first-year client bill savings of \$68,974, averaging \$157 per dwelling that received utility-funded measures. Electricity bill savings from utility-funded measures averaged \$66 per household that received utility-funded electricity measures. Gas bill savings from utility-funded measures averaged \$129 for households with utility-funded gas measures.

Table 1.11 provides the cost of energy savings for utility-funded measures with energy impacts. The first year cost of conserved energy over all housing types ranged from \$19.31 to \$20.81 per therm and \$1.47-\$2.22 per kWh (we ignored groups with fewer than 30 units for both gas and electricity).

**Table 1.11 Costs of First-Year Energy Savings from Utility-Funded Measures**

	Cost of Gas		Cost of Elec	
	Savings	Number of Units	Savings	Number of Units
<b>Alliant-IPL</b>				
Overall	\$19.31	134	\$2.22	216
Site-Built	\$19.06	125	\$2.26	195
Mobile Home	\$20.64	5	\$1.21	15
Multi-family	\$24.38	4	\$1.45	6
<b>Black Hills Corp</b>				
Overall	\$20.60	31	-	
Site-Built	\$20.60	30	-	
Mobile Home	\$20.82	1	-	
Multi-family	\$0.00	0	-	
<b>MidAmerican</b>				
Overall	\$20.81	174	\$1.47	168
Site-Built	\$20.91	150	\$1.53	145
Mobile Home	\$20.48	19	\$1.29	16
Multi-family	\$16.86	5	\$0.94	7

Table 1.12 provides the percentages of total expenditures for measures that were funded by the utilities, and demonstrates the high funding percentage provided by the utilities for efficiency measures. The utilities funded the majority of all measures except infiltration reduction, freezer exchanges, electric heating systems (including heat pumps), repairs, heating system ventilation and tune and cleans, water heater replacements and ventilation, and support.

**Table 1.12 Utility Funding Percentages by Measure**

Measure	Expenditures		Utility Percentage
	Total	Utility	
Wall Insulation	\$619,685	\$343,659	55.5%
Attic Insulation	\$736,216	\$446,031	60.6%
Kneewall Insulation	\$63,530	\$40,082	63.1%
Floor/Crawlspace Insulation	\$157,711	\$94,194	59.7%
Bandjoist Insulation	\$80,639	\$40,792	50.6%
Infiltration Reduction	\$589,000	\$118,461	20.1%
High Efficiency Htg Sys Repl.	\$1,076,292	\$539,659	50.1%
Electric Htg Sy/Ht Pump Repl.	\$102,122	\$29,745	29.1%
Pipe Wrap	\$7,964	\$4,792	60.2%
Faucet Aerator	\$473	\$295	62.3%
Shower Head	\$491	\$305	62.1%
Water Heater Replacement - Hi Eff	\$622,692	\$0	0.0%
Lighting	\$26,580	\$17,096	64.3%
Exchange Refrigerator	\$43,413	\$25,096	57.8%
Exchange Freezer	\$5,977	\$529	8.9%
Repairs	\$370,264	\$74,552	20.1%
Programmable Thermostat	\$1,400	\$1,300	92.9%
Htg Sys Tune/Clean	\$55,319	\$9,876	17.9%
Htg Sys Ventilation	\$76,911	\$37,045	48.2%
Water Heater Ventilation	\$43,511	\$421	1.0%
Support	\$2,261,937	\$208,312	9.2%

## EXPENDITURES AND SAVINGS BY AGENCY AND MEASURE

This section provides breakouts of expenditures and savings by agency. Each agency receives funding from the utilities and DCAA (Table 1.13). Section 3 of this report, Detailed Spending and Impact Profiles by Funding Entity provides detailed result tables for the overall program, state funding, and for each of the three funding utilities. Those tables include counts of installations and totals and average energy savings, demand impacts, and program expenditures by measure.

**Table 1.13 Counts of Completed Units by Agency and Funding Entity**

Agency	Units With Funding				
	State	DCAA	Alliant-IPL	Black Hills	MidAmerican
NewOpp	27	27	9	2	10
HACAP	64	64	52	4	32
CAEI	25	25	16	0	9
Matura	10	10	1	0	2
MICA	24	24	21	1	0
Mid-Sioux	25	25	4	0	6
NE Iowa	40	40	17	8	3
New View	16	16	8	3	0
Threshold	43	43	1	1	30
IMPACT	19	19	9	1	8
SCICAP	17	17	12	0	1
CASEI	41	41	39	0	3
SIEDA	30	30	19	0	10
Upper Des Moines	67	67	34	4	16
West Central	26	26	1	7	14
CASiouxland	12	12	0	0	9
Polk County	93	93	0	0	64
<b>Total</b>	<b>579</b>	<b>579</b>	<b>243</b>	<b>31</b>	<b>217</b>

Figure 1.12 provides the first-year client bill savings by agency. The series are arranged from left to right in the chart according to left to right and top to bottom and in the legend, e.g., Bldg Shell Cooling, then Bldg Shell Heating, then Heating system, etc.

Savings attained by each agency were adjusted according to results of the natural gas and electricity fuel consumption analyses, detailed in Section 2 of this report. The estimated impacts for propane and fuel oil were adjusted using the same factors as those used for natural gas.

The statewide average client bill savings was \$246 per dwelling. The average first-year client bill savings varied across agencies, from a low of \$100 per dwelling for MATURA to a high of \$365 for NE Iowa. The wide variation in results across agencies is typical of what we've observed in past years. Bear in mind that various factors affect the values shown in this chart, factors beyond quality or intensity of weatherization treatment (an example is climate variations within the state). Consequently, these results should not be used as a basis for comparing the quality, attention to detail, dedication, or other factors of agency performance.

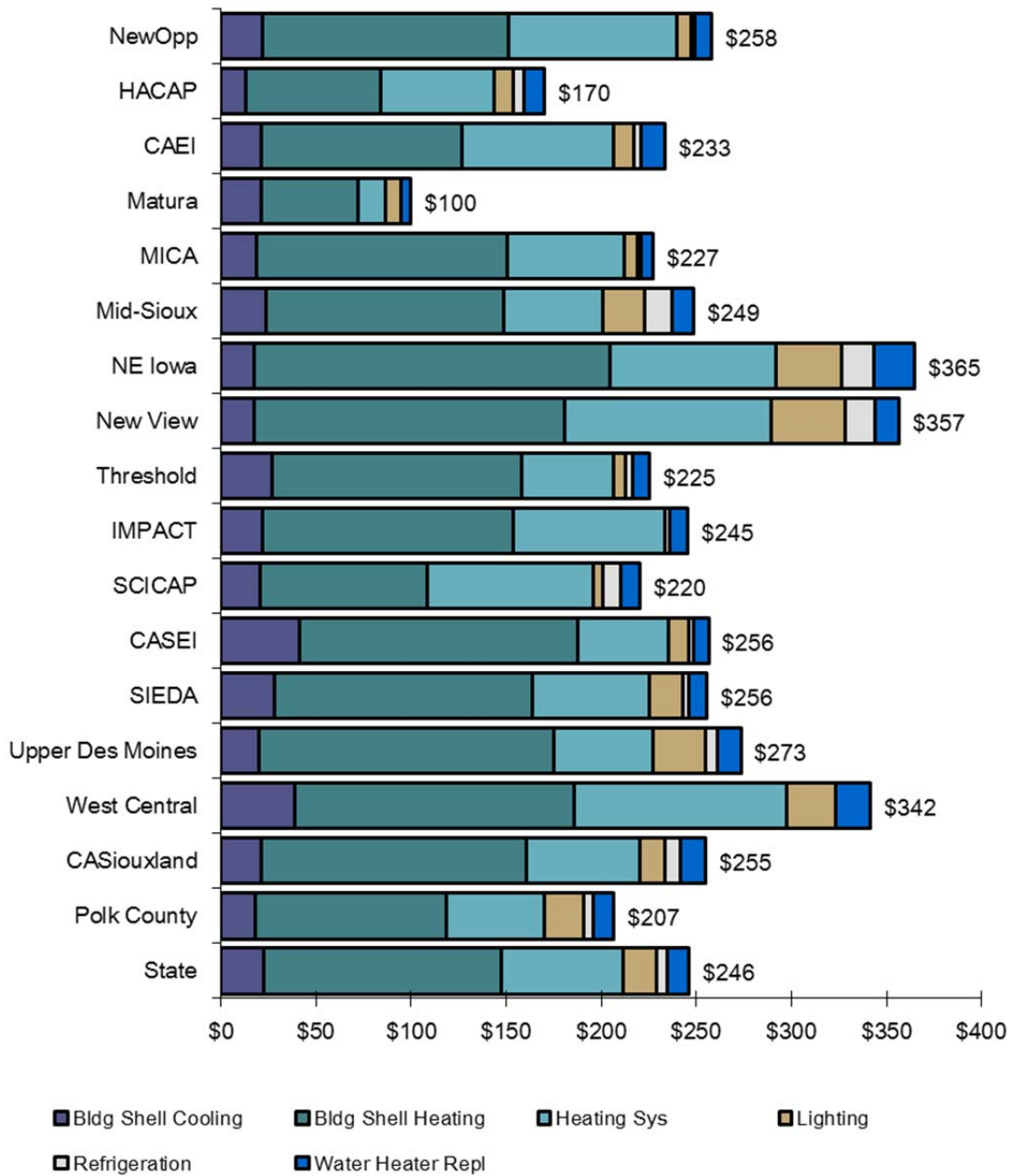
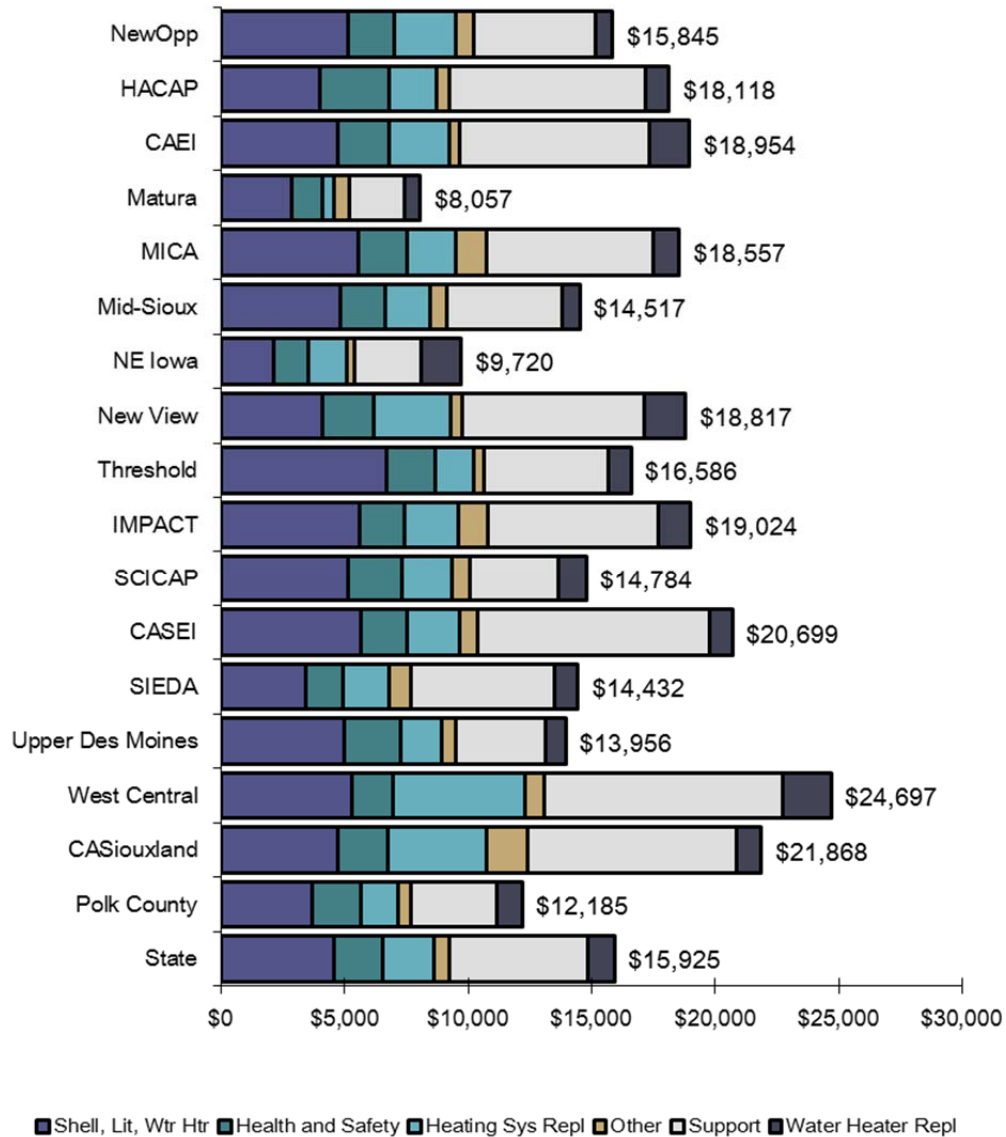


Figure 1.12 Average Annual Fuel Bill Savings per Housing Unit by Agency



Figure 1.13 shows the average expenditures for all households with impacts, ranging from a low of \$8,057 for Northeast Iowa to \$24,697 for West Central. The statewide average expenditure was \$15,925 per dwelling unit.



**Figure 1.13 Average Expenditures per Housing Unit by Agency**

The average installation rates, costs, and savings for energy efficiency and heating and water heating system replacement measures are shown in Figures 1.14a and 1.14b for most recent three years of the program.

The installation rate of wall and floor/crawlspace insulation has trended downward slightly over the three year period, but the rate for other shell insulation measures has tended to fluctuate around the same level. (see Figure 1.14a, left chart).

The condensing heating system replacement rate is in the same range as the prior two years. The replacement rate for non-condensing heating system replacements is declining over the three year period.

The installation rates of water heater efficiency measures are all within the same range over the three year period. Many of these are lower cost measures, however the installation rates of the higher cost high-efficiency water heater replacements declined by 6.5 percentage points to nearly the same rate as in 2018. Refrigerator replacement rates increased slightly from declined to 9.5%.

Figure 1.14a, right chart, shows that the average measure costs. Wall insulation costs decreased slightly but costs for other shell insulation measures have increased.

The cost of mechanical system replacements have all increased. The cost for condensing heating systems is within a range for the three year period and is currently at \$3,058. The cost of non-condensing heating system replacements is almost the same at \$3,050. The cost of high efficiency water heater replacements increased was \$1,711, about the same as the previous year. The cost of refrigerator replacements was \$789 and within a range for the three year period while the cost of freezer replacements increased to \$598.

The average first-year energy gas and electricity savings for each major measure is shown in Figures 1.14b.

The average natural gas savings for insulation measures were all within a range for the three year period.

Gas savings for condensing heating systems increased slightly to 125 therms. Non-condensing heating system savings increased significantly but large fluctuations can be expected due to small numbers of installations (only 2 units in 2020). Non-condensing heating systems are installed for health and safety reasons in cases where condensing heating systems cannot be installed due to ventilation issues or other atypical situations.

The average electricity savings were higher for ceiling/attic insulation (199 kWh versus an average of 157 the prior year). Electricity savings were within a few kWh all other insulation measures.

Lighting measure savings averaged 208 kWh per unit. Savings for all refrigerator appliance measures were within the prior year range.

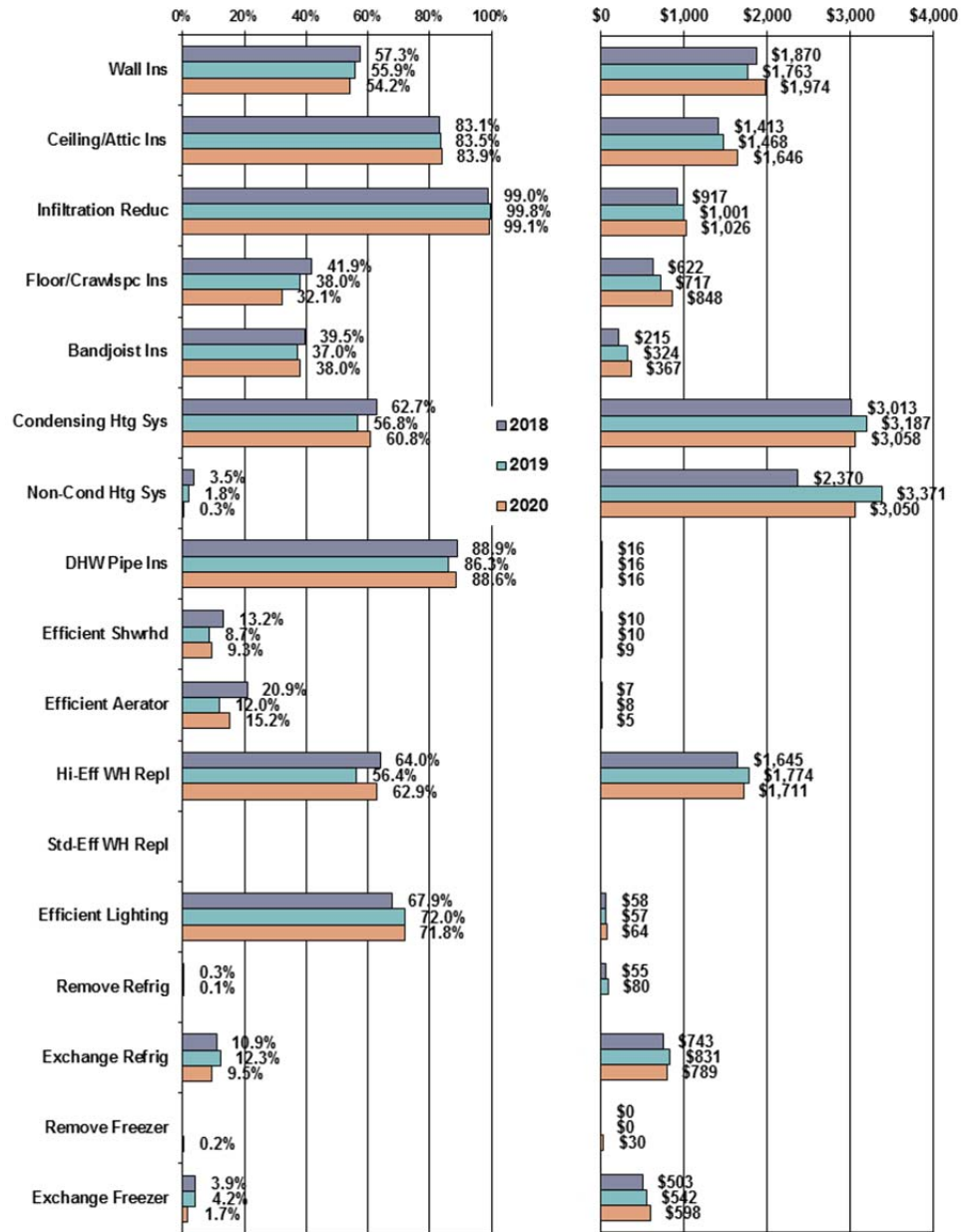


Figure 1.14a Average Installation Rates and Measure Costs of Efficiency Measures, Heating System and Water Heating Replacements

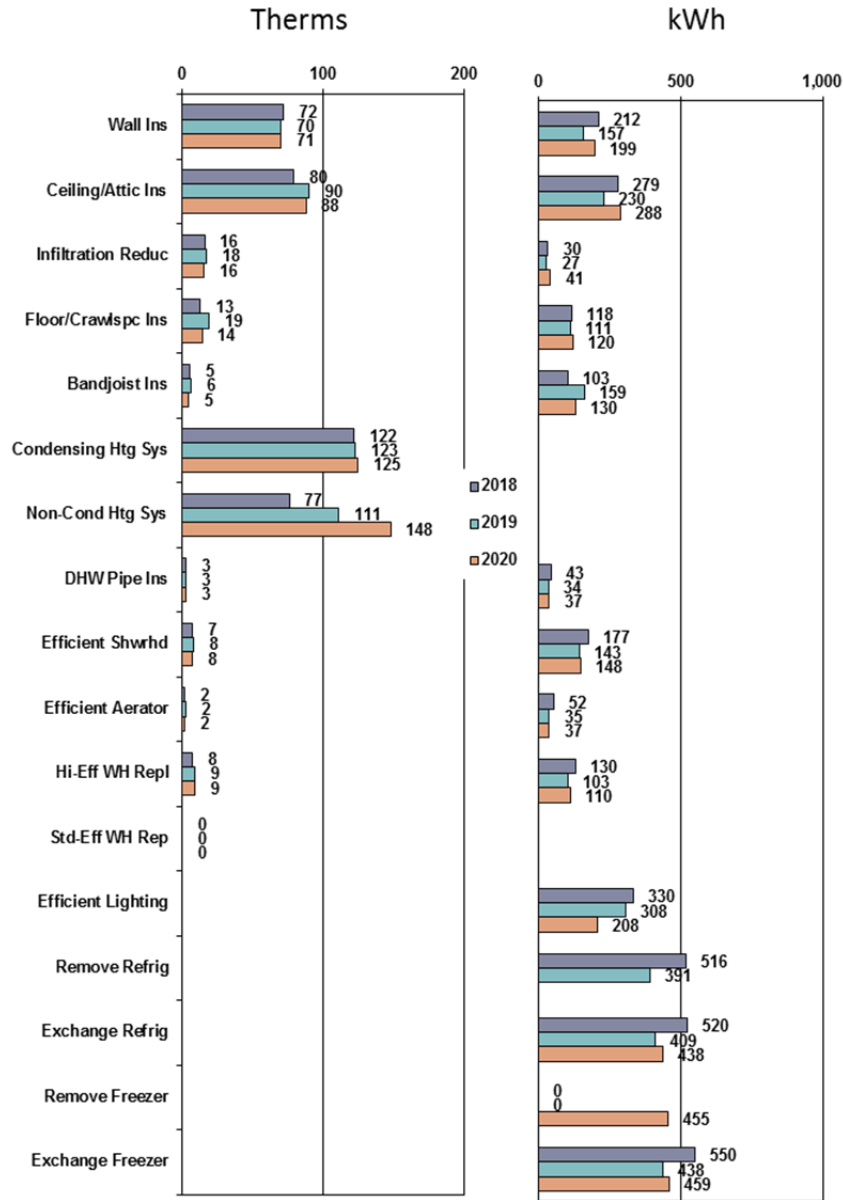


Figure 1.14b Average Gas and Electricity Savings of Efficiency Measures, Heating System and Water Heater Replacements

Tables 1.14 and 1.15 provide tabular data corresponding to data shown in Figures 1.14a and 1.14b but over a five year period. Table 1.14 provides a listing of the percentage of households receiving measures. Small percentage changes from the previous year are to be expected, and typically correct for lower or higher installation rates of the prior year. The year over year (recent year) change tends to be greatest for measures with very low installation rates and/or savings which are not indicative of major changes in the installation protocols for these measures or program impacts.

**Table 1.14 Installation Rates of Measures (% of units receiving measures)**

Measure	2016	2017	2018	2019	2020	Recent Year Change (%)
<b>Insulation and Infiltration Reduction Measures</b>						
Wall Insulation	55.1	58.9	57.3	55.9	54.2	-2.9%
Ceiling/Attic Insulation	84.7	84.7	83.1	83.5	83.9	0.5%
Floor/Crawlspace Insulation	39.4	40.5	41.9	38.0	32.1	-15.5%
Bandjoist Insulation	43.1	39.1	39.5	37.0	38.0	2.7%
Infiltration Reduction	98.1	99.1	99.0	99.8	99.1	-0.7%
<b>Heating System Measures</b>						
Htg. Sys. Replacement	70.3	68.1	66.3	58.6	61.1	4.3%
High Eff Htg Sys Repl	66.8	60.2	62.7	56.8	60.8	7.1%
Std/Unspec Eff Htg Sys Repl	3.4	7.9	3.5	1.8	0.3	-81.1%
Htg. Sys. Tune and Clean	26.3	30.0	30.9	37.8	39.2	3.7%
Heating System Safety Check	9.3	0.1	0.0	2.5	2.4	-2.2%
Heating System Ventilation	52.9	59.1	63.9	53.8	54.4	1.2%
<b>Water Heater Measures</b>						
Pipe Wrap	86.9	89.7	88.9	86.3	88.6	2.7%
Shower Head	14.9	14.7	13.2	8.7	9.3	7.2%
Faucet Aerator	27.7	24.9	20.9	12.0	15.2	26.7%
Water Heater Replacement	69.2	65.9	64.0	56.4	62.9	11.4%
Hi-Eff Wtr Htr Repl.	69.2	65.9	64.0	56.4	62.9	11.4%
Std-Eff Wtr Htr Repl.	-	-	-	-	-	-
Water Heater Ventilation	39.8	50.9	51.5	48.1	42.1	-12.3%
Water Heater Repair	6.5	9.4	9.5	13.4	10.5	-21.2%
<b>Lighting Measures</b>						
Efficient Lighting	75.6	70.4	68.0	72.0	71.8	-0.2%
<b>Refrigeration Measures</b>						
Refrigerator Removal	22.4	18.8	14.0	15.7	10.9	-30.5%
Refrigerator Exchange	0.1	0.3	0.3	0.1	-	-
Refrigerator Exchange	19.0	15.7	10.9	12.3	9.5	-22.6%
Freezer Removal	0.2	0.2	0.0	-	0.2	-
Freezer Exchange	5.3	4.2	3.9	4.2	1.7	-59.0%
<b>Health and Safety (other than heating &amp; water heating measures listed above)</b>						
CO Detector	90.9	93.9	91.9	95.9	95.3	-0.6%
Smoke Detector	65.3	68.4	61.5	66.8	69.6	4.1%
Exhaust Ventilation	89.3	89.8	87.9	86.6	86.4	-0.3%
Fuses	0.7	0.8	0.4	0.3	-	-
<b>Repairs</b>	87.9	92.3	93.3	91.4	91.5	0.2%

Table 1.15 shows details of the average installed costs for each measure over the past 5 years. As with the installation rates, the greatest changes tend to occur for measures with few installations and/or small costs.

**Table 1.15 Average Measure Costs (\$)**

<b>Measure</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Recent Year Change (%)</b>
<b><i>Insulation and Infiltration Reduction Measures</i></b>						
Wall Insulation	1,904	1,827	1,870	1,763	1,974	11.9%
Ceiling/Attic Insulation	1,352	1,287	1,413	1,468	1,646	12.1%
Infiltration Reduction	824	840	917	1,001	1,026	2.5%
Floor/Crawlspace Insulation	759	643	622	717	848	18.2%
Bandjoist Insulation	238	208	215	324	367	13.0%
<b><i>Heating System Measures</i></b>						
Htg. Sys. Replacement						
Condensing Htg Sys Repl	2,957	2,868	3,013	3,187	3,058	-4.1%
Non-Cond Htg Sys Repl	2,611	1,830	2,370	3,371	3,050	-9.5%
Htg. Sys. Tune and Clean	214	201	238	242	244	0.6%
Heating System Safety Check	149	85	0	78	69	-12.1%
Heating System Ventilation	232	209	234	234	244	4.1%
<b><i>Water Heater Measures</i></b>						
Pipe Wrap	15	14	16	16	16	-1.9%
Shower Head	9	9	10	10	9	-10.1%
Faucet Aerator	6	6	7	8	5	-30.9%
Water Heater Replacement						
Hi-Eff Wtr Htr Repl.	1,561	1,559	1,645	1,774	1,711	-3.6%
Std-Eff Wtr Htr Repl.	-	-	-	-	-	-
Water Heater Ventilation	175	157	178	190	178	-6.2%
Water Heater Repair	130	120	89	116	110	-5.8%
<b><i>Lighting Measures</i></b>						
Efficient Lighting (avg spent per home)	53	53	57	57	64	11.5%
<b><i>Refrigeration Measures</i></b>						
Refrigerator Removal	58	25	55	80	#N/A	-
Refrigerator Exchange	759	760	743	831	789	-5.1%
Freezer Removal	30	27	-	-	30	-
Freezer Exchange	453	468	503	542	598	10.2%
<b><i>Health and Safety (other than heating &amp; water heating measures listed above)</i></b>						
CO Detector	66	72	75	98	106	8.8%
Smoke Detector	54	58	60	68	80	16.9%
Exhaust Ventilation	881	887	894	956	950	-0.7%
Fuses	128	113	134	145	#N/A	-
<b>Repairs</b>	<b>723</b>	<b>715</b>	<b>780</b>	<b>658</b>	<b>699</b>	<b>6.2%</b>
<b>Support</b>	<b>3,755</b>	<b>3,677</b>	<b>3,932</b>	<b>3,757</b>	<b>3,948</b>	<b>5.1%</b>
<small>Note: Kneewall insulation was reported with wall insulation prior to 2007, it is now bundled with Ceiling./Attic Ins</small>						

## SAVINGS OF WATER HEATER, LIGHTING, AND REFRIGERATION MEASURES

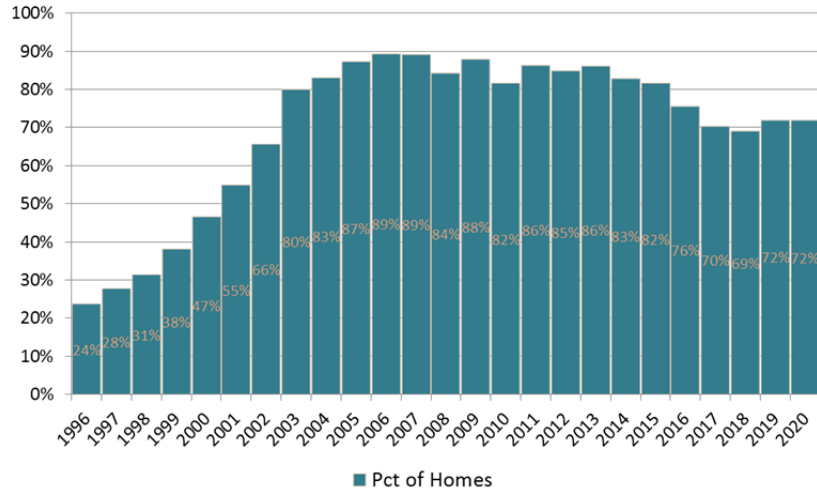
Table 1.16 shows the installation rates for energy efficiency measures other than space heating or cooling. These measures include water heater efficiency measures, lighting, and refrigeration measures. Statewide, client bill savings averaged \$28 for these measures. The highest average bill savings were attained by NE Iowa (\$62 per unit). MICA and IMPACT each averaged less than \$10 per unit.

**Table 1.16 Installation Rates and Savings of Baseload Measures**

Agency	Water Heating			Lighting	Refrigeration				Average First Year Bill Savings
	Pipe Wrap	Eff Shower-head	Eff Faucet Aerator	Efficient Lighting	Exchange Refrig	Exchange Freezer	Remove Refrig	Remove Freezer	
New Opp	59%	22%	33%	63%	4%	0%	4%	0%	\$14.67
HACAP	92%	6%	0%	81%	6%	5%	19%	0%	\$21.25
Eastern IA	88%	0%	28%	40%	8%	0%	4%	0%	\$19.30
Matura	80%	0%	0%	80%	0%	0%	0%	0%	\$10.69
MICA	4%	0%	0%	21%	4%	0%	0%	0%	\$8.86
Mid-Sioux	96%	0%	0%	88%	20%	8%	0%	0%	\$40.54
NE Iowa	93%	0%	65%	95%	30%	3%	33%	0%	\$62.21
New View	94%	0%	0%	100%	25%	6%	0%	0%	\$58.69
Threshold	100%	0%	5%	74%	5%	2%	9%	0%	\$14.18
IMPACT	84%	0%	0%	0%	5%	0%	0%	0%	\$5.29
SCICAP	53%	0%	0%	29%	6%	6%	24%	6%	\$19.24
SE Iowa	100%	0%	0%	51%	2%	2%	0%	0%	\$15.99
SIEDA	93%	0%	0%	77%	7%	0%	3%	0%	\$24.34
Upper Des Moines	99%	10%	0%	94%	12%	0%	0%	0%	\$40.81
West Central	96%	0%	54%	100%	0%	0%	31%	0%	\$35.27
CAA Siouxland	100%	0%	8%	92%	17%	0%	8%	0%	\$28.07
Polk County	98%	0%	31%	72%	10%	0%	10%	0%	\$30.33
State	89%	3%	15%	72%	9%	2%	9%	0%	\$28.03

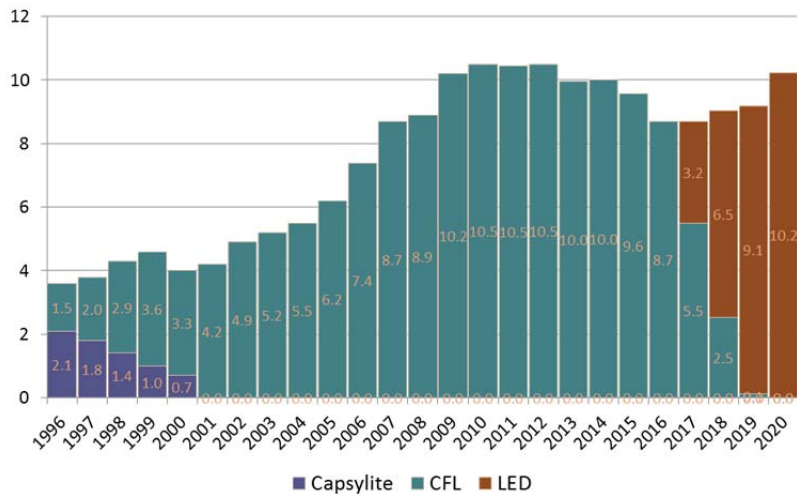
## TRENDS IN THE INSTALLATION RATES OF LIGHTING, REFRIGERATION, AND HEATING SYSTEM REPLACEMENTS

This section focuses on trends in the installation rates of several efficiency measures phased into the joint utility/WAP program, including efficient lighting, heating system replacements, and refrigeration measures. These are shown in Figures 1.15 through 1.18.



**Figure 1.15 Percentage of Housing Units Receiving Lighting Measures**

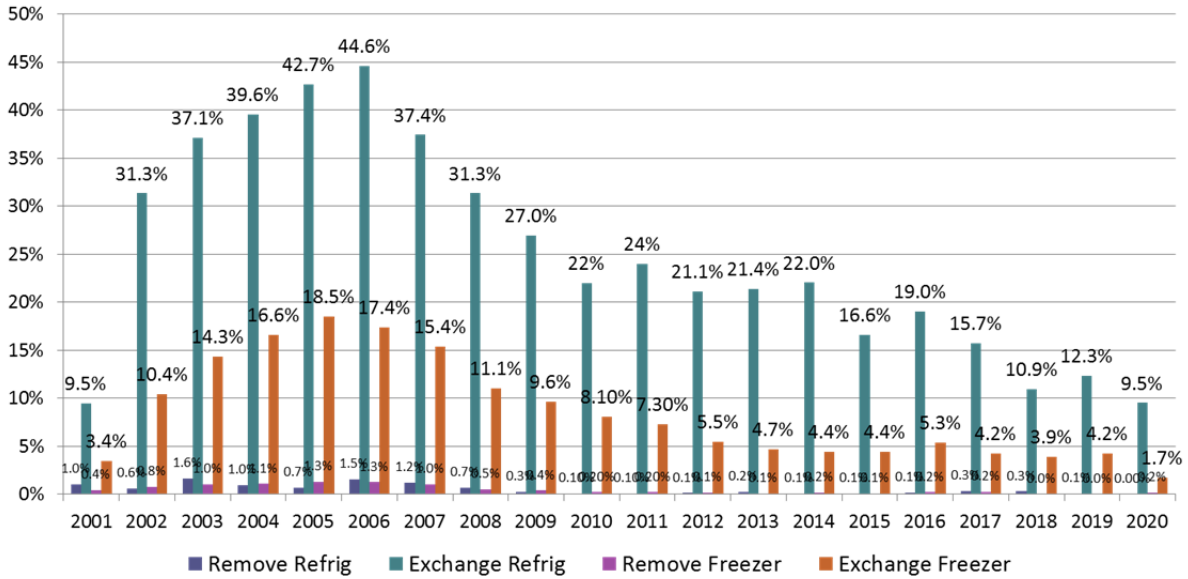
Figure 1.15 shows the percentage of dwellings receiving at least one lighting measure for each year, beginning in 1996. Lighting measures were installed in 38% of dwellings in 1996 and peaked in 2006 and 2007 at 89%. The installation rates for lighting have generally trended downward since 2006 as more units already have efficient lighting installed. The percentage of dwellings receiving efficient lighting remained unchanged from 2019 at 72%.



**Figure 1.16 Average Number of Bulbs Installed for Housing Units Receiving Lighting Measures**

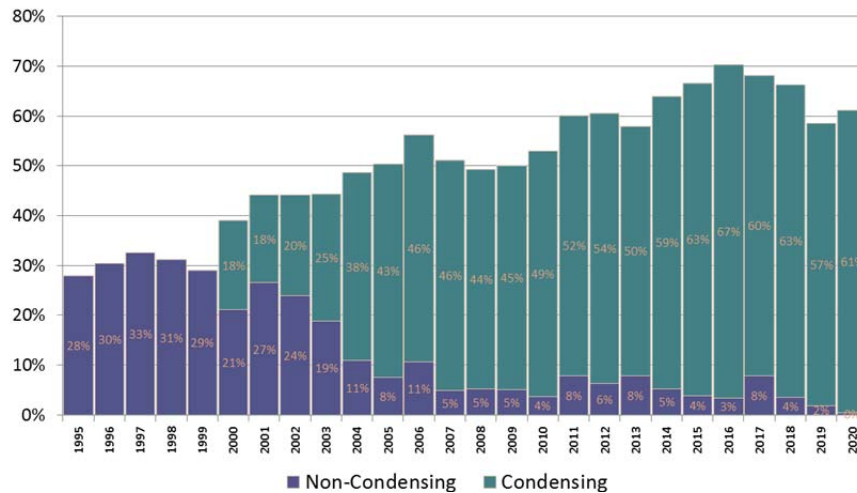
The average number of bulbs installed in dwellings that received at least one lighting measure averaged 10.2 bulbs per house. Agencies began installing LEDs in 2017 and effectively all lighting measures installed in the current year were LEDs (Figure 1.16).





**Figure 1.17 Installation Rates of Refrigeration Measures**

Figure 1.17 shows the initial ramp up of refrigeration measure installation rates as well as declines in recent years as the efficiency of in-place units have increased in the client population. The refrigerator replacement rate decreased to 9.5% from the prior year (12.3%).



**Figure 1.18 Installation Rates of Natural Gas Heating System Replacements**

Figure 1.18 shows the transition to condensing (90+ efficiency) furnaces from non-condensing (80% efficiency) heating systems. Overall, 61% of dwellings with natural gas heating received a heating system replacement. All were condensing systems except for two units.

Thirty-three percent of the heating systems that were replaced were done so for health and safety; the remaining units were replaced for efficiency.

AVERAGE COSTS OF MAJOR MEASURES BY AGENCY

Figures 1.19-1.23 show the agency-specific average costs for ceiling, wall, and floor/crawlspace insulation and furnace replacements for the overall program and for utility-funded measures only. These costs represent the total expenditures for these measures averaged over the number of households that received the measure (as opposed to an average across all households that were treated by the agency).

CEILING AND ATTIC INSULATION EXPENDITURES

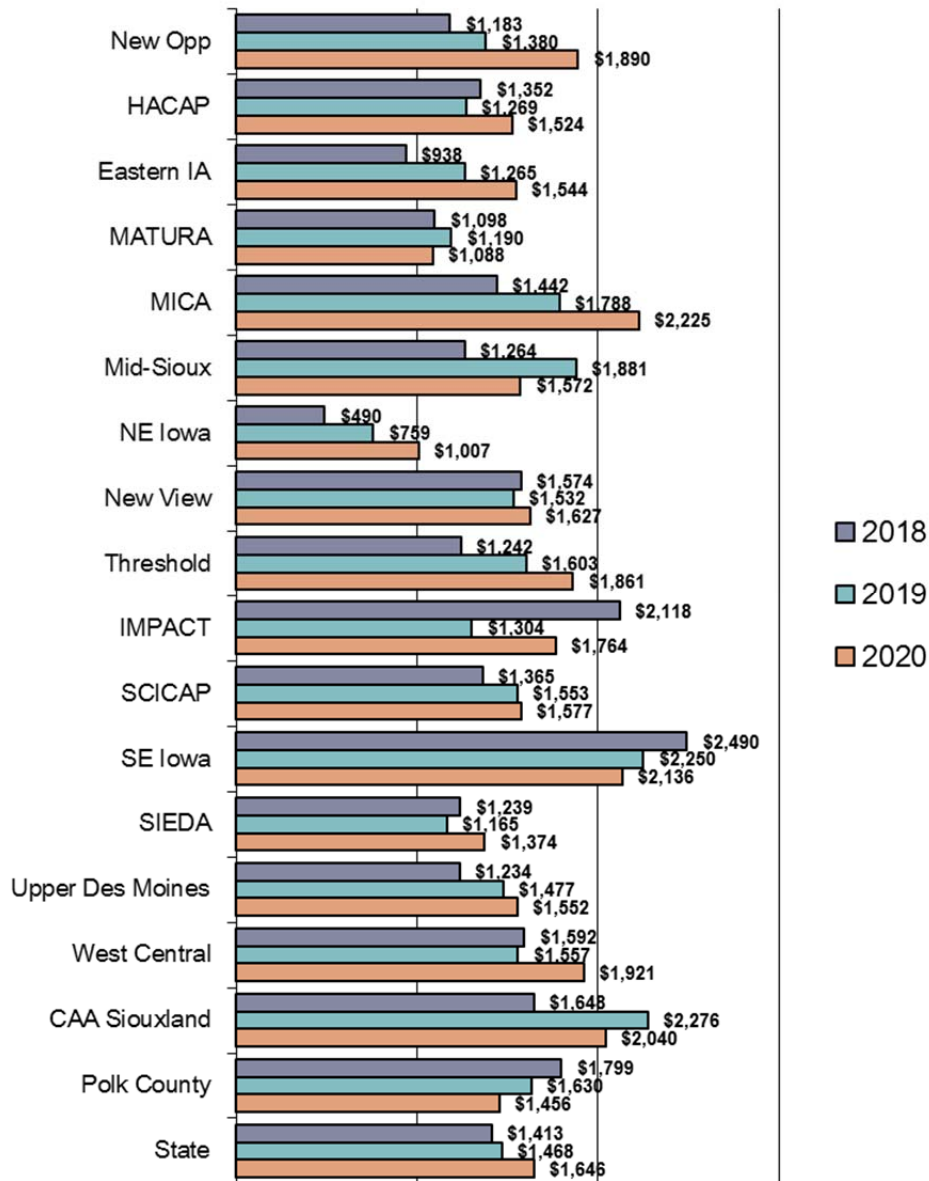


Figure 1.19a Average Program Expenditures on Ceiling Insulation by Agency

Figures 1.19a shows the average installed costs for ceiling and attic insulation (including cavity-fill blown attic insulation) for all expenditures. The statewide average cost for ceiling insulation was \$1,646.

MICA, CAA Siouxland and SE Iowa averaged more than \$2,000 per dwelling unit that received ceiling and attic insulation. The lowest average spending was reported by Northeast Iowa, averaging \$1,007.

Figure 1.19b shows that for units receiving utility funding for this measure, the statewide average expenditure of utility funds on ceiling and attic insulation was \$1,442. CAA Siouxland and MICA spent over \$2,000 in utility funding. NE Iowa spent the least utility funds (\$554) for ceiling and attic insulation.

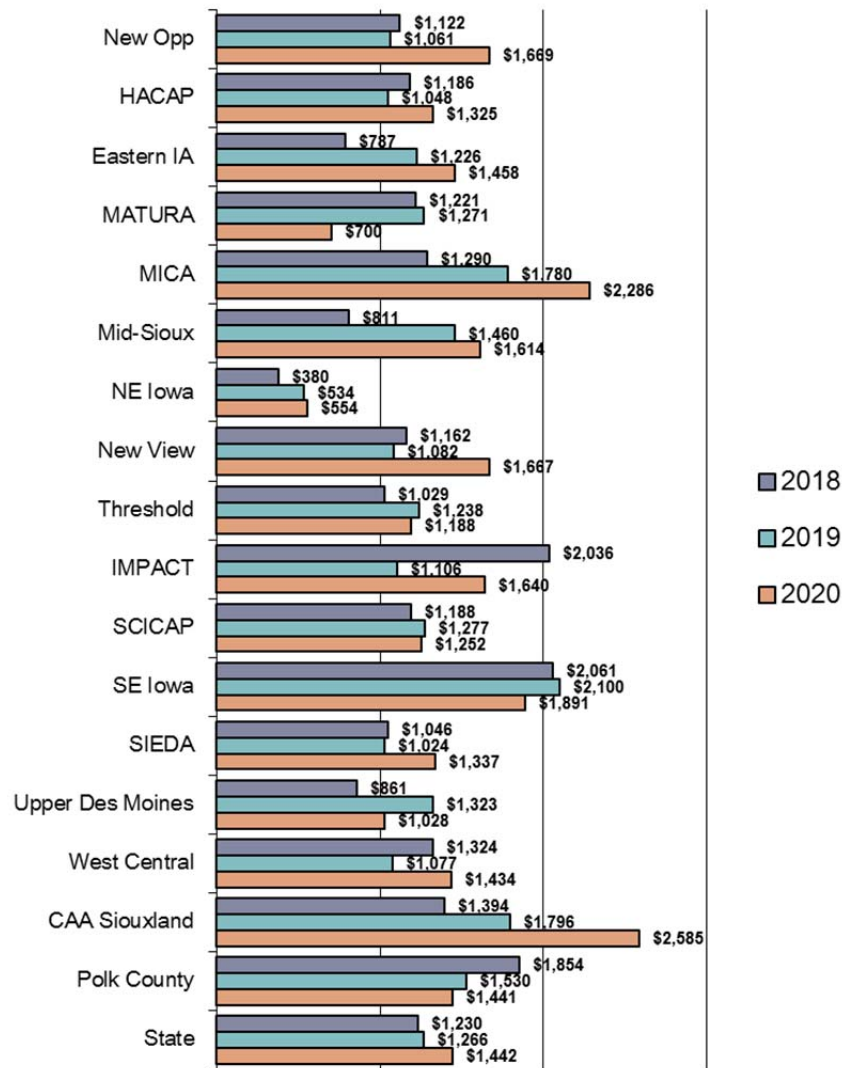


Figure 1.19b Average Utility Expenditures on Ceiling Insulation by Agency

## WALL INSULATION EXPENDITURES

Figure 1.20a shows the average installed costs for wall insulation for all funding. The state average expenditure for wall insulation was \$1,974. West Central and Threshold each averaged more than \$2,500. New View spent the least, averaging \$363 per dwelling unit.

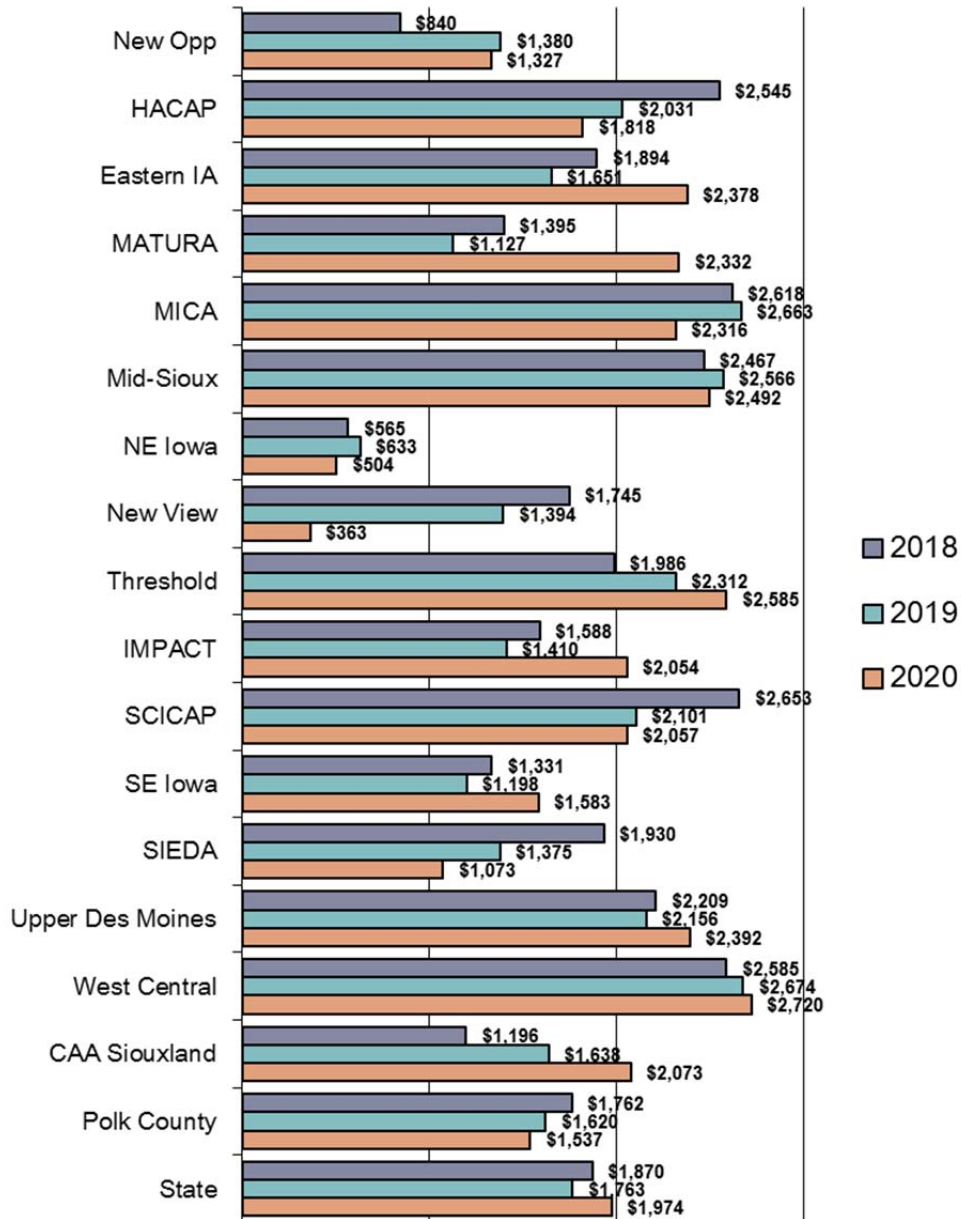


Figure 1.20a Average Program Expenditures on Wall Insulation by Agency

Figure 1.20b provides agency expenditures for utility-funded wall insulation. Statewide, the average expenditures for utility-funded wall insulation averaged \$1,606. MATURA spent the most at \$3,920 utility funds, with MICA, Siouxland, Eastern Iowa, and West Central averaging over \$2,000. Northeast Iowa spent \$498 while New View spend no utility funds.

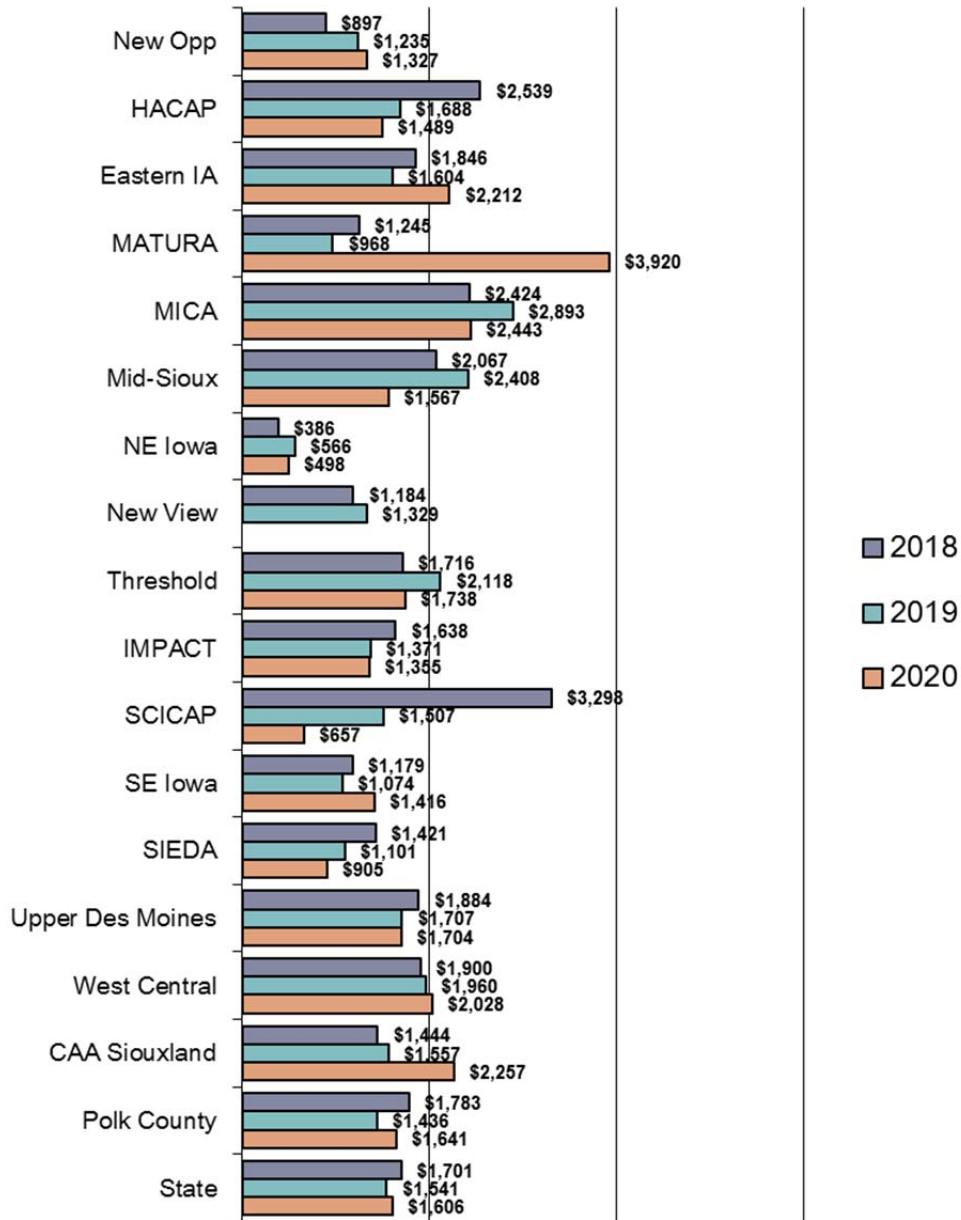


Figure 1.20b Average Utility Expenditures on Wall Insulation by Agency

## FLOOR/CRAWLSPACE INSULATION

Figure 1.21a shows the average expenditures for floor/crawlspace insulation from all funding sources. Statewide, the cost for floor/crawlspace insulation averaged \$689. SCICAP spent the most at \$1,267 per unit, while MICA spent the least, at \$243.

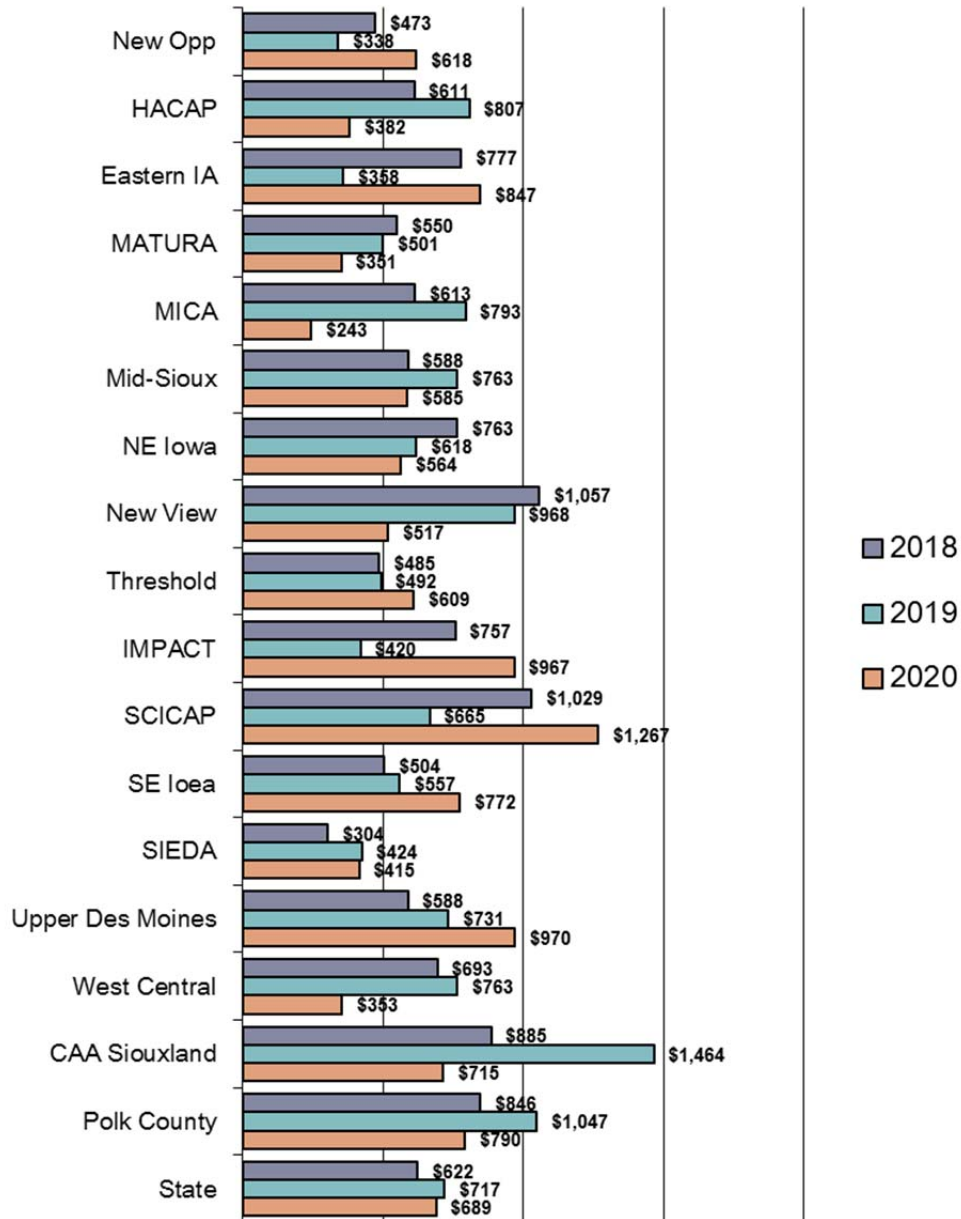


Figure 1.21a Average Program Expenditures on Floor/Crawlspace Insulation by Agency

The average expenditure of utility funds for floor/crawlspace insulation (Figure 1.21b) was \$604. Polk County spent the most at \$860 while new View spent \$101. MATURA had no utility expenditures for this measure.

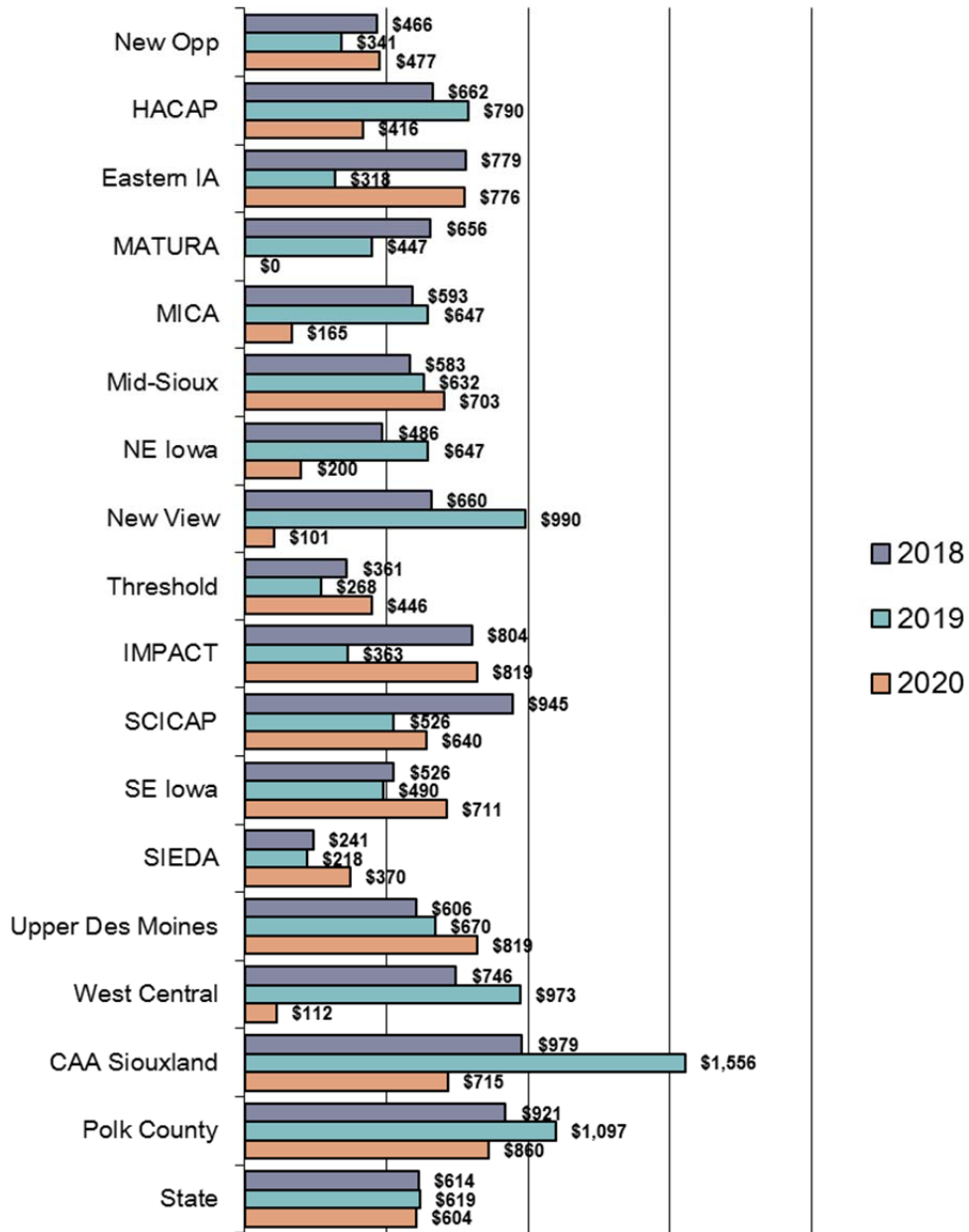


Figure 1.21b Average Utility Expenditures on Floor/Crawlspace Insulation by Agency

## NON-ELECTRIC HEATING SYSTEM REPLACEMENT EXPENDITURES

Figure 1.22a shows the average expenditures for all non-electric heating system replacements from all funding sources. Statewide average heating system replacement costs were \$3,159. West Central spent the most at \$5,581, and three other agencies reported average expenditures exceeding \$4,000, including CAA Siouxland (\$4,744), New View (\$4,501), and New Opportunities (\$4,203). Three agencies averaged less than \$2,500, including Polk County (\$2,402), MATURA (\$2,363), and Threshold (\$2,233).

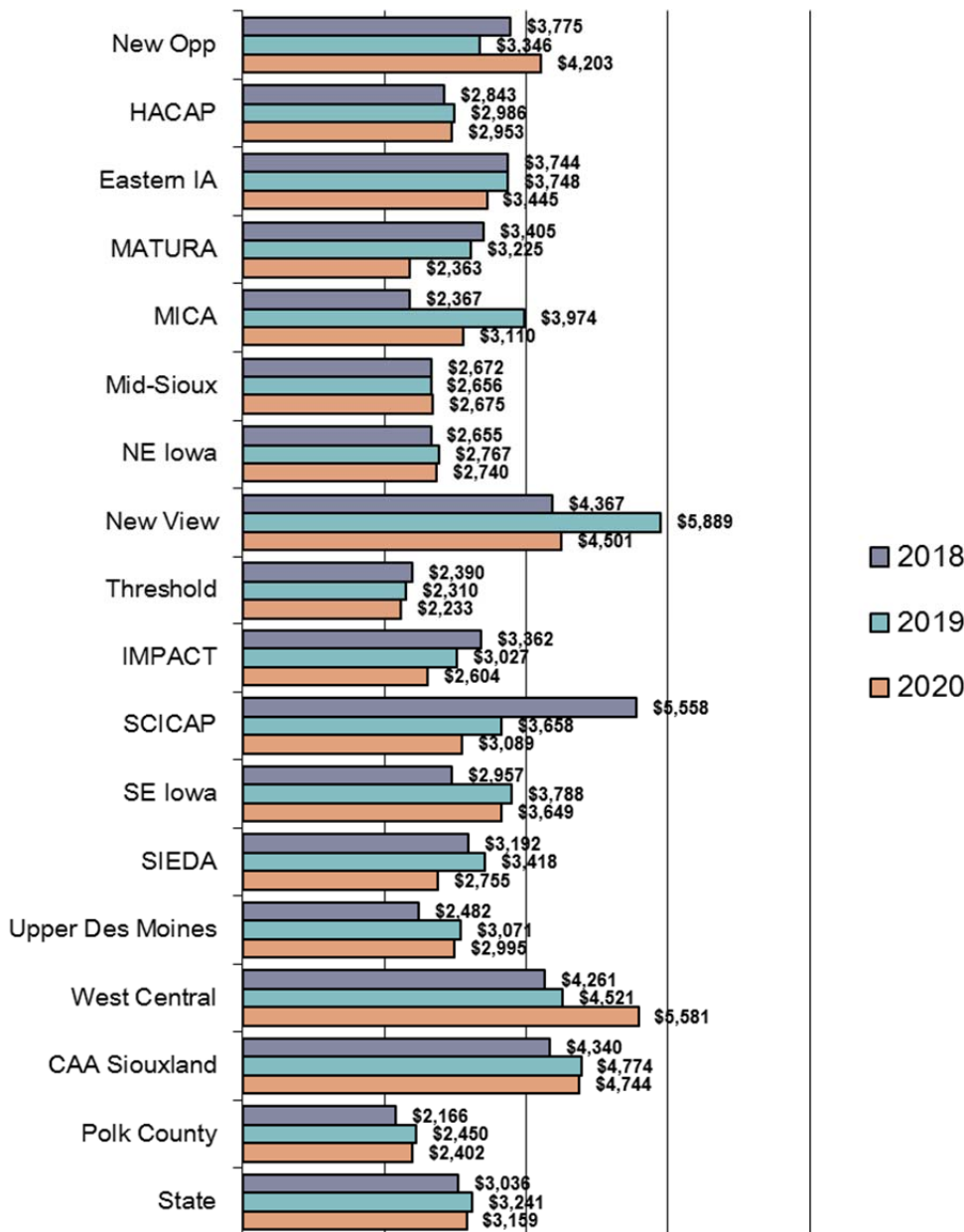


Figure 1.22a Average Program Expenditures on Heating System Replacements by Agency



Figure 1.22b shows the average utility funding for replacement heating systems of \$2,612 statewide. West Central, CAA Siouxland, SE Iowa, and New Opportunities each spent more than \$3,000. Polk County and Threshold spent less than \$2,000. MATURA had no expenditures of utility funds for this measure.

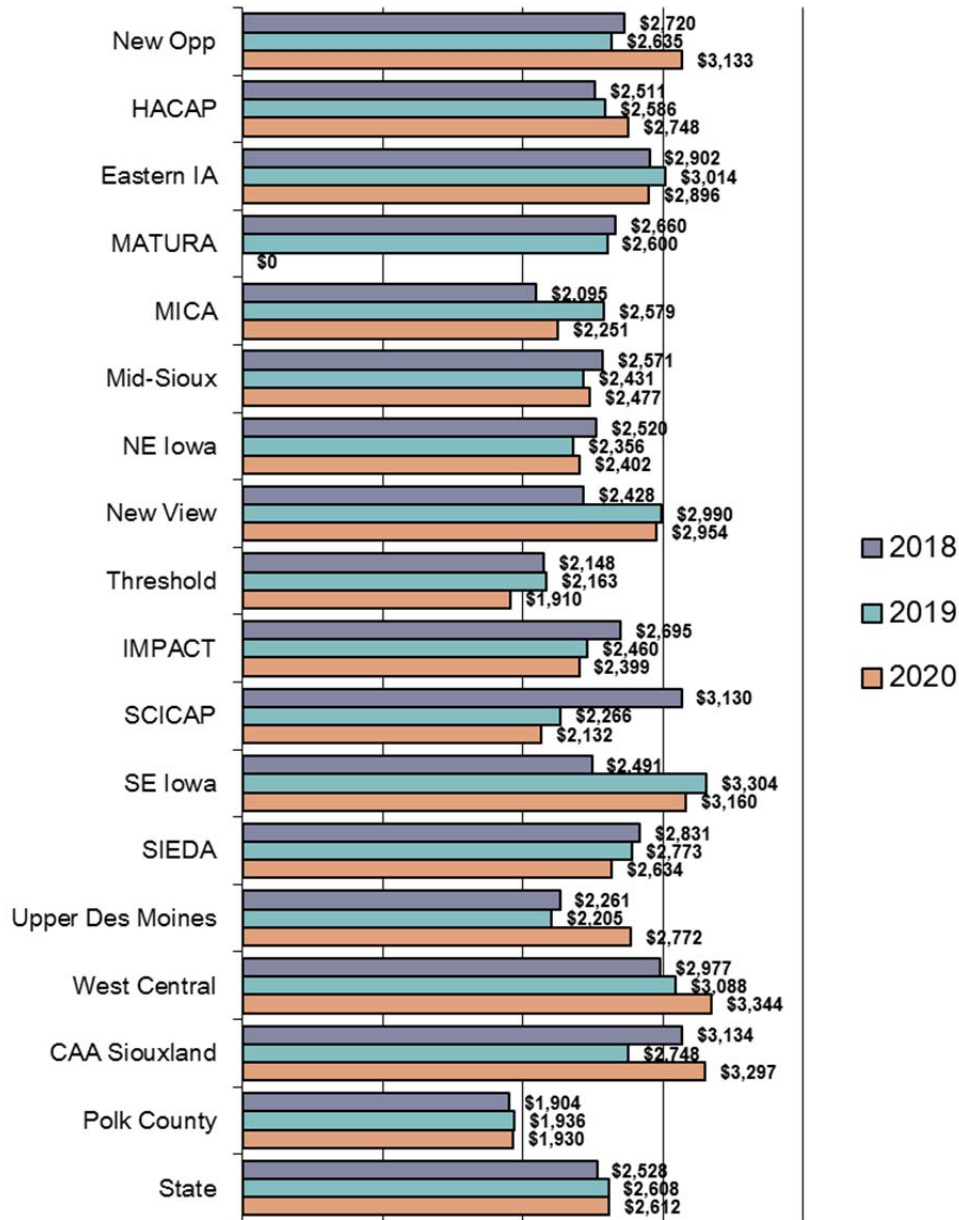


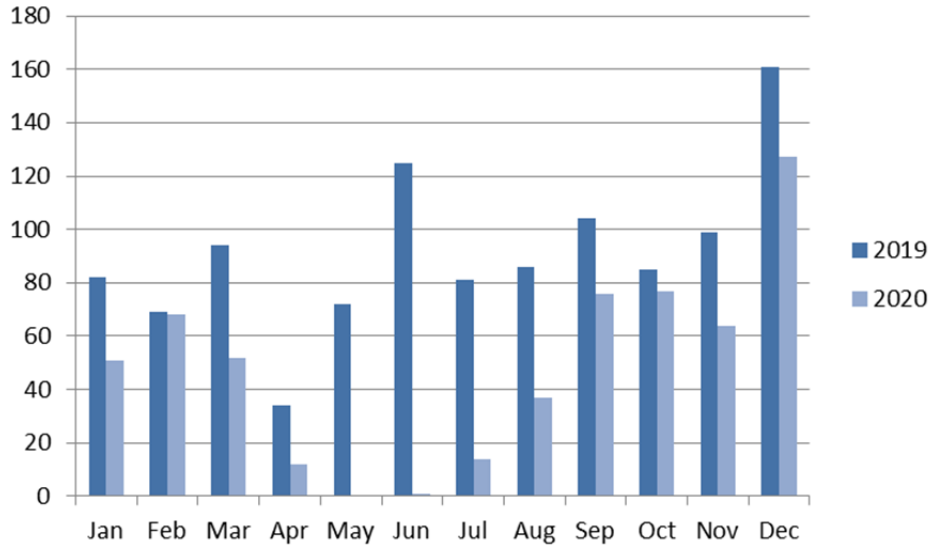
Figure 1.22b Average Utility Expenditures on Heating System Replacements by Agency

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PROGRAM IMPACTS RELATED TO COVID 19

The weatherization assistance program paused installations mid-2020 and incurred additional expenses upon startup owing to the COVID 19 pandemic.

Figure 1.23 shows the number of completions by month for 2019 and 2020.



**Figure 1.23 Monthly completions in 2019 and 2020**

A total of 579 units were weatherized in 2020 compared with 1,092 in 2019, which is a 47% decline. Fewer units were weatherized during every month during 2020 as compared to the prior year. No units were completed during May, and a single unit was recorded as completed in June, 2020.

Costs were higher owing in part to additional expenditures on PPE and COVID-related support (i.e., costs incurred to maintain staffing levels by supporting non-field related weatherization efforts.)

Weatherization costs averaged \$14,927 during the first six months of 2020: this covers the period prior to the pause in weatherization installations. Costs were about 10% higher than during the same period in 2019 (see Table 1.17).

**Table 1.17 Weatherization expenditures in 2019 and 2020**

Year	First Half of Year		Second Half of Year				Full Year		
	Units	Average Expenditures	Units	Averaged Wx Expenditures excl Covid	PPE Expenditures	Covid Support Expenditures	Average	Units	Annual Average
2019	476	\$13,489	616	\$13,603	-	-	\$13,603	1,092	\$13,553
2020	184	\$14,927	395	\$14,066	207	2116	\$16,389	579	\$15,925

The portion of weatherization expenditures that account for typical installations (i.e., no COVID expenditures) were \$14,066 during the second half of the year -- this was about 3.4% higher than the average in 2019 (\$13,603).

COVID-related expenditures for PPE and support significantly increased the average for the second half of the year as well as the total year. PPE expenditures averaged \$207 per unit in the second half of the year, and COVID-related support expenditures averaged \$2,116 per unit. The combined average expenditure including these COVID-related costs during the second half was \$16,389.

On an annual basis, expenditures averaged \$15,925 for all units and expenditures. This was a 17.5% increase over the 2019 average. If all COVID-related expenditures were excluded, costs would have averaged \$14,340 per unit, or a 5.6% increase.

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## 2. FUEL CONSUMPTION ANALYSIS

Savings were estimated for all clients based upon measures installed in each dwelling, using algorithms developed in prior studies of the Iowa low-income program. The fuel consumption analysis provides adjustment factors to the estimated impacts, with gas adjustments applied to estimates of natural gas, propane, and fuel oil heating impacts.

### STUDY SAMPLE AND METHODOLOGY

The treatment groups for the gas and electricity analyses included weatherization jobs completed from May 1, 2019 through September 30, 2020.

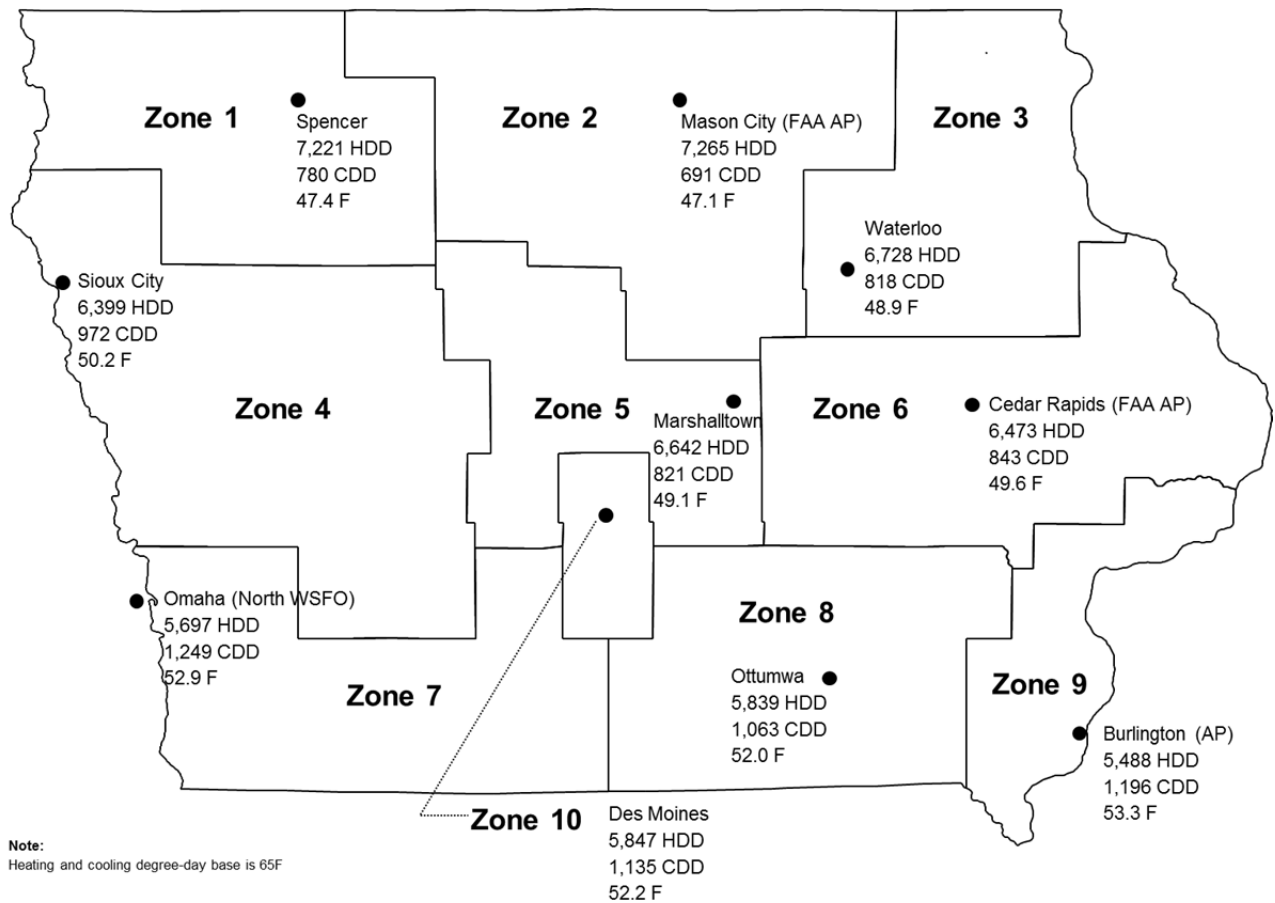
We used a comparison group to adjust for non-weatherization program factors that affect fuel usage, including but not limited to fuel price shocks, naturally-occurring conservation, and participation in other energy programs. Our comparison group consisted of all LIHEAP clients of the SLICE utilities and who applied for energy assistance from October, 2020 through March, 2021. In order to assess a change in consumption for the comparison group, we established a pseudo-treatment period for each comparison group household by assigning the same period as that of a randomly selected household from the treatment group.

Estimated usage readings were combined with subsequent actual readings. Phone/postcard readings and final or corrected readings were considered actual readings. Reading codes not corresponding to actual readings were considered estimated.

The weatherization period was defined as beginning with the audit date and ending with the date the dwelling was reported as complete. We truncated the usage data to a period of no more than 380 days prior to the beginning of the weatherization period, and up to 380 days following end of the weatherization period.

Fuel consumption was weather-normalized using weather data from the same ten weather zones (Figure 2.1). Our long-term normal weather datasets are comprised of the 28-year period ending in Dec, 2017.

The comparison group records were matched with treatment group records based upon normalized annual pre-weatherization consumption, housing type, heating fuel, and model components (heating and or/ cooling and/or baseload).



**Figure 2.1 Weather zones used in the weather-normalization**

## MODEL SELECTION

We investigated impacts using five model specifications for each dwelling:

- Heating/Baseload (gas and electricity)
  - HB using floating point reference temperatures ranging between 40°F to 70°F
  - HBF using fixed reference temperatures of 62°F for natural gas and 58°F for electricity
- Cooling/Baseload (electricity only)
  - CB using floating point reference temperatures ranging between 60°F to 72°F
  - CBF using fixed reference temperatures of 68°F
- Heating only (gas only)
  - HO using floating point reference temperatures ranging between 40°F and 70°F
  - HOF using fixed reference temperatures of 62°F

- Heating/Cooling/Baseload (electricity only)
  - Heating floating point reference temperatures ranging between 40°F and 70°F
  - Cooling floating point reference temperatures ranging between 60°F and 72°F
  - HCF using fixed reference temperatures of 58°F for heating and 68°F for cooling
- BO Baseload (electricity and gas, but no gas models passed the selection process)
  - flat usage, requiring nine months of data.

Three levels of screens were used, including:

- 1) Insufficient usage history or usage characteristics
- 2) Poor model diagnostics
- 3) Poor model reliability.

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#### SCREENS FOR POOR MODEL DIAGNOSTICS

Models were dropped if:

- the coefficient of variation of NAC exceeded 0.1
- negative values for adjusted  $r^2$
- Gas:  $R^2$  of at least 0.7, electricity:  $R^2$  of at least 0.5

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#### SCREENS FOR POOR MODEL RELIABILITY

Models were dropped if:

- the normalized annual heating consumption, heating slope, or baseload components were negative
- Minimal requirements for specific model types:
  - Heating models require usage during periods representing at least 50% of the annual heating days
  - Baseload models required 8.5 months of consumption
- Usage histories had insufficient data during heating and/or cooling seasons. Histories must have usage during periods of at least 50% of heating degree days (base 62 for gas, 58 for electricity heating models), and 50% of cooling degree days base 68 (electricity only)
- Homes heating with electricity heating models had less than 40% of annual usage allocated to heating usage

## ATTRITION ANALYSIS – GAS

We requested data for 522 weatherization client dwellings with gas heating and 51,457 LIHEAP client dwellings for our comparison group (also with gas heating).

### ATTRITION RATES

Table 2.1 provides a breakout of the attrition rates of the natural gas billing data request, by state and utility.

The utilities returned data for 87% of the treatment group and 82% of the comparison group. For cases that were returned, 95% of the treatment group and 87% of the comparison group (LIHEAP) dwellings has useable histories. Our final analytic dataset after assessing model diagnostics, model reliability, and outlier screens included 368 weatherization client dwellings and 27,718 comparison dwellings, representing 86% and 76% of the cases with useable usage histories for the treatment and comparison groups, respectively.

**Table 2.1 Gas Analysis Sample Attrition**

		State		IPL		BHC		MAE	
		Trt	Cmpr	Trt	Cmpr	Trt	Cmpr	Trt	Cmpr
Return Rate	Requested	522	51,457	199	13,974	65	6,815	258	30,668
	Returned	454	42,023	185	11,946	62	6,421	207	23,656
	Percentage Returned	87.0%	81.7%	93.0%	85.5%	95.4%	94.2%	80.2%	77.1%
Useable Histories	Both Pre and Pst Cnt	430	36,579	167	8,706	56	4,741	207	23,132
	Pct of Returned	94.7%	87.0%	90.3%	72.9%	90.3%	73.8%	100.0%	97.8%
Passed Model Diagnostics	Both Pre and Pst Cnt	403	32,176	148	7,847	54	4,506	201	19,823
	Pct of Useable Histories	93.7%	88.0%	88.6%	90.1%	96.4%	95.0%	97.1%	85.7%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	368	27,718	134	6,941	49	4,086	185	16,691
	Pct of Useable Histories	85.6%	75.8%	80.2%	79.7%	87.5%	86.2%	89.4%	72.2%

Table 2.2 provides the attrition analysis broken out by housing type. Overall, 86% of the returned account data for weatherized single family site-built dwellings passed all analytic screens. Similarly, of those cases with returned data, 90% of mobile homes and 60% of the few multi-family dwellings weatherized by the program passed all analytic screens.



**Table 2.2 Gas Attrition by Housing Type**

		State		IPL		BHC		MAE	
		Trt	Cmpr	Trt	Cmpr	Trt	Cmpr	Trt	Cmpr
<b>Single Family Detached Framed Dwellings</b>									
Requested		455	34,010	176	10,008	59	4,793	220	19,209
Returned		402	29,533	166	9,076	56	4,633	180	15,824
Percentage Returned		88.4%	86.8%	94.3%	90.7%	94.9%	96.7%	81.8%	82.4%
Useable Histories	Both Pre and Pst Cnt	381	26,186	150	6,990	51	3,609	180	15,587
	Pct of Returned	94.8%	88.7%	90.4%	77.0%	91.1%	77.9%	100.0%	98.5%
Passed Model Diagnostics	Both Pre and Pst Cnt	357	24,083	132	6,372	49	3,470	176	14,241
	Pct of Useable Histories	93.7%	92.0%	88.0%	91.2%	96.1%	96.1%	97.8%	91.4%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	327	20,951	120	5,672	45	3,150	162	12,129
	Pct of Useable Histories	85.8%	80.0%	80.0%	81.1%	88.2%	87.3%	90.0%	77.8%
<b>Mobile Homes</b>									
Requested		54	4,370	14	1,159	2	771	38	2,440
Returned		40	3,635	11	1,021	2	701	27	1,913
Percentage Returned		74.1%	83.2%	78.6%	88.1%	100.0%	90.9%	71.1%	78.4%
Useable Histories	Both Pre and Pst Cnt	39	3,049	10	733	2	485	27	1,831
	Pct of Returned	97.5%	83.9%	90.9%	71.8%	100.0%	69.2%	100.0%	95.7%
Passed Model Diagnostics	Both Pre and Pst Cnt	37	2,732	10	657	2	463	25	1,612
	Pct of Useable Histories	94.9%	89.6%	100.0%	89.6%	100.0%	95.5%	92.6%	88.0%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	35	2,357	10	583	2	428	23	1,346
	Pct of Useable Histories	89.7%	77.3%	100.0%	79.5%	100.0%	88.2%	85.2%	73.5%
<b>Multi-Family</b>									
Requested		13	6,274	9	1,546	4	706	-	4,022
Returned		12	4,743	8	1,102	4	607	-	3,034
Percentage Returned		92.3%	75.6%	88.9%	71.3%	100.0%	86.0%	-	75.4%
Useable Histories	Both Pre and Pst Cnt	10	3,924	7	574	3	379	-	2,971
	Pct of Returned	83.3%	82.7%	87.5%	52.1%	75.0%	62.4%	-	97.9%
Passed Model Diagnostics	Both Pre and Pst Cnt	9	3,094	6	480	3	348	-	2,266
	Pct of Useable Histories	90.0%	78.8%	85.7%	83.6%	100.0%	91.8%	-	76.3%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	6	2,595	4	415	2	311	-	1,869
	Pct of Useable Histories	60.0%	66.1%	57.1%	72.3%	66.7%	82.1%	-	62.9%

**GAS IMPACT ANALYSIS**

Our results are summarized in Table 2.3. The agency-specific results are summarized on each line, with the overall program impacts summarized on the bottom line. The column labeled ‘Population’ provides the count of all dwellings with natural gas heating that were treated by the weatherization program during the calendar year. The treatment group columns indicate the number of dwellings in our screened analysis dataset (‘n’), the weather-normalized annual consumption prior to weatherization (‘Baseline’ consumption), the 90% confidence interval on the baseline consumption (interpreted as the variation from baseline for which we are 90% certain that the true mean value of the baseline consumption falls within), the unadjusted savings (‘Savings’) and the 90% confidence interval on the savings.

The next section of Table 3.2 provides results for the matched comparison group. To the right of those results are the net savings by agency, including average savings and percentage savings.

The overall adjusted savings (reported under the Net Savings column) averaged 224 therms for single family site-built dwellings. The 90% confidence interval was 36 therms, which is suggestive that 90%

certain that the true population mean savings falls in the approximate range of 188 and 260 therms. The overall mean percent savings was 22.7%, with a 3.2% confidence interval.

Net gas savings for thirty-five mobile homes averaged 189 therms  $\pm$ 107 therms. The overall percentage savings for mobile homes was 20.2%, with a 10.8% confidence interval.

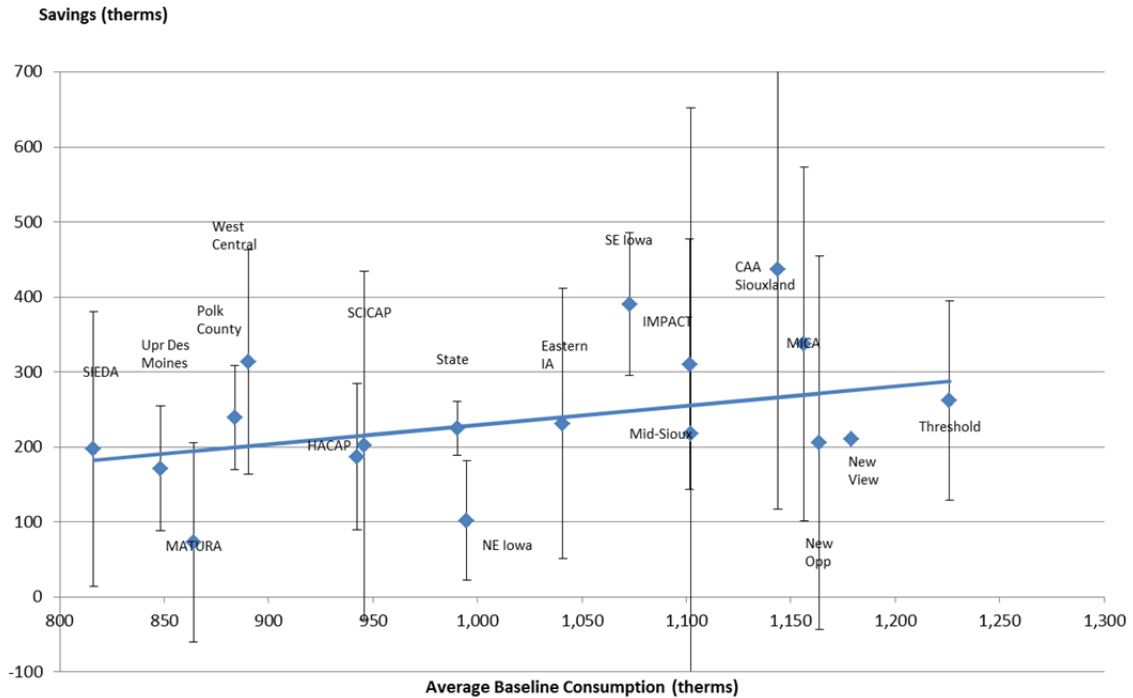
We did not have enough data to provide reliable results for the few multi-family dwellings weatherized.

**Table 2.3 Gas Fuel Consumption Analysis Results**

	Population (with gas heating source)	Treatment Group					Comparison Group					Net			
		n	Baseline Cons. (therms)	90% CI	Savings (therms)	90% CI	n	Baseline Cons. (therms)	90% CI	Savings (therms)	90% CI	Savings (therms)	90% CI	Percent Savings (%)	90% CI
<b>Single Family Detached Framed Dwelling Results</b>															
New Opportunities	19	15	1,164	195	228	249	505	1,034	21	26	28	205	249	17.7%	19.4%
HACAP	47	34	942	70	198	98	2,144	939	8	11	12	187	98	19.8%	9.5%
Eastern IA	26	20	1,041	140	246	180	1,300	994	15	16	21	231	180	22.2%	15.2%
MATURA	12	3	864	81	91	131	78	862	10	19	21	72	133	8.4%	15.2%
MICA	15	11	1,156	200	365	238	517	1,056	19	29	27	337	236	29.2%	16.7%
Mid-Sioux	3	3	1,102	258	248	433	52	1,097	34	30	51	217	435	19.7%	37.7%
NE Iowa	44	32	995	57	82	77	691	985	12	-19	17	101	80	10.2%	7.4%
New View	15	9	1,179	225	211	305	0	0	0	0	0	211	0	17.9%	0.0%
Threshold	43	28	1,226	103	287	133	1,034	1,180	13	26	19	262	133	21.4%	9.6%
IMPACT	21	14	1,102	145	358	170	605	1,037	18	55	24	310	167	28.2%	12.6%
SCICAP	4	2	946	228	225	233	45	948	15	23	27	202	232	21.3%	19.9%
SE Iowa	40	20	1,073	70	389	92	342	1,049	13	-2	21	390	95	36.4%	7.1%
SIEDA	19	17	816	149	213	182	856	801	19	15	27	197	183	24.2%	19.0%
Upper Des Moines	64	45	848	66	180	82	1,400	853	11	9	16	171	83	20.2%	8.6%
West Central	22	15	890	132	334	150	1,096	884	14	21	19	313	149	35.2%	12.5%
CAA Siouxland	9	7	1,144	284	464	323	577	1,136	24	27	33	437	320	38.2%	20.4%
Polk County	71	52	884	58	239	69	2,699	844	6	0	9	240	69	27.1%	6.4%
Overall	474	327	990	28	239	36	20,965	970	3	15	5	224	36	22.7%	3.2%
<b>Mobile Home Results (entire state)</b>															
Overall	54	35	867	84	202	107	2,141	865	11	13	15	189	107	20.2%	10.8%

## SAVINGS WITH RESPECT TO PRE-WEATHERIZATION USAGE

We plotted the relationship between the normalized annual consumption and the net savings for single family site-built dwellings (Figure 2.2). The upward trending regression line indicates the population-weighted fit between NAC and savings, and demonstrates savings in relation to baseline consumption. The statewide average is shown at the center, labeled 'State'.



**Figure 2.2 Savings in relation to the pre-weatherization normalized annual consumption (single family site-built dwellings).**

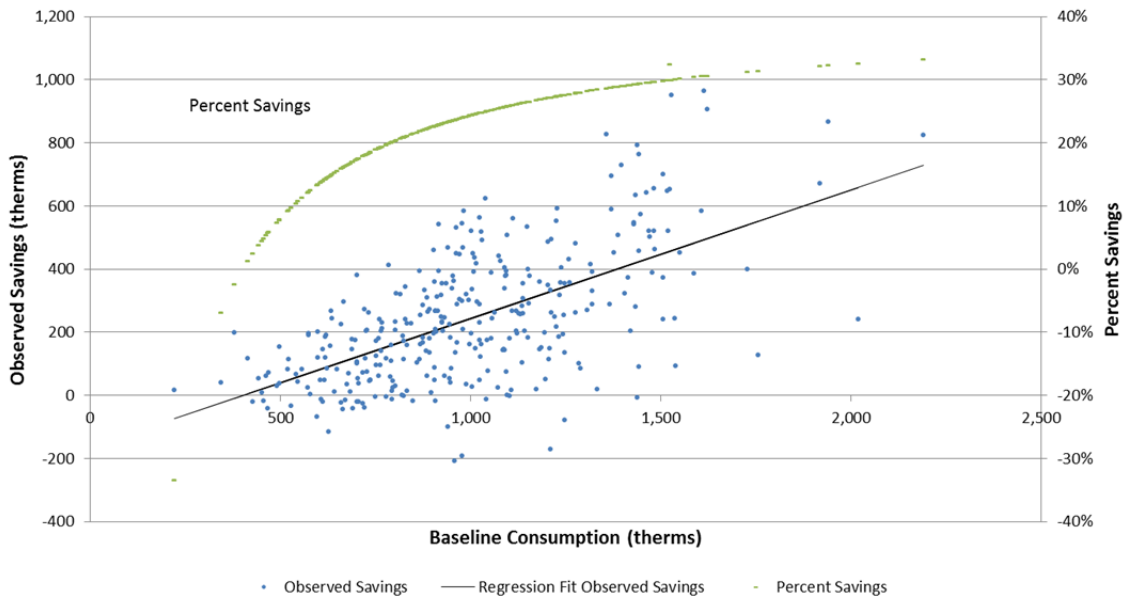
The 90% confidence intervals are extremely wide for several agencies, including IMPACT, Mid-Sioux, and New Opportunities. The 90% confidence intervals of the average adjusted savings for each agency are shown in the error bars. Agencies with confidence intervals overlapping the regression line produced savings consistent with the state overall for dwellings relative to the baseline consumption for those agencies.

Any agency in which the entire confidence interval falls below the regression line is underperforming relative to other agencies. One agency, NE Iowa, fell into this range.

Similarly, any agency in which the entire confidence interval lies above the regression line outperformed other agencies. SE Iowa achieved this.

The high variation in savings can be attributed to various factors including wide variations in housing stock, agency practices, and lower sample sizes. These factors have become a hindrance to assessing agency-specific results in recent years as fewer numbers of homes weatherized. No confidence interval was determined for New View due to a lack of comparison group dwellings for that agency (New View had halted operations prior to the period in which we sampled the comparison group).

Figure 2.3 provides another view of the savings with respect to baseline consumption. The plot shows a point for the savings for dwellings in our billing dataset, a regression line through all points, and an assessment of the percentage savings as determined by this regression line (shown by the curved line). The chart provides confirmation that absolute savings increase as higher-consumption dwellings are targeted. Percent savings increases significantly as baseline consumption increases at the lower range, and less so at higher ranges as the curve flattens out.



**Figure 2.3 Relationship between baseline consumption, savings, and percentage savings**

## TRENDS IN BASELINE CONSUMPTION AND ENERGY SAVINGS

Figure 2.4 provides a yearly summary of baseline consumption, savings, and percentage savings for billing analyses conducted since the calendar year 1998 program. The treatment group normalized annual consumption averaged 1,394 therms the CY 1998 program. Baseline consumption has declined by 28.7% since then, averaging 990 therms in CY 2020. Net savings (224 therms) has been trending downward slightly in the past seven years and is in the lower range compared to those in prior years. The percentage savings of 22.6% is slightly less than a year earlier (23.8%).

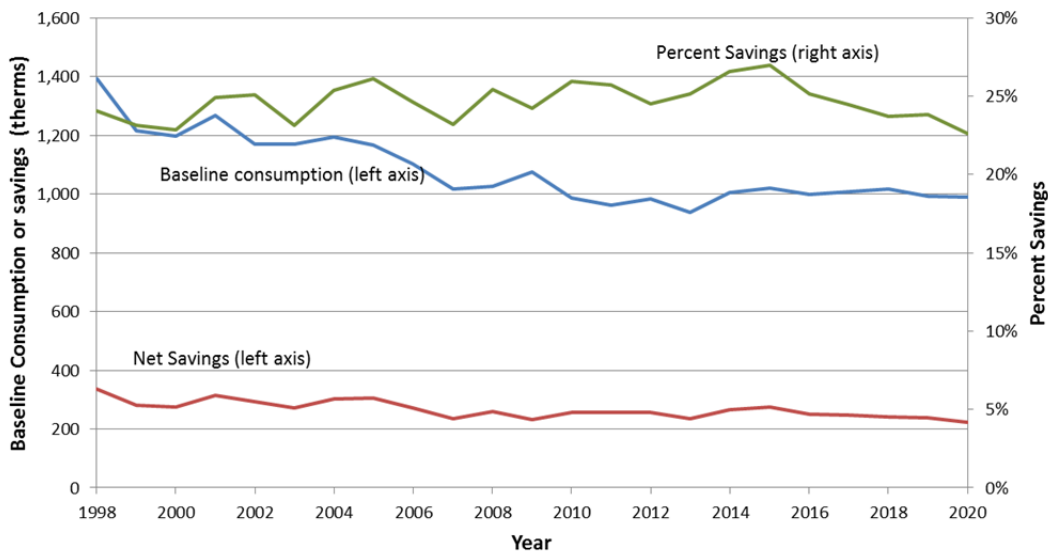


Figure 2.4 Annual Baseline Consumption, Savings, and Percent Savings

## ATTRITION ANALYSIS – ELECTRICITY

We requested data for 535 weatherization clients and 64,185 LIHEAP households for our comparison group. Overall we had 273 treatment and 25,664 comparison group homes which passed all screens.

**Table 2.5 Electricity Analysis Sample Attrition**

		State		IPL		MAE	
		Trt	Cmpr	Trt	Cmpr	Trt	Cmpr
Return Rate	Requested	535	64,185	303	28,343	232	35,842
	Returned	477	53,910	288	24,655	189	29,255
	Percentage Returned	89.2%	84.0%	95.0%	87.0%	81.5%	81.6%
Useable Histories	Both Pre and Pst Cnt	413	42,220	239	15,738	174	26,479
	Pct of Returned	86.6%	78.3%	83.0%	63.8%	92.1%	90.5%
Passed Model Diagnostics	Both Pre and Pst Cnt	348	34,215	195	14,026	153	20,187
	Pct of Useable Histories	84.3%	81.0%	81.6%	89.1%	87.9%	76.2%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	273	25,664	153	11,179	120	14,483
	Pct of Useable Histories	66.1%	60.8%	64.0%	71.0%	69.0%	54.7%

Table 2.6 provides the attrition analysis broken out by housing type. Most of the cases with electricity results were for weatherized single family detached frame dwellings, totaling 238 cases. Weatherization results for thirty mobile homes and five multi-family units passed all screens.

**Table 2.6 Electricity Attrition by Housing Type**

		State		IPL		MAE	
		Trt	Cmpr	Trt	Cmpr	Trt	Cmpr
<b>Single Family Detached Framed Dwellings</b>							
Requested		470	36,192	259	16,682	211	19,510
Returned		417	31,687	247	15,254	170	16,433
Percentage Returned		88.7%	87.6%	95.4%	91.4%	80.6%	84.2%
Useable Histories	Both Pre and Pst Cnt	358	25,680	202	10,707	156	14,973
	Pct of Returned	85.9%	81.0%	81.8%	70.2%	91.8%	91.1%
Passed Model Diagnostics	Both Pre and Pst Cnt	304	21,631	168	9,467	136	12,164
	Pct of Useable Histories	84.9%	84.2%	83.2%	88.4%	87.2%	81.2%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	238	17,291	131	7,886	107	9,405
	Pct of Useable Histories	66.5%	67.3%	64.9%	73.7%	68.6%	62.8%
<b>Mobile Homes</b>							
Requested		49	4,418	30	2,214	19	2,204
Returned		46	3,619	29	1,912	17	1,707
Percentage Returned		93.9%	81.9%	96.7%	86.4%	89.5%	77.5%
Useable Histories	Both Pre and Pst Cnt	43	2,783	27	1,256	16	1,525
	Pct of Returned	93.5%	76.9%	93.1%	65.7%	94.1%	89.3%
Passed Model Diagnostics	Both Pre and Pst Cnt	36	2,350	21	1,136	15	1,213
	Pct of Useable Histories	83.7%	53.2%	70.0%	51.3%	78.9%	55.0%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	30	1,910	18	955	12	954
	Pct of Useable Histories	69.8%	68.6%	66.7%	76.0%	75.0%	62.6%
<b>Multi-Family</b>							
Requested		16	8,885	14	4,124	2	4,761
Returned		14	7,007	12	3,217	2	3,790
Percentage Returned		66.7%	72.8%	0.0%	72.6%	100.0%	73.1%
Useable Histories	Both Pre and Pst Cnt	12	5,062	10	1,639	2	3,423
	Pct of Returned	85.7%	72.2%	83.3%	50.9%	100.0%	90.3%
Passed Model Diagnostics	Both Pre and Pst Cnt	8	3,905	6	1,482	2	2,423
	Pct of Useable Histories	66.7%	77.1%	60.0%	90.4%	100.0%	70.8%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	5	2,672	4	1,061	1	1,611
	Pct of Useable Histories	41.7%	52.8%	40.0%	64.7%	50.0%	47.1%

**ELECTRICITY IMPACT ANALYSIS**

We developed state-level electricity savings results for two groups, those with non-electric space heat and for those with electric space heat. Our results are summarized in Table 2.7.



**Table 2.7 Electricity Fuel Consumption Analysis Results (State Level Results)**

	Population		Treatment Group				Comparison Group					Net		Percent	
	n	n	Baseline Cons. (kWh)	90% CI	Savings (kWh)	90% CI	n	Baseline Cons. (kWh)	90% CI	Savings (kWh)	90% CI	Savings (kWh)	90% CI	Savings (%)	90% CI
<b>Electric Savings for Dwellings with Non-Electric Space Heat</b>															
Overall	623	258	9,648	453	643	631	22,921	9,305	48	28	68	617	637	6.4%	6.3%
<b>Electric Savings for Dwellings with Electric Space Heat</b>															
Overall	47	15	20,199	2,698	2,597	3,629	2,437	18,496	220	101	36	2,492	3,639	12.3%	16.9%

Dwellings with non-electric space heat averaged 617 kWh ( $\pm 637$  kWh) net savings from lighting, refrigerators and freezers, water heating, cooling measures, and reductions in furnace blower fan usage. The average net savings for dwellings with electric heat averaged 2,492 kWh per dwelling, with a wide 90% confidence range of 3,639 kWh.

**COMPARISON OF POPULATION AND SAMPLE ENERGY USAGE**

Table 2.8 provides the adjustment factors that were applied to estimated savings for each dwelling weatherized by the program. The adjustment factor for natural gas was also applied to dwellings heated by propane, fuel oil, and other non-electric fuels.

**Table 2.8 Adjustment Factors Applied to Estimated Savings**

	Estimated Savings	Observed Savings	Adjustment Factor
<b>Electricity</b>			
Dwellings with Non-Electric Space Heat	660	617	0.93
Dwellings with Electric Space Heat	2,436	2,492	1.02
<b>Natural Gas Heat</b>			
Single Family Detached and Small Multi-family	245	224	0.92
Mobile Home	112	189	1.68

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### 3. DETAILED SPENDING AND IMPACT PROFILES BY FUNDING ENTITY

This section provides tables of spending and impacts for the utilities, the state, and the overall program. The tables are designed to provide information to meet the filing requirements for cost recovery.

The summaries of impacts for state and utility funding are similar in format to those provided in the earlier SLICE reports.

We show a second table for each of the utilities in this report. These tables show the combined impacts of electricity and natural gas measures from all funding sources. These tables should prove useful for the energy and demand planning departments at the utilities to account for the aggregate impacts of the low-income program, and not just the impacts funded by a specific utility.







**Alliant - Interstate Power and Light**  
**Billing Adjusted Impacts for All Customers of the Utility From All Funding Sources**

Measure	Number of Dwellings with Impacts			Number of Dwellings with Electricity Impacts Season		Billing Adjusted First-Year Savings					Average Billing Adjusted Savings per Dwelling Receiving Measures									
	Total	Electric	Gas	Cooling	Heating	Electricity			Pk-Day therms	Gas Annual therms	Electricity			Pk-Day therms	Gas Annual therms					
						Summer kW	Summer kWh	Winter kWh			Annual kWh	Summer kW	Winter kWh			Annual kWh				
<b>Total Efficiency Measures</b>	<b>254</b>	<b>226</b>	<b>139</b>	<b>225</b>	<b>226</b>	<b>40.3</b>		<b>53.2</b>		<b>159,745</b>	<b>323</b>	<b>29,885</b>	<b>0.179</b>	<b>0.235</b>	<b>707</b>	<b>2.33</b>	<b>215</b>			
<b>Total Shell &amp; Htg. Sys. Repl</b>	<b>254</b>	<b>226</b>	<b>139</b>	<b>224</b>	<b>226</b>	<b>35.8</b>	<b>40,793</b>	<b>46.2</b>	<b>69,064</b>	<b>109,857</b>	<b>318</b>	<b>28,864</b>	<b>0.160</b>	<b>182</b>	<b>0.204</b>	<b>306</b>	<b>486</b>	<b>2.29</b>	<b>208</b>	
<b>Total Shell Measures</b>	<b>254</b>	<b>226</b>	<b>139</b>	<b>224</b>	<b>226</b>	<b>35.8</b>	<b>40,793</b>	<b>45.5</b>	<b>68,038</b>	<b>108,831</b>	<b>209</b>	<b>18,892</b>	<b>0.160</b>	<b>182</b>	<b>0.201</b>	<b>301</b>	<b>482</b>	<b>1.50</b>	<b>136</b>	
Wall Insul.	129	110	88	110	6	12.8	15,431	4.8	6,879	22,310	64	5,807	0.116	140	0.794	1,147	203	0.73	66	
Open Blown Ceiling Insul.	192	169	110	168	20	14.0	16,909	19.3	28,903	45,813	69	6,214	0.083	101	0.965	1,445	271	0.63	56	
Cavity Fill Insul.	61	45	45	44	4	1.9	2,240	2.1	3,184	5,423	26	2,412	0.042	51	0.532	796	121	0.59	54	
Sloped Attic Insul.	67	59	46	59	2	2.6	3,185	1.1	1,633	4,818	18	1,671	0.045	54	0.543	817	82	0.40	36	
Kneewall Insul.	59	51	38	51	3	0.9	1,040	0.1	138	1,178	6	549	0.017	20	0.031	46	23	0.16	14	
Infil. Reduction	248	214	138	213	24	2.9	3,439	4.5	6,718	10,157	21	1,914	0.013	16	0.186	280	47	0.15	14	
Found./Crawl. Insul.	69	28	52	22	10	1.2	1,406	2.0	3,000	4,406	6	564	0.053	64	0.200	300	157	0.12	11	
Bandjoist Insul.	58	9	49	-	9	0.0	0	1.1	1,681	1,681	3	281	0.000	0	0.125	187	187	0.06	6	
Furnace Blower Fan <sup>1</sup>	229	201	139	-	201	0.0	0	14.4	21,848	21,848	(1)	(77)	0.000	0	0.072	109	109	(0.01)	(1)	
Exhaust Ventilation <sup>2</sup>	156	138	82	138	138	-0.4	(2,857)	(3.9)	(5,946)	(8,803)	(5)	(445)	-0.003	(21)	(0.028)	(43)	(64)	(0.06)	(5)	
<b>Total Heating System Repl</b>	<b>92</b>	<b>8</b>	<b>84</b>	<b>-</b>	<b>8</b>	<b>0.0</b>	<b>0</b>	<b>0.7</b>	<b>1,026</b>	<b>1,026</b>	<b>110</b>	<b>9,972</b>	<b>0.000</b>	<b>0</b>	<b>0.087</b>	<b>128</b>	<b>128</b>	<b>1.31</b>	<b>119</b>	
Condensing Htg Sys Repl	84	0	84	-	-	0.0	0	0.0	0	0	110	9,972	-	-	-	-	-	1.31	119	
Non-Cond Htg Sys Repl	0	0	0	-	-	0.0	0	0.0	0	0	0	0	-	-	-	-	-	-	-	
Electric Htg Sys Repl	6	6	0	-	6	0.0	0	0.5	760	760	0	0	0.000	0	0.087	127	127	-	-	
Heat Pump Repl	2	2	0	-	2	0.0	0	0.2	266	266	0	0	0.000	0	0.086	133	133	-	-	
Other Htg Sys Repl	0	0	0	-	0	0.0	0	0.0	0	0	0	0	-	-	-	-	-	-	-	
				Number of Measures by Fuel Type			Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms				
	Total	Electric	Gas	Total	Electric	Gas														
<b>Water Heating</b>	<b>174</b>	<b>76</b>	<b>98</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0.1</b>	<b>9,551</b>	<b>4.9</b>	<b>1,021</b>	<b>0.000</b>	<b>0.002</b>	<b>126</b>	<b>0.050</b>	<b>10</b>				
Temp. Reduct.	13	6	7	0	0	0	0.0	0.0	586	0.1	51	0.000	0.000	98	0.02	7				
WH Wrap	11	5	6	0	0	0	0.0	0.0	529	0.2	57	0.000	0.000	106	0.03	9				
Pipe Insul.	154	72	82	0	0	0	0.0	0.0	2,643	0.7	248	0.000	0.000	37	0.01	3				
LF Showerhead	14	7	7	0	0	0	0.0	0.0	1,023	0.2	62	0.000	0.003	146	0.03	9				
Faucet Aerator	14	9	5	0	0	0	0.0	0.0	384	0.0	10	0.000	0.001	43	0.01	2				
Std-Eff Wtr Htr Repl.	0	0	0	0	0	0	0.0	0.0	0	0.0	0	-	-	-	-	-				
Hi-Eff or Electric Wtr Htr Repl.	109	40	69	0	0	0	0.0	0.1	4,384	3.6	594	0.000	0.003	110	0.05	9				
<b>Lighting</b>	<b>149</b>	<b>149</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2.9</b>	<b>5.5</b>	<b>28,093</b>	<b>-</b>	<b>-</b>	<b>0.020</b>	<b>0.037</b>	<b>189</b>	<b>-</b>	<b>-</b>					
<b>Refrigerator/Freezer<sup>3</sup></b>	<b>26</b>	<b>26</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1.5</b>	<b>1.4</b>	<b>12,243</b>	<b>-</b>	<b>-</b>	<b>0.058</b>	<b>0.054</b>	<b>471</b>	<b>-</b>	<b>-</b>					
Refrigerator Removal	0	0	0	0	0	0.0	0.0	0	-	-	-	-	-	-	-					
Refrigerator Exchange	23	23	0	0	0	1.3	1.2	10,380	-	-	0.056	0.052	451	-	-					
Freezer Removal	0	0	0	0	0	0.0	0.0	0	-	-	-	-	-	-	-					
Freezer Exchange	4	4	0	0	0	0.2	0.2	1,864	-	-	0.057	0.054	466	-	-					





**Black Hills Energy**  
**Billing Adjusted Impacts for All Customers of the Utility From All Funding Sources**

Measure	Number of Dwellings with Impacts			Number of Dwellings with Electricity Impacts Season			Billing Adjusted First-Year Savings					Average Billing Adjusted Savings per Dwelling Receiving Measures				
	Total	Electric	Gas	Cooling	Heating	Electricity			Pk-Day therms	Gas Annual therms	Electricity			Pk-Day therms	Gas Annual therms	
						Summer kW	Winter kWh	Annual kWh			Summer kW	Winter kWh	Annual kWh			
<b>Total Efficiency Measures</b>	<b>39</b>	<b>0</b>	<b>39</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>100</b>	<b>9,321</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2.58</b>	<b>239</b>
<b>Total Shell &amp; Htg. Sys. Repl</b>	<b>39</b>	<b>0</b>	<b>39</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>99</b>	<b>8,960</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2.53</b>	<b>230</b>
<b>Total Shell Measures</b>	<b>39</b>	<b>0</b>	<b>39</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>56</b>	<b>5,064</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1.43</b>	<b>130</b>
Wall Insul.	19	0	19	0	0	0.0	0	0.0	0	13	1,164	-	-	-	0.68	61
Open Blown Ceiling Insul.	34	0	34	0	0	0.0	0	0.0	0	26	2,346	-	-	-	0.76	69
Cavity Fill Insul.	6	0	6	0	0	0.0	0	0.0	0	4	369	-	-	-	0.68	62
Sloped Attic Insul.	10	0	10	0	0	0.0	0	0.0	0	5	423	-	-	-	0.47	42
Kneewall Insul.	9	0	9	0	0	0.0	0	0.0	0	2	162	-	-	-	0.20	18
Infil. Reduction	39	0	39	0	0	0.0	0	0.0	0	6	592	-	-	-	0.17	15
Found./Crawl. Insul.	9	0	9	0	0	0.0	0	0.0	0	1	103	-	-	-	0.12	11
Bandjoist Insul.	10	0	10	-	0	0.0	0	0.0	0	1	58	-	-	-	0.06	6
Furnace Blower Fan <sup>1</sup>	39	0	39	-	0	0.0	0	0.0	0	(0)	(18)	-	-	-	(0.00)	(0)
Exhaust Ventilation <sup>2</sup>	25	0	25	0	0	0.0	0	0.0	0	(1)	(135)	-	-	-	(0.06)	(5)
<b>Total Heating System Repl</b>	<b>30</b>	<b>0</b>	<b>30</b>	<b>-</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>43</b>	<b>3,895</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1.43</b>	<b>130</b>
Condensing Htg Sys Repl	30	0	30	-	-	0.0	0	0.0	0	43	3,895	-	-	-	1.43	130
Non-Cond Htg Sys Repl	0	0	0	-	-	0.0	0	0.0	0	0	0	-	-	-	-	-
Electric Htg Sys Repl	0	0	0	-	0	0.0	0	0.0	0	0	0	-	-	-	-	-
Heat Pump Repl	0	0	0	-	0	0.0	0	0.0	0	0	0	-	-	-	-	-
Other Htg Sys Repl	0	0	0	-	0	0.0	0	0.0	0	0	0	-	-	-	-	-
				Number of Measures by Fuel Type			Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms
	Total	Electric	Gas	Total	Electric	Gas										
<b>Water Heating</b>	<b>29</b>	<b>0</b>	<b>29</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>1.7</b>	<b>361</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.060</b>	<b>12</b>
Temp. Reduct.	4	0	4	0	0	0	0.0	0.0	0	0.1	29	-	-	-	0.02	7
WH Wrap	0	0	0	0	0	0	0.0	0.0	0	0.0	0	-	-	-	-	-
Pipe Insul.	24	0	24	0	0	0	0.0	0.0	0	0.2	70	-	-	-	0.01	3
LF Showerhead	4	0	4	0	0	0	0.0	0.0	0	0.1	28	-	-	-	0.02	7
Faucet Aerator	13	0	13	0	0	0	0.0	0.0	0	0.1	26	-	-	-	0.01	2
Std-Eff Wtr Htr Repl.	0	0	0	0	0	0	0.0	0.0	0	0.0	0	-	-	-	-	-
Hi-Eff or Electric Wtr Htr Repl.	25	0	25	0	0	0	0.0	0.0	0	1.3	206	-	-	-	0.05	8
<b>Lighting</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Refrigerator/Freezer<sup>3</sup></b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Refrigerator Removal	0	0	0	0	0	0	0.0	0.0	0	-	-	-	-	-	-	-
Refrigerator Exchange	0	0	0	0	0	0	0.0	0.0	0	-	-	-	-	-	-	-
Freezer Removal	0	0	0	0	0	0	0.0	0.0	0	-	-	-	-	-	-	-
Freezer Exchange	0	0	0	0	0	0	0.0	0.0	0	-	-	-	-	-	-	-



**MidAmerican Energy**  
**Billing Adjusted Impacts for All Customers of the Utility From All Funding Sources**

Measure	Number of Dwellings with Impacts			Number of Dwellings with Electricity Impacts Season		Billing Adjusted First-Year Savings					Average Billing Adjusted Savings per Dwelling Receiving Measures								
	Total	Electric	Gas	Cooling	Heating	Electricity			Pk-Day therms	Gas Annual therms	Electricity			Pk-Day therms	Gas Annual therms				
						Summer kW	Summer kWh	Winter kWh			Summer kW	Winter kWh	Annual kWh						
<b>Total Efficiency Measures</b>	<b>292</b>	<b>238</b>	<b>249</b>	<b>238</b>	<b>238</b>	<b>43.4</b>		<b>38.7</b>		<b>142,221</b>	<b>604</b>	<b>56,688</b>	<b>0.182</b>	<b>0.162</b>	<b>598</b>	<b>2.42</b>	<b>228</b>		
<b>Total Shell &amp; Htg. Sys. Repl</b>	<b>292</b>	<b>238</b>	<b>249</b>	<b>235</b>	<b>238</b>	<b>38.3</b>	<b>42,988</b>	<b>30.2</b>	<b>46,706</b>	<b>89,694</b>	<b>592</b>	<b>54,352</b>	<b>0.163</b>	<b>183</b>	<b>0.127</b>	<b>196</b>	<b>377</b>	<b>2.38</b>	<b>218</b>
<b>Total Shell Measures</b>	<b>292</b>	<b>238</b>	<b>249</b>	<b>235</b>	<b>238</b>	<b>38.3</b>	<b>42,988</b>	<b>29.5</b>	<b>45,661</b>	<b>88,649</b>	<b>354</b>	<b>32,528</b>	<b>0.163</b>	<b>183</b>	<b>0.124</b>	<b>192</b>	<b>372</b>	<b>1.42</b>	<b>131</b>
Wall Insul.	164	132	143	132	7	15.1	18,240	3.5	5,387	23,627	112	10,249	0.115	138	0.498	770	179	0.78	72
Open Blown Ceiling Insul.	219	174	186	174	11	14.1	16,948	7.0	10,898	27,846	115	10,573	0.081	97	0.639	991	160	0.62	57
Cavity Fill Insul.	88	62	80	61	3	2.5	3,022	1.7	2,761	5,783	37	3,394	0.041	50	0.569	920	93	0.46	42
Sloped Attic Insul.	80	57	67	57	2	2.4	2,917	1.1	1,651	4,568	29	2,680	0.042	51	0.552	826	80	0.43	40
Kneewall Insul.	66	48	62	48	2	0.8	979	0.3	390	1,369	10	951	0.017	20	0.126	195	29	0.17	15
Infil. Reduction	290	219	247	219	12	3.0	3,586	1.0	1,580	5,166	46	4,245	0.014	16	0.085	132	24	0.19	17
Found./Crawl. Insul.	83	18	78	17	1	0.8	1,016	0.0	71	1,087	15	1,384	0.050	60	0.045	71	60	0.19	18
Bandjoist Insul.	88	5	83	-	5	0.0	0	0.2	351	351	4	355	0.000	0	0.045	70	70	0.05	4
Furnace Blower Fan <sup>1</sup>	280	226	249	-	226	0.0	0	18.8	28,818	28,818	(1)	(136)	0.000	0	0.083	128	128	(0.01)	(1)
Exhaust Ventilation <sup>2</sup>	233	186	198	186	186	-0.5	(3,720)	(4.1)	(6,247)	(9,967)	(13)	(1,166)	-0.002	(20)	(0.022)	(34)	(54)	(0.06)	(6)
<b>Total Heating System Repl</b>	<b>182</b>	<b>6</b>	<b>176</b>	<b>-</b>	<b>6</b>	<b>0.0</b>	<b>0</b>	<b>0.7</b>	<b>1,046</b>	<b>1,046</b>	<b>238</b>	<b>21,824</b>	<b>0.000</b>	<b>0</b>	<b>0.116</b>	<b>174</b>	<b>174</b>	<b>1.35</b>	<b>124</b>
Condensing Htg Sys Repl	176	0	176	-	-	0.0	0	0.0	0	0	238	21,824	-	-	-	-	-	1.35	124
Non-Cond Htg Sys Repl	0	0	0	-	-	0.0	0	0.0	0	0	0	0	-	-	-	-	-	-	-
Electric Htg Sys Repl	3	3	0	-	3	0.0	0	0.3	408	408	0	0	0.000	0	0.093	136	136	-	-
Heat Pump Repl	4	4	0	-	4	0.0	0	0.4	638	638	0	0	0.000	0	0.105	159	159	-	-
Other Htg Sys Repl	0	0	0	-	0	0.0	0	0.0	0	0	0	0	-	-	-	-	-	-	-
				Number of Measures by Fuel Type			Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms			
<b>Water Heating</b>	<b>250</b>	<b>47</b>	<b>203</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0.1</b>	<b>5,453</b>	<b>11.3</b>	<b>2,336</b>	<b>0.000</b>	<b>0.002</b>	<b>116</b>	<b>0.056</b>	<b>12</b>			
Temp. Reduct.	8	3	5	0	0	0	0.0	0.0	394	0.1	37	0.000	0.000	131	0.02	7			
WH Wrap	2	0	2	0	0	0	0.0	0.0	0	0.0	16	-	-	-	0.02	8			
Pipe Insul.	243	43	200	0	0	0	0.0	0.0	1,575	1.8	634	0.000	0.000	37	0.01	3			
LF Showerhead	26	4	22	0	0	0	0.0	0.0	585	0.5	163	0.000	0.003	146	0.02	7			
Faucet Aerator	45	5	40	0	0	0	0.0	0.0	165	0.3	99	0.000	0.001	33	0.01	2			
Std-Eff Wtr Htr Repl.	0	0	0	0	0	0	0.0	0.0	0	0.0	0	-	-	-	-	-			
Hi-Eff or Electric Wtr Htr Repl.	167	25	142	0	0	0	0.0	0.1	2,734	8.5	1,389	0.000	0.003	109	0.06	10			
<b>Lighting</b>	<b>182</b>	<b>182</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3.9</b>	<b>7.2</b>	<b>37,160</b>	<b>-</b>	<b>-</b>	<b>0.021</b>	<b>0.040</b>	<b>204</b>	<b>-</b>	<b>-</b>				
<b>Refrigerator/Freezer<sup>3</sup></b>	<b>23</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1.2</b>	<b>1.1</b>	<b>9,914</b>	<b>-</b>	<b>-</b>	<b>0.053</b>	<b>0.050</b>	<b>431</b>	<b>-</b>	<b>-</b>				
Refrigerator Removal	0	0	0	0	0	0.0	0.0	0	-	-	-	-	-	-	-				
Refrigerator Exchange	20	20	0	0	0	1.1	1.0	8,549	-	-	0.053	0.049	427	-	-				
Freezer Removal	0	0	0	0	0	0.0	0.0	0	-	-	-	-	-	-	-				
Freezer Exchange	3	3	0	0	0	0.2	0.2	1,366	-	-	0.056	0.052	455	-	-				

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## 4. SPENDING AND IMPACT PROFILES BY AGENCY

This section provides tables of spending and impacts at an aggregate level for each weatherization agency.

Table 4.1, Billing Adjusted Costs and Impacts for All Measures Installed During Calendar Year 2020 by Agency, provides the counts of units completed, total and average expenditures, and total and average energy impacts for all installed measures *without regard to the funding source*.

Table 4.2, Billing Adjusted Costs and Impacts for Utility-Funded Measures Installed During Calendar Year 2020 by Agency, provides the counts of units completed, total and average expenditures, and total and average energy impacts for *measures paid for by the utilities*.

**Billing Adjusted Costs and Impacts for All Measures Installed During Calendar Year 2020 by Agency**

Agency	Number of Dwellings with Impacts						Total Expenditures			Average Expenditures		
	Total	Electric	Gas	Propane	Fuel Oil	Other	Efficiency Measures	Health, Safety, Repairs	Total Expenditures	Efficiency Measures	Health, Safety, Repairs	Total Expenditures
New Opportunities	27	27	15	6	0	0	\$221,277	\$206,544	\$427,821	\$8,195	\$7,650	\$15,845
Hawkeye Area Comm Action Prg	64	64	62	2	0	0	\$463,534	\$696,044	\$1,159,578	\$7,243	\$10,876	\$18,118
Comm Action of Eastern Iowa	25	25	21	4	0	0	\$217,672	\$256,177	\$473,849	\$8,707	\$10,247	\$18,954
MATURA Action Corporation	10	10	9	0	0	0	\$40,556	\$40,015	\$80,571	\$4,056	\$4,001	\$8,057
Mid-Iowa Community Action	24	24	17	5	0	0	\$209,895	\$235,481	\$445,376	\$8,746	\$9,812	\$18,557
Mid-Sioux Opportunity	25	25	18	3	0	0	\$193,407	\$169,514	\$362,922	\$7,736	\$6,781	\$14,517
Northeast Iowa Comm Action Corp	40	40	13	19	1	0	\$238,417	\$150,383	\$388,801	\$5,960	\$3,760	\$9,720
Operation: New View	16	16	5	6	1	0	\$136,378	\$164,691	\$301,069	\$8,524	\$10,293	\$18,817
Operation Threshold	43	43	39	0	0	0	\$391,332	\$321,868	\$713,200	\$9,101	\$7,485	\$16,586
IMPACT	19	19	17	1	0	0	\$176,966	\$184,490	\$361,455	\$9,314	\$9,710	\$19,024
South Central Iowa Comm Action Prg	17	17	9	6	0	0	\$142,473	\$108,849	\$251,322	\$8,381	\$6,403	\$14,784
Comm Action of South Eastern Iowa	41	41	38	0	0	0	\$339,758	\$508,897	\$848,656	\$8,287	\$12,412	\$20,699
Southern Iowa Economic Dvlp Authority	30	30	19	3	0	0	\$193,131	\$239,825	\$432,956	\$6,438	\$7,994	\$14,432
Upper Des Moines Opportunity	67	67	48	15	0	0	\$538,825	\$396,247	\$935,071	\$8,042	\$5,914	\$13,956
West Central Development Corp	26	26	20	3	0	0	\$343,897	\$298,224	\$642,122	\$13,227	\$11,470	\$24,697
Comm Action Agency of Siouxland	12	12	11	0	0	0	\$116,823	\$145,598	\$262,421	\$9,735	\$12,133	\$21,868
Polk County	93	93	91	0	0	0	\$583,519	\$549,716	\$1,133,235	\$6,274	\$5,911	\$12,185

Agency	Billing Adjusted First-Year Savings									Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures						
	Electricity		Gas kWh	Gas		Propane gallons	Fuel Oil gallons	Other Mbtu	Summer kW	Electricity		Annual kWh	Gas		Propane gallons	Fuel Oil gallons
Summer kW	Winter kW	Pk-Day therms		Annual therms	Summer kW					Winter kW	Pk-Day therms		Annual therms			
New Opportunities	4.4	7.4	18,403	45	4,207	1,396	0	0	0.162	0.275	682	3.02	280	233	-	-
Hawkeye Area Comm Action Prg	7.3	3.8	21,220	124	11,693	261	0	0	0.114	0.060	332	2.00	189	131	-	-
Comm Action of Eastern Iowa	4.0	2.1	9,892	60	5,644	534	0	0	0.158	0.082	396	2.87	269	134	-	-
MATURA Action Corporation	1.5	1.0	3,732	9	807	0	0	0	0.150	0.100	373	1.01	90	-	-	-
Mid-Iowa Community Action	3.5	3.6	10,723	43	4,041	1,012	0	0	0.145	0.151	447	2.52	238	202	-	-
Mid-Sioux Opportunity	5.1	8.0	24,534	41	3,754	609	0	0	0.204	0.320	981	2.26	209	203	-	-
Northeast Iowa Comm Action Corp	7.0	12.5	44,193	35	3,373	4,912	103	0	0.176	0.314	1,105	2.72	259	259	103	-
Operation: New View	2.7	6.0	18,053	15	1,415	1,593	188	0	0.171	0.374	1,128	3.03	283	265	188	-
Operation Threshold	8.4	7.9	24,758	104	9,902	0	0	0	0.195	0.183	576	2.67	254	-	-	-
IMPACT	3.0	1.3	5,969	51	4,837	429	0	0	0.157	0.067	314	3.01	285	429	-	-
South Central Iowa Comm Action Prg	2.7	2.8	9,471	16	1,469	1,156	0	0	0.171	0.164	557	1.83	163	193	-	-
Comm Action of South Eastern Iowa	11.8	12.9	35,598	108	9,273	0	0	0	0.289	0.314	868	2.84	244	-	-	-
Southern Iowa Economic Dvlp Authority	6.4	13.3	31,741	48	4,259	828	0	0	0.212	0.442	1,058	2.51	224	276	-	-
Upper Des Moines Opportunity	11.6	12.8	48,519	89	9,012	4,542	0	0	0.173	0.190	724	1.86	188	303	-	-
West Central Development Corp	7.6	7.6	24,679	68	6,052	1,299	0	0	0.293	0.291	949	3.41	303	433	-	-
Comm Action Agency of Siouxland	2.0	3.8	10,202	30	2,765	0	0	0	0.171	0.320	850	2.70	251	-	-	-
Polk County	14.6	11.5	47,083	211	19,936	0	0	0	0.157	0.123	506	2.32	219	-	-	-

## Billing Adjusted Costs and Impacts for Utility-Funded Measures Installed During Calendar Year 2020 by Agency

Agency	Number of Dwellings with Impacts			Total Expenditures			Average Expenditures		
	Total	Electric	Gas	Efficiency Measures	Health, Safety, Repairs	Total Expenditures	Efficiency Measures	Health, Safety, Repairs	Total Expenditures
New Opportunities	20	17	13	\$77,618	\$17,682	\$95,300	\$3,881	\$884	\$4,765
Hawkeye Area Comm Action Prg	58	55	48	\$192,829	\$49,370	\$242,200	\$3,325	\$851	\$4,176
Comm Action of Eastern Iowa	23	18	19	\$103,467	\$22,299	\$125,767	\$4,499	\$970	\$5,468
MATURA Action Corporation	3	1	3	\$6,777	\$2,741	\$9,518	\$2,259	\$914	\$3,173
Mid-Iowa Community Action	21	17	17	\$100,000	\$23,051	\$123,052	\$4,762	\$1,098	\$5,860
Mid-Sioux Opportunity	10	8	7	\$49,056	\$8,921	\$57,977	\$4,906	\$991	\$5,798
Northeast Iowa Comm Action Corp	24	19	12	\$40,039	\$6,359	\$46,398	\$1,668	\$265	\$1,933
Operation: New View	8	8	4	\$22,187	\$4,903	\$27,090	\$2,773	\$613	\$3,386
Operation Threshold	26	25	22	\$120,080	\$21,433	\$141,513	\$4,618	\$691	\$5,443
IMPACT	15	10	13	\$72,909	\$15,824	\$88,733	\$4,861	\$989	\$5,916
South Central Iowa Comm Action Prg	13	11	9	\$34,016	\$10,895	\$44,910	\$2,617	\$908	\$3,455
Comm Action of South Eastern Iowa	39	36	32	\$197,898	\$44,248	\$242,146	\$5,074	\$1,135	\$6,209
Southern Iowa Economic Dvlp Authority	29	29	18	\$102,982	\$27,222	\$130,204	\$3,551	\$939	\$4,490
Upper Des Moines Opportunity	51	43	39	\$203,322	\$40,953	\$244,275	\$3,987	\$803	\$4,790
West Central Development Corp	16	13	14	\$101,051	\$19,644	\$120,694	\$6,316	\$1,228	\$7,543
Comm Action Agency of Siouxland	9	9	9	\$62,387	\$16,525	\$78,911	\$6,932	\$1,836	\$8,768
Polk County	64	64	60	\$214,318	\$42,023	\$256,341	\$3,349	\$657	\$4,005

	Billing Adjusted First-Year Savings					Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures				
	Electricity			Gas		Summer kW	Electricity		Gas Pk-Day therms	Annual therms
	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms		Winter kW	Annual kWh		
New Opportunities	2.8	3.5	9,761	29	2,694	0.167	0.208	574	2.25	207
Hawkeye Area Comm Action Prg	5.4	1.9	13,809	85	7,961	0.098	0.034	251	1.78	166
Comm Action of Eastern Iowa	2.3	1.0	6,039	45	4,165	0.137	0.056	336	2.36	219
MATURA Action Corporation	0.0	0.0	46	2	130	0.021	0.014	46	0.50	43
Mid-Iowa Community Action	2.0	3.0	7,279	42	3,885	0.133	0.178	428	2.45	229
Mid-Sioux Opportunity	1.2	3.8	8,401	14	1,282	0.205	0.473	1,050	2.00	183
Northeast Iowa Comm Action Corp	3.2	3.4	15,188	27	2,528	0.168	0.177	799	2.22	211
Operation: New View	1.0	3.4	9,301	7	622	0.128	0.419	1,163	1.68	156
Operation Threshold	4.0	5.7	15,433	44	4,174	0.168	0.228	617	2.00	190
IMPACT	1.5	0.6	3,061	33	3,122	0.145	0.058	306	2.56	240
South Central Iowa Comm Action Prg	1.4	0.3	2,523	11	958	0.154	0.032	229	1.21	106
Comm Action of South Eastern Iowa	9.6	8.4	25,334	69	5,902	0.274	0.234	704	2.17	184
Southern Iowa Economic Dvlp Authority	5.7	13.0	29,748	41	3,614	0.196	0.448	1,026	2.26	201
Upper Des Moines Opportunity	6.3	6.4	25,955	60	5,948	0.145	0.149	604	1.53	153
West Central Development Corp	3.3	3.0	10,345	39	3,388	0.257	0.232	796	2.76	242
Comm Action Agency of Siouxland	1.4	0.9	4,259	22	2,020	0.175	0.100	473	2.43	224
Polk County	9.1	8.3	33,582	118	10,962	0.156	0.130	525	1.97	183

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## APPENDIX A -- CLIENT CHARACTERISTICS

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Household characteristics</b>										
Quarterly gross income	\$4,344	\$4,355	\$4,286	\$4,406	\$4,600	\$6,691	\$9,414	\$9,871	\$9,161	\$6,338
Average members	2.9	2.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Percentage of households with:										
Elderly	29.1	29.4	30.8	28.9	31.3	34.4	35.5	38.2	37.7	40.8
Handicapped	32.9	30.1	32.6	31.3	30.6	34.1	33.4	35.1	33.0	29.5
Young children	25.2	21.9	20.1	22.4	19.4	17.4	20.7	17.6	18.9	18.8
<b>Housing type (%)</b>										
Single family home	89.6	87.3	84.8	87.4	88.4	88.1	89.1	87.9	88.0	88.3
Mobile home	10.0	10.2	11.9	10.6	8.6	7.9	7.2	7.5	8.6	8.3
Small Multi-family	0.4	2.5	3.3	2.0	3.0	3.9	3.7	4.6	3.4	3.5
<b>Heating system type (%)</b>										
Natural gas	81.0	80.8	80.3	84.2	86.7	85.4	84.1	86.9	85.6	78.1
Propane	12.9	13.3	12.3	9.2	8.1	8.6	8.3	6.3	8.4	12.6
Fuel oil	0.8	0.8	0.9	0.2	0.1	0.5	1.1	0.3	0.2	0.3
Electricity	5.4	5.1	6.4	6.4	5.2	5.5	6.4	6.6	5.9	9.0
Other	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0
<b>Air conditioning type (%)</b>										
Central	58.7	57.3	60.2	63.6	62.0	62.6	64.9	67.9	67.1	69.1
Room	27.8	30.4	29.4	26.3	29.5	28.0	27.3	26.2	28.1	22.8
None or Missing Data	13.6	12.3	10.4	10.1	8.5	9.4	7.8	5.9	4.8	8.1
<b>Blower door readings (average cfm50)</b>										
Pre	3,294	3,454	3,281	3,437	3,429	3,420	3,447	3,601	3,535	3,327
Post	2,054	2,139	2,053	2,100	2,148	2,565	2,160	2,283	2,218	2,210

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## APPENDIX B – FIGURE DATA

Figure 1.1 First Year Energy Savings (therms) – Program

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heating System Work	286,414	192,441	102,711	116,295	113,515	107,412	89,404	84,822	70,868	38,370
Infiltration Reduction	59,030	35,991	24,403	24,864	22,482	20,948	16,743	16,078	16,432	7,148
Insulation	494,564	333,793	197,200	197,846	184,203	148,756	123,312	116,900	118,016	54,818
Light/Water Heat/Other Utilit	16,057	9,698	7,726	6,002	6,062	4,403	3,874	3,586	3,336	1,605
Water Heater Replacement	54,904	32,819	25,296	28,290	33,942	29,679	23,656	5,486	4,730	2,323
Whole House Ventilation					-2,392	-4,936	-4,269	-3,681	-3,746	-1,824

Figure 1.2 First Year Energy Savings (kWh) – Program

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heating System Work	8,324	4,975	3,937	186,516	201,190	185,546	159,209	141,656	102,592	61,845
Infiltration Reduction	150,295	59,937	39,935	46,035	32,037	41,401	42,306	32,996	27,914	22,005
Insulation	1,811,722	759,702	466,832	466,307	358,537	446,239	470,351	393,957	296,097	192,872
Light/Water Heat/Other Utilit	2,734,566	947,748	596,538	567,195	572,018	371,009	369,048	372,411	328,967	127,057
Water Heater Replacement	19,171	7,824	12,343	14,023	15,089	17,269	15,857	12,699	8,466	10,546
Whole House Ventilation					-24,538	-59,517	-70,405	-55,641	-44,172	-25,555

Figure 1.3 Overall Program Expenditures

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heating System Work	8,182,168	5,189,193	3,123,974	3,465,461	3,376,066	3,390,913	2,747,745	2,639,470	2,427,437	1,343,847
Infiltration Reduction	2,357,653	1,476,133	1,002,359	1,041,087	1,005,719	1,182,412	1,045,485	1,050,911	1,091,550	589,000
Insulation	12,616,772	7,584,763	4,317,731	4,509,492	4,279,518	4,188,388	3,440,858	3,296,812	3,144,993	1,845,872
Light/Water Heat/Other Utilit	1,233,806	720,138	424,488	356,538	327,532	328,738	241,252	181,688	201,940	87,199
Other	2,584,355	1,988,982	1,752,150	1,700,878	2,151,835	1,982,511	1,558,300	1,558,818	1,433,013	1,692,941
Repair	2,405,336	1,491,583	1,039,839	971,976	785,187	930,041	828,300	841,939	656,413	370,264
Support	8,932,316	5,818,840	4,656,124	4,864,035	4,756,716	5,302,237	4,570,198	4,333,342	3,955,748	2,261,937
Water Heater Replacement	2,426,666	1,527,656	1,034,375	1,316,775	1,562,901	1,579,574	1,289,234	1,216,971	1,093,003	622,692
Whole House Ventilation	687,151	648,556	367,224	488,871	368,924	1,018,951	898,996	802,972	795,679	406,672

Figure 1.4 Average Program Expenditures per Housing Unit

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heating System Work	1,800	1,750	1,690	2,080	2,230	2,302	2,189	2,281	2,223	2,321
Infiltration Reduction	520	500	540	620	660	803	833	908	1,000	1,017
Insulation	2,780	2,550	2,330	2,710	2,830	2,843	2,742	2,849	2,880	3,188
Light/Water Heat/Other Ut	270	240	230	210	220	223	192	157	185	151
Other	690	670	950	1,020	1,420	1,346	1,242	1,347	1,312	2,924
Repair	530	500	560	580	520	631	660	728	601	639
Support	1,970	1,960	2,520	2,920	3,140	3,600	3,642	3,745	3,622	3,907
Water Heater Repl	540	510	560	790	1,030	1,072	1,027	1,052	1,001	1,075
Whole House Ventilation	150	220	200	290	240	692	716	694	729	702
	9,258	8,901	9,577	11,227	12,295	13,512	13,255	13,762	13,553	15,925

Figure 1.6 First Year Client Fuel Cost Savings (Nominal Dollars)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Whole House Ventilation					-5,593	-12,094	-13,169	-10,721	-9,291	-5,077
Heating System Work	371,197	227,712	121,871	129,924	123,290	114,855	107,911	89,550	67,844	43,177
Infiltration Reduction	84,236	43,906	29,920	28,584	23,482	23,425	21,220	17,763	16,180	9,303
Insulation	759,964	424,194	256,624	234,798	199,673	183,128	174,531	149,405	127,081	75,201
Light/Water Heat/Other Ut	280,880	103,539	66,702	63,990	67,400	45,384	46,038	46,041	41,775	16,230
Water Heater Replacement	63,944	37,826	29,556	31,404	35,593	31,142	27,027	7,249	5,625	3,591

Figure 1.8 First Year Energy Savings (therms) – Utility only

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heating System Work	111,218	67,910	60,813	70,795	67,323	69,667	58,964	56,587	39,540	23,032
Infiltration Reduction	10,340	5,358	5,129	5,467	4,923	4,784	5,275	5,361	3,766	1,783
Insulation	207,156	131,917	131,486	132,525	119,370	102,315	93,879	82,856	73,820	37,505
Light/Water Heat/Other Utilit	6,809	4,029	4,604	3,911	3,852	2,809	2,838	2,480	1,794	1,035
Water Heater Replacement	25,346	13,943	15,335	15,826	18,230	17,885	16,361	3,501	2,272	0

Figure 1.9 First Year Energy Savings (kWh) – Utility only

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heating System Work	3,286	417	224	64,339	66,083	71,506	66,476	56,869	32,598	22,538
Infiltration Reduction	18,659	7,535	6,267	9,268	8,069	8,430	12,372	9,802	8,018	4,910
Insulation	613,470	264,752	237,590	282,915	212,946	283,722	321,895	242,091	153,290	118,784
Light/Water Heat/Other Utilit	922,461	347,294	336,976	344,858	350,640	218,339	251,166	247,622	174,167	73,832
Water Heater Replacement	11,516	4,774	3,587	5,753	6,780	9,119	9,580	7,629	2,532	0

Figure 1.10 Utility Expenditures

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heating System Work	2,082,247	1,176,515	1,200,207	1,557,590	1,520,693	1,594,196	1,379,543	1,344,597	984,042	580,579
Infiltration Reduction	288,225	173,869	172,746	198,737	204,838	212,265	273,962	271,847	230,486	118,461
Insulation	3,753,358	2,295,748	2,306,634	2,528,094	2,353,124	2,422,997	2,190,461	2,014,536	1,638,982	992,074
Light/Water Heat/Other Utilit	375,480	249,184	227,782	200,560	188,571	180,770	160,696	106,432	97,986	48,313
Other	128,109	72,842	62,892	107,646	124,082	147,766	176,289	182,118	127,974	52,738
Repair	157,260	96,832	104,157	129,832	121,538	123,880	168,145	177,192	126,545	74,552
Support	706,131	420,502	466,296	564,572	523,448	602,760	585,371	548,279	393,167	208,312
Water Heater Replacement	702,797	414,525	481,837	597,828	762,163	849,809	815,113	685,224	469,445	0