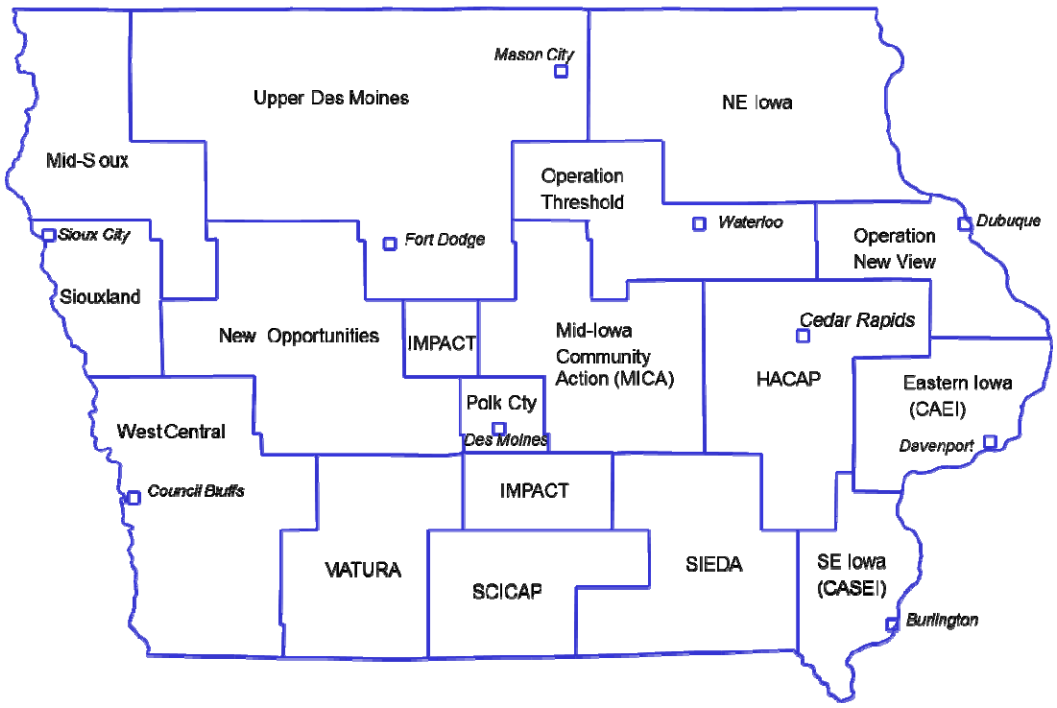
REPORT ON THE IMPACTS AND COSTS OF THE IOWA LOW-INCOME WEATHERIZATION PROGRAM -- Calendar Year 2019

November 15, 2020

Iowa Local Weatherization Agencies



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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 2019 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[1]. The estimated impacts were adjusted using billing analysis of the program clients.

PROGRAM COSTS AND IMPACTS

The WAP program spent $14,799,777 for materials, labor, and support while installing measures in 1,092 dwellings during calendar year (CY) 2019. Funding decreased by 7.1% from the prior year while completions declined by 5.6%. Federal and state funding accounted for 72.5% of overall expenditures while utilities funded the remaining 27.5%.

The program expenditures for materials, labor, and support averaged $13,553 compared to $13,764 in the prior year (a 1.5% decrease). The major measures installed by the program were essentially unchanged from the previous year.

First-year savings totaled 209,640 therms; 719,860 kWh electricity; 22,960 gallons of propane; and 326 gallons of fuel oil. First-year peak demand savings totaled 2,247 therms, 193 kW summer demand, and 190 kW winter demand.

Electricity savings averaged 659 kWh for 1,092 dwellings with electricity impacts. The program saved an average of 224 therms of natural gas for 934 dwellings with gas impacts. In addition, the program delivered first-year savings of 250 gallons of propane in 92 dwellings with propane impacts, and 163 gallons of fuel oil in 2 dwellings with fuel oil impacts.

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

First-year client energy cost savings totaled $249,213, averaging $228 per housing unit.

	Electricity (kWh and kW)			Natural Gas (therms)			Propane (gals)	Fuel Oil (gals)
	Overall	DCAA	Utility	Overall	DCAA	Utility	DCAA	DCAA
Energy	719,860	349,260	370,610	209,640	88,440	121,190	22,960	326
Summer Demand	193	89	104	NA	NA	NA	NA	NA
Winter Demand	190	100	90	2,247	942	1,305	NA	NA

Average Impacts[1] 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
Energy	659	322	556	224	95	194	250	163
Summer Demand	0.177	0.082	0.156	NA	NA	NA	NA	NA
Winter Demand	0.174	0.092	0.135	2.4	1.0	2.1	NA	NA

Expenditures and First Year Client Fuel Bill Savings

Totals	Overall	DCAA	Utility	Averages	Overall	DCAA	Utility
Expenditures[2]	$14,799,777	$10,731,150	$4,068,627	Expenditures	$13,553	$9,827	$5,144
Client Fuel Savings	$249,213	$128,146	$121,067	Client Fuel Savings	$228	$117	$153

[1] 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

[2] 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 $4,068,627, accounting for 27.5% of total program expenditures. The utility expenditures averaged $5,144 for the 791 dwellings that received utility-funded measures.

Utility-funded measures saved a total of 370,610 kWh, averaging of 556 kWh of electricity for the 667 dwellings with utility-funded electricity measures. Utility funded measures also saved a total of 121,190 therms, averaging 194 therms for the 626 dwellings with utility-funded natural gas measures. Utility-funded measures reduced peak electricity demand by 104 kW in the summer and 90 kW in the winter, and provided 1,305 peak-day therms of gas savings. Utility-funded measures accounted for 51.5% of program electricity savings and 57.8% of program gas savings.

Utility-funded measures yielded first-year client bill savings of $121,067, averaging $153 per dwelling that received utility-funded efficiency measures. Electricity bill savings averaged $66 per household for utility-funded electricity measures. Gas bill savings averaged $123 for those with utility-funded gas measures.

FUEL CONSUMPTION ANALYSIS RESULTS

Natural gas savings for single family site-built dwellings averaged 237 therms ± 32 at 90% confidence. This represents a 23.8% savings ± 2.8% at 90% confidence for natural gas measures. Mobile home savings averaged 177 therms ± 86 at 90% confidence, equating to a 23.4% savings ± 8.4%.

Electricity savings averaged 2,158 kWh ± 5,772 for twenty dwellings in our analysis with electric main heat (8.7% savings), and 542 kWh ± 521 (5.9% savings) for 362 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

One agency, North Iowa, was inactive during CY 2019. Units in that agency's service territory were allocated to surrounding agencies.

There were no significant changes in major shell and heating system measure delivery as compared to the previous year.

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. A section was added at the end, entitled Comparison of Sample and Overall Program Populations.

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.

Appendix A provides a characterization of households and dwellings weatherized during 2019.

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

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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 1,092 dwelling units were weatherized to completion during calendar year (CY) 2019, compared to 1,157 in the prior program year. First-year savings totaled 209,640 therms; 719,860 kWh electricity; 22,960 gallons of propane; and 326 gallons of fuel oil. First-year peak demand savings totaled 2247 peak-day therms, 193 kW summer demand, and 190 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).

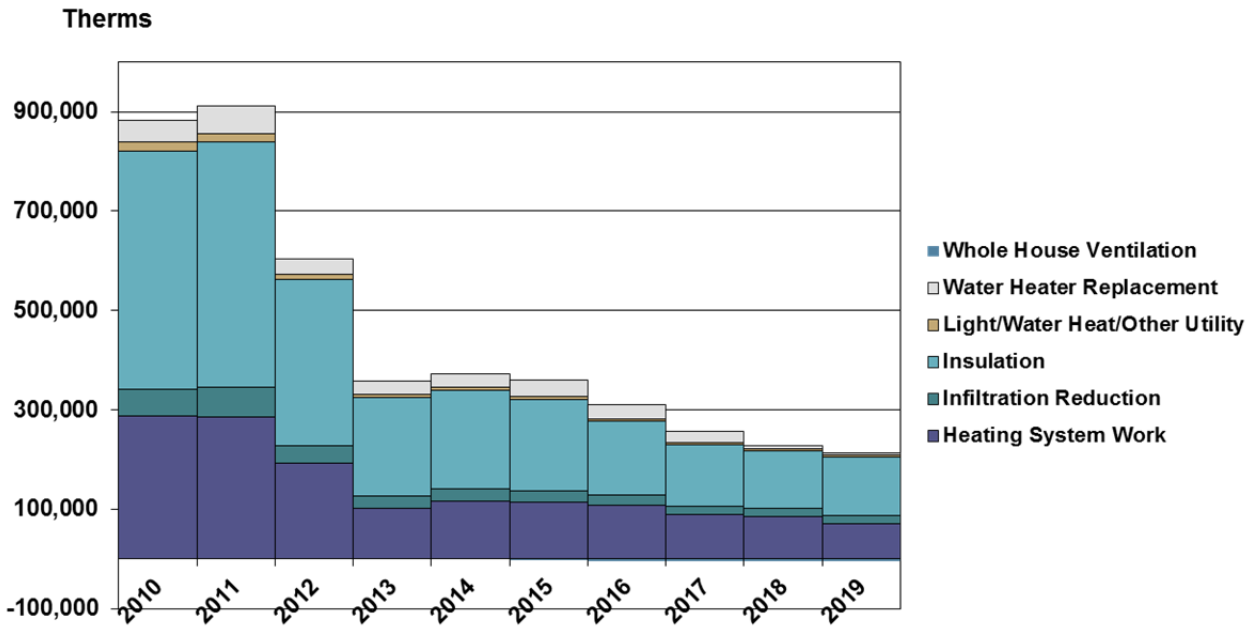

Figure 1.1 First Year Energy Savings (therms) – Program

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 (7.8% 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	70,868	33.8%
Infiltration Reduction	16,432	7.8%
Insulation	118,016	56.3%
Light/Water Heat/Other Utility	3,336	1.6%
Water Heater Replacement	4,730	2.3%
Whole House Ventilation	-3,746	-1.8%

Electricity savings totaled 719,860 kWh for the program overall (Figure 1.2).

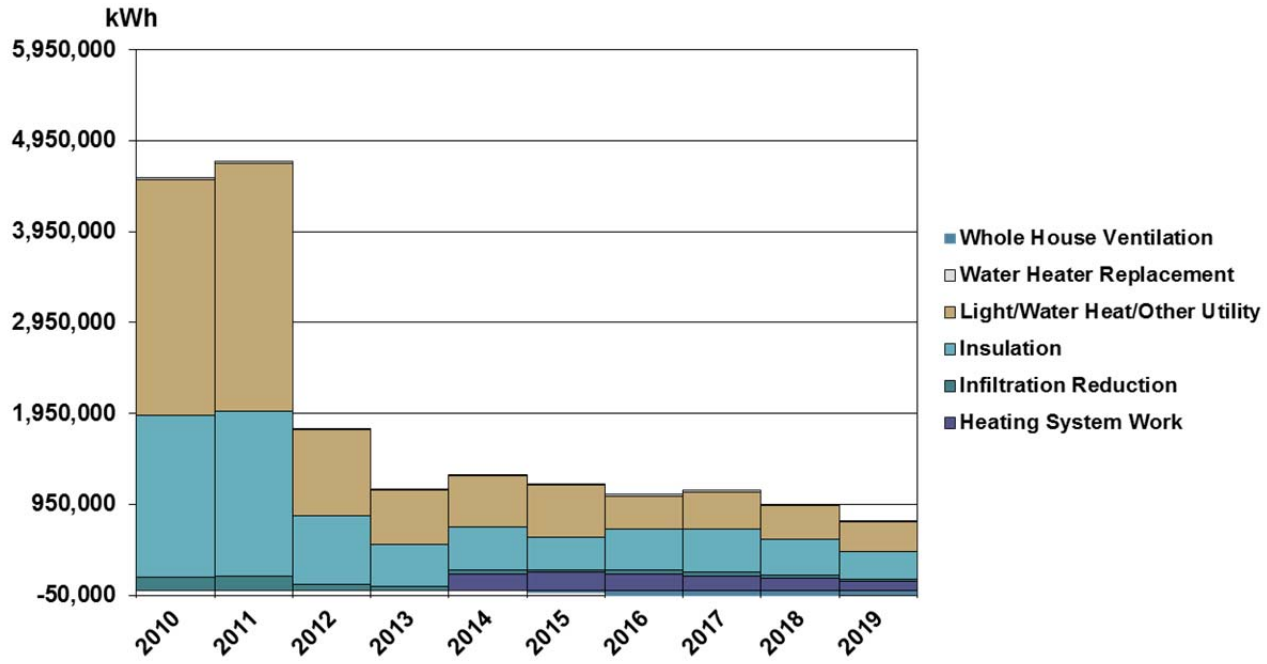

Figure 1.2 First Year Energy Savings (kWh) – Program

Insulation measures were credited with 41% 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 47% (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)	Percentage
Heating System Work	102,592	14.3%
Infiltration Reduction	27,914	3.9%
Insulation	296,097	41.1%
Light/Water Heat/Other Utility	328,967	45.7%
Water Heater Replacement	8,466	1.2%
Whole House Ventilation	-44,172	-6.1%

Program expenditures for materials, labor, and support totaled $14,799,777, decreasing by 7.1 percent from $15,924,624 spent in the prior year's program (see Figure 1.3).

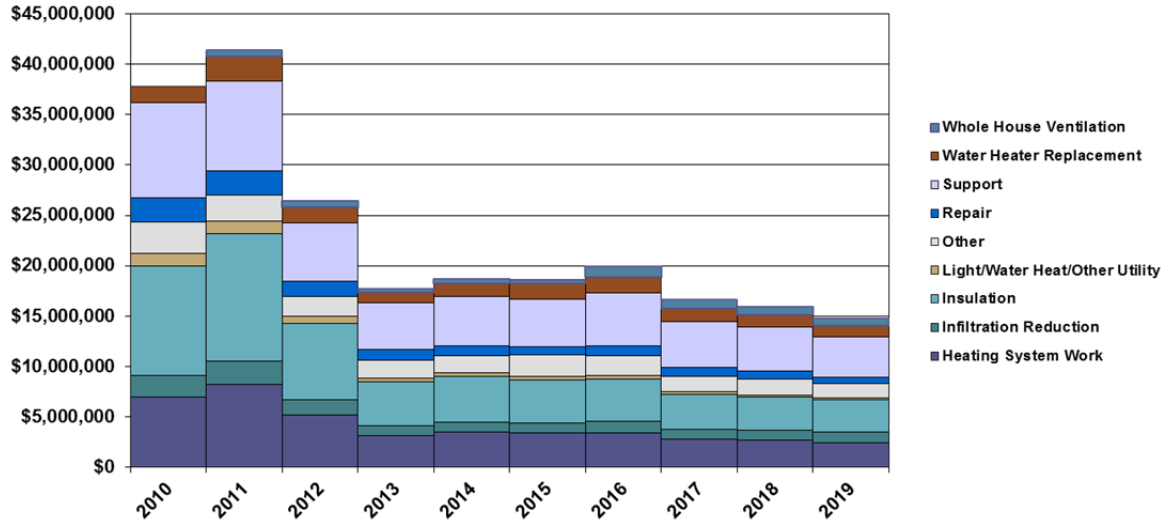

Figure 1.3 Overall Program Expenditures

Expenditures by major measure groups are shown in Table 1.3 (historical data is listed in Appendix B as Fig 1.3). Program support, which provides for agency overhead and administration, accounts for 26.7% of expenditures. Spending for efficiency measures, including infiltration reduction, insulation, lighting and water heater efficiency measures, accounts for 30.0% 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 23.8% of expenditures. The remainder of costs including repairs, whole house ventilation, and health and safety measures which together total 19.5%.

Table 1.3 Expenditures by Major Measure Category

Measure Group	Expenditures	Percentage
Heating System Work	$2,427,437	16.4%
Infiltration Reduction	$1,091,550	7.4%
Insulation	$3,144,993	21.3%
Light/Water Heat/Other Utility	$201,940	1.4%
Other	$1,432,863	9.7%
Repair	$656,413	4.4%
Support	$3,955,748	26.7%
Water Heater Replacement	$1,093,003	7.4%
Whole House Ventilation	$795,679	5.4%

The nominal average household expenditures for all dwellings weatherized in 2019 decreased by 1.5% to $13,553 (Figure 1.4, historical data is listed in Appendix B as Fig 1.4). Nominal average expenditures have remained essentially flat over the past four years of the program.

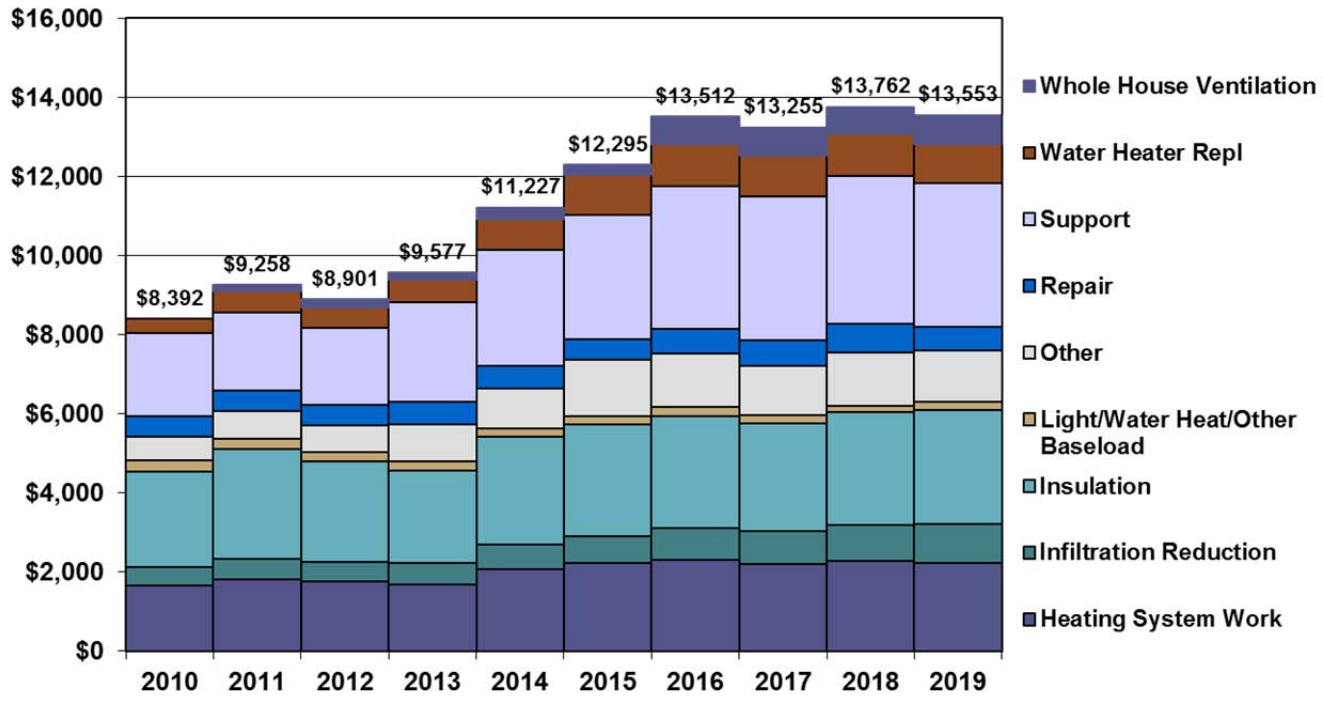

Figure 1.4 Average Program Expenditures per Housing Unit

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. Additionally, the prices of gas and electricity are adjusted to include only the variable cost of an additional kWh or therm, i.e., the monthly fixed account costs are removed.

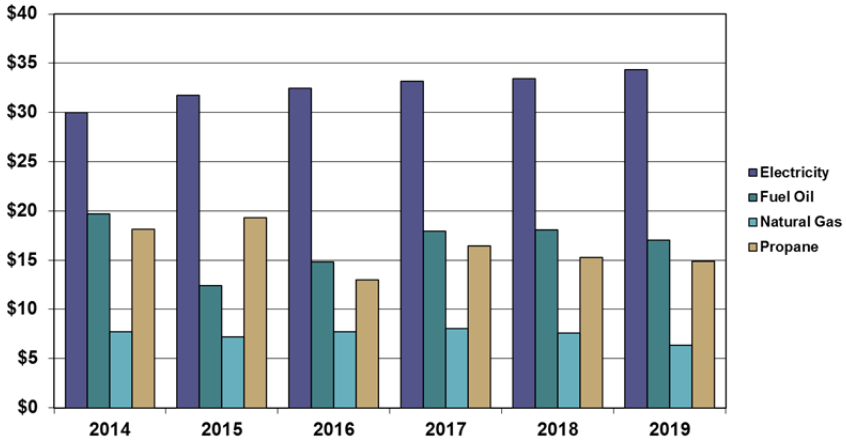

Figure 1.5 Average Fuel Cost per MBtu (Nominal Dollars)

The nominal first year client energy bill savings totaled $249,213 (Figure 1.6, historical data is listed in Appendix B as Fig 1.6).

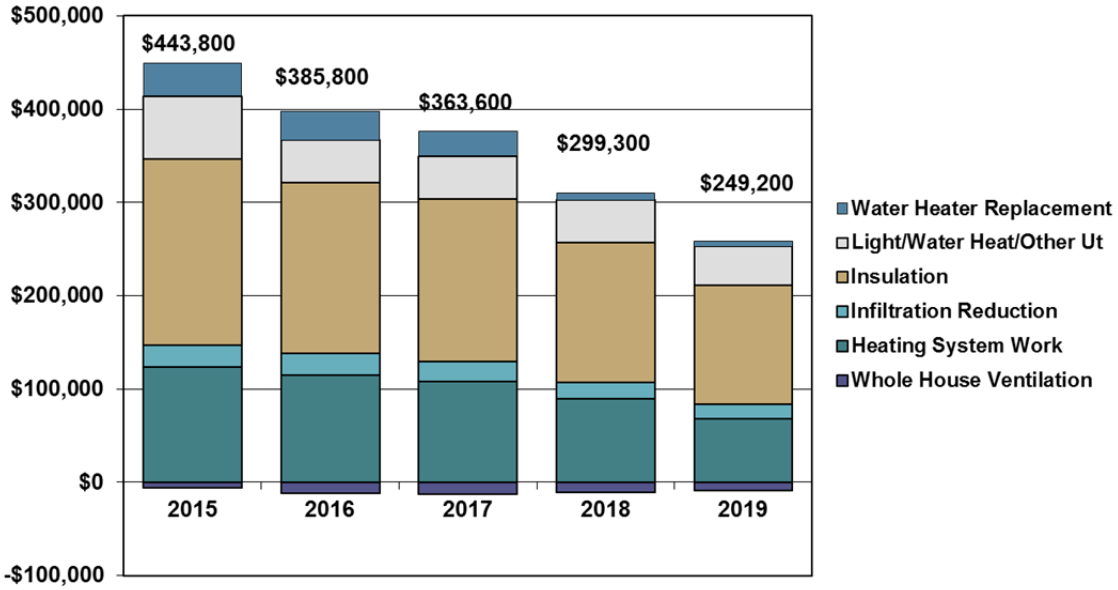

Figure 1.6 First Year Client Fuel Cost Savings (Nominal Dollars)

Insulation, infiltration reduction, and heating system work accounted for 86% of client bill savings (Table 1.4, historical data is listed in Appendix B as Fig 1.6). Lighting, water heating measures, and refrigeration measures accounted for 15%.

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

Measure Group	Fuel Bill Savings	Percentage
Heating System Work	$67,844	27.2%
Infiltration Reduction	$16,180	6.5%
Insulation	$127,081	51.0%
Light/Water Heat/Other Utility	$41,775	16.8%
Water Heater Replacement	$5,625	2.3%
Whole House Ventilation	-$9,291	-3.7%

First-year client fuel bill savings averaged $228 (Figure 1.7), decreasing from $259 in the previous year, driven largely by reductions in fuel prices for gas, propane, and fuel oil.

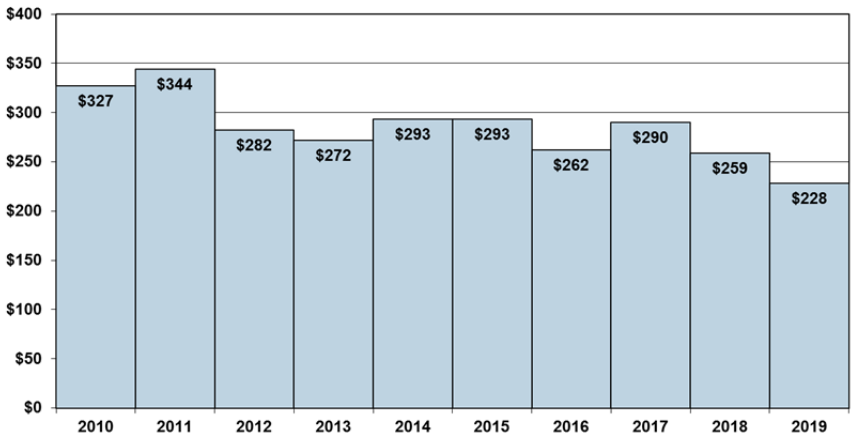

Figure 1.7 Average Annual Client Fuel Bill Savings per Housing Unit

Natural gas savings provided 53% of client bill savings, electricity accounted for 34%, propane accounted for 13%, and fuel oil provided less than 1%.

Approximately 49% of client bill savings are attributable to the heating impacts of shell measures (insulation and infiltration reduction), and 23% was due to heating system work. Taken together, heating impacts from shell improvements and heating system measures accounted for 72% of total client bill savings. Cooling savings accounted for another 9% of client bill savings, and lighting, refrigeration, and water heater measures accounted for 8%.

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 $13,866 over all fuel types, and provide $236 in first-year bill savings per unit. Savings averaged $213 for gas-heated units, $417 for propane heated units, $493 for fuel oil heated units, and $291 for electrically-heated units.

Expenditures for mobile homes averaged $11,432 overall and provided first-year client bill savings of $174. Savings for gas-heated units averaged $161, propane-heated mobile homes saved $346 per unit, and electrically-heated mobile homes save $71 (only 3 cases).

Expenditures for multi-family units heated with gas averaged $10,818 and had first-year client bill savings of $154. Gas-heated multifamily units saved $158 and electrically-heated multi-family unit saved $129 (only five units).

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

	Number of Units	Main Heat Savings (therms, gals)	Main Heat Bill Savings ($)	Electricity Savings (kWh)	Electricity Bill Savings ($)	Expenditures	Total Bill Savings
Site Built Single Family	961		$156		$80	$13,866	$236
Gas	819	232	$147	558	$67	$13,993	$213
Propane	84	253	$344	616	$73	$13,889	$417
Fuel Oil	2	163	$385	926	$109	$17,458	$493
Electricity	56	-	-	2,624	$291	$11,836	$291
Mobile Home	94		$123		$51	$11,432	$174
Gas	83	176	$111	429	$50	$11,498	$161
Propane	8	215	$293	454	$53	$12,202	$346
Fuel Oil	-	-	-	-	-	-	$0
Electricity	3	-	-	638	$71	$7,557	$71
Multi-Family	37		$89		$66	$10,818	$154
Gas	32	161	$102	469	$56	$11,471	$158
Propane	-	-	-	-	-	-	$0
Fuel Oil	-	-	-	-	-	-	$0
Electricity	5	-	-	1,174	$129	$6,637	$129

UTILITY SAVINGS AND EXPENDITURES

The utilities funded measures in 791 dwelling units, with first year savings totaling 121,190 therms and 370,610 kWh. These measures reached 72% of all units weatherized by the program, and accounted for 51.5% of electricity savings and 57.8% 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).

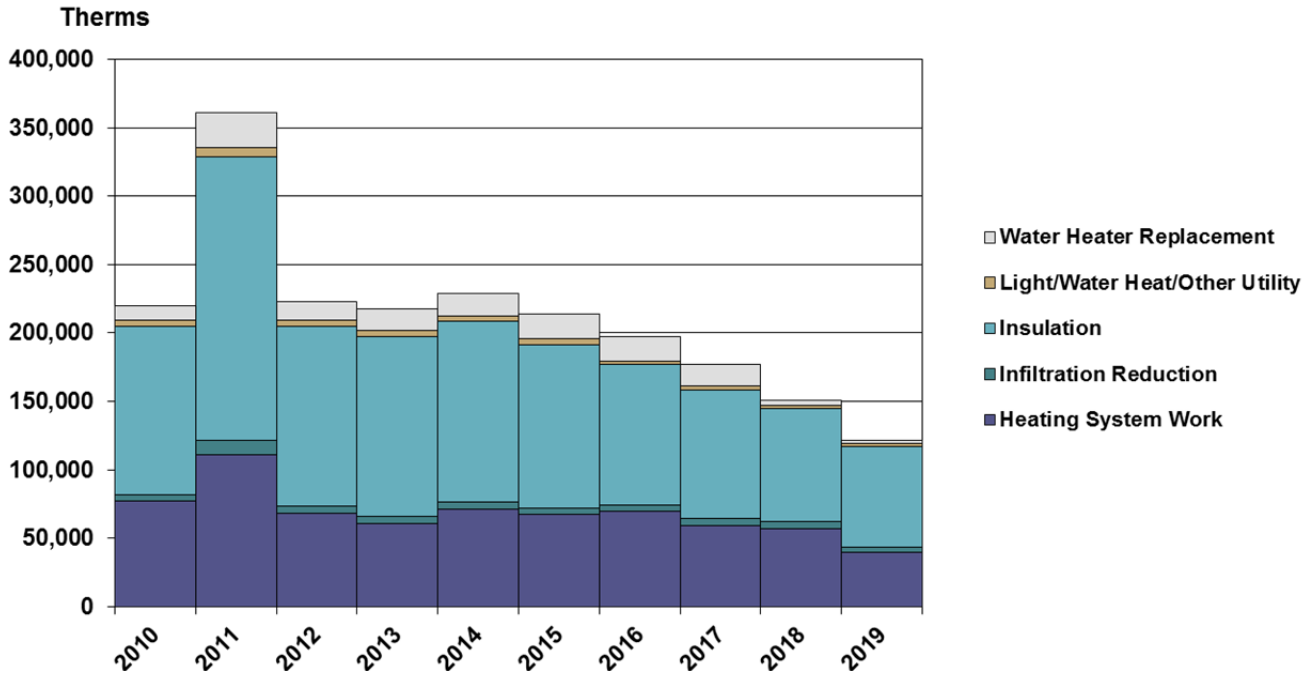

Figure 1.8 First Year Energy Savings (therms) – Utility only

Utility expenditures on gas measures were largely directed at insulation (61% of savings) and heating system work (33%). The heating system work was almost entirely for replacements, all of which were specified as replacements for efficiency (Table 1.6).

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

Measure Group	Savings (therms)	Percentage
Heating System Work	39,540	32.6%
Infiltration Reduction	3,766	3.1%
Insulation	73,820	60.9%
Light/Water Heat/Other Utility	1,794	1.5%
Water Heater Replacement	2,272	1.9%

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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).

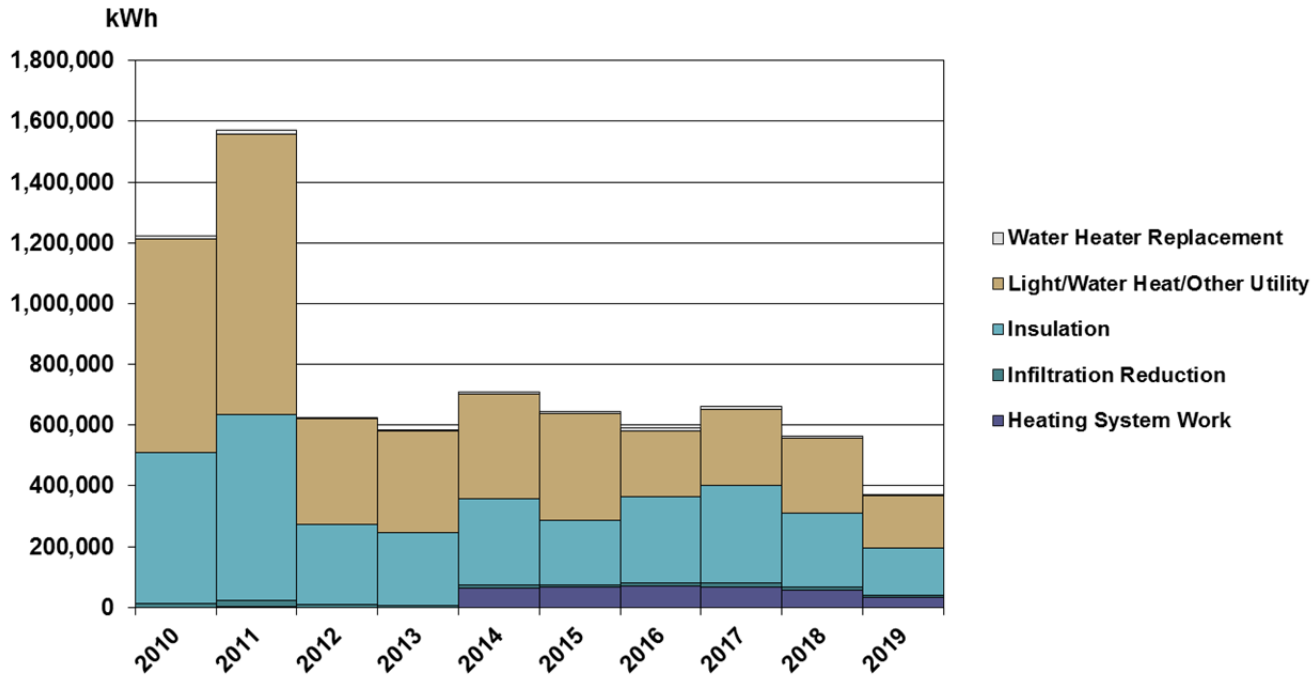

Figure1.9 First Year Energy Savings (kWh) – Utility only

The electricity savings attributed to insulation include cooling savings and heating savings in units with electric main heat; these accounted for 41% of electricity savings. Another 48% of electricity savings were due to lighting, refrigerator replacements or removals, electric water heater measures (Table 1.7).

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

Measure Group	Savings (kWh)	Percentage
Heating System Work	32,598	8.8%
Infiltration Reduction	8,018	2.2%
Insulation	153,290	41.4%
Light/Water Heat/Other Utility	174,167	47.0%
Water Heater Replacement	2,532	0.7%

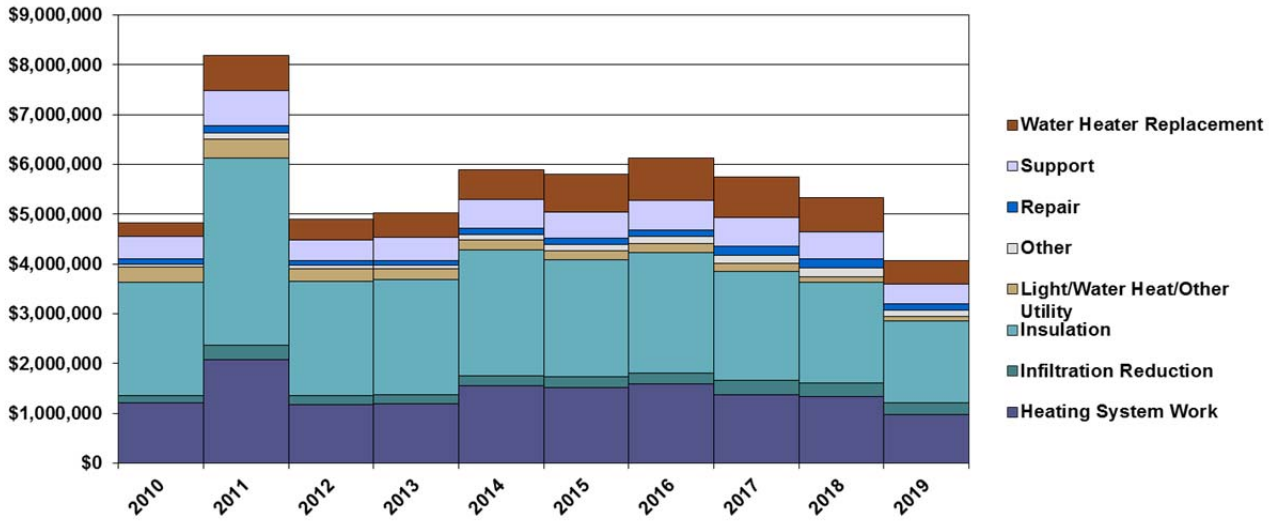

Figure 1.10 Utility Expenditures

The utilities spent $4,068,627 for program measures, labor, and support, 23.7% less than the previous year (Figure 1.10, Table 1.8, historical data in Appendix B listed as Fig 1.10). Utility expenditures accounted for 27.5% of the total low-income program expenditures.

Table 1.8 Expenditures by Measure Group – Utility only

Measure Group	Expenditures	Percentage
Heating System Work	$984,042	24.2%
Infiltration Reduction	$230,486	5.7%
Insulation	$1,638,982	40.3%
Light/Water Heat/Other Utility	$97,986	2.4%
Other	$127,974	3.1%
Repair	$126,545	3.1%
Support	$393,167	9.7%
Water Heater Replacement	$469,445	11.5%

In addition, the utilities spent $144,007 on program administration. Utility expenditures totaled $4,212,634 including spending on program measures, labor, support, and administration.

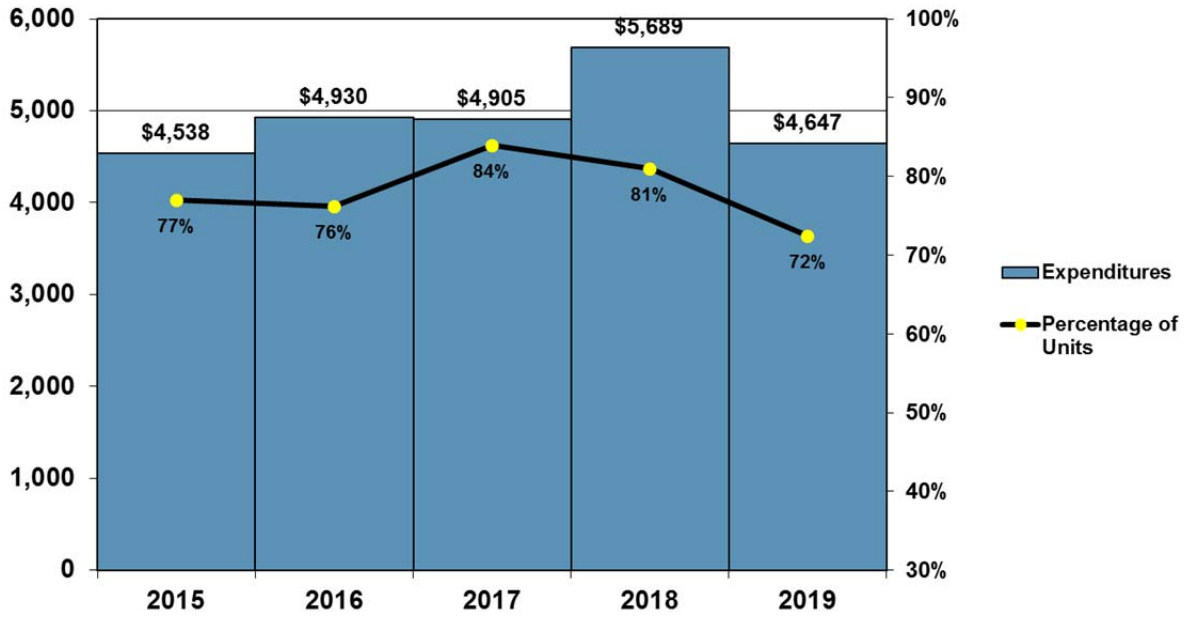

Figure 1.11 Average Utility Spending on Efficiency Measures (excludes Support and Administration), and Percentage of Homes Receiving Utility-Funded Measures with Impacts

Figure 1.11 provides the average utility funding for efficiency measures and percentages of dwellings with utility funding for the past five years. The utilities installed measures in 72% of units. The utilities expenditures averaged $4,647 on units that received utility 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

	Total Expenditures		Counts of Dwellings With Energy Impacts			
Utility	Excluding Program Support	With Program Support	Electric Impacts	Pct of Prg	Gas Impacts	Pct of Prg
Alliant IPL	$ 1,949,500	$ 2,155,100	434	39.7%	296	31.7%
Black Hills Corp	$ 286,500	$ 313,100			68	7.3%
MidAmerican	$ 1,439,500	$ 1,600,400	232	21.2%	261	27.9%
Total Utilities	$ 3,675,500	$ 4,068,600	667	61.1%	626	67.0%

Note: expenditures exclude utility administation costs

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	Pct of Prg	Summer Demand Savings	Pct of Prg	Winter Demand Savings	Pct of Prg	First Year Fuel Cost Savings	Pct of Prg
Electricity	(kWh)		(kW)		(kW)			
Alliant IPL	224,560	31.2%	60	33.5%	54	28.3%	$ 26,550	31.4%
MidAmerican	146,000	20.3%	40	20.4%	36	19.1%	$ 17,210	20.4%
Total Electric Utilities	370,610	51.5%	100	53.9%	90	47.4%	$ 43,760	51.8%
Gas	Therms				Peak Day Therms			
Alliant IPL	58,310	27.8%			633	28.2%	$ 37,150	28.0%
Black Hills Corp	11,160	5.3%			119	5.3%	$ 7,120	5.4%
MidAmerican	51,680	24.7%			553	24.6%	$ 33,010	24.9%
Total Gas Utilities	121,190	57.8%			1,305	58.1%	$ 77,300	58.2%

Utility-funded measures yielded first-year client bill savings of $121,067, averaging $153 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 $123 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 $21.83 to $24.02 per therm and $1.19-$1.89 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 Savings	Number of Units	Cost of Elec Savings	Number of Units
Alliant-IPL				
Overall	$23.14	298	$1.81	434
Site-Built	$23.30	271	$1.89	374
Mobile Home	$17.59	15	$1.19	39
Multi-family	$23.20	12	$1.35	21
Black Hills Corp				
Overall	$23.84	68	-	
Site-Built	$24.02	61	-	
Mobile Home	$20.93	4	-	
Multi-family	$28.22	3	-	
MidAmerican				
Overall	$21.88	261	$1.28	233
Site-Built	$21.83	233	$1.31	212
Mobile Home	$20.05	22	$0.53	14
Multi-family	$29.80	6	$1.24	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, repairs, heating system tune and cleans, and support.

Table 1.12 Utility Funding Percentages by Measure

	Expenditures		
Measure	Total	Utility	Utility Percentage
Wall Insulation	$1,075,680	$597,925	55.6%
Attic Insulation	$1,219,018	$706,379	57.9%
Kneewall Insulation	$119,343	$66,921	56.1%
Floor/Crawlspace Insulation	$297,709	$144,913	48.7%
Bandjoist Insulation	$131,080	$74,242	56.6%
Infiltration Reduction	$1,091,550	$230,486	21.1%
High Efficiency Htg Sys Repl.	$1,976,164	$943,031	47.7%
Electric Htg Sy/Ht Pump Repl.	$89,208	$19,435	21.8%
Pipe Wrap	$14,910	$8,542	57.3%
Faucet Aerator	$1,017	$455	44.7%
Shower Head	$960	$484	50.5%
Water Heater Replacement - Hi Eff	$1,093,003	$469,445	43.0%
Lighting	$45,027	$24,950	55.4%
Exchange Refrigerator	$111,415	$56,136	50.4%
Exchange Freezer	$24,947	$7,319	29.3%
Repairs	$656,413	$126,545	19.3%
Programmable Thermostat	$4,085	$3,885	95.1%
Htg Sys Tune/Clean	$100,028	$17,691	17.7%
Htg Sys Ventilation	$137,623	$57,953	42.1%
Water Heater Ventilation	$99,848	$46,356	46.4%
Support	$3,955,748	$393,167	9.9%

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

	Units With Funding				
Agency	State	DCAA	Alliant-IPL	Black Hills	MidAmerican
NewOpp	50	50	25	3	21
HACAP	119	119	97	1	38
CAEI	84	83	47	0	29
Matura	22	22	11	0	1
MICA	58	58	35	4	1
Mid-Sioux	20	20	6	0	9
NE Iowa	118	118	69	17	8
New View	32	32	21	19	0
Threshold	65	65	9	3	41
IMPACT	32	32	17	2	12
SCICAP	20	20	18	0	1
CASEI	58	58	58	0	3
SIEDA	58	58	41	0	12
Upper Des Moines	104	104	40	8	21
West Central	40	40	7	11	20
CASiouxland	24	24	0	0	19
Polk County	189	189	0	0	82
Total	1092	1092	501	68	318

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 $228 per dwelling. The average first-year client bill savings varied across agencies, from a low of $141 per dwelling for MATURA to a high of $349 for CAA Siouxland. 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.

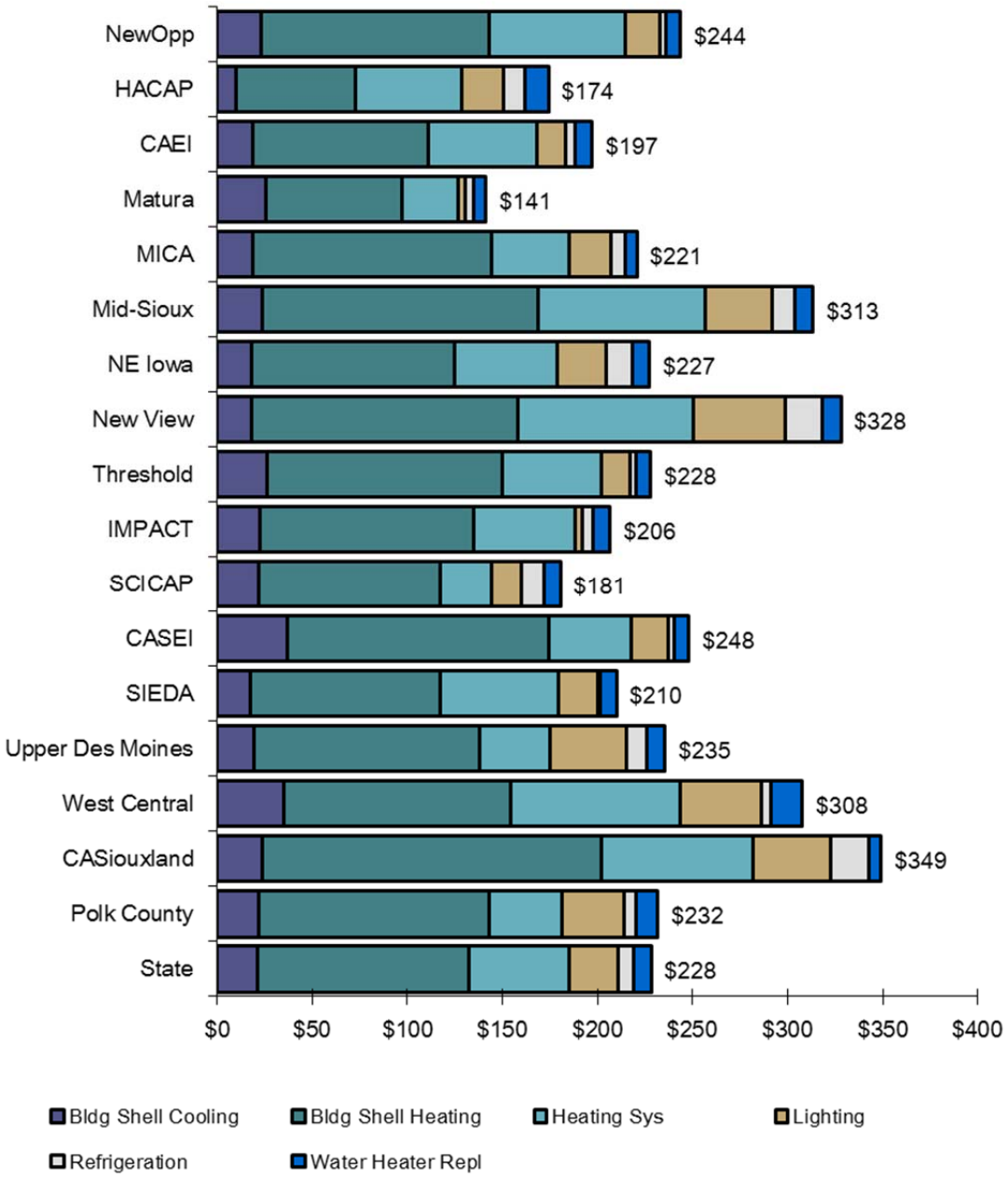

Figure 1.12 Average Annual Fuel Bill Savings per Housing Unit by Agency

Figure 1.13 shows the average expenditures for all households with impacts, ranging from a low of $8,227 for Northeast Iowa to $17,618 for West Central. The statewide average expenditure was $13,553 per dwelling unit.

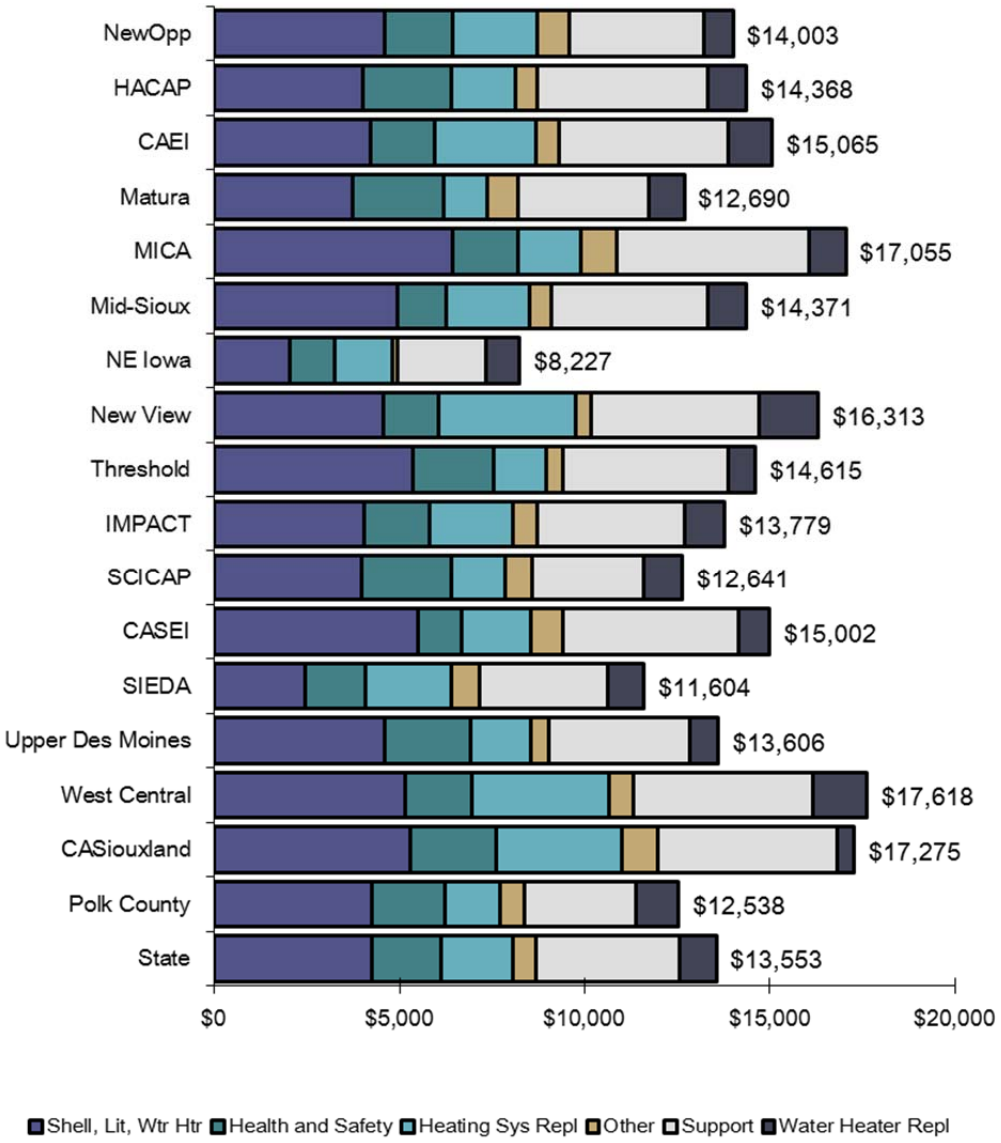

Figure 1.13 Average Expenditures per Housing Unit by Agency

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 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 trending downward, having decreased by 5.9 percentage points from last year. The replacement rate for non-condensing heating system replacements are declining as well, having decreased by 1.7 percentage points from last year and by 6.1 percentage points from two years ago.

The installation rates of water heater efficiency measures have all declined 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 7.6 percentage points. Refrigerator replacement rates increased slightly from 10.9% to 12.3% since last year.

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 has been on an upward trend and is now at $3,187. The cost of non-condensing heating system replacements increased considerably as well, to $3,371. The cost of high efficiency water heater replacements increased from $1,645 to $1,774. The cost of refrigerator replacements increased by about 12%, and the cost of freezer replacements increased by about 8%.

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 ceiling insulation increased by 10 therms, but was little changed for other insulation measures compared to the prior year.

Gas savings for condensing heating systems increased slightly to 123 therms. Non-condensing heating system savings increased significantly but large fluctuations can be expected due to small numbers of installations (20 units). 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 for all insulation measures declined except bandjoist insulation. Wall insulation savings averaged 157 kWh and ceiling/attic insulation savings averaged 230 kWh per unit. These differences are driven in part by year-to-year variation in housing stock for the few housing units that use electric main heat.

Lighting measure savings averaged 308 kWh per unit. Savings for all refrigerator appliance measures were lower than the prior year.

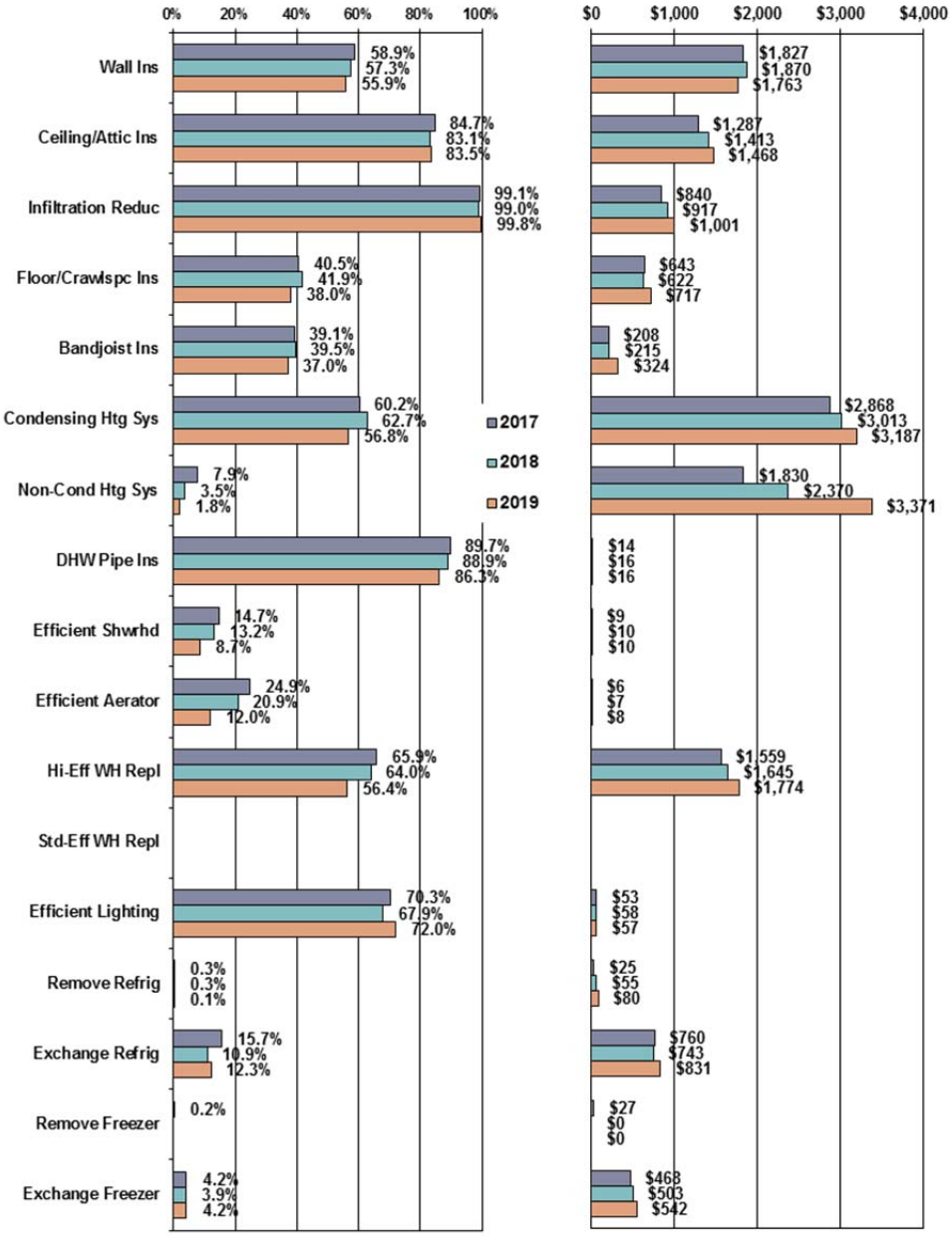

Figure 1.14a Average Installation Rates and Measure Costs of Efficiency Measures, Heating System and Water Heating Replacements

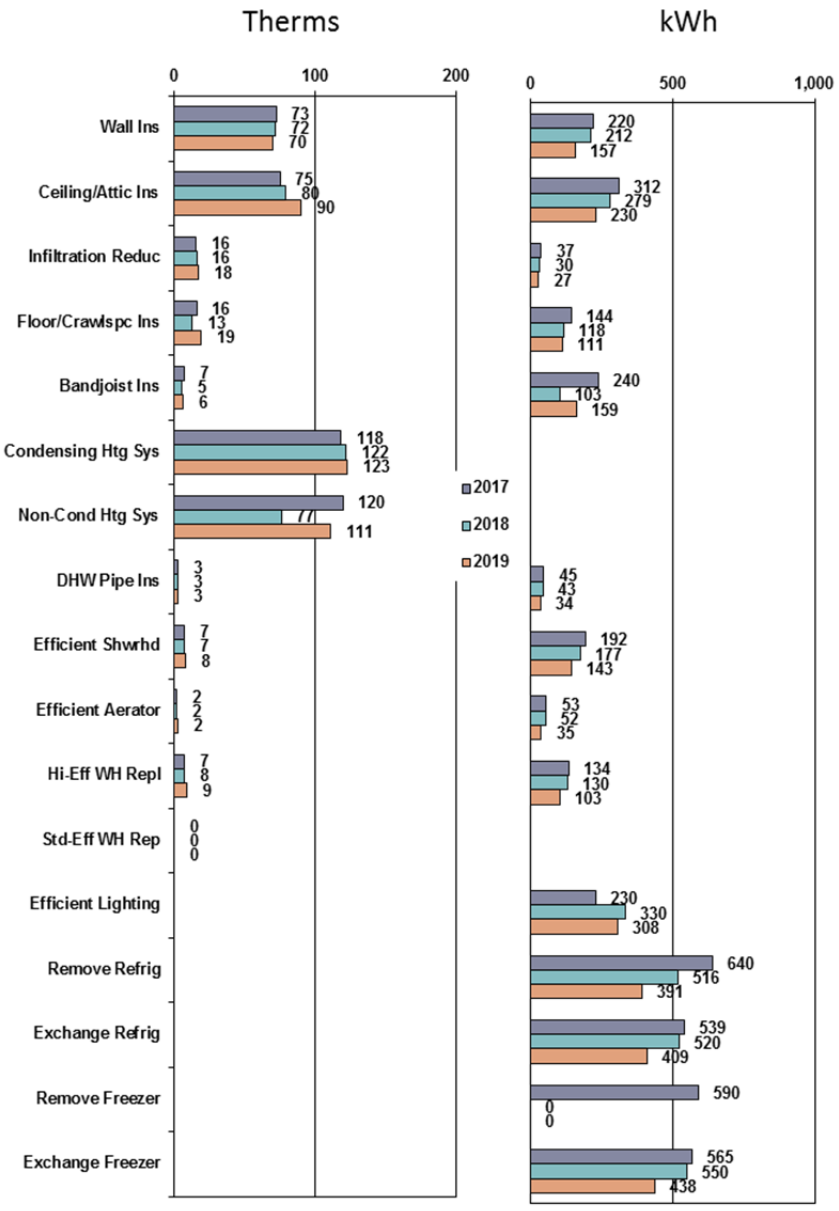

Figure 1.14b Average Gas and Electricity Savings of Efficiency Measures, Heating System and Water Heater Replacements

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	2015	2016	2017	2018	2019	Recent Year Change (%)
Insulation and Infiltration Reduction Measures						
Wall Insulation	61.4	55.1	58.9	57.3	55.9	-2.5%
Ceiling/Attic Insulation	85.1	84.7	84.7	83.1	83.5	0.4%
Floor/Crawlspace Insulation	42.4	39.4	40.5	41.9	38.0	-9.3%
Bandjoist Insulation	45.2	43.1	39.1	39.5	37.0	-6.3%
Infiltration Reduction	98.3	98.1	99.1	99.0	99.8	0.8%
Heating System Measures						
Htg. Sys. Replacement	66.6	70.3	68.1	66.3	58.6	-11.6%
High Eff Htg Sys Repl	62.7	66.8	60.2	62.7	56.8	-9.5%
Std/Unspec Eff Htg Sys Repl	3.9	3.4	7.9	3.5	1.8	-48.3%
Htg. Sys. Tune and Clean	27.5	26.3	30.0	30.9	37.8	22.6%
Heating System Safety Check	15.2	9.3	0.1	0.0	2.5	-
Heating System Ventilation	43.4	52.9	59.1	63.9	53.8	-15.8%
Water Heater Measures						
Pipe Wrap	86.3	86.9	89.7	88.9	86.3	-2.9%
Shower Head	19.6	14.9	14.7	13.2	8.7	-34.2%
Faucet Aerator	33.0	27.7	24.9	20.9	12.0	-42.6%
Water Heater Replacement	65.9	69.2	65.9	64.0	56.4	-11.8%
Hi-Eff Wtr Htr Repl.	64.5	69.2	65.9	64.0	56.4	-11.8%
Std-Eff Wtr Htr Repl.	1.5	-	-	-	-	-
Water Heater Ventilation	31.5	39.8	50.9	51.5	48.1	-6.7%
Water Heater Repair	5.4	6.5	9.4	9.5	13.4	40.6%
Lighting Measures						
Efficient Lighting	81.6	75.6	70.4	68.0	72.0	5.8%
Refrigeration Measures	19.7	22.4	18.8	14.0	15.7	11.8%
Refrigerator Removal	0.1	0.1	0.3	0.3	0.1	-64.7%
Refrigerator Exchange	16.6	19.0	15.7	10.9	12.3	12.7%
Freezer Removal	0.1	0.2	0.2	0.0	-	-
Freezer Exchange	4.4	5.3	4.2	3.9	4.2	8.3%
Health and Safety (other than heating & water heating measures listed above)						
CO Detector	85.2	90.9	93.9	91.9	95.9	4.4%
Smoke Detector	61.2	65.3	68.4	61.5	66.8	8.6%
Exhaust Ventilation	84.5	89.3	89.8	87.9	86.6	-1.4%
Fuses	0.9	0.7	0.8	0.4	0.3	-36.4%
Repairs	88.1	87.9	92.3	93.3	91.4	-2.1%

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 ($)

Measure	2015	2016	2017	2018	2019	Recent Year Change (%)
Insulation and Infiltration Reduction Measures						
Wall Insulation	1,803	1,904	1,827	1,870	1,763	-5.7%
Ceiling/Attic Insulation	1,264	1,352	1,287	1,413	1,468	3.8%
Infiltration Reduction	676	824	840	917	1,001	9.2%
Floor/Crawlspace Insulation	677	759	643	622	717	15.4%
Bandjoist Insulation	223	238	208	215	324	51.2%
Heating System Measures						
Htg. Sys. Replacement						
Condensing Htg Sys Repl	3,001	2,957	2,868	3,013	3,187	5.8%
Non-Cond Htg Sys Repl	2,189	2,611	1,830	2,370	3,371	42.2%
Htg. Sys. Tune and Clean	186	214	201	238	242	1.9%
Heating System Safety Check	145	149	85	0	78	-
Heating System Ventilation	236	232	209	234	234	0.2%
Water Heater Measures						
Pipe Wrap	14	15	14	16	16	-2.7%
Shower Head	9	9	9	10	10	0.1%
Faucet Aerator	6	6	6	7	8	6.3%
Water Heater Replacement						
Hi-Eff Wtr Htr Repl.	1,569	1,561	1,559	1,645	1,774	7.9%
Std-Eff Wtr Htr Repl.	1,426	-	-	-	-	-
Water Heater Ventilation	188	175	157	178	190	6.7%
Water Heater Repair	122	130	120	89	116	30.1%
Lighting Measures						
Efficient Lighting (avg spent per home)	59	53	53	57	57	-0.4%
Refrigeration Measures						
Refrigerator Removal	28	58	25	55	80	46.5%
Refrigerator Exchange	782	759	760	743	831	11.8%
Freezer Removal	25	30	27	-	-	-
Freezer Exchange	527	453	468	503	542	7.9%
Health and Safety (other than heating & water heating measures listed above)						
CO Detector	62	66	72	75	98	29.9%
Smoke Detector	59	54	58	60	68	14.6%
Exhaust Ventilation	830	881	887	894	956	6.9%
Fuses	82	128	113	134	145	7.9%
Repairs	589	723	715	780	658	-15.6%
Support	3,452	3,755	3,677	3,932	3,757	-4.5%

Note: Kneewall insulation was reported with wall insulation prior to 2007, it is now bundled with Ceiling./Attic Ins

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 $38 for these measures. The highest average bill savings were attained by New View ($71 per unit). MATURA and IMPACT each averaged less than $15 per unit.

Table 1.16 Installation Rates and Savings of Baseload Measures

	Water Heating			Lighting	Refrigeration				
Agency	Pipe Wrap	Eff Shower-head	Eff Faucet Aerator	Efficient Lighting	Exchange Refrig	Exchange Freezer	Remove Refrig	Remove Freezer	Average First Year Bill Savings
New Opp	52%	4%	34%	76%	0%	6%	10%	0%	$25.45
HACAP	91%	8%	1%	82%	12%	11%	28%	0%	$39.86
Eastern IA	84%	0%	18%	60%	11%	0%	6%	0%	$23.71
Matura	36%	0%	0%	18%	5%	5%	0%	0%	$9.71
MICA	28%	0%	0%	50%	9%	7%	0%	0%	$30.81
Mid-Sioux	80%	0%	0%	80%	20%	5%	0%	0%	$49.56
NE Iowa	97%	0%	0%	84%	25%	3%	9%	1%	$43.12
New View	94%	0%	0%	94%	19%	22%	3%	0%	$71.11
Threshold	94%	0%	3%	72%	6%	0%	6%	0%	$21.40
IMPACT	88%	0%	0%	16%	13%	0%	0%	0%	$12.43
SCICAP	50%	0%	5%	50%	15%	5%	20%	5%	$32.01
SE Iowa	98%	0%	0%	55%	5%	2%	0%	0%	$25.52
SIEDA	83%	0%	0%	53%	0%	2%	2%	0%	$25.43
Upper Des Moines	95%	16%	0%	93%	19%	3%	0%	0%	$55.98
West Central	100%	0%	63%	100%	3%	3%	23%	0%	$57.00
CAA Siouxland	100%	0%	0%	92%	29%	13%	0%	0%	$64.74
Polk County	99%	0%	37%	75%	13%	2%	12%	0%	$44.43
State	86%	3%	12%	72%	12%	4%	9%	0%	$38.26

* First-year household bill savings are averages of total water heater, and lighting for units receiving the measures

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.

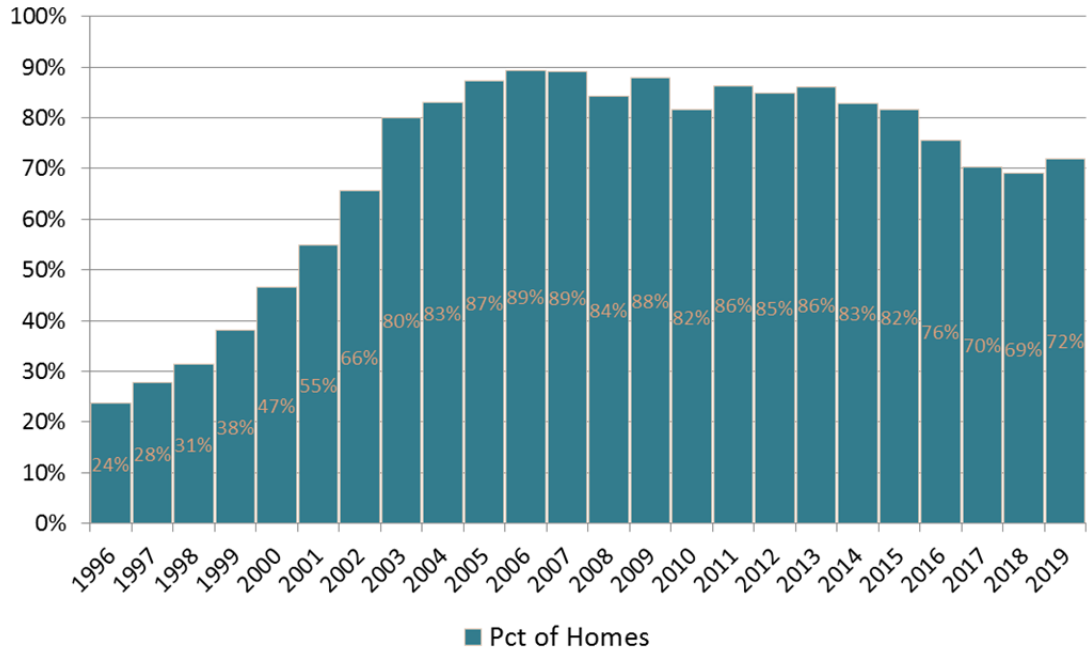

Figure 1.15 Percentage of Housing Units Receiving Lighting Measures

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. In 2019, 72% of units received lighting from the program.

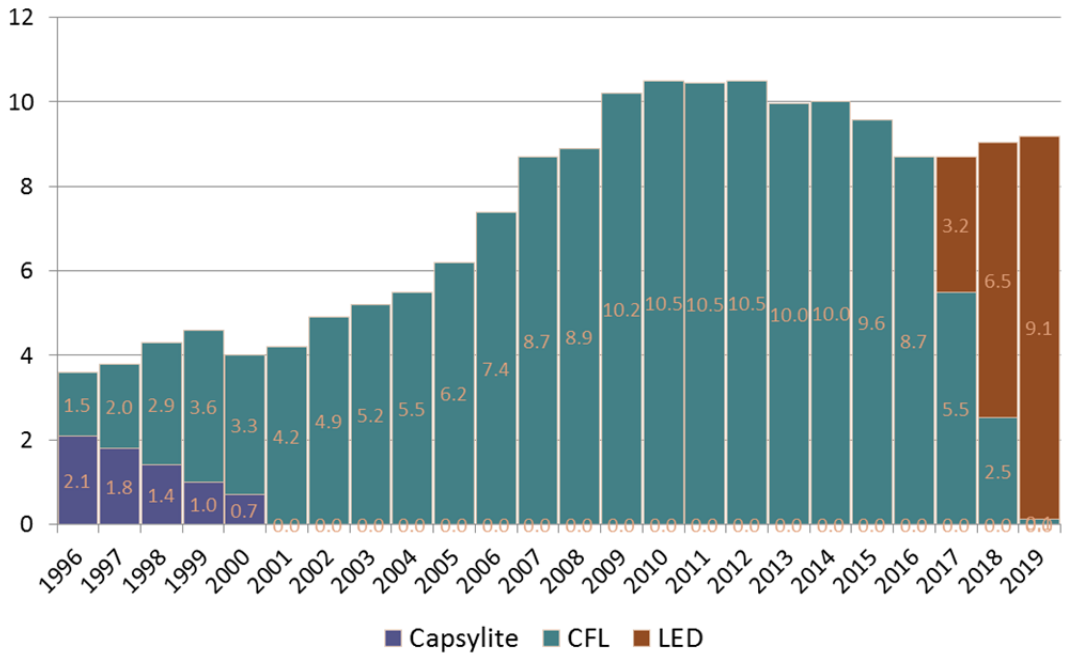

Figure 1.16 Average Number of Bulbs Installed for Housing Units Receiving Lighting Measures

The average number of bulbs installed in dwellings that received at least one lighting measure averaged 9.2 bulbs per house. Agencies began installing LEDs in 2017: 99% of lighting measures installed in the current year were LEDs (Figure 1.16).

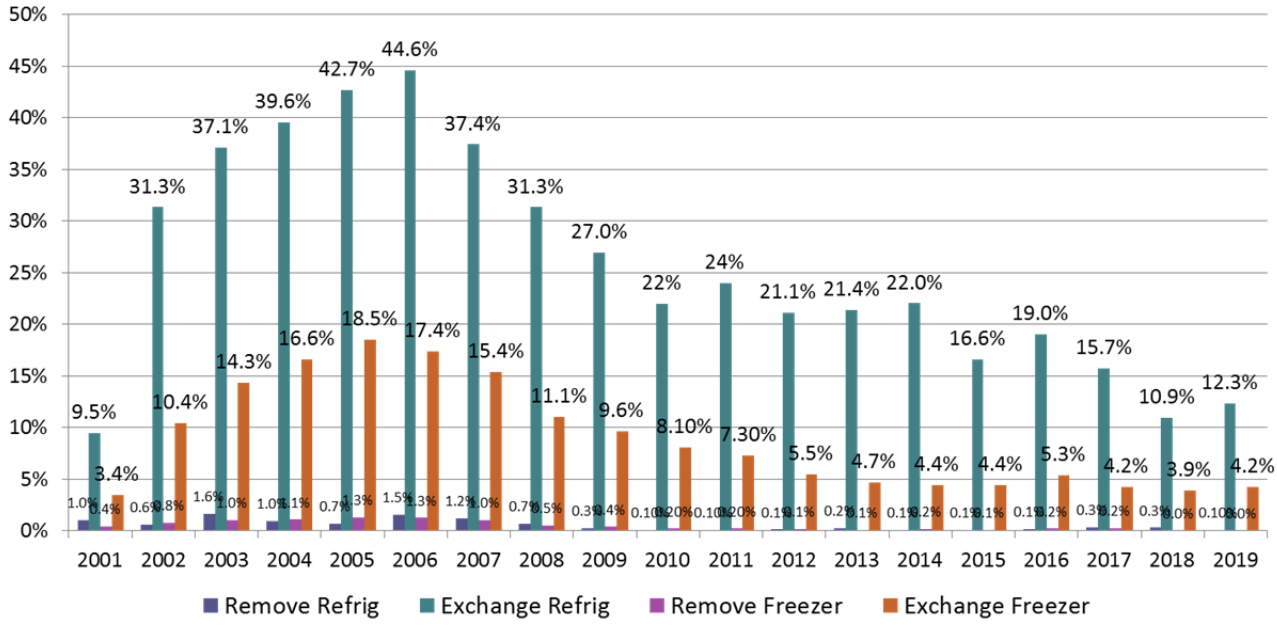

Figure 1.17 Installation Rates of Refrigeration Measures

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 is increasing in the client population. The refrigerator replacement rate slightly increased from the prior year to 12.4%.

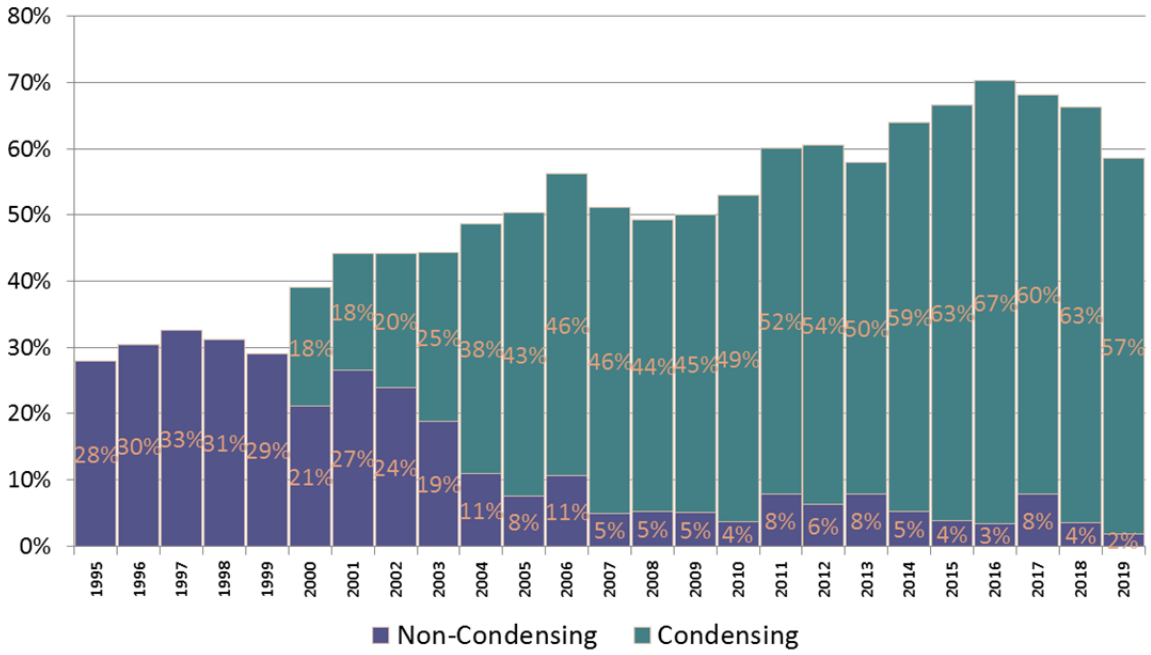

Figure 1.18 Installation Rates of Natural Gas Heating System Replacements

Figure 1.18 shows the transition to condensing (90+ efficiency) furnaces from non-condensing (80% efficiency) heating systems. Overall, 59% of dwellings with natural gas heating received a heating system replacement, with the vast majority of these being condensing units (57%).

Thirty-five 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

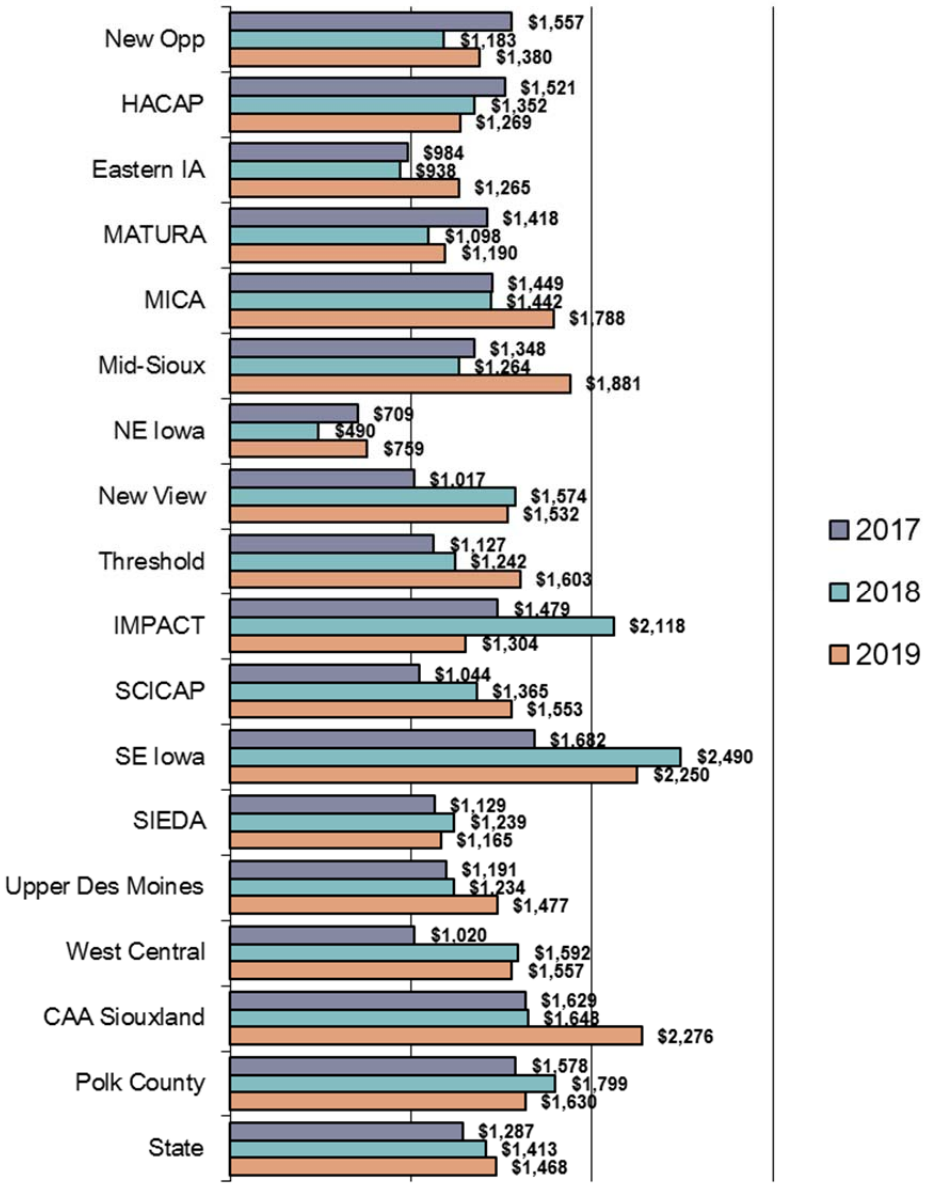

Figure 1.19a Average Program Expenditures on Ceiling Insulation by Agency

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 $1,468.

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 $759.

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 $1,266. SE Iowa spent more than $2,000 and CAA Siouxland and MICA spent $1,780 and $1,796, respectively. Northeast Iowa spent the least utility funds ($534) for ceiling and attic insulation.

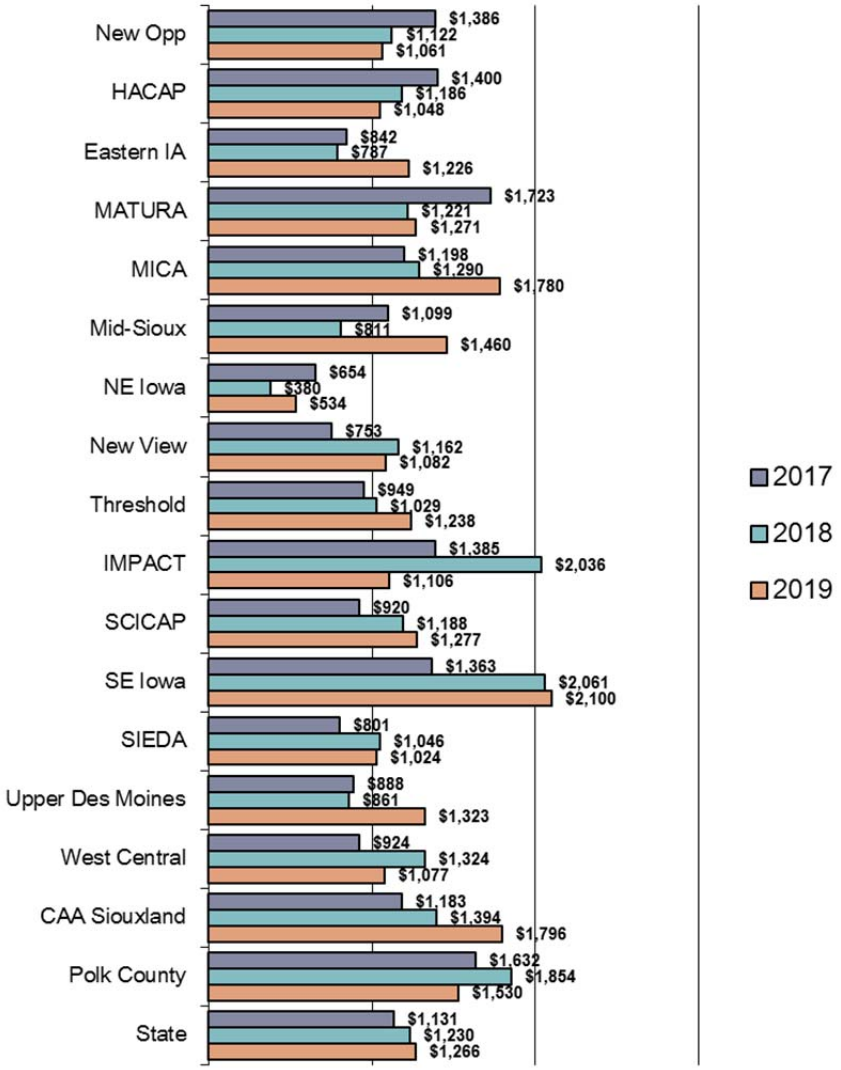

Figure 1.19b Average Utility Expenditures on Ceiling Insulation by Agency

WALL INSULATION EXPENDITURES

Figures 1.20a shows the average installed costs for wall insulation for all funding. The state average expenditure for wall insulation was $1,763. West Central, MICA, and Mid-Sioux each averaged more than $2,500. Northeast Iowa spent the least, averaging $633 per dwelling unit.

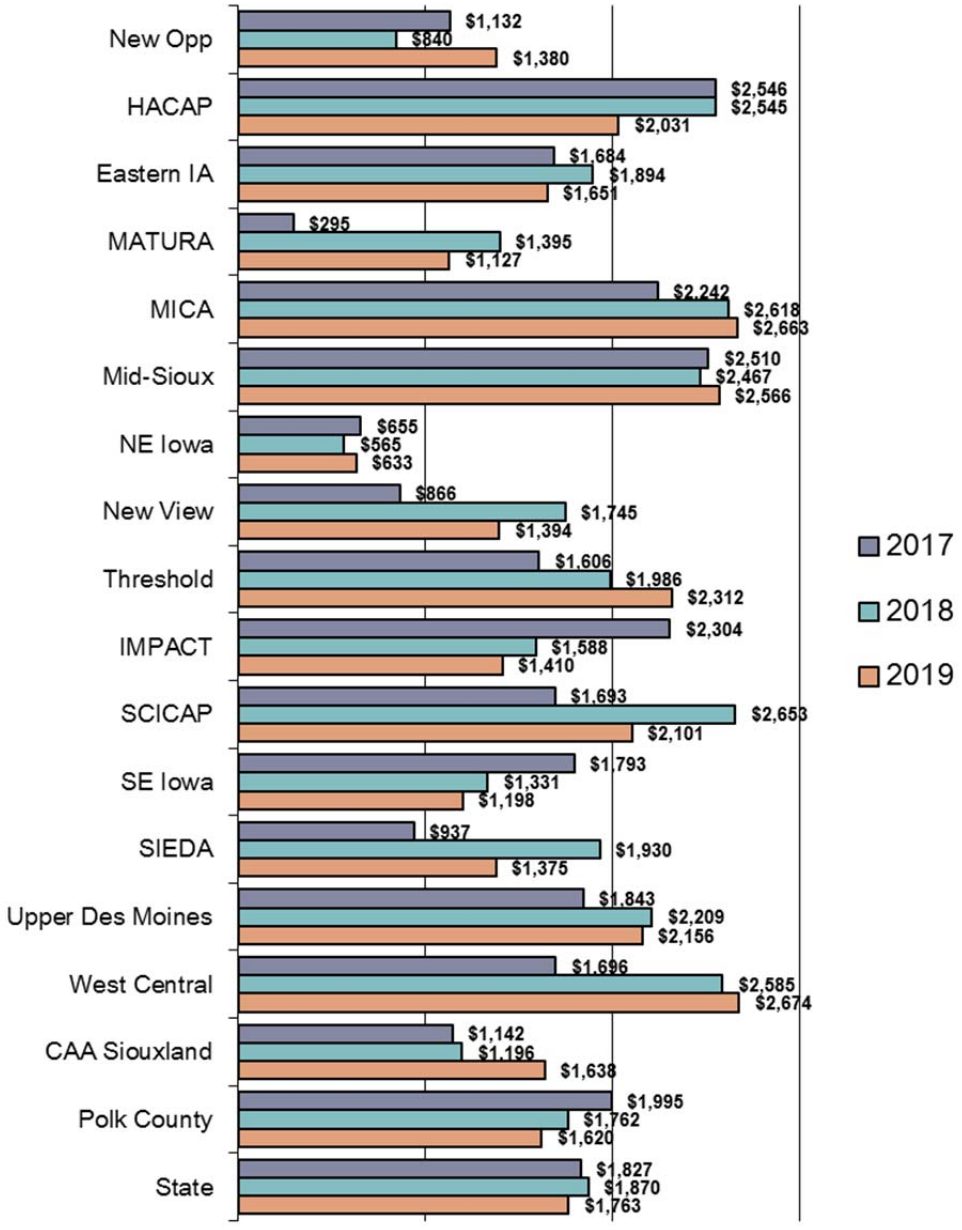

Figure 1.20a Average Program Expenditures on Wall Insulation by Agency

Figure 1.20b provides agency expenditures for utility-funded wall insulation. Statewide, the average expenditures for utility-funded wall insulation averaged $1,541. MICA, Mid-Sioux, and Threshold spent the most utility funds, averaging over $2,000; Northeast Iowa spent the least ($566).

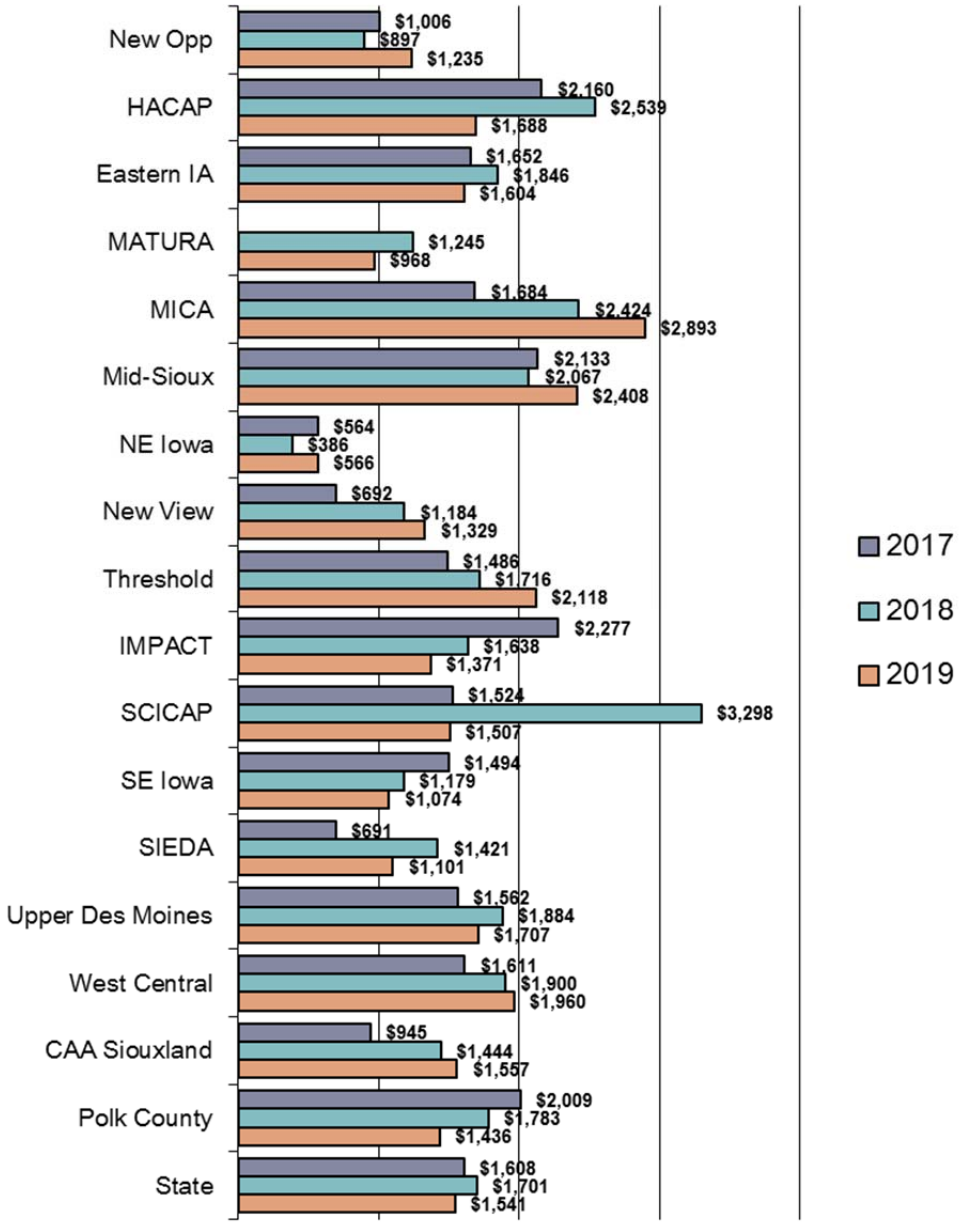

Figure 1.20b Average Utility Expenditures on Wall Insulation by Agency

FLOOR/CRAWLSPACE INSULATION

Figures 1.21a shows the average expenditures for floor/crawlspace insulation from all funding sources. Statewide, the cost for floor/crawlspace insulation averaged $717. CAA Siouxland spent the most at $1,464 per unit, while New Opportunities spent the least, at $338.

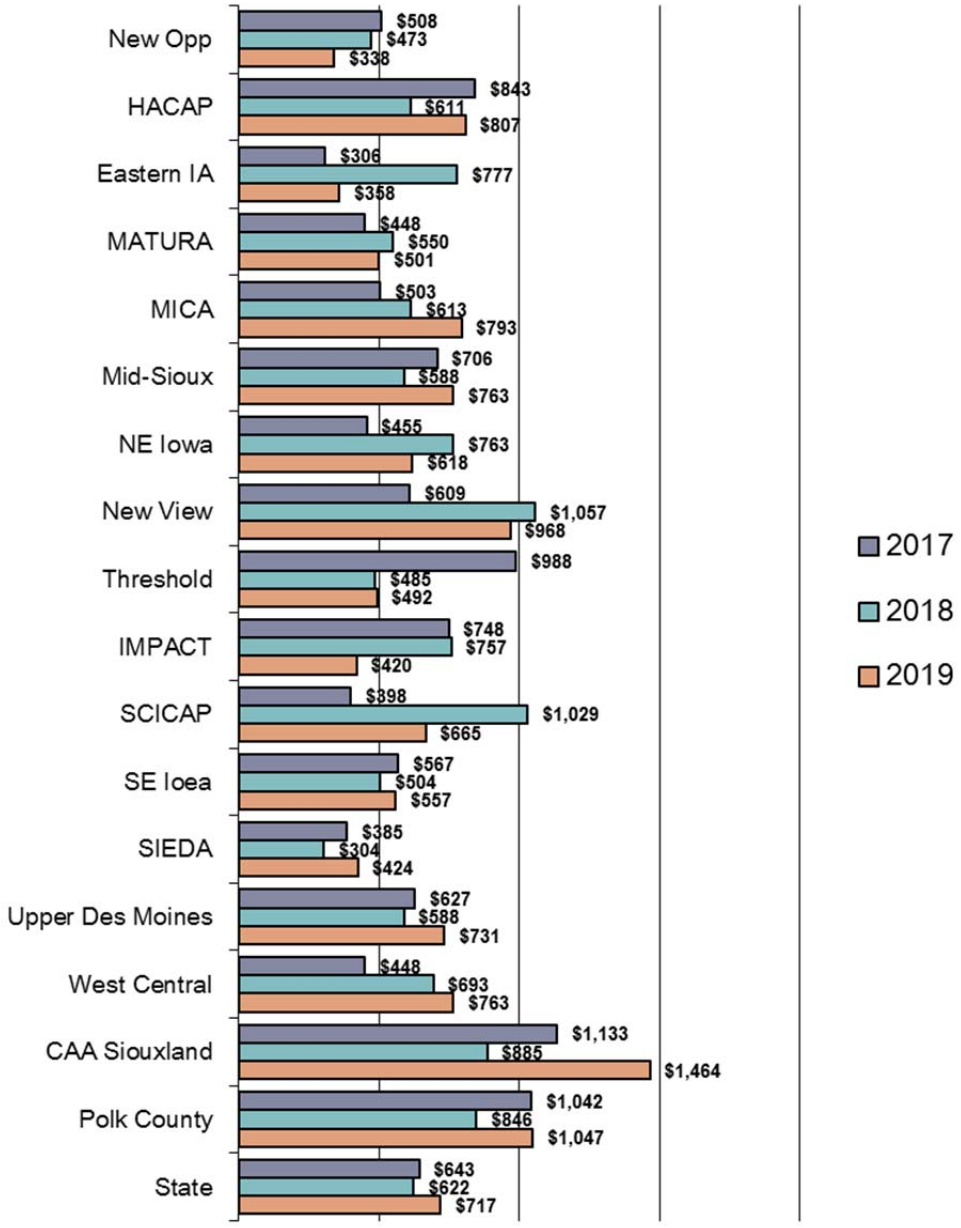

Figure 1.21a Average Program Expenditures on Floor/Crawlspace Insulation by Agency

The average expenditure of utility funds for floor/crawlspace insulation (Figure 1.21b) was $619. Polk County and CAA Siouxland spent over $1,000 while Threshold and SIEDA spent less than $300.

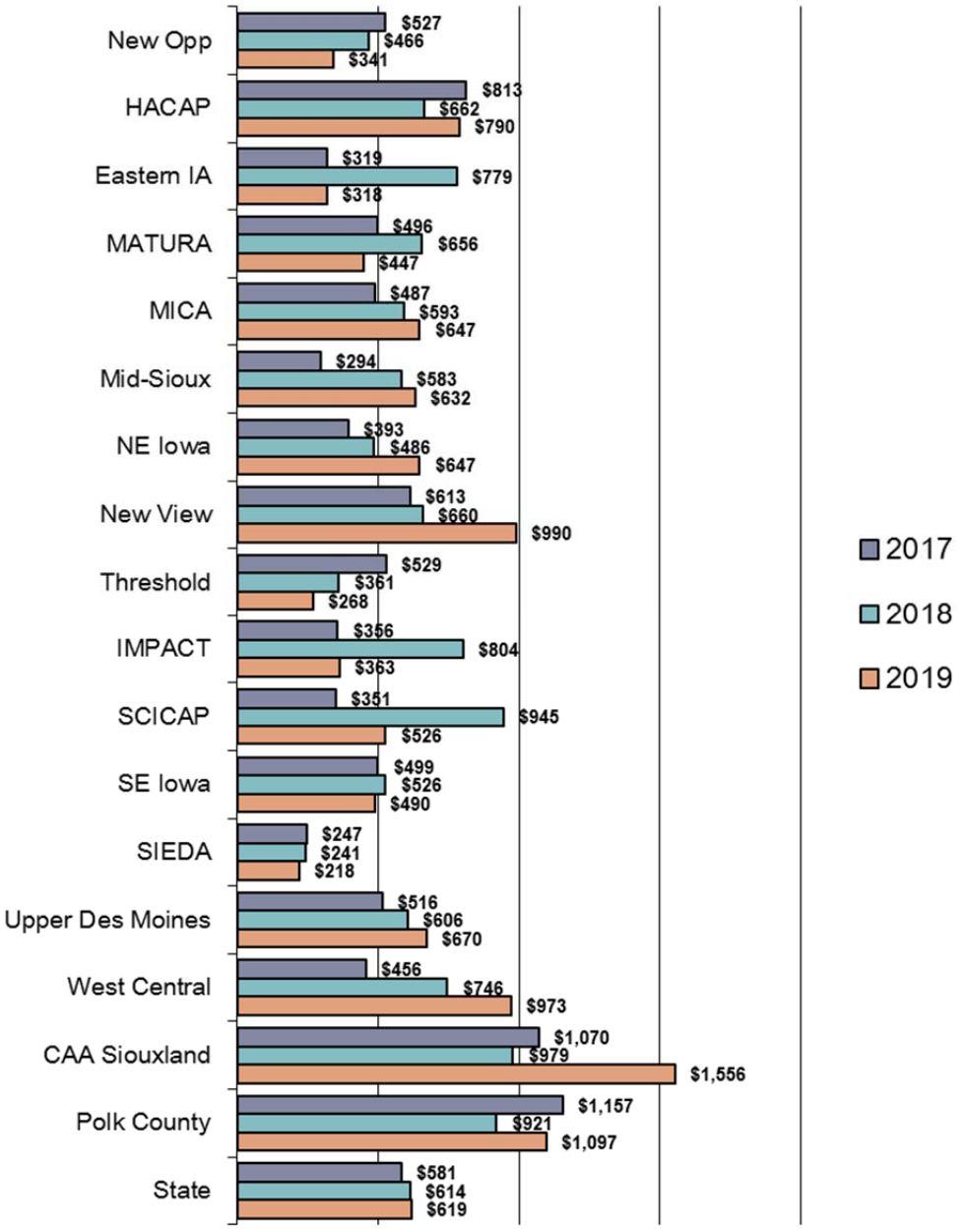

Figure 1.21b Average Utility Expenditures on Floor/Crawlspace Insulation by Agency

NON-ELECTRIC HEATING SYSTEM REPLACEMENT EXPENDITURES

Figures 1.22a shows the average expenditures for all non-electric heating system replacements from all funding sources. Statewide average heating system replacement costs were $3,241. Three agencies reported average expenditures exceeding $4,000, including New View ($5,889), CAA Siouxland ($4,774), and West Central ($4,521). Two agencies averaged less than $2,500, including Polk County ($2,450) and Threshold ($2,310).

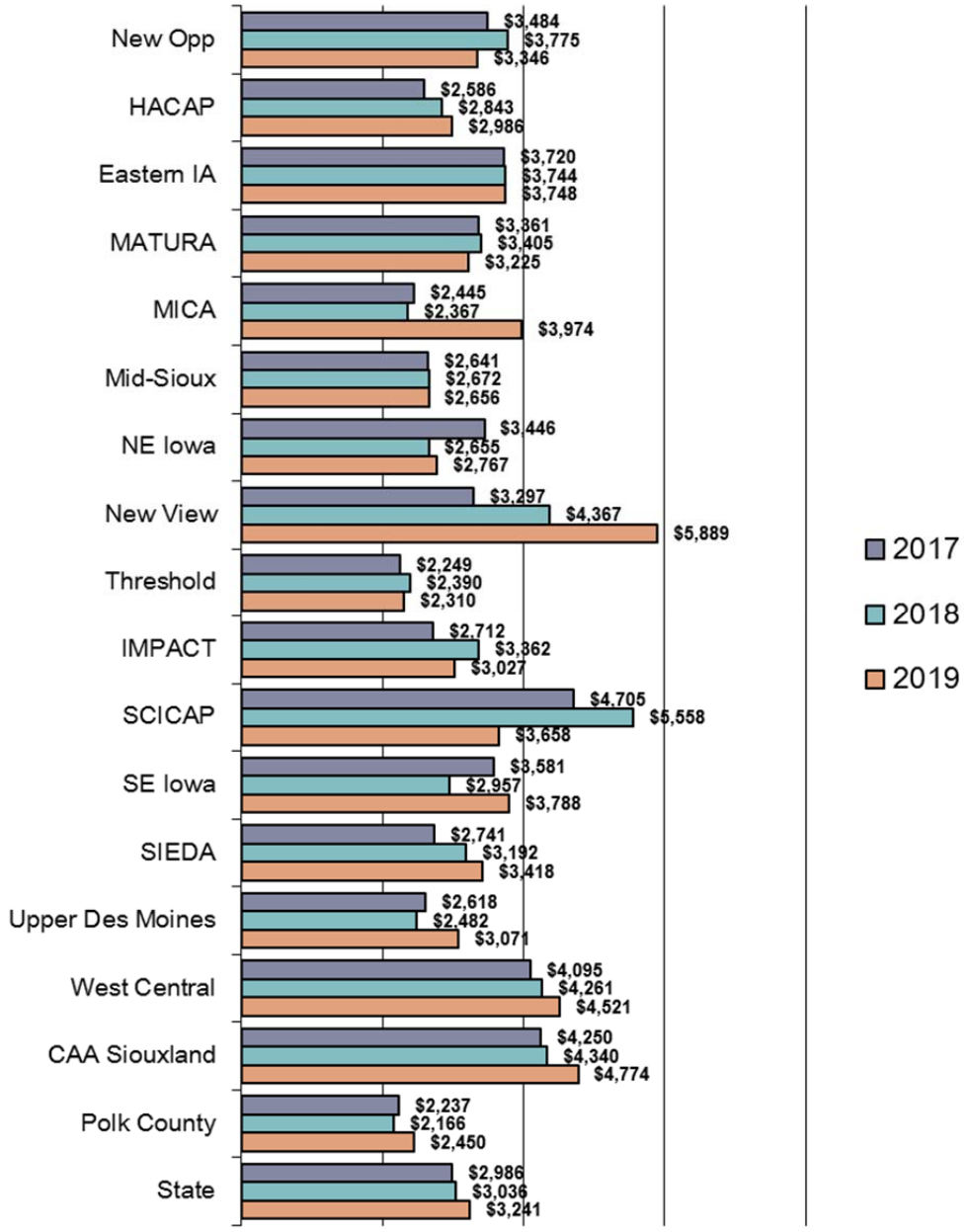

Figure 1.22a Average Program Expenditures on Heating System Replacements by Agency

Figure 1.22b shows the average utility funding for replacement heating systems of $2,608 statewide. SE Iowa, West Central, and Eastern Iowa spent more than $3,000. Polk County spent the least, averaging $1,936 per housing unit.

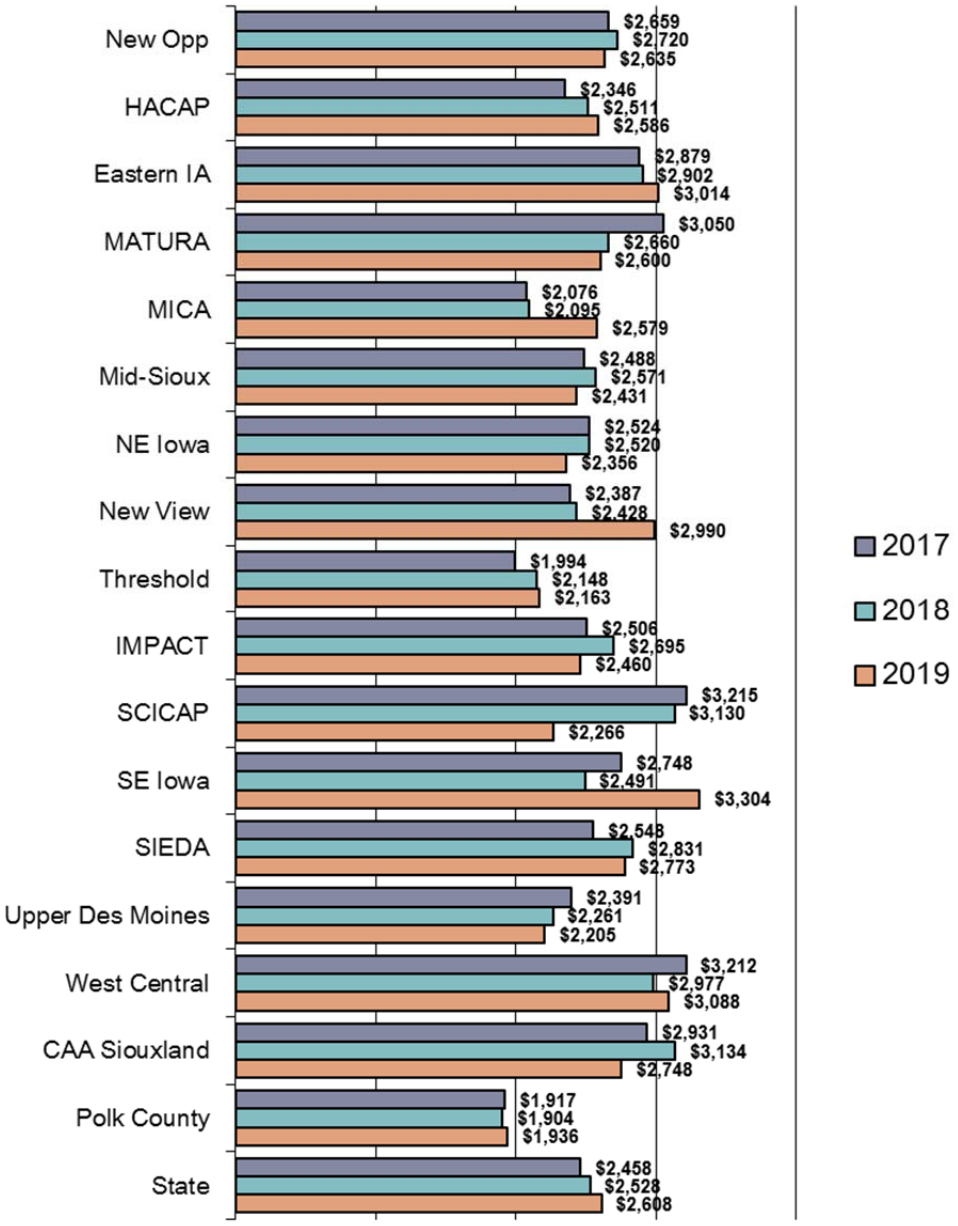

Figure 1.22b Average Utility Expenditures on Heating System Replacements by Agency

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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 natural gas analysis treatment group included weatherization jobs completed from October 1, 2018 through September 30, 2019. The electricity analysis treatment group included jobs weatherized from October 1, 2017 through June 30, 2018 and jobs completed between October 1, 2018 through June 30, 2019 comprised the electricity treatment group.

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, 2019 through March, 2020. 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 to 390 days prior to the beginning of the weatherization period, and up to 390 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).

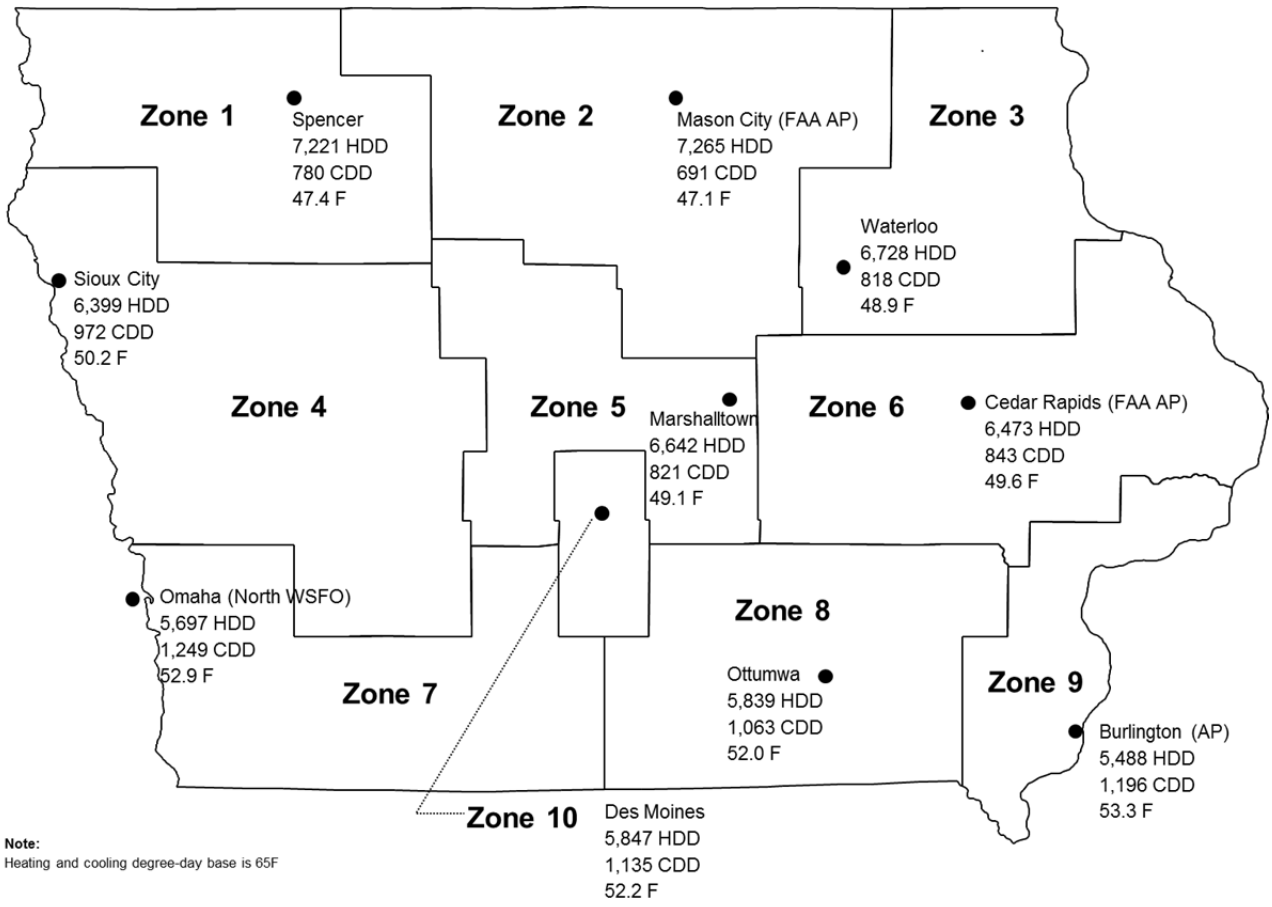

Figure 2.1 Weather zones used in the weather-normalization

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.

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

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 943 weatherization client dwellings with gas heating and 54,787 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 useable data for 77% of the treatment group and 74% of the comparison group (LIHEAP) dwellings. Useable histories with sufficient pre- and post-weatherization data were available for 92% of the returned treatment group clients and 90% of the returned comparison group . Our final analytic dataset after assessing model diagnostics, model reliability, and outlier screens included 464 weatherization client dwellings and 23,983 comparison dwellings, representing 69% and 66% 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	943	54,787	339	15,444	138	7,718	466	31,625
	Returned	729	40,445	290	11,851	102	5,201	337	23,393
	Percentage Returned	77.3%	73.8%	85.5%	76.7%	73.9%	67.4%	72.3%	74.0%
Useable Histories	Both Pre and Pst Cnt	671	36,306	252	9,050	96	4,900	323	22,356
	Pct of Returned	92.0%	89.8%	86.9%	76.4%	94.1%	94.2%	95.8%	95.6%
Passed Model Diagnostics	Both Pre and Pst Cnt	606	31,632	212	7,881	88	4,403	306	19,348
	Pct of Useable Histories	90.3%	87.1%	84.1%	87.1%	91.7%	89.9%	94.7%	86.5%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	464	23,983	164	6,281	70	3,374	230	14,328
	Pct of Useable Histories	69.2%	66.1%	65.1%	69.4%	72.9%	68.9%	71.2%	64.1%

Table 2.2 provides the attrition analysis broken out by housing type. Overall, 69% of the returned account data for weatherized single family site-built dwellings passed all analytic screens. Similarly, of those cases with returned data, 69% of mobile homes and 59% 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
Single Family Detached Framed Dwellings									
Requested		830	36,551	304	11,094	116	5,393	410	20,064
Returned		657	28,940	270	9,231	91	3,821	296	15,888
Percentage Returned		79.2%	79.2%	88.8%	83.2%	78.4%	70.9%	72.2%	79.2%
Useable Histories	Both Pre and Pst Cnt	606	26,216	237	7,295	86	3,629	283	15,292
	Pct of Returned	92.2%	90.6%	87.8%	79.0%	94.5%	95.0%	95.6%	96.2%
	Both Pre and Pst Cnt	547	23,785	199	6,437	79	3,356	269	13,992
Passed Model Diagnostics	Pct of Useable Histories	90.3%	90.7%	84.0%	88.2%	91.9%	92.5%	95.1%	91.5%
Passed Reliability and	Both Pre and Pst Cnt	421	18,073	156	5,133	61	2,572	204	10,368
Outlier Screens	Pct of Useable Histories	69.5%	68.9%	65.8%	70.4%	70.9%	70.9%	72.1%	67.8%
Mobile Homes									
Requested		67	4,891	10	1,327	10	846	47	2,718
Returned		51	3,633	10	1,038	5	530	36	2,065
Percentage Returned		76.1%	74.3%	100.0%	78.2%	50.0%	62.6%	76.6%	76.0%
Useable Histories	Both Pre and Pst Cnt	48	3,207	8	781	5	486	35	1,940
	Pct of Returned	94.1%	88.3%	80.0%	75.2%	100.0%	91.7%	97.2%	93.9%
	Both Pre and Pst Cnt	44	2,822	6	673	5	451	33	1,698
Passed Model Diagnostics	Pct of Useable Histories	91.7%	88.0%	75.0%	86.2%	100.0%	92.8%	94.3%	87.5%
Passed Reliability and	Both Pre and Pst Cnt	33	2,165	5	546	5	357	23	1,262
Outlier Screens	Pct of Useable Histories	68.8%	67.5%	62.5%	69.9%	100.0%	73.5%	65.7%	65.1%
Multi-Family									
Requested		46	6,548	25	1,682	12	858	9	4,008
Returned		21	4,256	10	947	6	497	5	2,812
Percentage Returned		45.7%	65.0%	40.0%	56.3%	50.0%	57.9%	55.6%	70.2%
Useable Histories	Both Pre and Pst Cnt	17	3,695	7	559	5	457	5	2,679
	Pct of Returned	81.0%	86.8%	70.0%	59.0%	83.3%	92.0%	100.0%	95.3%
	Both Pre and Pst Cnt	15	2,883	7	451	4	355	4	2,077
Passed Model Diagnostics	Pct of Useable Histories	88.2%	78.0%	100.0%	80.7%	80.0%	77.7%	80.0%	77.5%
Passed Reliability and	Both Pre and Pst Cnt	10	2,188	3	362	4	271	3	1,555
Outlier Screens	Pct of Useable Histories	58.8%	59.2%	42.9%	64.8%	80.0%	59.3%	60.0%	58.0%

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 if 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 237 therms for single family site-built dwellings. The 90% confidence interval was 32 therms, which is suggestive that 90%

certain that the true population mean savings falls in the approximate range of 205 and 269 therms. The overall mean percent savings was 23.8%, with a 2.8% confidence interval.

Net gas savings for thirty-three mobile homes averaged 177 therms ±86 therms. The overall percentage savings for mobile homes was 23.4%, with an 8.4% 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 Savings (therms)	90% CI	Percent Savings (%)	90% CI
		n	Baseline Cons. (therms)	90% CI	Savings (therms)	90% CI	n	Baseline Cons. (therms)	90% CI	Savings (therms)	90% CI				
Single Family Detached Framed Dwelling Results															
New Opportunities	44	20	1,137	142	344	170	496	1,019	19	31	26	317	171	27.9%	12.4%
HACAP	70	29	986	85	265	113	1,348	962	10	33	14	233	112	23.6%	10.2%
Eastern IA	73	39	1,069	87	333	104	1,747	1,038	12	33	17	301	103	28.1%	8.0%
MATURA	24	4	1,128	242	347	354	55	1,105	45	62	59	283	354	25.1%	29.2%
MICA	42	27	1,246	171	365	208	644	926	24	31	33	346	211	27.8%	14.1%
Mid-Sioux	18	7	1,329	192	448	221	46	1,125	33	15	54	439	231	33.1%	13.2%
NE Iowa	90	52	999	55	114	73	605	983	16	-27	22	141	78	14.1%	7.0%
New View	14	6	1,198	345	202	452	279	949	20	17	29	191	451	16.0%	34.6%
Threshold	62	30	1,082	101	253	123	1,021	1,016	13	-15	19	268	126	24.7%	9.6%
IMPACT	30	14	1,042	148	301	170	617	944	15	34	21	271	168	26.1%	13.4%
SCICAP	17	8	857	216	252	244	162	783	27	15	39	239	246	27.9%	22.9%
SE Iowa	49	11	1,056	56	390	71	191	1,046	12	22	20	368	74	34.8%	5.7%
SIEDA	35	17	895	127	227	151	931	901	17	12	24	216	152	24.1%	14.1%
Upper Des Moines	77	49	782	51	157	66	1,489	786	9	-26	14	183	69	23.4%	7.3%
West Central	35	17	735	67	177	80	870	722	9	1	13	176	81	23.9%	9.2%
CAA Siouxland	21	12	1,244	244	403	305	498	986	20	7	28	398	307	32.0%	19.9%
Polk County	148	79	916	43	229	50	2,184	914	8	15	11	213	51	23.3%	4.6%
Overall	854	421	994	26	248	32	18,034	947	3	12	5	237	32	23.8%	2.8%
Mobile Home Results (entire state)															
Overall	68	33	912	69	200	86	1,810	914	9	23	12	177	86	23.4%	8.4%

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'.

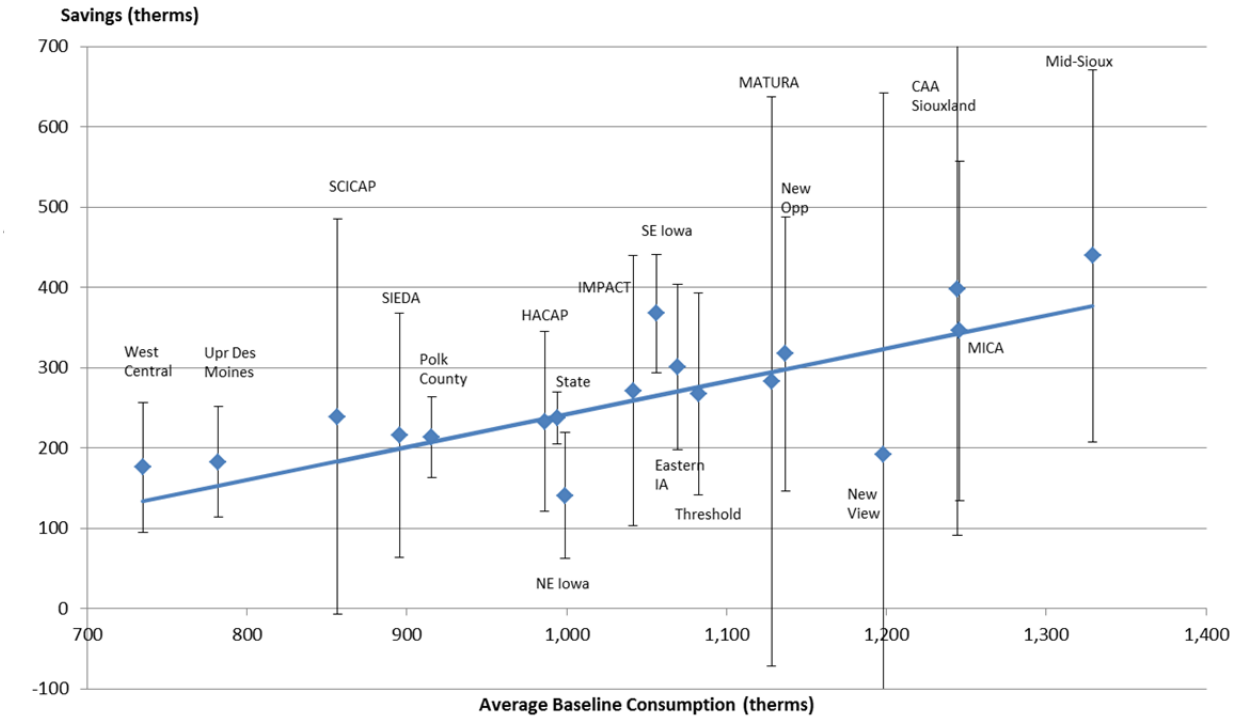

Figure 2.2 Savings in relation to the pre-weatherization normalized annual consumption (single family site-built dwellings).

The 90% confidence intervals are extremely wide for several agencies, including MATURA, New View, and CAA Siouxland. 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 are becoming a hindrance to assessing agency-specific results in recent years as fewer numbers of homes weatherized annually.

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.

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.

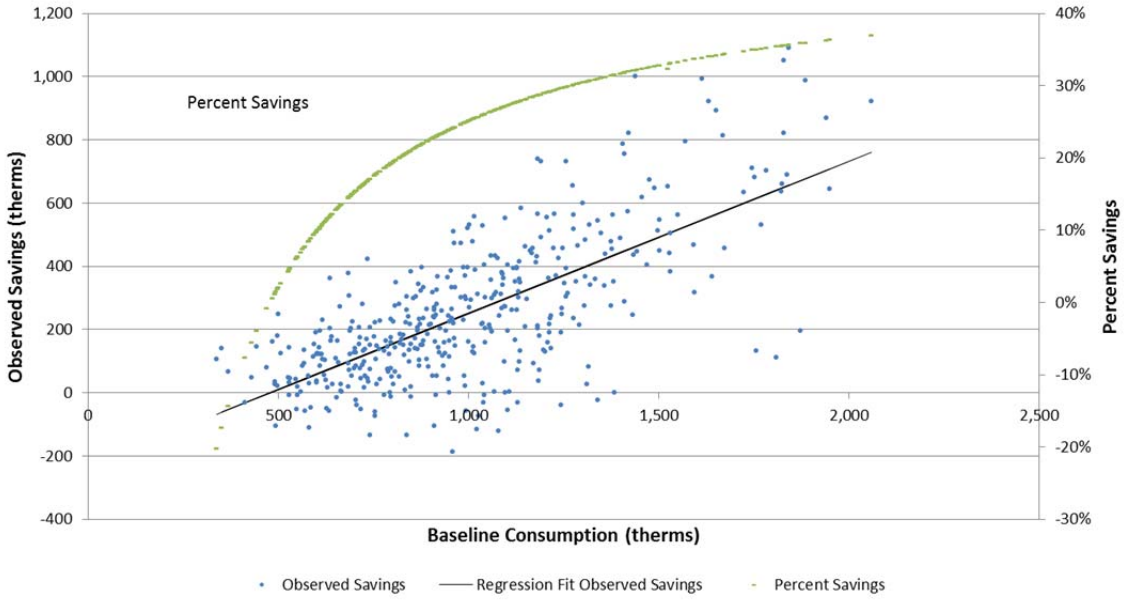

Figure 2.3 Relationship between baseline consumption, savings, and percentage savings

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 994 therms in CY 2019. Net savings (237 therms) has been trending downward slightly in the past six years but remains within a range seen in prior years. The percentage savings of 23.8% is essentially identical to the percentage savings a year earlier (23.7%).

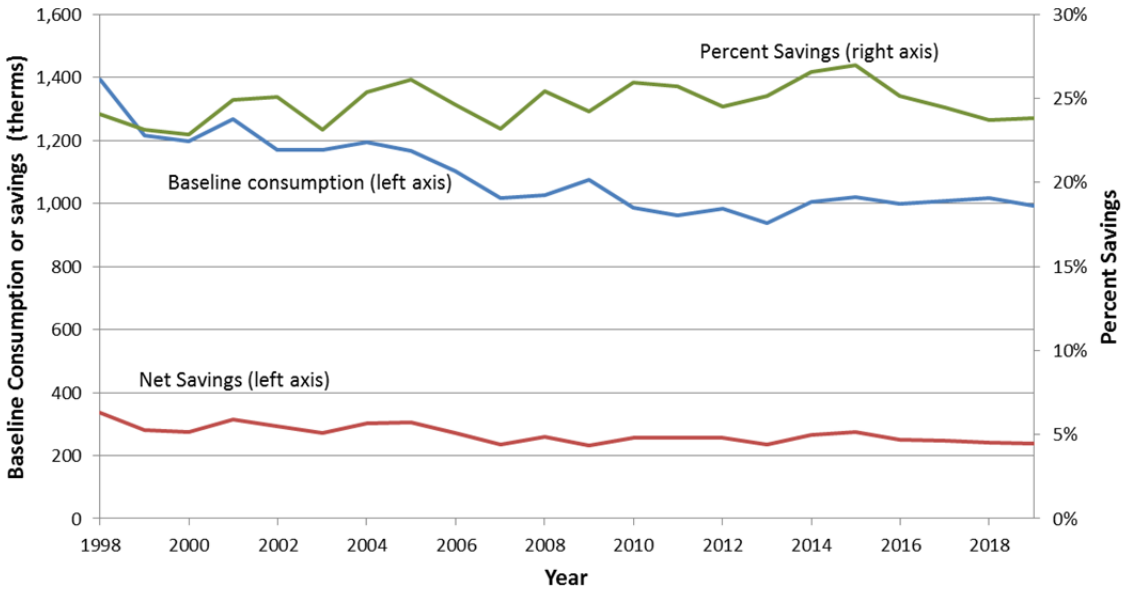

Figure 2.4 Annual Baseline Consumption, Savings, and Percent Savings

ATTRITION ANALYSIS – ELECTRICITY

We requested data for 1,139 weatherization clients and 69,969 LIHEAP households for our comparison group. We expanded the electricity analysis to increase reliability of the results: our treatment group included those weatherized from October 1, 2017 through June 30, 2018 (using summer 2017 as the pre-weatherization summer period), and between October 1, 2018 through June 30, 2019 (using summer 2018 as the pre- weatherization summer period).

Overall we had 381 treatment and 19,873 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	1,139	66,969	570	30,772	569	36,197
	Returned	846	52,321	470	24,083	376	28,238
	Percentage Returned	74.3%	78.1%	82.5%	78.3%	66.1%	78.0%
Useable Histories	Both Pre and Pst Cnt	643	39,347	270	12,214	373	27,126
	Pct of Returned	76.0%	75.2%	57.4%	50.7%	99.2%	96.1%
Passed Model Diagnostics	Both Pre and Pst Cnt	578	31,250	251	10,734	327	20,509
	Pct of Useable Histories	89.9%	79.4%	93.0%	87.9%	87.7%	75.6%
Passed Reliability and Outlier Screens	Both Pre and Pst Cnt	381	19,873	193	7,830	188	12,037
	Pct of Useable Histories	59.3%	50.5%	71.5%	64.1%	50.4%	44.4%

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 346 cases. Twenty-three mobile homes and twelve multi-family units weatherized by the program passed all screens.

Table 2.6 Electricity Attrition by Housing Type

Attrition Analysis of All Electricity Accounts by Housing Type

		State		IPL		MAE	
		Trt	Cmpr	Trt	Cmpr	Trt	Cmpr
Single Family Detached Framed Dwellings							
Requested		1,001	38,785	492	18,441	509	20,344
Returned		768	32,031	425	15,532	343	16,499
Percentage Returned		76.7%	82.6%	86.4%	84.2%	67.4%	81.1%
Useable Histories	Both Pre and Pst Cnt	587	24,434	246	8,513	341	15,917
	Pct of Returned	76.4%	76.3%	57.9%	54.8%	99.4%	96.5%
Passed Model Diagnostics	Both Pre and Pst Cnt	527	20,138	228	7,414	299	12,720
	Pct of Useable Histories	89.8%	82.4%	92.7%	87.1%	87.7%	79.9%
Passed Reliability and	Both Pre and Pst Cnt	346	14,002	176	5,764	170	8,235
Outlier Screens	Pct of Useable Histories	58.9%	57.3%	71.5%	67.7%	49.9%	51.7%
Mobile Homes							
Requested		83	4,925	32	2,493	51	2,432
Returned		54	3,746	26	1,951	28	1,795
Percentage Returned		65.1%	76.1%	81.3%	78.3%	54.9%	73.8%
Useable Histories	Both Pre and Pst Cnt	41	2,687	14	992	27	1,694
	Pct of Returned	75.9%	71.7%	53.8%	50.8%	96.4%	94.4%
Passed Model Diagnostics	Both Pre and Pst Cnt	38	2,238	14	877	24	1,360
	Pct of Useable Histories	92.7%	45.4%	43.8%	35.2%	47.1%	55.9%
Passed Reliability and	Both Pre and Pst Cnt	23	1,509	8	654	15	854
Outlier Screens	Pct of Useable Histories	56.1%	56.2%	57.1%	65.9%	55.6%	50.4%
Multi-Family							
Requested		55	9,199	46	4,556	9	4,643
Returned		24	6,483	19	2,993	5	3,490
Percentage Returned		66.7%	72.8%	0.0%	72.6%	100.0%	73.1%
Useable Histories	Both Pre and Pst Cnt	15	4,586	10	1,235	5	3,350
	Pct of Returned	62.5%	70.7%	52.6%	41.3%	100.0%	96.0%
	Both Pre and Pst Cnt	13	3,468	9	1,117	4	2,350
Passed Model Diagnostics	Pct of Useable Histories	86.7%	75.6%	90.0%	90.4%	80.0%	70.1%
Passed Reliability and	Both Pre and Pst Cnt	12	1,938	9	687	3	1,250
Outlier Screens	Pct of Useable Histories	80.0%	42.3%	90.0%	55.6%	60.0%	37.3%

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
Electric Savings for Dwellings with Non-Electric Space Heat															
Overall	1,283	362	9,189	373	714	518	18,013	9,069	54	173	77	542	521	5.9%	5.5%
Electric Savings for Dwellings with Electric Space Heat															
Overall	70	20	24,767	4,545	2,412	5,760	1,701	22,197	405	273	575	2,158	5,772	8.7%	22.2%

Dwellings with non-electric space heat averaged 542 kWh (±521 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 2,158 kWh per dwelling, with a wide 90% confidence range of 5,772 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
Electricity			
Dwellings with Non-Electric Space Heat	633	542	0.86
Dwellings with Electric Space Heat	2,122	2,158	1.02
Natural Gas Heat			
Single Family and Small Multi-family Site Built	254	237	0.93
Mobile Home	119	177	1.49

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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.

Combined State and Utility

Billing Adjusted Costs and Impacts for All Measures Installed During Calendar Year 2019

Total Reported Labor, Materials and Utility Admin Expenditures: $14,913,784

Utility Administration Expenditures: $114,007

Total Labor and Material Expenditures: $14,799,777

Measure	Number of Dwellings with Impacts: Total	Electric	Gas	Propane	Fuel Oil	Other	Number of Dwellings with kWh Impacts: Season Cooling	Heating	Spending on Materials & Labor ($)	Billing Adjusted First-Year Savings: Electricity Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas Pk-Day therms	Annual therms	Propane gallons	Fuel Oil gallons	Other Mbtu	Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures: Spending on Materials & Labor ($)	Electricity Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas Pk-Day therms	Annual therms	Propane gallons	Fuel Oil gallons	Other Mbtu
Total Efficiency Measures	**1,092**	**1,092**	**934**	**92**	**2**	**0**	**1,087**	**1,092**	**8,157,792**	**192.9**		**189.5**		**719,881**	**2,247**	**209,636**	**22,958**	**326**	**0**	**7,471**	**0.177**		**0.174**		**659**	**2.41**	**224**	**250**	**163**	**-**
Total Shell & Htg. Sys. Repl	1,092	1,092	934	92	2	0	1,079	1,090	6,862,849	158.2	178,289	133.7	204,158	382,448	2,208	201,570	22,567	326	0	6,285	0.147	165	0.123	187	350	2.36	216	245	163	-
Total Shell Measures	1,092	1,092	934	92	2	0	1,079	1,090	4,730,060	158.2	178,289	131.8	201,335	379,624	1,427	130,179	13,890	162	0	4,332	0.147	165	0.121	185	348	1.53	139	151	81	-
Wall Insul.	610	572	544	49	1	0	572	16	1,075,680	58.8	70,877	12.4	18,972	89,848	418	38,289	4,096	65	0	1,763	0.103	124	0.772	1,186	157	0.77	70	84	65	-
Open Blown Ceiling Insul	853	811	729	70	1	0	810	53	778,820	57.7	69,561	47.4	72,381	141,941	418	38,102	4,670	41	0	913	0.071	86	0.894	1,366	175	0.57	52	67	41	-
Cavity Fill Insul	318	265	294	15	0	0	263	9	273,619	10.0	12,018	4.0	6,106	18,124	153	13,943	926	0	0	860	0.038	46	0.450	678	68	0.52	47	62	-	-
Sloped Attic Insul	318	275	279	28	0	0	274	11	166,580	11.0	13,216	4.2	6,464	19,680	116	10,681	1,231	0	0	524	0.040	48	0.383	588	72	0.42	38	44	-	-
Kneewall Insul	270	234	240	22	0	0	234	8	119,343	4.3	5,240	0.9	1,454	6,694	91	8,113	380	0	0	442	0.019	22	0.117	182	29	0.38	34	17	-	-
Infil. Reduction	1,090	1,039	934	91	2	0	1,038	63	1,091,550	12.4	14,903	8.6	13,010	27,914	180	16,432	1,799	36	0	1,001	0.012	14	0.137	207	27	0.19	18	20	18	-
Found./Crawl. Insul	415	133	350	39	0	0	124	26	297,709	5.9	7,160	5.0	7,559	14,718	75	6,790	880	0	0	717	0.048	58	0.193	291	111	0.21	19	23	-	-
Bandjoist Insul.	404	32	325	45	2	0	-	32	131,080	0.0	0	3.4	5,092	5,092	23	2,098	314	25	0	324	0.000	0	0.106	159	159	0.07	6	7	12	-
Furnace Blower Fan[1]	1,028	1,015	934	92	2	0	-	1,015	0	0.0	0	65.1	99,786	99,786	(6)	(522)	(53)	(1)	0	0	0.000	0	0.064	98	98	(0.01)	(1)	(1)	(0)	-
Exhaust Ventilation[2]	775	775	663	58	1	0	775	775	795,679	-1.8	(14,684)	(19.3)	(29,488)	(44,172)	(41)	(3,746)	(353)	(4)	0	1,027	-0.002	(19)	(0.025)	(38)	(57)	(0.06)	(6)	(6)	(4)	-
Total Heating System Repl	658	18	584	54	2	0	-	18	2,132,789	0.0	0	1.9	2,823	2,823	781	71,391	8,677	164	0	3,241	0.000	0	0.105	157	157	1.34	122	161	82	-
Condensing Htg Sys Rep	620	0	565	53	2	0	-	-	1,976,164	0.0	0	0.0	0	0	757	69,276	8,607	164	0	3,187	-	-	-	-	-	1.34	123	162	82	-
Non-Cond Htg Sys Repl	20	0	19	1	0	0	-	-	67,418	0.0	0	0.0	0	0	23	2,115	70	0	0	3,371	-	-	-	-	-	1.21	111	70	-	-
Electric Htg Sys Repl	10	10	0	0	0	0	-	10	32,443	0.0	0	0.9	1,369	1,369	0	0	0	0	0	3,244	0.000	0	0.092	137	137	-	-	-	-	-
Heat Pump Repl	9	9	0	0	0	0	-	9	56,765	0.0	0	1.0	1,455	1,455	0	0	0	0	0	6,307	0.000	0	0.108	162	162	-	-	-	-	-
Other Htg Sys Repl	0	0	0	0	0	0	-	0	0	0.0	0	0.0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-

	Number of Measures Installed by Fuel Type: Total	Electric	Gas	Propane	Fuel Oil	Other		Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Propane gallons	Fuel Oil gallons	Other Mbtu		Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Propane gallons	Fuel Oil gallons	Other Mbtu
Water Heating	1,033	228	769	36	0	0	1,113,474	0.0	0.3	20,344	38.9	8,066	391	0	0	1,078	0.000	0.001	89	0.051	10	11	-	-
Temp. Reduct.	19	4	12	3	0	0	0	0.0	0.0	402	0.3	90	24	0	0	0	0.000	0.000	101	0.02	7	8	-	-
WH Wrap	28	6	22	0	0	0	3,584	0.0	0.0	600	0.5	186	0	0	0	128	0.000	0.000	100	0.02	8	-	-	-
Pipe Insul.	942	214	703	25	0	0	14,910	0.0	0.0	7,319	6.3	2,188	85	0	0	16	0.000	0.000	34	0.01	3	3	-	-
LF Showerhead	95	20	74	1	0	0	960	0.0	0.1	2,854	2.0	601	8	0	0	10	0.000	0.003	143	0.03	8	8	-	-
Faucet Aerator	131	20	109	2	0	0	1,017	0.0	0.0	702	0.9	272	5	0	0	8	0.000	0.001	35	0.01	2	2	-	-
Std-Eff Wtr Htr Repl.	0	0	0	0	0	0	0	0.0	0.0	0	0.0	0	0	0	0	0	-	-	-	-	-	-	-	-
Hi-Eff or Electric Wtr Htr Repl.	616	82	505	29	0	0	1,093,003	0.0	0.2	8,466	29.0	4,730	269	0	0	1,774	0.000	0.003	103	0.06	9	9	-	-
Lighting	786	786					45,027	25.4	46.9	241,781	-	-	-	-	-	57	0.032	0.060	308	-	-	-	-	-
Refrigerator/Freezer[3]	171	171					136,442	9.3	8.7	75,308	-	-	-	-	-	798	0.054	0.051	440	-	-	-	-	-
Refrigerator Removal	1	1					80	0.0	0.0	391	-	-	-	-	-	80	0.048	0.045	391	-	-	-	-	-
Refrigerator Exchange	134	134					111,415	6.7	6.3	54,752	-	-	-	-	-	831	0.050	0.047	409	-	-	-	-	-
Freezer Removal	0	0					0	0.0	0.0	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-
Freezer Exchange	46	46					24,947	2.5	2.3	20,165	-	-	-	-	-	542	0.054	0.050	438	-	-	-	-	-

Total Non-Efficiency Measures	1,092									**6,641,985**										**6,082**				
Misc Ins,Attic Access/Vent	924									302,163										327				
Duct Sealing	299									74,923										251				
Duct Insulation	526									62,706										119				
Damming Material	581									44,806										77				
Htg. Sys. Tune & Clean	413									100,028										242				
Htg. Sys./WH Other	322									190,535										592				
Air Conditioning Work	29									4,443										153				
Water Heater Repair	146									16,981										116				
Refrigerator Coil Clean	0									0										0				
Waterbed Mattress Pad	0									0										0				
Programmable Tstat	40									4,085										102				
Unspecified Utility Meas	0									0										0				
CO Detector	1,047									102,189										98				
Smoke Detector	730									49,985										68				
Fuses	3									434										145				
Htg Sys Safety Check	27									2,107										78				
Htg Sys Ventilation	587									137,623										234				
Water Heater Ventilation	525									99,848										190				
Bathroom Ventilation	510									94,848										186				
Dryer Ventilation	722									84,883										118				
Kitchen Ventilation	71									13,037										184				
Other Exhaust Ventilation	323									13,895										43				
Asbestos Removal (Minor)	6									7,300										1,217				
Health/Safety Repairs	788									330,589										420				
Health/Safety Other	124									8,913										72				
Consumables	260									11,364										44				
General Repairs	998									656,413										658				
Meter Refrig (no action)	875									150										0				
Meter Freezer (no action)	365									0										0				
Support	1,053									3,955,748										3,757				
Transportation Allowance	318									49,580										156				
Landlord Contr Misc	0									0										0				
Landlord Contr Furnace	0									0										0				
Landlord Contr DHW	0									0										0				
Client Contr (Any)	0									0										0				
Lead Safe Work	706									222,409										315				
Unspecifed/Other	0									0										0				

[1] Estimates are based upon reduced usage of the furnace due to shell improvements

[2] Impacts from continuous exhaust fans required by ASHRAE 62.2. The winter impacts exceed summer because these also include heating season impacts for dwellings with electric heat.

[3] The total number of dwellings may exceed the number of measures installed in cases where the utility partially funds refrigeration measure replacements. The percentage of expenditures for each appliance is totaled to get the total number of measures installed.

Iowa Division of Community Action Agencies

Billing Adjusted Costs and Impacts for DCAA-Funded Measures Installed During Calendar Year 2019

Total Reported Labor, Materials and Utility Admin Expenditures: $10,731,000
Utility Administration Expenditures: -
Total Labor and Material Expenditures: $10,731,000

Measure	Number of Dwellings with Impacts: Total	Electric	Gas	Propane	Fuel Oil	Other	Number of Dwellings with kWh Impacts: Season Cooling	Heating	Spending on Materials & Labor ($)	Billing Adjusted First-Year Savings: Electricity Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas Pk-Day therms	Gas Annual therms	Propane gallons	Fuel Oil gallons	Other Mbtu	Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures: Spending on Materials & Labor ($)	Electricity Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas Pk-Day therms	Gas Annual therms	Propane gallons	Fuel Oil gallons	Other Mbtu
Total Efficiency Measures	**1,086**	**1,084**	**929**	**92**	**2**	**0**	**1,048**	**1,084**	**4,807,028**	**88.8**		**99.7**		**349,258**	**942**	**88,444**	**22,958**	**326**	**0**	**4,426**	**0.085**		**0.092**		**322**	**1.01**	**95**	**250**	**163**	-
Total Shell & Htg. Sys. Repl	1,083	1,083	924	92	2	0	1,032	1,081	4,079,516	72.6	74,994	73.9	113,530	188,524	922	84,444	22,567	326	0	3,767	0.070	73	0.068	105	174	1.00	91	245	163	-
Total Shell Measures	1,083	1,083	924	92	2	0	1,032	1,081	2,909,193	72.6	74,994	72.4	111,215	186,209	577	52,795	13,890	162	0	2,686	0.070	73	0.067	103	172	0.62	57	151	81	-
Wall Insul.	338	276	228	49	1	0	276	10	477,755	26.6	32,063	8.2	12,743	44,805	163	14,869	4,096	65	0	1,413	0.096	116	0.823	1,274	162	0.71	65	84	65	-
Open Blown Ceiling Insul	461	369	297	70	1	0	368	26	337,189	24.9	30,035	25.2	38,843	68,878	157	14,379	4,670	41	0	731	0.068	82	0.968	1,494	187	0.53	48	67	41	-
Cavity Fill Insul	166	128	126	15	0	0	126	5	102,419	4.4	5,253	2.3	3,485	8,738	56	5,115	926	0	0	617	0.035	42	0.468	697	68	0.44	41	62	-	-
Sloped Attic Insul	171	127	113	28	0	0	126	7	73,031	4.9	5,888	2.0	3,063	8,951	45	4,198	1,231	0	0	427	0.039	47	0.288	438	70	0.40	37	44	-	-
Kneewall Insul	146	109	104	22	0	0	109	3	52,423	1.8	2,222	0.1	234	2,456	18	1,684	380	0	0	359	0.017	20	0.049	78	23	0.18	16	17	-	-
Infil. Reduction	1,022	881	845	91	2	0	880	52	861,064	9.1	10,994	5.9	8,902	19,895	139	12,666	1,799	36	0	843	0.010	12	0.113	171	23	0.16	15	20	18	-
Found./Crawl. Insul	230	66	166	39	0	0	62	15	152,796	2.7	3,224	2.5	3,853	7,077	35	3,185	880	0	0	664	0.043	52	0.169	257	107	0.21	19	23	-	-
Bandjoist Insul.	192	16	129	45	2	0	-	16	56,838	0.0	0	1.2	1,902	1,902	8	765	314	25	0	296	0.000	0	0.078	119	119	0.06	6	7	12	-
Furnace Blower Fan[1]	974	974	880	92	2	0	-	974	0	0.0	0	44.1	67,679	67,679	(4)	(321)	(53)	(1)	0	0	0.000	0	0.045	69	69	(0.00)	(0)	(1)	(0)	-
Exhaust Ventilation[2]	775	775	663	58	1	0	775	775	795,679	-1.8	(14,684)	(19.3)	(29,488)	(44,172)	(41)	(3,746)	(353)	(4)	0	1,027	-0.002	(19)	(0.025)	(38)	(57)	(0.06)	(6)	(6)	(4)	-
Total Heating System Repl	390	16	318	54	2	0	-	16	1,170,323	0.0	0	1.5	2,315	2,315	345	31,649	8,677	164	0	3,001	0.000	0	0.097	145	145	1.09	100	161	82	-
Condensing Htg Sys Rep	354	0	299	53	2	0	-	-	1,033,133	0.0	0	0.0	0	0	322	29,534	8,607	164	0	2,918	-	-	-	-	-	1.08	99	162	82	-
Non-Cond Htg Sys Repl	20	0	19	1	0	0	-	-	67,418	0.0	0	0.0	0	0	23	2,115	70	0	0	3,371	-	-	-	-	-	1.21	111	70	-	-
Electric Htg Sys Repl	8	8	0	0	0	0	-	8	23,769	0.0	0	0.7	1,032	1,032	0	0	0	0	0	2,971	0.000	0	0.086	129	129	-	-	-	-	-
Heat Pump Repl	9	9	0	0	0	0	-	9	46,003	0.0	0	0.9	1,283	1,283	0	0	0	0	0	5,111	0.000	0	0.095	143	143	-	-	-	-	-
Other Htg Sys Repl	0	0	0	0	0	0	-	0	0	0.0	0	0.0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-

	Number of Measures Installed by Fuel Type: Total	Electric	Gas	Propane	Fuel Oil	Other		Billing Adjusted First-Year Savings: Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Propane gallons	Fuel Oil gallons	Other Mbtu	Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures: Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Propane gallons	Fuel Oil gallons	Other Mbtu
Water Heating	723	153	534	36	0	0	958	210	687	61	0	0	634,447	0.0	0.2	12,628	19.7	4,000	391	0	0	878	0.000	0.001	83	0.037	7	11	-	-
Temp. Reduct.	12	4	5	3	0	0	12	4	5	3	0	0	0	0.0	0.0	402	0.1	37	24	0	0	0	0.000	0.000	101	0.02	7	8	-	-
WH Wrap	27	6	21	0	0	0	27	6	21	0	0	0	3,484	0.0	0.0	600	0.5	178	0	0	0	129	0.000	0.000	100	0.02	8	-	-	-
Pipe Insul.	410	110	275	25	0	0	410	110	275	25	0	0	6,368	0.0	0.0	3,752	2.5	879	85	0	0	16	0.000	0.000	34	0.01	3	3	-	-
LF Showerhead	46	10	35	1	0	0	52	12	39	1	0	0	476	0.0	0.0	1,414	1.0	297	8	0	0	10	0.000	0.003	141	0.03	8	8	-	-
Faucet Aerator	69	14	53	2	0	0	116	20	93	3	0	0	562	0.0	0.0	526	0.5	151	5	0	0	8	0.000	0.001	38	0.01	3	2	-	-
Std-Eff Wtr Htr Repl.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0	0.0	0	0	0	0	0	-	-	-	-	-	-	-	-
Hi-Eff or Electric Wtr Htr Repl.	529	76	424	29	0	0	341	58	254	29	0	0	623,558	0.0	0.1	5,934	15.1	2,458	269	0	0	1,179	0.000	0.002	78	0.04	6	9	-	-
Lighting	334	334					3,218	3,218					20,078	11.3	20.9	107,712	-	-	-	-	-	60	0.034	0.063	322	-	-	-	-	-
Refrigerator/Freezer[3]	115	115					100	100					72,987	5.0	4.6	40,393	-	-	-	-	-	635	0.043	0.040	351	-	-	-	-	-
Refrigerator Removal	1	1					1	1					80	0.0	0.0	391	-	-	-	-	-	80	0.048	0.045	391	-	-	-	-	-
Refrigerator Exchange	85	85					65	65					55,279	3.2	3.0	25,994	-	-	-	-	-	650	0.038	0.035	306	-	-	-	-	-
Freezer Removal	0	0					0	0					0	0.0	0.0	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-
Freezer Exchange	37	37					33	33					17,628	1.7	1.6	14,008	-	-	-	-	-	476	0.047	0.044	379	-	-	-	-	-

Total Non-Efficiency Measures	1,092	**5,923,971**		**5,425**
Misc Ins,Attic Access/Vent	893	253,561		284
Duct Sealing	275	66,598		242
Duct Insulation	510	54,621		107
Damming Material	581	44,806		77
Htg. Sys. Tune & Clean	342	82,337		241
Htg. Sys./WH Other	322	190,535		592
Air Conditioning Work	29	4,443		153
Water Heater Repair	146	16,981		116
Refrigerator Coil Clean	0	0		0
Waterbed Mattress Pad	0	0		0
Programmable Tstat	1	200		200
Unspecified Utility Meas	0	0		0
CO Detector	1,046	102,109		98
Smoke Detector	730	49,985		68
Fuses	3	434		145
Htg Sys Safety Check	27	2,107		78
Htg Sys Ventilation	351	79,670		227
Water Heater Ventilation	275	53,492		195
Bathroom Ventilation	510	94,848		186
Dryer Ventilation	722	84,883		118
Kitchen Ventilation	71	13,037		184
Other Exhaust Ventilation	323	13,895		43
Asbestos Removal (Minor)	6	7,300		1,217
Health/Safety Repairs	751	323,553		431
Health/Safety Other	124	8,913		72
Consumables	260	11,364		44
General Repairs	829	529,867		639
Meter Refrig (no action)	716	0		0
Meter Freezer (no action)	314	0		0
Support	1,050	3,562,582		3,393
Transportation Allowance	318	49,580		156
Landlord Contr Misc	0	0		0
Landlord Contr Furnace	0	0		0
Landlord Contr DHW	0	0		0
Client Contr (Any)	0	0		0
Lead Safe Work	705	222,269		315
Unspecifed/Other	0	0		0

[1] Estimates are based upon reduced usage of the furnace due to shell improvements

[2] Impacts from continuous exhaust fans required by ASHRAE 62.2. The winter impacts exceed summer because these also include heating season impacts for dwellings with electric heat.

[3] The total number of dwellings may exceed the number of measures installed in cases where the utility partially funds refrigeration measure replacements. The percentage of expenditures for each appliance is totaled to get the total number of measures installed.

Alliant - Interstate Power and Light

Billing Adjusted Costs and Impacts for Utility-Funded Measures Installed During Calendar Year 2019

Total Reported Labor, Materials and Utility Admin Expenditures: $2,219,177

Utility Administration Expenditures: $64,093

Total Labor and Material Expenditures: $2,155,084

Measure	Number of Dwellings with Impacts: Total	Electric	Gas	Number of Dwellings with Electricity Impacts: Season: Cooling	Heating	Spending on Materials & Labor ($)	Billing Adjusted First-Year Savings: Electricity: Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas: Pk-Day therms	Annual therms	Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures: Spending on Materials & Labor ($)	Electricity: Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas: Pk-Day therms	Annual therms
Total Efficiency Measures	**497**	**434**	**298**	**430**	**434**	**1,760,227**	**64.7**		**53.6**		**224,573**	**633**	**58,355**	**3,542**	**0.150**		**0.124**		**517**	**2.12**	**196**
Total Shell & Htg. Sys. Repl	468	405	296	383	405	1,482,228	53.8	64,876	35.9	54,016	118,892	624	56,539	3,167	0.140	169	0.089	133	294	2.11	191
Total Shell Measures	468	405	295	383	405	983,905	53.8	64,876	35.6	53,596	118,471	404	36,575	2,102	0.140	169	0.088	132	293	1.37	124
Wall Insul.	237	192	174	192	3	313,681	19.5	23,577	1.7	2,491	26,069	136	12,366	1,324	0.102	123	0.563	830	136	0.78	71
Open Blown Ceiling Insul.	343	288	213	287	22	219,519	19.9	23,994	15.0	22,429	46,423	122	10,968	640	0.069	84	0.682	1,020	161	0.57	51
Cavity Fill Insul.	110	84	78	84	2	94,641	3.5	4,241	0.5	712	4,952	47	4,254	860	0.042	50	0.229	356	59	0.61	55
Sloped Attic Insul.	144	104	101	104	3	54,726	4.2	5,064	1.5	2,400	7,464	40	3,627	380	0.040	49	0.514	800	72	0.39	36
Kneewall Insul.	106	83	71	83	4	43,013	1.6	1,893	0.7	1,108	3,001	14	1,239	406	0.019	23	0.180	277	36	0.19	17
Infil. Reduction	411	336	287	335	29	149,464	2.4	2,839	1.9	2,892	5,731	22	2,035	364	0.007	8	0.067	100	17	0.08	7
Found./Crawl. Insul.	140	59	116	56	10	71,721	2.7	3,267	1.7	2,575	5,842	17	1,560	512	0.048	58	0.174	257	99	0.15	13
Bandjoist Insul.	109	12	97	-	12	37,140	0.0	0	1.5	2,176	2,176	7	619	341	0.000	0	0.122	181	181	0.07	6
Furnace Blower Fan[1]	439	376	295	-	376	0	0.0	0	11.0	16,813	16,813	(1)	(93)	0	0.000	0	0.029	45	45	(0.00)	(0)
Exhaust Ventilation[2]	0	0	0	0	0	0	0.0	0	0.0	0	0	0	0	0	-	-	-	-	-	-	-
Total Heating System Repl	181	5	176	-	5	498,322	0.0	0	0.3	420	420	220	19,964	2,753	0.000	0	0.057	84	84	1.25	113
Condensing Htg Sys Repl	176	0	176	-	-	482,648	0.0	0	0.0	0	0	220	19,964	2,742	-	-	-	-	-	1.25	113
Non-Cond Htg Sys Repl	0	0	0	-	-	0	0.0	0	0.0	0	0	0	0	0	-	-	-	-	-	-	-
Electric Htg Sys Repl	3	3	0	-	3	8,674	0.0	0	0.2	337	337	0	0	2,891	0.000	0	0.076	112	112	-	-
Heat Pump Repl	2	2	0	-	2	7,000	0.0	0	0.1	84	84	0	0	3,500	0.000	0	0.028	42	42	-	-
Other Htg Sys Repl	0	0	0	-	0	0	0.0	0	0.0	0	0	0	0	0	-	-	-	-	-	-	-

	Number of Measures: Total	Electric	Gas	Number of Measures by Fuel Type: Total	Electric	Gas		Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms		Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms
Water Heating	305	85	220	449	108	341	225,767	0.0	0.1	5,834	8.8	1,816	740	0.000	0.001	69	0.040	8
Temp. Reduct.	2	0	2	2	0	2	0	0.0	0.0	0	0.0	15	0	-	-	-	0.02	7
WH Wrap	0	0	0	0	0	0	0	0.0	0.0	0	0.0	0	0	-	-	-	-	-
Pipe Insul.	269	80	189	269	80	189	3,961	0.0	0.0	2,744	1.7	576	15	0.000	0.000	34	0.01	3
LF Showerhead	25	8	17	25	8	17	233	0.0	0.0	1,172	0.5	140	9	0.000	0.003	146	0.03	8
Faucet Aerator	11	2	9	15	2	13	75	0.0	0.0	50	0.1	18	7	0.000	0.001	25	0.01	2
Std-Eff Wtr Htr Repl.	0	0	0	0	0	0	0	0.0	0.0	0	0.0	0	0	-	-	-	-	-
Hi-Eff or Electric Wtr Htr Repl.	162	25	137	138	18	120	221,499	0.0	0.0	1,867	6.5	1,066	1,367	0.000	0.002	75	0.05	8
Lighting	289	289		2,348	2,348		13,373	8.3	15.3	78,615	-	-	46	0.029	0.053	272	-	-
Refrigerator/Freezer[3]	55	55		53	53		38,859	2.6	2.4	21,232	-	-	707	0.047	0.044	386	-	-
Refrigerator Removal	0	0		0	0		0	0.0	0.0	0	-	-	0	-	-	-	-	-
Refrigerator Exchange	47	47		44	44		34,089	2.1	2.0	17,330	-	-	725	0.045	0.042	369	-	-
Freezer Removal	0	0		0	0		0	0.0	0.0	0	-	-	0	-	-	-	-	-
Freezer Exchange	10	10		9	9		4,769	0.5	0.4	3,902	-	-	477	0.048	0.045	390	-	-

Total Non-Efficiency Measures	499					**394,857**							**791**					
Misc Ins,Attic Access/Vent	181					32,524							180					
Duct Sealing	20					4,621							231					
Duct Insulation	14					4,778							341					
Damming Material	0					0							0					
Htg. Sys. Tune & Clean	79					9,020							114					
Htg. Sys./WH Other	0					0							0					
Air Conditioning Work	0					0							0					
Water Heater Repair	0					0							0					
Refrigerator Coil Clean	0					0							0					
Waterbed Mattress Pad	0					0							0					
Programmable Tstat	27					2,685							99					
Unspecified Utility Meas.	0					0							0					
CO Detector	0					0							0					
Smoke Detector	0					0							0					
Fuses	0					0							0					
Htg Sys Safety Check	0					0							0					
Htg Sys Ventilation	159					29,172							183					
Water Heater Ventilation	141					21,232							151					
Bathroom Ventilation	0					0							0					
Dryer Ventilation	0					0							0					
Kitchen Ventilation	0					0							0					
Other Exhaust Ventilation	0					0							0					
Asbestos Removal (Minor)	0					0							0					
Health/Safety Repairs	58					4,317							74					
Health/Safety Other	0					0							0					
Consumables	0					0							0					
General Repairs	314					80,936							258					
Meter Refrig (no action)	94					0							0					
Meter Freezer (no action)	38					0							0					
Support	483					205,572							426					
Transportation Allowance	0					0							0					
Landlord Contr Misc	0					0							0					
Landlord Contr Furnace	0					0							0					
Landlord Contr DHW	0					0							0					
Client Contr (Any)	0					0							0					
Lead Safe Work	0					0							0					
Unspecifed/Other	0					0							0					

[1] Estimates are based upon reduced usage of the furnace due to shell improvements

[2] Impacts from continuous exhaust fans required by ASHRAE 62.2. The winter impacts exceed summer because these also include heating season impacts for dwellings with electric heat.

[3] The total number of dwellings may exceed the number of measures installed in cases where the utility partially funds refrigeration measure replacements. The percentage of expenditures for each appliance is totaled to get the total number of measures installed.

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		Billing Adjusted First-Year Savings							Average Billing Adjusted Savings per Dwelling Receiving Measures						
				Season		Electricity					Gas		Electricity					Gas	
						Summer		Winter		Annual	Pk-Day	Annual	Summer		Winter		Annual	Pk-Day	Annual
	Total	Electric	Gas	Cooling	Heating	kW	kWh	kW	kWh	kWh	therms	therms	kW	kWh	kW	kWh	kWh	therms	therms
Total Efficiency Measures	**555**	**487**	**324**	**483**	**487**	**78.5**		**73.3**		**284,920**	**758**	**70,150**	**0.163**		**0.150**		**585**	**2.34**	**217**
Total Shell & Htg. Sys. Repl	555	487	324	478	487	64.8	72,872	51.4	77,814	150,686	746	67,643	0.136	152	0.106	160	309	2.30	209
Total Shell Measures	555	487	324	478	487	64.8	72,872	51.0	77,129	150,001	476	43,096	0.136	152	0.105	158	308	1.47	133
Wall Insul.	286	232	206	232	3	23.6	28,514	2.4	3,479	31,993	157	14,288	0.102	123	0.786	1,160	138	0.76	69
Open Blown Ceiling Insul.	393	332	241	331	25	23.1	27,893	18.2	27,578	55,470	137	12,430	0.070	84	0.730	1,103	167	0.57	52
Cavity Fill Insul.	115	88	81	88	2	3.8	4,540	0.5	712	5,252	50	4,463	0.043	52	0.229	356	60	0.61	55
Sloped Attic Insul.	164	118	115	118	4	4.8	5,772	2.1	3,177	8,949	45	4,087	0.041	49	0.517	794	76	0.39	36
Kneewall Insul.	120	95	81	95	4	1.8	2,217	0.7	1,108	3,325	15	1,366	0.019	23	0.180	277	35	0.19	17
Infil. Reduction	545	462	324	461	34	5.3	6,379	4.4	6,602	12,981	56	5,073	0.011	14	0.131	194	28	0.17	16
Found./Crawl. Insul.	165	67	136	63	12	3.1	3,770	2.5	3,622	7,392	22	1,964	0.050	60	0.204	302	110	0.16	14
Bandjoist Insul.	126	15	111	-	15	0.0	0	2.0	3,037	3,037	8	701	0.000	0	0.136	202	202	0.07	6
Furnace Blower Fan[1]	521	453	324	-	453	0.0	0	27.5	41,988	41,988	(2)	(168)	0.000	0	0.061	93	93	(0.01)	(1)
Exhaust Ventilation[2]	371	320	203	320	320	-0.8	(6,212)	(9.3)	(14,173)	(20,385)	(12)	(1,109)	-0.002	(19)	(0.029)	(44)	(64)	(0.06)	(5)
Total Heating System Repl	204	6	198	-	6	0.0	0	0.5	684	684	270	24,547	0.000	0	0.076	114	114	1.36	124
Condensing Htg Sys Repl	197	0	197	-	-	0.0	0	0.0	0	0	269	24,441	-	-	-	-	-	1.37	124
Non-Cond Htg Sys Repl	1	0	1	-	-	0.0	0	0.0	0	0	1	106	-	-	-	-	-	1.16	106
Electric Htg Sys Repl	4	4	0	-	4	0.0	0	0.3	489	489	0	0	0.000	0	0.082	122	122	-	-
Heat Pump Repl	2	2	0	-	2	0.0	0	0.1	195	195	0	0	0.000	0	0.065	97	97	-	-
Other Htg Sys Repl	0	0	0	-	0	0.0	0	0.0	0	0	0	0	-	-	-	-	-	-	-

				Number of Measures by Fuel Type														
	Total	Electric	Gas	Total	Electric	Gas	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms
Water Heating	357	109	248	0	0	0	0.0	0.1	9,160	12.2	2,507	0.000	0.001	84	0.049	10
Temp. Reduct.	5	0	5	0	0	0	0.0	0.0	0	0.1	37	-	-	-	0.02	7
WH Wrap	17	3	14	0	0	0	0.0	0.0	291	0.3	115	0.000	0.000	97	0.02	8
Pipe Insul.	314	102	212	0	0	0	0.0	0.0	3,496	1.9	646	0.000	0.000	34	0.01	3
LF Showerhead	30	10	20	0	0	0	0.0	0.0	1,465	0.5	162	0.000	0.003	146	0.03	8
Faucet Aerator	12	2	10	0	0	0	0.0	0.0	50	0.1	20	0.000	0.001	25	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.	200	37	163	0	0	0	0.0	0.1	3,859	9.4	1,526	0.000	0.003	104	0.06	9
Lighting	331	331		0	0		9.8	18.0	92,877	-	-	0.029	0.054	281	-	-
Refrigerator/Freezer[3]	74	74		0	0		4.0	3.7	32,197	-	-	0.054	0.050	435	-	-
Refrigerator Removal	0	0		0	0		0.0	0.0	0	-	-	-	-	-	-	-
Refrigerator Exchange	55	55		0	0		2.8	2.6	22,531	-	-	0.050	0.047	410	-	-
Freezer Removal	0	0		0	0		0.0	0.0	0	-	-	-	-	-	-	-
Freezer Exchange	23	23		0	0		1.2	1.1	9,665	-	-	0.052	0.048	420	-	-

Black Hills Energy

Billing Adjusted Costs and Impacts for Utility-Funded Measures Installed During Calendar Year 2019

Total Reported Labor, Materials and Utility Admin Expenditures: $322,208

Utility Administration Expenditures: $9,101

Total Labor and Material Expenditures: $313,107

Measure	Number of Dwellings with Impacts: Total	Electric	Gas	Number of Dwellings with Electricity Impacts: Season: Cooling	Heating	Spending on Materials & Labor ($)	Billing Adjusted First-Year Savings: Electricity: Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas: Pk-Day therms	Annual therms	Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures: Spending on Materials & Labor ($)	Electricity: Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas: Pk-Day therms	Annual therms
Total Efficiency Measures	**68**	**0**	**68**	**0**	**0**	**266,101**	**0.0**		**0.0**		**0**	**119**	**11,157**	**3,913**	**-**		**-**		**-**	**1.75**	**164**
Total Shell & Htg. Sys. Repl	66	0	66	0	0	230,217	0.0	0	0.0	0	0	118	10,785	3,488	-	-	-	-	-	1.78	163
Total Shell Measures	66	0	66	0	0	132,466	0.0	0	0.0	0	0	76	6,995	2,007	-	-	-	-	-	1.15	106
Wall Insul.	32	0	32	0	0	43,599	0.0	0	0.0	0	0	22	2,025	1,362	-	-	-	-	-	0.69	63
Open Blown Ceiling Insul.	50	0	50	0	0	34,710	0.0	0	0.0	0	0	24	2,237	694	-	-	-	-	-	0.49	45
Cavity Fill Insul.	15	0	15	0	0	13,488	0.0	0	0.0	0	0	9	871	899	-	-	-	-	-	0.62	58
Sloped Attic Insul.	19	0	19	0	0	8,526	0.0	0	0.0	0	0	9	842	449	-	-	-	-	-	0.48	44
Kneewall Insul.	8	0	8	0	0	2,931	0.0	0	0.0	0	0	1	119	366	-	-	-	-	-	0.16	15
Infil. Reduction	37	0	37	0	0	12,898	0.0	0	0.0	0	0	4	375	349	-	-	-	-	-	0.11	10
Found./Crawl. Insul.	19	0	19	0	0	13,744	0.0	0	0.0	0	0	5	495	723	-	-	-	-	-	0.28	26
Bandjoist Insul.	14	0	14	-	0	2,570	0.0	0	0.0	0	0	0	46	184	-	-	-	-	-	0.03	3
Furnace Blower Fan[1]	66	0	66	-	0	0	0.0	0	0.0	0	0	(0)	(15)	0	-	-	-	-	-	(0.00)	(0)
Exhaust Ventilation[2]	0	0	0	0	0	0	0.0	0	0.0	0	0	0	0	0	-	-	-	-	-	-	-
Total Heating System Repl	36	0	36	-	0	97,751	0.0	0	0.0	0	0	42	3,790	2,715	-	-	-	-	-	1.16	105
Condensing Htg Sys Repl	36	0	36	-	-	97,751	0.0	0	0.0	0	0	42	3,790	2,715	-	-	-	-	-	1.16	105
Non-Cond Htg Sys Repl	0	0	0	-	-	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	0	0	0	-	-	-	-	-	-	-
Heat Pump Repl	0	0	0	-	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	0	0	0	-	-	-	-	-	-	-
	Number of Measures: Total	Electric	Gas	Number of Measures by Fuel Type: Total	Electric	Gas		Summer kW	Winter kW		Annual kWh	Pk-Day therms	Annual therms		Summer kW		Winter kW		Annual kWh	Pk-Day therms	Annual therms
Water Heating	49	0	49	86	0	86	35,885	0.0	0.0		0	1.6	372	732	-		-		-	0.033	8
Temp. Reduct.	3	0	3	3	0	3	0	0.0	0.0		0	0.1	22	0	-		-		-	0.02	7
WH Wrap	0	0	0	0	0	0	0	0.0	0.0		0	0.0	0	0	-		-		-	-	-
Pipe Insul.	45	0	45	45	0	45	706	0.0	0.0		0	0.4	138	16	-		-		-	0.01	3
LF Showerhead	4	0	4	7	0	7	41	0.0	0.0		0	0.1	29	10	-		-		-	0.02	7
Faucet Aerator	9	0	9	11	0	11	55	0.0	0.0		0	0.1	16	6	-		-		-	0.01	2
Std-Eff Wtr Htr Repl.	0	0	0	0	0	0	0	0.0	0.0		0	0.0	0	0	-		-		-	-	-
Hi-Eff or Electric Wtr Htr Repl.	24	0	24	20	0	20	35,082	0.0	0.0		0	1.0	167	1,462	-		-		-	0.04	7
Lighting	0	0		0	0		0	0.0	0.0		0	-	-	0	-		-		-	-	-
Refrigerator/Freezer[3]	0	0		0	0		0	0.0	0.0		0	-	-	0	-		-		-	-	-
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	-		-		-	-	-
Total Non-Efficiency Measures	67					**47,006**								**702**							
Misc Ins,Attic Access/Vent	20					2,122								106							
Duct Sealing	1					350								350							
Duct Insulation	3					264								88							
Damming Material	0					0								0							
Htg. Sys. Tune & Clean	10					1,114								111							
Htg. Sys./WH Other	0					0								0							
Air Conditioning Work	0					0								0							
Water Heater Repair	0					0								0							
Refrigerator Coil Clean	0					0								0							
Waterbed Mattress Pad	0					0								0							
Programmable Tstat	0					0								0							
Unspecified Utility Meas.	0					0								0							
CO Detector	0					0								0							
Smoke Detector	0					0								0							
Fuses	0					0								0							
Htg Sys Safety Check	0					0								0							
Htg Sys Ventilation	28					5,526								197							
Water Heater Ventilation	24					4,165								174							
Bathroom Ventilation	0					0								0							
Dryer Ventilation	0					0								0							
Kitchen Ventilation	0					0								0							
Other Exhaust Ventilation	0					0								0							
Asbestos Removal (Minor)	0					0								0							
Health/Safety Repairs	8					393								49							
Health/Safety Other	0					0								0							
Consumables	0					0								0							
General Repairs	30					6,415								214							
Meter Refrig (no action)	0					0								0							
Meter Freezer (no action)	0					0								0							
Support	61					26,656								437							
Transportation Allowance	0					0								0							
Landlord Contr Misc	0					0								0							
Landlord Contr Furnace	0					0								0							
Landlord Contr DHW	0					0								0							
Client Contr (Any)	0					0								0							
Lead Safe Work	0					0								0							
Unspecifed/Other	0					0								0							

[1] Estimates are based upon reduced usage of the furnace due to shell improvements

[2] Impacts from continuous exhaust fans required by ASHRAE 62.2. The winter impacts exceed summer because these also include heating season impacts for dwellings with electric heat.

[3] The total number of dwellings may exceed the number of measures installed in cases where the utility partially funds refrigeration measure replacements. The percentage of expenditures for each appliance is totaled to get the total number of measures installed.

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		Billing Adjusted First-Year Savings							Average Billing Adjusted Savings per Dwelling Receiving Measures						
				Season		Electricity					Gas		Electricity					Gas	
						Summer		Winter		Annual	Pk-Day	Annual	Summer		Winter		Annual	Pk-Day	Annual
	Total	Electric	Gas	Cooling	Heating	kW	kWh	kW	kWh	kWh	therms	therms	kW	kWh	kW	kWh	kWh	therms	therms
Total Efficiency Measures	**120**	**0**	**120**	**0**	**0**	**0.0**		**0.0**		**0**	**268**	**25,312**	**-**		**-**		**-**	**2.24**	**211**
Total Shell & Htg. Sys. Repl	120	0	120	0	0	0.0	0	0.0	0	0	264	24,409	-	-	-	-	-	2.20	203
Total Shell Measures	120	0	120	0	0	0.0	0	0.0	0	0	163	15,098	-	-	-	-	-	1.36	126
Wall Insul.	67	0	67	0	0	0.0	0	0.0	0	0	48	4,457	-	-	-	-	-	0.72	67
Open Blown Ceiling Insul.	104	0	104	0	0	0.0	0	0.0	0	0	47	4,371	-	-	-	-	-	0.45	42
Cavity Fill Insul.	32	0	32	0	0	0.0	0	0.0	0	0	16	1,462	-	-	-	-	-	0.49	46
Sloped Attic Insul.	44	0	44	0	0	0.0	0	0.0	0	0	19	1,776	-	-	-	-	-	0.43	40
Kneewall Insul.	28	0	28	0	0	0.0	0	0.0	0	0	4	404	-	-	-	-	-	0.16	14
Infil. Reduction	120	0	120	0	0	0.0	0	0.0	0	0	23	2,147	-	-	-	-	-	0.19	18
Found./Crawl. Insul.	35	0	35	0	0	0.0	0	0.0	0	0	9	822	-	-	-	-	-	0.25	23
Bandjoist Insul.	36	0	36	-	0	0.0	0	0.0	0	0	2	199	-	-	-	-	-	0.06	6
Furnace Blower Fan[1]	120	0	120	-	0	0.0	0	0.0	0	0	(1)	(62)	-	-	-	-	-	(0.01)	(1)
Exhaust Ventilation[2]	87	0	87	0	0	0.0	0	0.0	0	0	(5)	(478)	-	-	-	-	-	(0.06)	(5)
Total Heating System Repl	73	0	73	-	0	0.0	0	0.0	0	0	101	9,311	-	-	-	-	-	1.39	128
Condensing Htg Sys Repl	72	0	72	-	-	0.0	0	0.0	0	0	99	9,134	-	-	-	-	-	1.38	127
Non-Cond Htg Sys Repl	1	0	1	-	-	0.0	0	0.0	0	0	2	177	-	-	-	-	-	1.90	177
Electric Htg Sys Repl	0	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	0	-	-	-	-	-	-	-
Other Htg Sys Repl	0	0	0	-	0	0.0	0	0.0	0	0	0	0	-	-	-	-	-	-	-

				Number of Measures by Fuel Type													
	Total	Electric	Gas	Total	Electric	Gas	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms
Water Heating	97	0	97	0	0	0	0.0	0.0	0	4.3	903	-	-	-	0.044	9
Temp. Reduct.	5	0	5	0	0	0	0.0	0.0	0	0.1	37	-	-	-	0.02	7
WH Wrap	1	0	1	0	0	0	0.0	0.0	0	0.0	8	-	-	-	0.02	8
Pipe Insul.	92	0	92	0	0	0	0.0	0.0	0	0.8	282	-	-	-	0.01	3
LF Showerhead	6	0	6	0	0	0	0.0	0.0	0	0.1	44	-	-	-	0.02	7
Faucet Aerator	10	0	10	0	0	0	0.0	0.0	0	0.1	17	-	-	-	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.	59	0	59	0	0	0	0.0	0.0	0	3.2	515	-	-	-	0.05	9
Lighting	0	0		0	0		0.0	0.0	0	-	-	-	-	-	-	-
Refrigerator/Freezer[3]	0	0		0	0		0.0	0.0	0	-	-	-	-	-	-	-
Refrigerator Removal	0	0		0	0		0.0	0.0	0	-	-	-	-	-	-	-
Refrigerator Exchange	0	0		0	0		0.0	0.0	0	-	-	-	-	-	-	-
Freezer Removal	0	0		0	0		0.0	0.0	0	-	-	-	-	-	-	-
Freezer Exchange	0	0		0	0		0.0	0.0	0	-	-	-	-	-	-	-

MidAmerican Energy

Billing Adjusted Costs and Impacts for Utility-Funded Measures Installed During Calendar Year 2019

Total Reported Labor, Materials and Utility Admin Expenditures: $1,641,249

Utility Administration Expenditures: $40,813

Total Labor and Material Expenditures: $1,600,436

Measure	Number of Dwellings with Impacts: Total	Electric	Gas	Number of Dwellings with Electricity Impacts: Season: Cooling	Heating	Spending on Materials & Labor ($)	Billing Adjusted First-Year Savings: Electricity: Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas: Pk-Day therms	Annual therms	Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures: Spending on Materials & Labor ($)	Electricity: Summer kW	Summer kWh	Winter kW	Winter kWh	Annual kWh	Gas: Pk-Day therms	Annual therms
Total Efficiency Measures	**303**	**233**	**261**	**224**	**233**	**1,324,435**	**39.4**		**36.2**		**146,050**	**553**	**51,680**	**4,371**	**0.176**		**0.155**		**627**	**2.12**	**198**
Total Shell & Htg. Sys. Repl	296	227	257	206	227	1,070,888	31.9	38,419	23.9	36,613	75,032	544	49,802	3,618	0.155	187	0.105	161	331	2.12	194
Total Shell Measures	296	227	257	206	227	704,495	31.9	38,419	23.8	36,524	74,944	370	33,814	2,380	0.155	187	0.105	161	330	1.44	132
Wall Insul.	158	127	136	127	4	240,646	12.6	15,237	2.4	3,738	18,975	98	9,029	1,523	0.099	120	0.611	934	149	0.72	66
Open Blown Ceiling Insul.	222	175	190	175	7	187,401	12.9	15,532	7.2	11,108	26,640	115	10,518	844	0.074	89	1.034	1,587	152	0.60	55
Cavity Fill Insul.	89	60	85	60	2	63,070	2.1	2,523	1.2	1,910	4,433	41	3,702	709	0.035	42	0.625	955	74	0.48	44
Sloped Attic Insul.	68	54	57	54	2	30,297	1.9	2,264	0.7	1,002	3,265	22	2,015	446	0.035	42	0.328	501	60	0.39	35
Kneewall Insul.	66	49	64	49	1	20,977	0.9	1,125	0.1	112	1,237	57	5,071	318	0.019	23	0.072	112	25	0.90	79
Infil. Reduction	179	124	159	124	7	68,124	0.9	1,070	0.8	1,217	2,287	15	1,357	381	0.007	9	0.114	174	18	0.09	9
Found./Crawl. Insul.	80	14	75	12	3	59,447	0.6	669	0.7	1,130	1,799	17	1,549	743	0.046	56	0.246	377	128	0.22	21
Bandjoist Insul.	99	5	94	-	5	34,533	0.0	0	0.7	1,015	1,015	7	668	349	0.000	0	0.135	203	203	0.08	7
Furnace Blower Fan[1]	287	218	257	-	218	0	0.0	0	9.9	15,293	15,293	(1)	(94)	0	0.000	0	0.046	70	70	(0.00)	(0)
Exhaust Ventilation[2]	0	0	0	0	0	0	0.0	0	0.0	0	0	0	0	0	-	-	-	-	-	-	-
Total Heating System Repl	152	2	150	-	2	366,393	0.0	0	0.1	88	88	173	15,988	2,410	0.000	0	0.029	44	44	1.16	107
Condensing Htg Sys Repl	150	0	150	-	-	362,632	0.0	0	0.0	0	0	173	15,988	2,418	-	-	-	-	-	1.16	107
Non-Cond Htg Sys Repl	0	0	0	-	-	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	0	0	0	-	-	-	-	-	-	-
Heat Pump Repl	2	2	0	-	2	3,761	0.0	0	0.1	88	88	0	0	1,881	0.000	0	0.029	44	44	-	-
Other Htg Sys Repl	0	0	0	-	0	0	0.0	0	0.0	0	0	0	0	0	-	-	-	-	-	-	-

Measure	Number of Measures by Fuel Type: Total	Electric	Gas	Spending on Materials & Labor ($)	Billing Adjusted First-Year Savings: Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures: Spending on Materials & Labor ($)	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms
Water Heating	239	26	213	217,375	0.0	0.0	1,882	8.9	1,878	910	0.000	0.001	72	0.042	9
Temp. Reduct.	2	0	2	0	0.0	0.0	0	0.0	15	0	-	-	-	0.02	7
WH Wrap	1	0	1	100	0.0	0.0	0	0.0	8	100	-	-	-	0.02	8
Pipe Insul.	218	24	194	3,875	0.0	0.0	823	1.7	594	18	0.000	0.000	34	0.01	3
LF Showerhead	20	2	18	210	0.0	0.0	268	0.4	135	11	0.000	0.003	134	0.02	7
Faucet Aerator	42	4	38	325	0.0	0.0	126	0.3	86	8	0.000	0.001	31	0.01	2
Std-Eff Wtr Htr Repl.	0	0	0	0	0.0	0.0	0	0.0	0	0	-	-	-	-	-
Hi-Eff or Electric Wtr Htr Repl.	148	11	137	212,865	0.0	0.0	665	6.4	1,039	1,438	0.000	0.001	60	0.05	8
Lighting	168	168		11,576	5.8	10.8	55,454	-	-	69	0.035	0.064	330	-	-
Refrigerator/Freezer[3]	35	35		24,596	1.7	1.6	13,682	-	-	703	0.048	0.045	391	-	-
Refrigerator Removal	0	0		0	0.0	0.0	0	-	-	0	-	-	-	-	-
Refrigerator Exchange	31	31		22,047	1.4	1.3	11,427	-	-	711	0.045	0.042	369	-	-
Freezer Removal	0	0		0	0.0	0.0	0	-	-	0	-	-	-	-	-
Freezer Exchange	5	5		2,550	0.3	0.3	2,255	-	-	510	0.055	0.052	451	-	-

Measure	Total	Spending on Materials & Labor ($)	Average Billing Adjusted First Year Costs and Savings per Dwelling Receiving Measures: Spending on Materials & Labor ($)
Total Non-Efficiency Measures	305	**276,001**	**905**
Misc Ins,Attic Access/Vent	92	13,956	152
Duct Sealing	14	3,354	240
Duct Insulation	6	3,042	507
Damming Material	0	0	0
Htg. Sys. Tune & Clean	74	7,558	102
Htg. Sys./WH Other	0	0	0
Air Conditioning Work	0	0	0
Water Heater Repair	0	0	0
Refrigerator Coil Clean	0	0	0
Waterbed Mattress Pad	0	0	0
Programmable Tstat	12	1,200	100
Unspecified Utility Meas.	0	0	0
CO Detector	1	80	80
Smoke Detector	0	0	0
Fuses	0	0	0
Htg Sys Safety Check	0	0	0
Htg Sys Ventilation	131	23,254	178
Water Heater Ventilation	128	20,959	164
Bathroom Ventilation	0	0	0
Dryer Ventilation	0	0	0
Kitchen Ventilation	0	0	0
Other Exhaust Ventilation	0	0	0
Asbestos Removal (Minor)	0	0	0
Health/Safety Repairs	34	2,326	68
Health/Safety Other	0	0	0
Consumables	0	0	0
General Repairs	158	39,195	248
Meter Refrig (no action)	65	0	0
Meter Freezer (no action)	14	0	0
Support	270	160,938	596
Transportation Allowance	0	0	0
Landlord Contr Misc	0	0	0
Landlord Contr Furnace	0	0	0
Landlord Contr DHW	0	0	0
Client Contr (Any)	0	0	0
Lead Safe Work	1	140	140
Unspecifed/Other	0	0	0

[1] Estimates are based upon reduced usage of the furnace due to shell improvements

[2] Impacts from continuous exhaust fans required by ASHRAE 62.2. The winter impacts exceed summer because these also include heating season impacts for dwellings with electric heat.

[3] The total number of dwellings may exceed the number of measures installed in cases where the utility partially funds refrigeration measure replacements. The percentage of expenditures for each appliance is totaled to get the total number of measures installed.

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		Billing Adjusted First-Year Savings							Average Billing Adjusted Savings per Dwelling Receiving Measures						
				Season		Electricity					Gas		Electricity					Gas	
						Summer		Winter		Annual	Pk-Day	Annual	Summer		Winter		Annual	Pk-Day	Annual
	Total	Electric	Gas	Cooling	Heating	kW	kWh	kW	kWh	kWh	therms	therms	kW	kWh	kW	kWh	kWh	therms	therms
Total Efficiency Measures	**539**	**427**	**468**	**427**	**426**	**82.4**		**73.0**		**292,566**	**1,165**	**109,171**	**0.193**		**0.171**		**685**	**2.49**	**233**
Total Shell & Htg. Sys. Repl	539	427	468	426	426	67.4	76,064	48.6	74,320	150,384	1,143	104,669	0.158	179	0.114	174	352	2.44	224
Total Shell Measures	539	427	468	426	426	67.4	76,064	47.9	73,321	149,385	756	69,109	0.158	179	0.112	172	350	1.62	148
Wall Insul.	302	243	263	242	6	25.4	30,665	3.9	5,860	36,525	203	18,617	0.105	127	0.644	977	150	0.77	71
Open Blown Ceiling Insul.	420	341	366	341	12	24.7	29,741	12.1	18,654	48,395	225	20,605	0.072	87	1.011	1,555	142	0.62	56
Cavity Fill Insul.	190	142	177	141	4	4.7	5,633	2.6	3,896	9,529	84	7,707	0.033	40	0.656	974	67	0.48	44
Sloped Attic Insul.	136	112	116	111	4	4.4	5,307	1.2	1,869	7,176	52	4,739	0.040	48	0.309	467	64	0.45	41
Kneewall Insul.	135	105	128	105	1	1.9	2,342	0.1	112	2,453	70	6,228	0.018	22	0.072	112	23	0.55	49
Infil. Reduction	535	409	468	408	14	5.1	6,190	1.6	2,482	8,672	95	8,708	0.013	15	0.117	177	21	0.20	19
Found./Crawl. Insul.	185	44	171	42	6	2.0	2,381	1.6	2,380	4,762	42	3,805	0.047	57	0.260	397	108	0.24	22
Bandjoist Insul.	176	8	168	-	8	0.0	0	0.8	1,268	1,268	12	1,106	0.000	0	0.105	158	158	0.07	7
Furnace Blower Fan[1]	524	412	468	-	412	0.0	0	30.3	46,485	46,485	(3)	(283)	0.000	0	0.074	113	113	(0.01)	(1)
Exhaust Ventilation[2]	427	341	366	341	341	-0.8	(6,194)	(6.3)	(9,686)	(15,880)	(23)	(2,122)	-0.002	(18)	(0.019)	(28)	(47)	(0.06)	(6)
Total Heating System Repl	304	4	299	-	4	0.0	0	0.7	999	999	387	35,560	0.000	0	0.169	250	250	1.29	119
Condensing Htg Sys Repl	283	0	282	-	-	0.0	0	0.0	0	0	367	33,729	-	-	-	-	-	1.30	120
Non-Cond Htg Sys Repl	17	0	17	-	-	0.0	0	0.0	0	0	20	1,831	-	-	-	-	-	1.18	108
Electric Htg Sys Repl	2	2	0	-	2	0.0	0	0.3	390	390	0	0	0.000	0	0.133	195	195	-	-
Heat Pump Repl	3	3	0	-	3	0.0	0	0.4	609	609	0	0	0.000	0	0.137	203	203	-	-
Other Htg Sys Repl	0	0	0	-	0	0.0	0	0.0	0	0	0	0	-	-	-	-	-	-	-

				Number of Measures by Fuel Type														
	Total	Electric	Gas	Total	Electric	Gas	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms	Summer kW	Winter kW	Annual kWh	Pk-Day therms	Annual therms
Water Heating	465	55	410	0	0	0	0.0	0.1	4,950	21.5	4,502	0.000	0.001	90	0.053	11
Temp. Reduct.	3	1	2	0	0	0	0.0	0.0	88	0.0	15	0.000	0.000	88	0.02	7
WH Wrap	7	0	7	0	0	0	0.0	0.0	0	0.2	62	-	-	-	0.03	9
Pipe Insul.	442	54	388	0	0	0	0.0	0.0	1,849	3.5	1,226	0.000	0.000	34	0.01	3
LF Showerhead	52	4	48	0	0	0	0.0	0.0	535	1.3	395	0.000	0.003	134	0.03	8
Faucet Aerator	101	13	88	0	0	0	0.0	0.0	517	0.8	233	0.000	0.001	40	0.01	3
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.	290	19	271	0	0	0	0.0	0.0	1,960	15.8	2,570	0.000	0.003	103	0.06	9
Lighting	327	327		0	0		11.4	21.1	108,662	-	-	0.035	0.064	332	-	-
Refrigerator/Freezer[3]	64	64		0	0		3.5	3.3	28,570	-	-	0.055	0.051	446	-	-
Refrigerator Removal	1	1		0	0		0.0	0.0	391	-	-	0.048	0.045	391	-	-
Refrigerator Exchange	53	53		0	0		2.6	2.5	21,431	-	-	0.050	0.047	404	-	-
Freezer Removal	0	0		0	0		0.0	0.0	0	-	-	-	-	-	-	-
Freezer Exchange	15	15		0	0		0.8	0.8	6,748	-	-	0.055	0.052	450	-	-

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APPENDIX A -- CLIENT CHARACTERISTICS

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Household characteristics										
Quarterly gross income	$4,130	$4,344	$4,355	$4,286	$4,406	$4,600	$6,691	$9,414	$9,871	$9,161
Average members	2.9	2.9	2.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Percentage of households with:										
Elderly	24.0	29.1	29.4	30.8	28.9	31.3	34.4	35.5	38.2	37.7
Handicapped	25.4	32.9	30.1	32.6	31.3	30.6	34.1	33.4	35.1	33.0
Young children	18.6	25.2	21.9	20.1	22.4	19.4	17.4	20.7	17.6	18.9
Housing type (%)										
Single family home	82.6	89.6	87.3	84.8	87.4	88.4	88.1	89.1	87.9	88.0
Mobile home	7.6	10.0	10.2	11.9	10.6	8.6	7.9	7.2	7.5	8.6
Duplex	0.3	0.1	0.7	3.2	1.9	2.8	3.9	3.6	3.5	3.4
Three+ unit apartment	6.8	0.3	1.8	0.1	0.1	0.2	0.1	0.2	1.0	0.0
Rent a room	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown/other	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heating system type (%)										
Natural gas	82.7	81.0	80.8	80.3	84.2	86.7	85.4	84.1	86.9	85.6
Propane	11.9	12.9	13.3	12.3	9.2	8.1	8.6	8.3	6.3	8.4
Fuel oil	0.8	0.8	0.8	0.9	0.2	0.1	0.5	1.1	0.3	0.2
Electricity	4.5	5.4	5.1	6.4	6.4	5.2	5.5	6.4	6.6	5.9
Other	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0
Air conditioning type (%)										
Central	54.1	58.7	57.3	60.2	63.6	62.0	62.6	64.9	67.9	67.1
Room	31.4	27.8	30.4	29.4	26.3	29.5	28.0	27.3	26.2	28.1
None or Missing Data	14.5	13.6	12.3	10.4	10.1	8.5	9.4	7.8	5.9	4.8
Blower door readings (average cfm50)										
Pre	3,281	3,294	3,454	3,281	3,437	3,429	3,420	3,447	3,601	3,535
Post	2,040	2,054	2,139	2,053	2,100	2,148	2,565	2,160	2,283	2,218

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APPENDIX B –FIGURE DATA

Figure 1.1 First Year Energy Savings (therms) – Program

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Heating System Work	286,866	286,414	192,441	102,711	116,295	113,515	107,412	89,404	84,822	70,868
Infiltration Reduction	54,194	59,030	35,991	24,403	24,864	22,482	20,948	16,743	16,078	16,432
Insulation	480,401	494,564	333,793	197,200	197,846	184,203	148,756	123,312	116,900	118,016
Light/Water Heat/Other Utilit	17,070	16,057	9,698	7,726	6,002	6,062	4,403	3,874	3,586	3,336
Water Heater Replacement	44,509	54,904	32,819	25,296	28,290	33,942	29,679	23,656	5,486	4,730
Whole House Ventilation						-2,392	-4,936	-4,269	-3,681	-3,746

Figure 1.2 First Year Energy Savings (kWh) – Program

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Heating System Work	6,770	8,324	4,975	3,937	186,516	201,190	185,546	159,209	141,656	102,592
Infiltration Reduction	146,544	150,295	59,937	39,935	46,035	32,037	41,401	42,306	32,996	27,914
Insulation	1,779,971	1,811,722	759,702	466,832	466,307	358,537	446,239	470,351	393,957	296,097
Light/Water Heat/Other Utilit	2,589,000	2,734,566	947,748	596,538	567,195	572,018	371,009	369,048	372,411	328,967
Water Heater Replacement	15,535	19,171	7,824	12,343	14,023	15,089	17,269	15,857	12,699	8,466
Whole House Ventilation						-24,538	-59,517	-70,405	-55,641	-44,172

Figure 1.3 Overall Program Expenditures

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Heating System Work	6,943,168	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
Infiltration Reduction	2,142,574	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
Insulation	10,920,427	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
Light/Water Heat/Other Utilit	1,198,884	1,233,806	720,138	424,488	356,538	327,532	328,738	241,252	181,688	201,940
Other	3,151,309	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
Repair	2,348,113	2,405,336	1,491,583	1,039,839	971,976	785,187	930,041	828,300	841,939	656,413
Support	9,459,046	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
Water Heater Replacement	1,673,951	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
Whole House Ventilation		687,151	648,556	367,224	488,871	368,924	1,018,951	898,996	802,972	795,679

Figure 1.4 Average Program Expenditures per Housing Unit

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Heating System Work	1,640	1,800	1,750	1,690	2,080	2,230	2,302	2,189	2,281	2,223
Infiltration Reduction	480	520	500	540	620	660	803	833	908	1,000
Insulation	2,420	2,780	2,550	2,330	2,710	2,830	2,843	2,742	2,849	2,880
Light/Water Heat/Other Ut	270	270	240	230	210	220	223	192	157	185
Other	600	690	670	950	1,020	1,420	1,346	1,242	1,347	1,312
Repair	520	530	500	560	580	520	631	660	728	601
Support	2,100	1,970	1,960	2,520	2,920	3,140	3,600	3,642	3,745	3,622
Water Heater Repl	370	540	510	560	790	1,030	1,072	1,027	1,052	1,001
Whole House Ventilation		150	220	200	290	240	692	716	694	729
	8,392	9,258	8,901	9,577	11,227	12,295	13,512	13,255	13,762	13,553

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

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Whole House Ventilation						-5,593	-12,094	-13,169	-10,721	-9,291
Heating System Work	347,960	371,197	227,712	121,871	129,924	123,290	114,855	107,911	89,550	67,844
Infiltration Reduction	79,880	84,236	43,906	29,920	28,584	23,482	23,425	21,220	17,763	16,180
Insulation	731,293	759,964	424,194	256,624	234,798	199,673	183,128	174,531	149,405	127,081
Light/Water Heat/Other Ut	264,515	280,880	103,539	66,702	63,990	67,400	45,384	46,038	46,041	41,775
Water Heater Replacement	49,095	63,944	37,826	29,556	31,404	35,593	31,142	27,027	7,249	5,625

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

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Heating System Work	77,401	111,218	67,910	60,813	70,795	67,323	69,667	58,964	56,587	39,540
Infiltration Reduction	4,425	10,340	5,358	5,129	5,467	4,923	4,784	5,275	5,361	3,766
Insulation	123,140	207,156	131,917	131,486	132,525	119,370	102,315	93,879	82,856	73,820
Light/Water Heat/Other Utilit	4,134	6,809	4,029	4,604	3,911	3,852	2,809	2,838	2,480	1,794
Water Heater Replacement	10,499	25,346	13,943	15,335	15,826	18,230	17,885	16,361	3,501	2,272

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

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Heating System Work	536	3,286	417	224	64,339	66,083	71,506	66,476	56,869	32,598
Infiltration Reduction	11,035	18,659	7,535	6,267	9,268	8,069	8,430	12,372	9,802	8,018
Insulation	497,304	613,470	264,752	237,590	282,915	212,946	283,722	321,895	242,091	153,290
Light/Water Heat/Other Utilit	704,991	922,461	347,294	336,976	344,858	350,640	218,339	251,166	247,622	174,167
Water Heater Replacement	8,485	11,516	4,774	3,587	5,753	6,780	9,119	9,580	7,629	2,532

Figure 1.10 Utility Expenditures

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Heating System Work	1,207,970	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
Infiltration Reduction	142,164	288,225	173,869	172,746	198,737	204,838	212,265	273,962	271,847	230,486
Insulation	2,285,914	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
Light/Water Heat/Other Utilit	296,528	375,480	249,184	227,782	200,560	188,571	180,770	160,696	106,432	97,986
Other	60,862	128,109	72,842	62,892	107,646	124,082	147,766	176,289	182,118	127,974
Repair	104,189	157,260	96,832	104,157	129,832	121,538	123,880	168,145	177,192	126,545
Support	458,520	706,131	420,502	466,296	564,572	523,448	602,760	585,371	548,279	393,167
Water Heater Replacement	272,140	702,797	414,525	481,837	597,828	762,163	849,809	815,113	685,224	469,445