Nebraska Energy Office

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P3 PARTNERS IN POLLUTION PREVENTION

ENERGY OFFICE

STATE OF NEBRASKA

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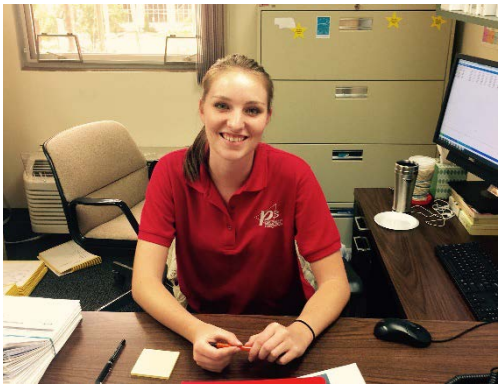

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Company Background

The Nebraska Energy Office is a government agency that was established in 1973 as a response to the crisis of energy needs in the state. The state agency offers programs and services which include the Weatherization Assistance Program, Dollar and Energy Savings Loans, and education concerning energy usage. The purpose behind the programs and services provided by the Nebraska Energy Office is to promote the efficient, economic and environmentally responsible use of energy.

Project Description

The primary focus of this project was to evaluate the Nebraska Energy Office's Weatherization Assistance Program in order to determine the programs impacts. Also included in this project was an assessment of NEO's Dollar and Energy Saving Loans program as well as determining the use of NebGuides, which are informational articles with topics regarding energy efficiency.

Impacts

The quantifiable energy impacts, economic impacts, and environmental impacts of this project are summarized in the table on the following page. Another less quantifiable benefit resulting from the completion of this project is the increased education and awareness provided. Public education was addressed through the increased awareness of NebGuides and the programs provided by the Nebraska Energy Office. NEO also gained important knowledge regarding their Weatherization Assistance Program and Dollar and Energy Saving Loans.

Table 1

Summary of Impacts		
	Total	Per Home
Energy Impacts		
Natural Gas Energy Savings (therms/year)	5,797	73
Electric Energy Savings (kWhs/year)	94,286	1,194
Economic Impacts		
Natural Gas Cost Savings ($/year)	$5,317.30	$66.04
Electric Cost Savings ($/year)	$8,297.17	$105.03
Total Cost Savings ($/year)	$13,614.47	$171.07
Environmental Impacts		
Natural Gas Emission Reductions (MTCO2e/yr)	30.8	0.39
Electric Emission Reductions (MTCO2e/yr)	102.4	1.30
Total Emission Reductions (MTCO2e/yr)	133.2	1.69

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Weatherization Assistance Program

Summer 2015

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EXECUTIVE SUMMARY

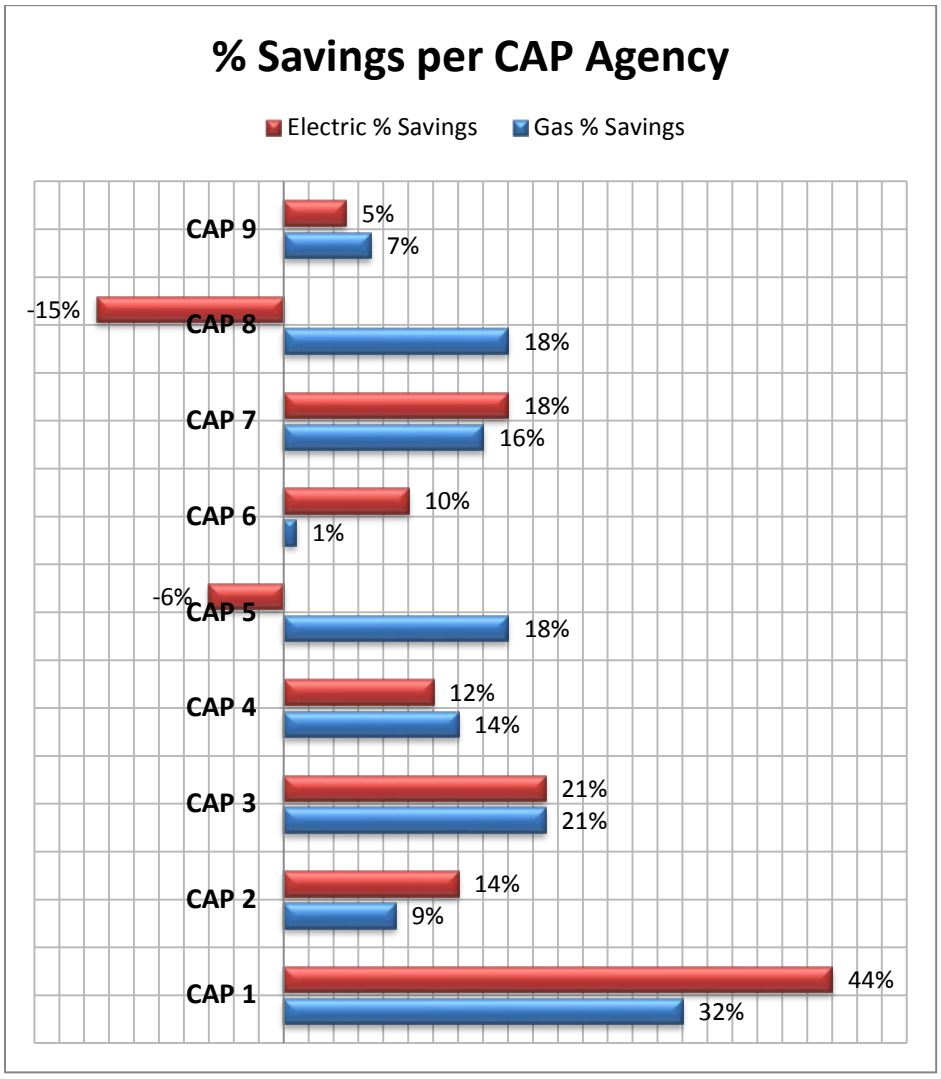
The Nebraska Energy Office has a Weatherization Assistance Program which provides weatherization services to low-income households. The purpose of this program is to reduce energy consumption in homes as well as energy burdens for the household occupants. This study aimed to assess the Weatherization Assistance Program by determining the actual energy savings seen in each home that participated in this study. The original sampling was made up of 100 randomly selected homes, 79 of which were actually used in the study. Audits that provide energy savings estimates were done on each home prior to any weatherization work taking place. It was the goal of this study to determine if the program was performing as it was projected to. Table 2 provides a summary of the impacts of the Weatherization Assistance Program.

Table 2

Summary of Impacts of the Weatherization Assistance Program		
	Total	Per Home
Energy Impacts		
Natural Gas Energy Savings (therms/year)	5,797	73
Electric Energy Savings (kWhs/year)	94,286	1,194
Economic Impacts		
Natural Gas Cost Savings ($/year)	$5,317.30	$66.04
Electric Cost Savings ($/year)	$8,297.17	$105.03
Total Cost Savings ($/year)	$13,614.47	$171.07
Environmental Impacts		
Natural Gas Emission Reductions (MTCO2e/yr)	30.8	0.39
Electric Emission Reductions (MTCO2e/yr)	102.4	1.30
Total Emission Reductions (MTCO2e/yr)	133.2	1.69

Another aspect of this project included assessing the Community Action Partnerships (CAP) that are in charge of providing the weatherization services to the homes. There are nine CAP agencies throughout the state of Nebraska, with each agency responsible for the homes in a particular region of the state. The goal of this study was to determine if some agencies were performing better than others. Figure 1 shows the percent savings of each Community Action Partnership.

Figure 1



PROJECT DESCRIPTION

The Nebraska Energy Office has a Low Income Weatherization Assistance Program (WAP) which is a federally-funded program that enables low-income families in Nebraska to reduce their energy bills by making their homes more energy efficient. The Nebraska Energy Office has administered this program for over 35 years with its first home assistance occurring in 1979. Total household income is the determining factor for who qualifies for this assistance program. If the household income falls below 200% of the federal poverty level, the home will receive free weatherization services. These services vary for each home and are decided upon after a professional evaluation. Some typical improvements include but are not limited to: adding insulation, replacing windows, replacing old or broken-down heating equipment, and installing weather-stripping to doors.

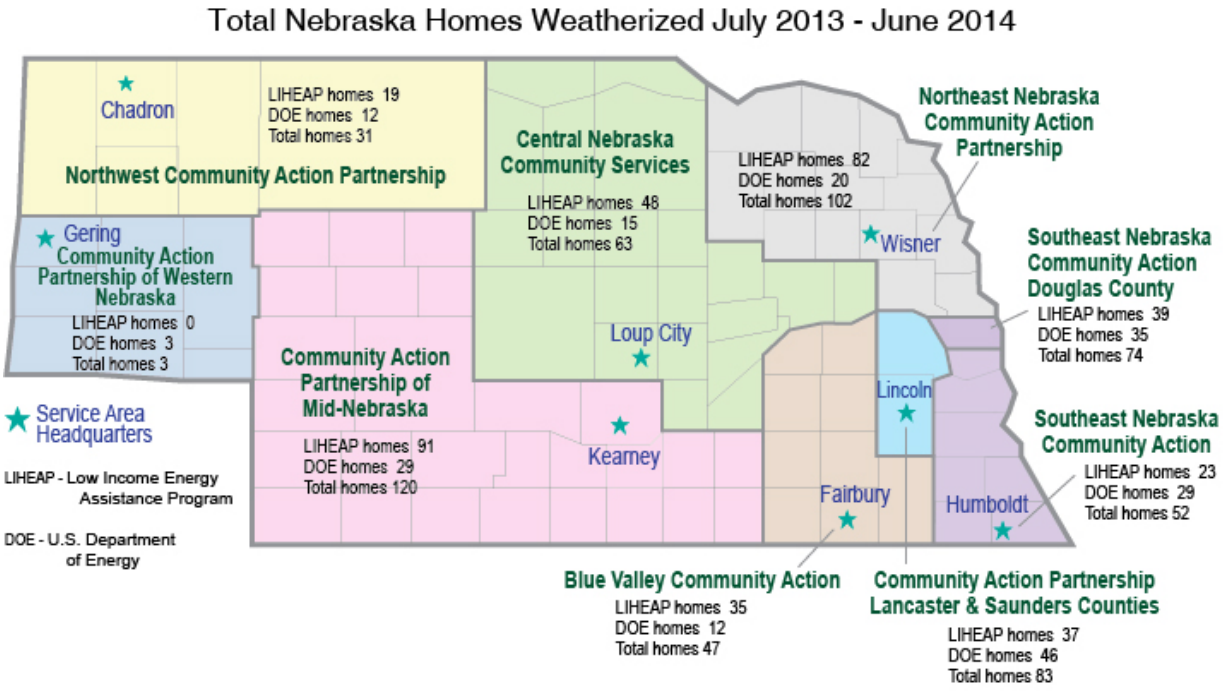
The purpose of the Weatherization Assistance Program is to reduce consumers' energy usage. However, in addition to decreasing the energy being consumed; WAP can also lead to positive economic and environmental impacts. The Nebraska Energy Office paired up with Partners in Pollution Prevention in order to examine the Weatherization Assistance Program and its impacts throughout the state. In order to accomplish this, 100 homes that were weatherized between July 2013 and June 2014 and were funded through WAP were randomly selected. It was the goal that for each of these 100 homes, actual energy savings would be calculated through the comparison of pre-weatherization energy consumption to post-weatherization energy consumption. Once the actual energy savings were obtained they could be compared to the projected savings that were estimated prior to any weatherization work being done.

METHODOLOGY

Energy Impacts

There were several steps to take in the process of evaluating the energy savings resulting from the Weatherization Assistance Program. The Nebraska Energy Office provides government funding to nine different Community Action Partnerships who then provide the weatherization services to approved clients. The Community Action Partnerships include: Blue Valley Community Action Partnership (BVCA), Community Action Partnership of Lancaster and Saunders Counties (CAPLSC), Community Action Partnership of Mid-Nebraska (CAPMN), Community Action Partnership of Western Nebraska (CAPWN), Central Nebraska Community Services (CNCS), Northwest Community Action Partnership (NCAP), Northeast Nebraska Community Action Partnership (NENCAP), Southeast Nebraska Community Action (SENCA), and Southeast Nebraska Community Action Douglas County (SENCA-DC). Figure 1 on the following page depicts the regions of each Community Action Partnership as well as the total number of homes weatherized in each area between July 2013 and June 2014.

Figure 1



In the application process clients sign a Consumption Release From which authorizes the Community Action Partnerships to obtain the consumption records for each particular home. The Nebraska Energy Office must receive the release forms before any consumption can be collected. From here utility service providers are contacted and the consumption records are requested for a particular period for each home. In order to compare pre-weatherization consumption to post-weatherization consumption the dates of consumption were requested for 12 months prior to the production date and 12 months subsequent to the production date. This ensured enough data would be collected to effectively compare before and after consumption in both cooling and heating periods.

The energy usage was modeled as a function of heating degree days (HDD) and cooling degree days (CDD) and then normalized to 20 years. This was done through a software program developed by the Center for Energy and Environmental Studies of Princeton University called PRISM (Advanced Version 1.0; Fels, Kissock, Marean, Reynolds & Stram; 1995). 20 years of daily average temperatures were gathered for a specific region from the National Oceanic and

Atmospheric Administration (NOAA). For this study we used daily temperature readings from three different Nebraska cities which included Omaha, North Platte, and Kimball. These temperatures as well as monthly energy usage were inputted into PRISM which then produced an energy savings report based on the normalized data. Refer to Appendix A for an example of one of the savings reports.

Non-Energy Impacts

While the purpose of the Weatherization Assistance Program is to reduce energy consumption, there are non-energy benefits accompanying the program as well. These come in the form of economic and environmental impacts. WAP can help benefit the economy through the creation of jobs in the state. This program also reduces energy consumption which therefore reduces energy bills. This allows for money that was previously going toward energy bills to be spent elsewhere in the state. On the environmental side, reducing energy consumption can also reduce pollution. Another non-energy benefit includes improved comfort health and safety for the occupants of the homes that receive weatherization.

PROJECT BARRIERS

The largest barrier encountered in assessing the Weatherization Assistance Program, was obtaining the energy consumption records necessary for analysis. Each Community Action Partnership has its own unique consumption release form, and many of these forms do not directly grant the Nebraska Energy Office access to utility information. This can result in a lengthy process of obtaining the Consumption Release Form, contacting the specific Community Action Partnership to provide them with the consumption request, waiting for the CAP agency to contact the utility service provider and finally forward the utility information on to NEO. Another obstacle involved in obtaining energy consumption was the occasional

difficulty in getting in contact with some utility service providers. In some cases the occupants had moved out of the residence or the accounts were under a different name during the time period needed. In these specific instances, consumption was not gathered and those homes were excluded from the study. In total there were 79 homes for which consumption records were received. Therefore there were 79 homes involved in this study.

PRISM, the program which was used to normalize the data and give the savings, would not run propane consumption usage. Propane is supplied based on need so in many cases there is not a steady monthly consumption amount that can be determined. For this reason there were not enough pre and post entries for the program to make an accurate assessment. Therefore, the five homes for which propane consumption records were received were excluded from the study.

The final barrier in conjunction with this project was the learning curve associated with computer software. PRISM was a new program not only to the intern but to the Nebraska Energy Office as well. With no one else knowing the program and very little experience in this type of software, it took a significant amount of time to learn. Another computer software issue arose when dealing with a statistical analysis tool created by the University of Nebraska-Lincoln. This tool was created in conjunction with a study performed in 2012 which aimed to analyze the Nebraska Energy Office's Weatherization Assistance Program and its Loan Program. The UNL tool came up with estimates for Energy Impacts, Economic Impacts, and Environmental Impacts. The energy impacts included: electric energy savings, natural gas energy savings, annual dollars of energy savings, and PDV of future savings. Economic impacts included: output, value-added, labor income and job-years created. The final section of environmental impacts included: reduction in emissions of carbon dioxide, sulfur dioxide, nitrogen oxide, particulate matter < 2.5 micro-meters, volatile organic compounds, and particulate matter < 10 micro-meters. Table 3 is a copy from the UNL study that was done in 2012. It shows the results of that particular study.

Table 3

	Energy Loan Program	Weatherization Assistance Program	Total
Nebraska Energy Office Investment			
NEO Investment	$4,038,616	$1,980,176	$6,018,792
Matching Investment	$4,038,616		$4,038,616
Total Investment	$8,077,232	$1,980,176	$10,057,408
Energy Impacts			
Electric Energy Savings	253,025	238,722	491,747
Natural Gas Energy Savings	109,538	56,730	166,268
Annual Dollars of Energy Savings	$141,226	$81,756	$222,982
PDV of Future Savings	$2,151,487	$1,346,950	$3,498,437
Economic Impacts			
Output	$8,122,360	$1,334,801	$9,457,161
Value-Added	$4,789,475	$916,438	$5,705,913
Labor Income	$3,576,867	$1,014,284	$4,591,151
Job-Years	92.52	32.12	124.64
Environmental Impacts			
Carbon Dioxide	21,593,951	14,480,918	36,074,869
Sulfur Dioxide	22,599	27,144	49,743
Nitrogen Oxide	26,252	22,338	48,590
Particulate Matter < 2.5 micro-meters	393	473	866
Volatile Organic Compounds	868	1,045	1,913
Particulate Matter < 10 micro-meters	630	759	1,389

Source: *The Energy, Economic and Environmental Impacts of the Nebraska Energy Office's Dollar and Energy Savings Loan Program and Weatherization Assistance Program*, Department of Economics College of Business Administration University of Nebraska-Lincoln, prepared by: Rosenbaum, Thompson, DeKraai, Laitner, and Pursley, 2012)

However, the tool used to obtain the data that is found in Table 3 had not been updated since its creation so therefore there were bugs in the system. And in the time period of the P3 internship, the bugs were not able to be worked out. Therefore this program was not able to be used in this study. It did bring the issue to the attention of the Nebraska Energy Office, which was not previously aware that there was a problem with the tool.

ENERGY BENEFITS

A total of 96 out of the 100 Consumption Release Forms were collected. From this group of 96, consumption records from utility service providers for 79 homes were obtained. Therefore the sampling for this study included 79 homes throughout the state of Nebraska. While the initial goal was to include 90 homes, 79 was an acceptable sampling to permit a thorough assessment of the Weatherization Assistance Program. For this particular project, the homes were separated into categories based on which Community Action Partnership (CAP) they fell under. This allowed for the Nebraska Energy Office to determine if some CAP agencies performed better than others.

Projected Savings

The projected savings come from what is called a NEAT audit. Refer to Appendix B for examples of three of these audits, each from a different CAP agency. The audit is made up of an examination done on a home prior to being accepted for the Weatherization Assistance Program. These home examinations are performed by certified professionals. Once finished, the audit determines recommended weatherization measures to be done to that home as well as the estimated savings of each measure. Table 4 shows the categories of weatherization measures that can be taken and gives a short description of improvements included in each category.

Table 4

Type	Description
Air Conditioning	New air conditioning units and repairs to existing units, including related labor costs.

Doors & Windows	Replacement of existing doors & windows, addition of storm doors and windows, repair of existing doors and windows, weather stripping, and repair of existing walls for air infiltration purposes, including related labor costs.
Furnace	New furnace units and repair to existing units, including related labor costs.
Heat Pump	Addition of new heat pumps and replacement of existing heat pumps, including related labor costs.
Hot Water Heater	New hot water heaters and repair of existing hot water heaters, including related labor costs.
HVAC	Repair to existing ducts system, including related labor costs.
Insulation	Addition of new insulation and replacement of existing insulation, including related labor costs.
Lighting	Replacement of existing light bulbs with CFLs.
Miscellaneous	Health and Safety improvements and other non-energy efficiency investments such as pressure testing, and unallocated labor costs.
Other Appliances	Appliances such as refrigerators, dishwashers, clothes washers, freezers, and fireplace inserts.

The NEAT audit breaks down the estimated savings into Heating, Cooling, and Base Load categories. These savings can be seen of the first page of each audit located in Appendix B. It provides a projection for both energy and cost savings. The heating energy savings are measured in MMBtus (one million British Thermal Units) while the cooling and base load energy savings are measured in kWhs (kilowatt-hours). The estimated savings for each home are listed in Table 5. In this table the cooling and base load savings are combined into one column of total

kWh's saved. Heating energy savings make up two columns of this table. The first column of heating energy savings is measured in MMBtus while the second column converts these savings into therms. The reason for this conversion is to allow for a simple comparison to the actual energy usage which is in units of therms. The blank lines represent the NEAT audits that were not available to pull the numbers from; there were a total of five.

Table 5

					ESTIMATED SAVINGS		
	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Estimated Savings (MMBtu)	Estimated Savings (therms)	Estimated Savings (kWh)
Home 1	CAP 1	Frame	$2,665.48	$194.99	43.2	432	912
Home 2	CAP 1	Frame	$1,816.77	$165.67	43.6	436	2214
Home 3	CAP 1	Frame	$3,584.32	$44.09	109.2	1092	2489
Home 4	CAP 1	Frame	$1,902.70	$580.72	66.6	666	3100
Home 5	CAP 2	Frame	$4,704.81	$595.00	143.9	1439	6949
Home 6	CAP 2	Mobile	$766.40	$2,582.00	16.7	167	2537
Home 7	CAP 2	Frame	$2,123.00	$1,045.00	9.4	94	2700
Home 8	CAP 2	Frame	$2,630.00	$1,230.00	31.3	313	4890
Home 9	CAP 2	Frame	$4,193.00	$130.00	38.8	388	6168
Home 10	CAP 2	Frame	$3,817.64	$634.00	35.1	351	4350
Home 11	CAP 2	Frame	$4,842.20	$1,040.50	45.3	453	5857
Home 12	CAP 2	Mobile	$1,903.30	$2,790.00	25.9	259	6600
Home 13	CAP 2	Mobile	$4,415.60	$1,972.29	19.7	197	6003
Home 14	CAP 2	Mobile	$0.00	$1,128.00			
Home 15	CAP 2	Frame	$1,956.00	$275.00	29.1	291	8020
Home 16	CAP 3	Frame	$3,110.99	$251.69	19.6	196	1350
Home 17	CAP 3	Frame	$3,937.50	$1,835.00	24.7	247	749
Home 18	CAP 3	Frame	$1,671.26	$4,329.65	24.2	242	658
Home 19	CAP 3	Frame	$1,729.66	$32.23	27.7	277	2621
Home 20	CAP 3	Frame	$4,010.12	$536.09	41.9	419	1767
Home 21	CAP 3	Frame	$582.60	$4,558.45	23.7	237	705
Home 22	CAP 3	Frame	$3,911.41	$101.46	79.5	795	551
Home 23	CAP 3	Frame	$211.17	$1,426.72	2.1	21	1044
Home 24	CAP 3	Frame	$623.30	$34.15	15	150	1589
Home 25	CAP 3	Mobile	$837.79	$5,014.21	43	430	1236
Home 26	CAP 3	Frame	$885.71	$228.21	8.9	89	560
Home 27	CAP 3	Mobile	$1,018.92	$1,701.30	4.6	46	1550
Home 28	CAP 3	Frame	$906.84	$9.39	19.3	193	1062

Home 29	CAP 3	Frame	$1,751.41	$4,622.07	41.4	414	659
Home 30	CAP 3	Frame	$4,733.90	$1,598.78	20.2	202	975
Home 31	CAP 3	Mobile	$2,091.48	$305.16	13.2	132	871
Home 32	CAP 3	Mobile	$1,200.07	$365.84	31.1	311	838
Home 33	CAP 3	Frame	$5,930.72	$103.81	93	930	1912
Home 34	CAP 4	Frame	$880.63	$2,572.52			
Home 35	CAP 5	Frame	$5,738.64	$229.80	10.7	107	411
Home 36	CAP 5	Frame	$4,592.74	$84.82	27.1	271	412
Home 37	CAP 5	Frame	$794.59	$3,121.10	39.5	395	763
Home 38	CAP 5	Frame	$106.57	$29.90	16.6	166	1007
Home 39	CAP 5	Frame	$1,632.74	$102.73	25.6	256	875
Home 40	CAP 5	Frame	$239.70	$3.90	9.4	94	957
Home 41	CAP 5	Frame	$596.79	$56.57	19.3	193	552
Home 42	CAP 6	Frame	$1,421.69	$73.07			
Home 43	CAP 6	Frame	$699.37	$178.20			
Home 44	CAP 6	Mobile	$330.98	$4,599.41	17.6	176	1623
Home 45	CAP 6	Frame	$1,641.28	$60.97	19.6	196	1659
Home 46	CAP 6	Frame	$809.38	$145.79	19.2	192	1584
Home 47	CAP 7	Mobile	$18.43	$21.51	4.4	44	543
Home 48	CAP 7	Frame	$4,547.30	$37.44	43.3	433	1819
Home 49	CAP 7	Frame	$5,026.30	$31.97	45.4	454	3094
Home 50	CAP 7	Frame	$474.44	$37.54	28.8	288	1211
Home 51	CAP 7	Frame	$2,969.75	$55.52	42.3	423	3265
Home 52	CAP 7	Frame	$2,253.40	$44.91	11.7	117	492
Home 53	CAP 7	Frame	$386.85	$38.16	16.8	168	519
Home 54	CAP 7	Frame	$6,872.10	$59.91	95.8	958	1474
Home 55	CAP 7	Frame	$6,174.77	$3.73	30.3	303	663
Home 56	CAP 7	Frame	$9,516.76	$15.00			
Home 57	CAP 8	Frame	$2,151.66	$20.50	40	400	1201
Home 58	CAP 8	Mobile	$626.61	$1,704.82	2.3	23	1386
Home 59	CAP 8	Frame	$213.56	$772.13	0.2	2	1312
Home 60	CAP 8	Frame	$342.28	$1,004.50	18.5	185	1061
Home 61	CAP 8	Frame	$4,749.95	$1,178.00	37.8	378	1698
Home 62	CAP 8	Frame	$1,130.00	$4,049.00	16.6	166	3066
Home 63	CAP 8	Frame	$400.97	$1,593.00	-3.6	-36	962
Home 64	CAP 8	Frame	$4,121.06	$182.00	33.7	337	1515
Home 65	CAP 8	Frame	$1,604.01	$2,941.82	46.3	463	1820
Home 66	CAP 9	Frame	$3,053.01	$828.30	25.9	259	871
Home 67	CAP 9	Frame	$520.79	$5,213.66	22	220	1849
Home 68	CAP 9	Frame	$715.87	$903.00	33.9	339	3602
Home 69	CAP 9	Frame	$1,588.92	$1,190.03	38.9	389	594
Home 70	CAP 9	Frame	$109.78	$94.44	5.2	52	1849
Home 71	CAP 9	Frame	$2,033.80	$1,500.88	27.7	277	767

Home 72	CAP 9	Mobile	$1,302.37	$1,626.87	5.8	58	1323
Home 73	CAP 9	Frame	$2,314.51	$132.83	33.6	336	1372
Home 74	CAP 9	Frame	$3,723.02	$84.38	75.7	757	2566
Home 75	CAP 9	Frame	$1,667.02	$1,227.76	14.9	149	774
Home 76	CAP 9	Frame	$2,176.33	$1,778.88	87.7	877	1550
Home 77	CAP 9	Frame	$1,836.70	$1,352.62	14.9	149	1306
Home 78	CAP 9	Frame	$1,757.81	$24.12	44.7	447	1200
Home 79	CAP 9	Frame	$3,039.32	$89.50	25.9	259	1760
				Totals	2362.9	23629	141813

Actual Savings

The actual savings values were obtained through the process of inputting energy consumption from utility bills along with average daily temperatures for the region in which the home was located, into the software program PRISM. The program models the energy consumption as a function of heating degree days and cooling degree days. This allows for a fair comparison among all the homes that participated in this study. There was a large range in savings seen in the 79 homes. On the natural gas side, the savings ranged from a -87% up to a 59% savings. The range for electric consumption was larger than that for natural gas. Electric savings varied from a 141% increase in consumption to a 67% decrease in consumption. There was an overall average % savings for this study of 13% per home for natural gas energy usage and 12% savings per home for electric energy usage. Table 6 lists the natural gas savings for each home that used natural gas and Table 7 lists the electric savings for each electric using home.

Table 6

					GAS			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings
Home 2	CAP 1	Frame	$1,816.77	$165.67	944	383	561	59%
Home 3	CAP 1	Frame	$3,584.32	$44.09	228	417	-189	-83%
Home 4	CAP 1	Frame	$1,902.70	$580.72	830	553	277	33%
Home 5	CAP 2	Frame	$4,704.81	$595.00	1582	1374	208	13%
Home 6	CAP 2	Mobile	$766.40	$2,582.00	1116	870	246	22%
Home 7	CAP 2	Frame	$2,123.00	$1,045.00	708	358	350	49%
Home 8	CAP 2	Frame	$2,630.00	$1,230.00	695	689	6	1%
Home 9	CAP 2	Frame	$4,193.00	$130.00	382	559	-177	-46%
Home 10	CAP 2	Frame	$3,817.64	$634.00	818	518	300	37%
Home 11	CAP 2	Frame	$4,842.20	$1,040.50	336	401	-65	-19%
Home 12	CAP 2	Mobile	$1,903.30	$2,790.00	429	446	-17	-4%
Home 13	CAP 2	Mobile	$4,415.60	$1,972.29	689	689	0	0%
Home 14	CAP 2	Mobile	$0.00	$1,128.00	527	673	-146	-28%
Home 15	CAP 2	Frame	$1,956.00	$275.00	541	540	1	0%
Home 17	CAP 3	Frame	$3,937.50	$1,835.00	541	296	245	45%
Home 19	CAP 3	Frame	$1,729.66	$32.23	608	401	207	34%
Home 24	CAP 3	Frame	$623.30	$34.15	657	478	179	27%
Home 25	CAP 3	Mobile	$837.79	$5,014.21	593	378	215	36%
Home 27	CAP 3	Mobile	$1,018.92	$1,701.30	857	862	-5	-1%
Home 32	CAP 3	Mobile	$1,200.07	$365.84	741	723	18	2%
Home 34	CAP 4	Frame	$880.63	$2,572.52	606	519	87	14%
Home 36	CAP 5	Frame	$4,592.74	$84.82	722	527	195	27%
Home 37	CAP 5	Frame	$794.59	$3,121.10	363	307	56	15%
Home 38	CAP 5	Frame	$106.57	$29.90	684	608	76	11%
Home 43	CAP 6	Frame	$699.37	$178.20	1014	1006	8	1%
Home 44	CAP 6	Mobile	$330.98	$4,599.41	905	904	1	0%
Home 46	CAP 6	Frame	$809.38	$145.79	459	434	25	5%
Home 47	CAP 7	Mobile	$18.43	$21.51	613	642	-29	-5%
Home 48	CAP 7	Frame	$4,547.30	$37.44	557	503	54	10%
Home 49	CAP 7	Frame	$5,026.30	$31.97	702	455	247	35%
Home 50	CAP 7	Frame	$474.44	$37.54	1546	1301	245	16%
Home 51	CAP 7	Frame	$2,969.75	$55.52	919	663	256	28%
Home 52	CAP 7	Frame	$2,253.40	$44.91	379	321	58	15%
Home 53	CAP 7	Frame	$386.85	$38.16	784	788	-4	-1%
Home 54	CAP 7	Frame	$6,872.10	$59.91	1487	1171	316	21%
Home 57	CAP 8	Frame	$2,151.66	$20.50	1253	868	385	31%
Home 58	CAP 8	Mobile	$626.61	$1,704.82	625	657	-32	-5%
Home 59	CAP 8	Frame	$213.56	$772.13	749	751	-2	0%
Home 60	CAP 8	Frame	$342.28	$1,004.50	812	808	4	0%
Home 61	CAP 8	Frame	$4,749.95	$1,178.00	599	429	170	28%
Home 62	CAP 8	Frame	$1,130.00	$4,049.00	523	432	91	17%
Home 63	CAP 8	Frame	$400.97	$1,593.00	621	558	63	10%
Home 64	CAP 8	Frame	$4,121.06	$182.00	800	402	398	50%
Home 65	CAP 8	Frame	$1,604.01	$2,941.82	635	503	132	21%
Home 66	CAP 9	Frame	$3,053.01	$828.30	557	618	-61	-11%
Home 67	CAP 9	Frame	$520.79	$5,213.66	824	607	217	26%

Home 68	CAP 9	Frame	$715.87	$903.00	548	452	96	18%
Home 69	CAP 9	Frame	$1,588.92	$1,190.03	1039	1047	-8	-1%
Home 70	CAP 9	Frame	$109.78	$94.44	966	981	-15	-2%
Home 71	CAP 9	Frame	$2,033.80	$1,500.88	1121	849	272	24%
Home 72	CAP 9	Mobile	$1,302.37	$1,626.87	553	1034	-481	-87%
Home 73	CAP 9	Frame	$2,314.51	$132.83	1029	814	215	21%
Home 74	CAP 9	Frame	$3,723.02	$84.38	1406	1095	311	22%
Home 75	CAP 9	Frame	$1,667.02	$1,227.76	693	591	102	15%
Home 76	CAP 9	Frame	$2,176.33	$1,778.88	2178	2105	73	3%
Home 77	CAP 9	Frame	$1,836.70	$1,352.62	487	416	71	15%
Home 78	CAP 9	Frame	$1,757.81	$24.12	991	850	141	14%
Home 79	CAP 9	Frame	$3,039.32	$89.50	949	917	32	3%
				Totals	45520	39541	5979	
						Total Average % Savings		13%

Table 7

					ELECTRIC			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 1	CAP 1	Frame	$2,665.48	$194.99	12711	10678	2033	16%
Home 3	CAP 1	Frame	$3,584.32	$44.09	15587	5097	10490	67%
Home 5	CAP 2	Frame	$4,704.81	$595.00	14404	13572	832	6%
Home 6	CAP 2	Mobile	$766.40	$2,582.00	9543	7839	1704	18%
Home 7	CAP 2	Frame	$2,123.00	$1,045.00	4307	3229	1078	25%
Home 8	CAP 2	Frame	$2,630.00	$1,230.00	15230	14953	277	2%
Home 10	CAP 2	Frame	$3,817.64	$634.00	3793	3593	200	5%
Home 11	CAP 2	Frame	$4,842.20	$1,040.50	13198	11146	2052	16%
Home 12	CAP 2	Mobile	$1,903.30	$2,790.00	13063	10174	2889	22%
Home 13	CAP 2	Mobile	$4,415.60	$1,972.29	15452	10988	4464	29%
Home 15	CAP 2	Frame	$1,956.00	$275.00	8859	8815	44	0%
Home 16	CAP 3	Frame	$3,110.99	$251.69	20316	22650	-2334	-11%
Home 17	CAP 3	Frame	$3,937.50	$1,835.00	10052	7992	2060	20%
Home 18	CAP 3	Frame	$1,671.26	$4,329.65	6560	7220	-660	-10%
Home 19	CAP 3	Frame	$1,729.66	$32.23	10960	9646	1314	12%
Home 20	CAP 3	Frame	$4,010.12	$536.09	11398	8863	2535	22%
Home 21	CAP 3	Frame	$582.60	$4,558.45	9586	6356	3230	34%
Home 22	CAP 3	Frame	$3,911.41	$101.46	20780	6834	13946	67%
Home 23	CAP 3	Frame	$211.17	$1,426.72	8097	19524	-11427	-141%
Home 24	CAP 3	Frame	$623.30	$34.15	2759	2404	355	13%
Home 26	CAP 3	Frame	$885.71	$228.21	24959	18037	6922	28%
Home 28	CAP 3	Frame	$906.84	$9.39	28864	25530	3334	12%
Home 29	CAP 3	Frame	$1,751.41	$4,622.07	12482	5845	6637	53%
Home 30	CAP 3	Frame	$4,733.90	$1,598.78	8312	8362	-50	-1%
Home 31	CAP 3	Mobile	$2,091.48	$305.16	22151	17378	4773	22%
Home 32	CAP 3	Mobile	$1,200.07	$365.84	21998	16278	5720	26%

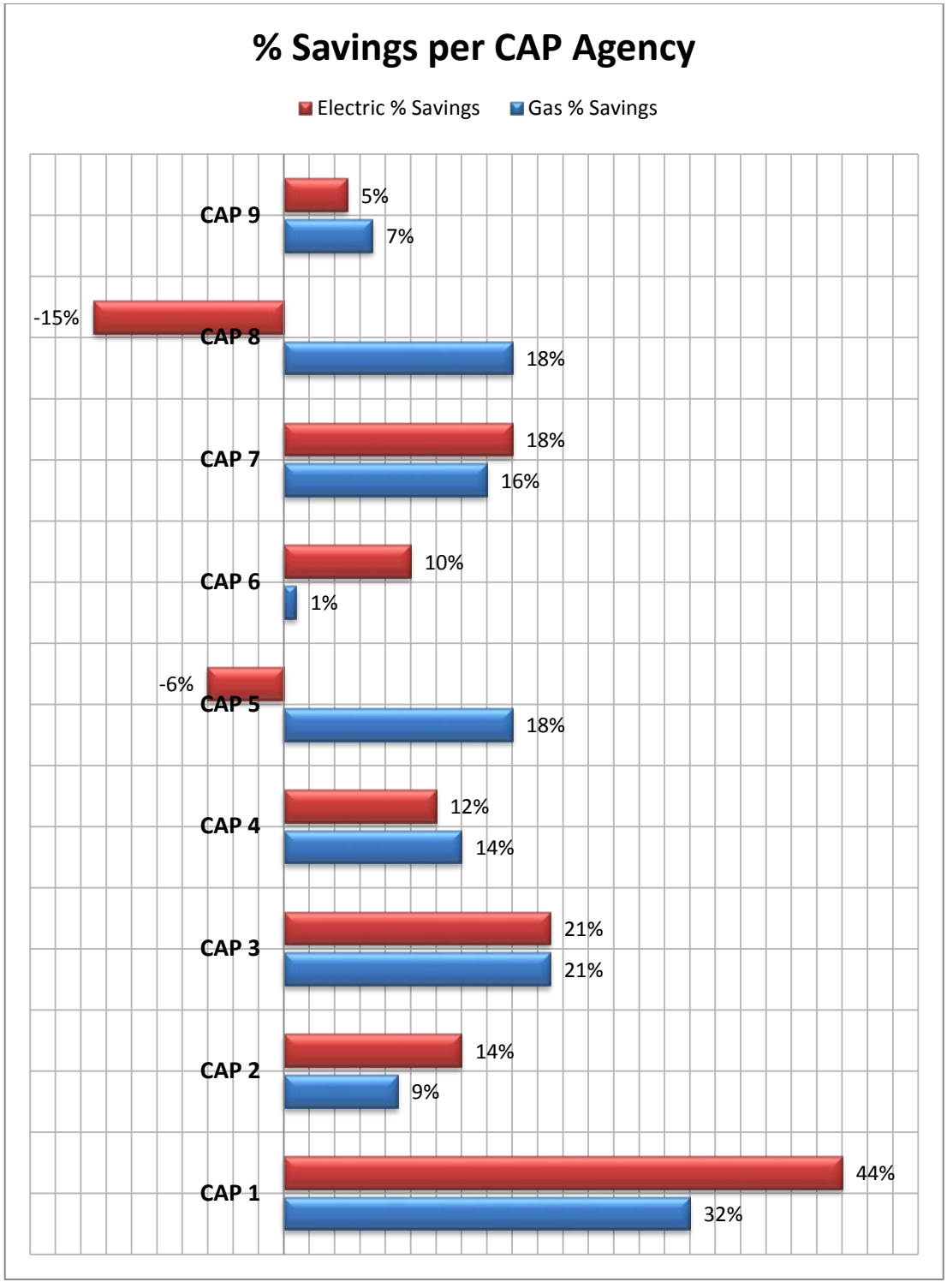
Home 33	CAP 3	Frame	$5,930.72	$103.81	35080	18168	16912	48%
Home 34	CAP 4	Frame	$880.63	$2,572.52	6561	5744	817	12%
Home 35	CAP 5	Frame	$5,738.64	$229.80	18668	19771	-1103	-6%
Home 36	CAP 5	Frame	$4,592.74	$84.82	4098	5268	-1170	-29%
Home 37	CAP 5	Frame	$794.59	$3,121.10	11241	10841	400	4%
Home 38	CAP 5	Frame	$106.57	$29.90	13564	13556	8	0%
Home 39	CAP 5	Frame	$1,632.74	$102.73	16964	18106	-1142	-7%
Home 40	CAP 5	Frame	$239.70	$3.90	24276	23442	834	3%
Home 41	CAP 5	Frame	$596.79	$56.57	8049	11259	-3210	-40%
Home 42	CAP 6	Frame	$1,421.69	$73.07	29476	27605	1871	6%
Home 45	CAP 6	Frame	$1,641.28	$60.97	14364	11906	2458	17%
Home 48	CAP 7	Frame	$4,547.30	$37.44	23253	17484	5769	25%
Home 49	CAP 7	Frame	$5,026.30	$31.97	2885	3076	-191	-7%
Home 50	CAP 7	Frame	$474.44	$37.54	15593	12917	2676	17%
Home 55	CAP 7	Frame	$6,174.77	$3.73	33199	28308	4891	15%
Home 56	CAP 7	Frame	$9,516.76	$15.00	25592	20799	4793	19%
Home 58	CAP 8	Mobile	$626.61	$1,704.82	5744	7184	-1440	-25%
Home 60	CAP 8	Frame	$342.28	$1,004.50	10608	16644	-6036	-57%
Home 61	CAP 8	Frame	$4,749.95	$1,178.00	4764	4895	-131	-3%
Home 63	CAP 8	Frame	$400.97	$1,593.00	14074	14456	-382	-3%
Home 64	CAP 8	Frame	$4,121.06	$182.00	5043	4346	697	14%
Home 65	CAP 8	Frame	$1,604.01	$2,941.82	6285	6185	100	2%
Home 67	CAP 9	Frame	$520.79	$5,213.66	8779	8061	718	8%
Home 68	CAP 9	Frame	$715.87	$903.00	4225	3241	984	23%
Home 69	CAP 9	Frame	$1,588.92	$1,190.03	6077	6547	-470	-8%
Home 71	CAP 9	Frame	$2,033.80	$1,500.88	6160	8054	-1894	-31%
Home 72	CAP 9	Mobile	$1,302.37	$1,626.87	19481	10402	9079	47%
Home 73	CAP 9	Frame	$2,314.51	$132.83	8616	6735	1881	22%
Home 74	CAP 9	Frame	$3,723.02	$84.38	15081	15942	-861	-6%
Home 76	CAP 9	Frame	$2,176.33	$1,778.88	17373	23204	-5831	-34%
Home 77	CAP 9	Frame	$1,836.70	$1,352.62	3382	3102	280	8%
Home 78	CAP 9	Frame	$1,757.81	$24.12	6816	6255	561	8%
				Totals	770792	676506	94286	
						Total Average % Savings		12%

These tables provide the overall energy usage savings for the entire sampling of homes that participated in this study. The energy consumption was also assessed in separate categories based on Community Action Partnerships. The homes were split into nine different groups depending upon which CAP agency they fell under. This allowed for the comparison of all Community Action Partnerships to determine if some were performing better than others. For the sake of this study each Community Action Partnership was assigned a number (1-9) at random. This was to retain ambiguity among the agencies. The number of homes in each category varied due to the fact that the original 100 homes were randomly selected from the entire Weatherization Assistance Program list. CAP 3 has the largest sampling of homes with 18

while CAP 4 has the smallest with only 1 home. The remaining agencies had sampling sizes that fell between these values.

The savings results for each CAP agency varied therefore indicating that some agencies were indeed performing better than others. The values ranged from -15% for electric savings up to 44% also for electric energy savings. Overall, CAP 8 was the poorest performer with 18% savings for natural gas and -15% savings for electric resulting in an average of 1.5% savings for that agency. CAP 1 had the highest performance with 32% savings for natural gas and 44% savings for electric resulting in an average of 38% savings for that agency. Figure 2 shows the overall savings in natural gas and electric for each Community Action Partnership. Refer to Appendix D to see the detailed savings for each of the nine CAP agencies.

Figure 2


% Savings per CAP Agency
Electric % Savings
Gas % Savings
CAP 9
5%
7%
CAP 8
-15%
18%
CAP 7
18%
16%
CAP 6
10%
1%
CAP 5
-6%
18%
CAP 4
12%
14%
CAP 3
21%
21%
CAP 2
14%
9%
CAP 1
44%
32%

NON-ENERGY BENEFITS

The purpose behind the Weatherization Assistance Program is to reduce energy consumption in homes. However, the program does not solely have energy impacts, it has non-energy impacts associated with it as well. For the purpose of this study these non-energy impacts were separated into three categories. These categories were made up of: comfort, health, and safety impacts, economic impacts, and environmental impacts. Household can benefit from weatherization services due to the increased comfort, health and safety that those services can provide. The economic impacts come in the form of increased economic output, jobs, and labor income that result from the Weatherization Assistance Program. Finally, the environmental impacts are considered in reference to the reduction of pollution that results in the use of less energy.

Household Occupants Well-Being

The Weatherization Assistance Program provides services that can aid in the comfort, health and safety of a household's occupants. Increasing the energy efficiency of a home results in that home being more comfortable to live in. In fact, in some cases energy usage may increase in response to the lower costs of heating and cooling a more energy efficient home. This may seem counter-productive to the Weatherization Assistance Program, however adding comfort to people's lives has great value that should be acknowledged. Many of the measures taken to weatherize a home result in reduced drafts throughout the home. This has both comfort and health benefits associated with it. Also, reducing energy usage reduces indoor air pollution which provides health benefits to the home's occupants. On the safety side, replacing old or faulty equipment and systems reduces the risk of fires or other mishaps that could occur.

Economic Benefits

There are economic impacts associated with the reduction in energy consumption due to the fact that this causes a reduction in energy bills. For the participants in the Weatherization Assistance Program this can greatly their reduce energy burdens. Overall, the savings for 79 homes that participated in this study totaled $13,514.46 per year, this amounts to an average of $171.07 per home each year. Separately, the natural gas savings amounted to $5217.30/year or $66.04/home-year, while the electric savings came to $8297.17/year or $105.03/home-year. Calculations for these numbers can be seen in Appendix C. Economic impacts do not end at the household level, however. Benefits to the economy occur that effect society as a whole. As mentioned earlier, this program lessens the burden of energy payments, therefore money that was previously being put toward energy bills can be dispersed elsewhere in the economy. Examples include food, entertainment and retail items. WAP also increases equipment purchases and construction activity which aids in job creation and labor income.

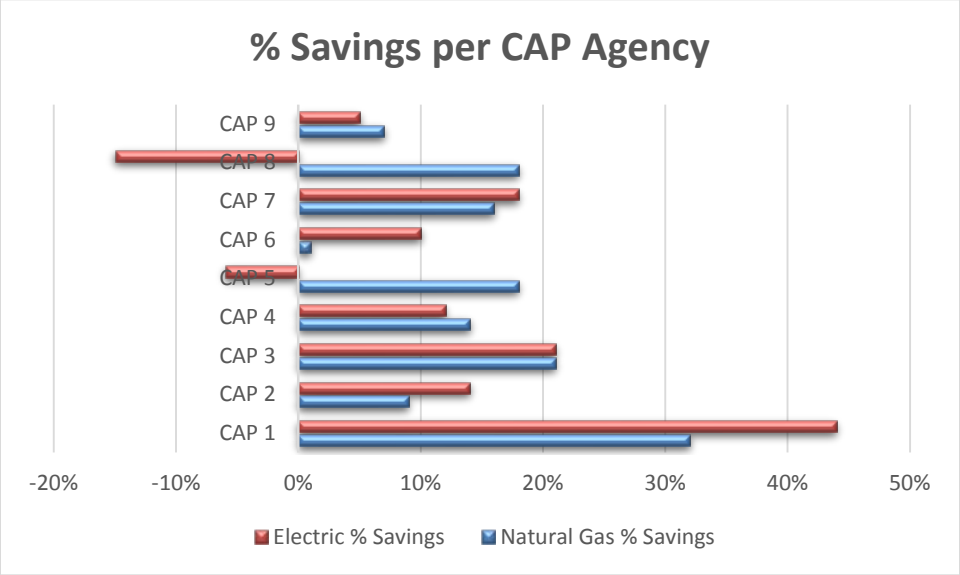
Environmental Benefits

Similar to the economic benefits, the environmental benefits affect not only the household occupants but the entirety of society as well. The environmental impacts of the Weatherization Assistance Program occur as a ripple effect. The program provides weatherization services that lead to reductions in energy consumption which lead to reductions in energy production which lead to reductions in pollution emissions. For this study the environmental benefits are measured in air pollution emission reductions. Air pollutants directly affect the climate as well as the health of both plants and animals. The overall emission reductions resulting from the energy savings of all 79 homes was 133.2 $MTCO_2e$/year. This came to an average of 1.69 $MTCO_2e$/year for each home that received weatherization services. 30.8 $MTCO_2e$/year were reduced due to natural gas energy savings and 102.4 $MTCO_2e$/year were reduced due to electric energy savings. To see how these numbers were calculated refer to Appendix C.

SUMMARY OF RESULTS

Overall, this study provided an assessment of the Nebraska Energy Office's Weatherization Assistance Program. It allowed for the comparison of the nine Community Action Partnerships to determine each agencies performance. Figure 3 below shows the % savings values for natural gas and electric for each agency. It can be seen that CAP 1 performed the best overall, while CAP 6 had the worst overall performance.

Figure 3



The overall energy savings amounted to 5797 therms and 94286 kWhs being reduced for this sampling of 79 homes. One the economic side, the 79 homes that participated in this study resulted in a savings of $13,514.46/year which comes down to an average savings of $171.07/year per home that took part in the Weatherization Assistance Program. Greenhouse gas emissions were reduced by a total of 133.2 $MTCO_2e$/year or an average of 1.69 $MTCO_2e$/year per home. A summary of these values can be found in Table 8.

Table 8

Summary of Impact of the Weatherization Assistance Program		
	Total	Per Home
Energy Impacts		
Natural Gas Energy Savings (therms/year)	5,797	73
Electric Energy Savings (kWhs/year)	94,286	1,194
Economic Impacts		
Natural Gas Cost Savings ($/year)	$5,317.30	$66.04
Electric Cost Savings ($/year)	$8,297.17	$105.03
Total Cost Savings ($/year)	$13,614.47	$171.07
Environmental Impacts		
Natural Gas Emission Reductions (MTCO2e/yr)	30.8	0.39
Electric Emission Reductions (MTCO2e/yr)	102.4	1.30
Total Emission Reductions (MTCO2e/yr)	133.2	1.69

APPENDICES

APPENDIX A: PRISM Savings Report

APPENDIX B: NEAT Recommended Measures Reports

APPENDIX C: Calculations for Energy Reductions

APPENDIX D: Energy Savings per Community Action Partnership

APPENDIX A: PRISM Savings Report

		PRE			POST			SAVINGS		
BUILDING ID	**UNITS**	**NAC**	**NAC(CV)**	**R^2**	**NAC**	**NAC(CV)**	**R^2**	**NAS**	**$^{+}_{-}$NAS**	**%ERR**
CAP_222E7	kWh	10052	1.7	0.952	7992	7.4	0.193	2060	618	30.0
CAP_1400	kWh	2759	-0.3	0.093	2404	-0.4	0.639	355	-9	-9
CAP_1113LINCO	kWh	24959	7.8	0.843	18037	4.1	0.973	6922	2072	29.9
CAP_403ADAMS	kWh	21998	2.1	0.981	16278	4.5	0.979	5721	867	15.2
CAP_1009NORTH	kWh	10960	7.0	0.898	9646	3.0	0.944	1315	820	62.4
CAP_511VERMON	kWh	8312	14.3	0.447	8362	29.5	0.558	-50	2739	5489.7
CAP_814P	kWh	9586	18.7	0.407	6356	-0.1	0.301	3230	-9	-9
CAP_519VERNON	kWh	35080	6.0	0.826	18168	2.3	0.950	16912	2160	12.8
CAP_812ELM	kWh	22151	4.6	0.938	17378	4.4	0.960	4772	1284	26.9
CAP_405	kWh	20780	9.3	0.831	6834	9.1	0.751	13946	2023	14.5
CAP_43481	kWh	6560	9.7	0.480	7220	4.4	0.803	-660	707	107.2
CAP_403WEST	kWh	12482	7.9	0.903	5845	6.3	0.509	6638	1054	15.9
CAP_1218HARRI	kWh	8097	-0.1	0.594	19524	3.2	0.909	-11427	-9	-9
CAP_4370LINCO	kWh	11398	2.8	0.967	8863	15.2	0.847	2536	1385	54.6
CAP_204OAK	kWh	20316	9.5	0.790	22650	6.5	0.907	-2335	2427	103.9
CAP_307J	kWh	28864	1.9	0.935	25530	2.2	0.732	3334	772	23.2

APPENDIX B: NEAT Recommended Measures Reports

NEAT Recommended Measures

Agency: Community Action Partnership of Lancaster and Saun | State: NE | Run On: 12/9/2013 8:53:43 A | RunID: 1386600823
Client ID: 2012-117 | Version: 8.6.0.4 (11/9/2009) | AuditID: -1430307338

Audit Name: Audit (781) | Audit Date: 12/9/2013
Client Nam[redacted] | Auditor:
Weather File: OMAHANEB.WX | Setup Library Name: CAPLSC

Comment

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating ($)	Cooling (kWh)	Cooling ($)	BaseLoad (kWh)	BaseLoad ($)	Total (MMBtu)
1	Infiltration Redctn		-1.6	-15	-19	-2	0	0	-1.7
2	Lighting Retrofits	1	0.0	0	0	0	2470	205	8.4
3	Replace Storm Door		0.0	0	0	0	0	0	2.7
4	Replace Storm Door 2		0.0	0	0	0	0	0	2.7
5	Replace Storm Door 3		0.0	0	0	0	0	0	2.7
6	DWH Pipe Insulation		0.0	0	0	0	246	8	0.8
7	Foundation Ins.	W & S walls	11.0	106	3	0	0	0	11.0
			9.4				2700		

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	Lighting Retrofits	1	205	162	3.9	162	3.9
2	Replace Storm Door		26	133	1.7	295	2.9
3	Replace Storm Door 2		26	133	1.7	428	2.5
4	Replace Storm Door 3		26	135	1.7	563	2.3
5	DWH Pipe Insulation		8	80	1.1	643	2.2
6	Foundation Ins.	W & S walls	107	1593	1.1	2236	1.4
7	Mechanical Fan		0	775	0.0	3011	0.0

Materials

Index	Material	Type	Quantity	Units
1	Foundation Wall Insulation	Rigid Foam Board - R-12	531	SqFt
2	Compact Fl.	13 Watt	18	Each Lamp
3	DHW Pipe Insulation		1	Each

Pre/Post Retrofit Energy and Loads

	Pre Retrofit		*Post Retrofit*	
	Heating	*Cooling*	*Heating*	*Cooling*
Annual load (MBtu/yr)	58.4	13.6	51.3	13.8
Annual Energy (MBtu/yr)	77.3	3.8	68.0	3.9
Heat loss/gain (kBtu/hr)	34.2	9.8	30.4	9.5
Output required (kBtu/hr)(ton)	39.3	1.0	35.0	1.0

Approximate Manual J Component Contributions to Peak HEATING Load

Component Type	*Component Name*	*Area or Volume (Inf)*	*Pre Retrofit Load (Btu/h)*	*Post Retrofit Load (BTU/h)*
Wall	E	320	1984.6	1984.6
Wall	N 1	162	1006.2	1006.2
Wall	N2	300	1386.0	1386.0
Wall	S	40	250.5	250.5
Wall	S (2)	168	1041.9	1041.9
Wall	W	292	1809.8	1809.8
Window	1	42	1812.2	1812.2
Window	2	28	1211.7	1211.7
Window	3	12	499.0	499.0
Door	Basement/ Balcony	36	1110.7	1110.7
Door	Front	20	826.8	826.8
Attic	1	1200	2247.8	2247.8
Foundation	S wall under stair	1200	2575.8	2575.8
Foundation	East	1200	4698.8	4698.8
Foundation	W & S walls	1200	8489.6	4114.9
Infiltration	Inf	9600	3208.4	3823.5
Total heat loss	Tot	0	34160.0	30400.4
Duct loss	Duct	0	5124.0	4560.1
Output required	Output	0	39284.0	34960.5

Approximate Manual J Component Contributions to Peak COOLING Load

Component Type	*Component Name*	*Area or Volume (Inf)*	*Pre Retrofit Load (Btu/h)*	*Post Retrofit Load (BTU/h)*
Wall	E	320	279.9	279.9
Wall	N 1	162	252.8	252.8
Wall	N2	300	348.3	348.3
Wall	S	40	62.9	62.9
Wall	S (2)	168	146.9	146.9
Wall	W	292	255.2	255.2
Window	1	42	902.4	902.4

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Window	2	28	1708.6	1708.6
Window	3	12	387.8	387.8
Door	Basement/ Balcony	36	989.7	989.7
Door	Front	20	207.8	207.8
Attic	1	1200	1150.0	1150.0
Foundation	S wall under stair	1200	0.0	0.0
Foundation	East	1200	0.0	0.0
Foundation	W & S walls	1200	494.0	70.4
Infiltration	Inf	9600	892.4	1009.6
People	People	2	552.0	552.0
Appliances	Appl	1	1200.0	1200.0
Total Sensible	TotS	0	9830.7	9524.2
Ducts	Ducts	0	983.1	952.4
Total (with ducts)	TotW	0	10813.8	10476.7
Size (tons)	Size	0	0.9	0.9
Latent Load (inf)	LatentI	0	936.8	1059.7
Latent Load (occ)	LatentO	0	460.0	460.0
Latent Load (tot)	LatentT	0	1396.8	1519.7
Total Load	Total	0	12210.6	11996.4
Size (tons)	Size	0	1.0	1.0

Special Notes

NOTE: Heat loss and Output required are only guides to sizing equipment.
NOTE: See NEAT User's Manual for further sizing details.
NOTE: Read cautions in NEAT User's Manual related to sizing results.
NOTE: (+) in the Materials list indicates there are more related User Defined Materials.

Comments

Type	Code	Comment
Foundation	W & S walls	47'x9' Thermaxx 12'x4' Thermaxx 11' of wall is already insulated under stairs
Water Heater		50 GAL 20' hot & cold
Lighting	1	Bid per bulb

Retrofit Measures NOT Considered

Electric vent damper
Electric vent damper IID
Evaporative cooler
Flame retention burner
IID
Refrigerator replacement
Smart thermostat
Sun screen fabric
Sun screen louvered
Thermal vent damper
Window film

Window shading (awning)

NEAT Recommended Measures

Weatherization Assistance Program

Agency Mid **State** NE **Run On** 8/1/2013 11:07:38 A **RunID** 1375373258
Client ID [redacted] **Version** 8.6.0.4 (11/9/2009) **AuditID** 1908222474

Audit Name 7937 **Audit Date** 8/1/2013 1
Client Name [redacted] **Auditor** Ken Oertle
Weather File NPLATTNE.WX **Setup Library Name** .Crew

Comment

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating ($)	Cooling (kWh)	Cooling ($)	BaseLoad (kWh)	BaseLoad ($)	Total (MMBtu)
1	Infiltration Redctn		-0.2	-4	0	0	0	0	-0.2
2	Low Flow Showerheads		0.0	0	0	0	991	79	3.4
3	Lighting Retrofits	l1	0.0	0	0	0	206	16	0.7
4	Foundation Ins.	f1	17.6	413	0	0	0	0	17.6
5	Replace Prime Door #3		0.0	0	0	0	0	0	3.7
6	DWH Pipe Insulation		0.0	0	0	0	153	12	0.5
7	Replace Prime Door and Stor		0.0	0	0	0	0	0	3.9
8	Low-E Windows	wda,wdb,wdd	2.2	52	0	0	0	0	2.2
			19.6				1350		

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	Blower door setup		0	40	0.0	40	0.0
2	Seal ductwork		0	20	0.0	60	0.0
3	Low Flow Showerheads		79	30	31.4	90	10.5
4	Lighting Retrofits	l1	16	22	8.3	112	10.1
5	Foundation Ins.	f1	413	921	6.6	1033	7.0
6	Replace Prime Door #3		87	280	4.6	1313	6.5
7	DWH Pipe Insulation		12	30	4.3	1343	6.4
8	Replace Prime Door and Storm Door #4		91	435	2.9	1778	5.6
9	Low-E Windows	wda,wdb,wdd	52	630	1.2	2408	4.4
10	H & S - Install a continuous running fan.		0	430	0.0	2838	0.0
11	H & S-Install vapor barrier		0	210	0.0	3048	0.0
12	H & S-Lead safe containment		0	176	0.0	3224	0.0

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
13	H & S-Vent the bath/kitchen fan out of the attic		0	75	0.0	3299	0.0
14	Mandated air sealing / attic access		0	140	0.0	3439	0.0

Materials

Index	Material	Type	Quantity	Units
1	Low E Window		3	Each
2	Compact Fl.	13 Watt	6	Each Lamp
3	DHW Pipe Insulation		1	Each
4	Low Flow Shower Heads		2	Each
5	Foundation Wall Insulation	Fiberglass Batt-13 - R-13	904	SqFt
6	Blower door setup		1	Each
7	H & S-Install vapor barrier		1	Each
8	H & S-Lead safe containment		1	Each
9	H & S-Vent the bath/kitchen vent out of the attic		1	Each
10	Replace Prime Exterior Door #2		1	Each
11	Replace Prime Door and Storm Door #4		1	Each
12	Seal ductwork with mastic		1	Each

Pre/Post Retrofit Energy and Loads

	Pre Retrofit		Post Retrofit	
	Heating	Cooling	Heating	Cooling
Annual load (MBtu/yr)	68.7	21.1	49.1	22.3
Annual Energy (MBtu/yr)	68.7	0.0	49.1	0.0
Heat loss/gain (kBtu/hr)	42.9	16.4	43.4	16.4
Output required (kBtu/hr)(ton)	42.9	1.4	43.4	1.4

Approximate Manual J Component Contributions to Peak HEATING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	wl1	313	2141.7	2141.7
Wall	wl2	445	3047.0	3047.0
Wall	wl3	277	1893.1	1893.1
Wall	wl3a	48	328.4	328.4
Wall	wl4	435	2978.5	2978.5

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Window	wd1	12	510.7	510.7
Window	wd10	9	384.1	384.1
Window	wd11,12	27	1146.1	1146.1
Window	wd2	12	528.3	528.3
Window	wd3	11	476.0	476.0
Window	wd4	10	428.3	428.3
Window	wd5	8	328.3	328.3
Window	wd6	10	428.3	428.3
Window	wd7	5	191.4	191.4
Window	wd8	7	302.9	302.9
Window	wd9	13	573.0	573.0
Window	wda	8	290.2	434.4
Window	wdb	7	247.0	369.7
Window	wdc	5	200.7	200.7
Window	wdd	10	358.1	536.1
Door	dr1,2	40	1653.6	1653.6
Door	dr3	20	826.8	826.8
Door	dr4	20	826.8	826.8
Attic	a	1618	1861.8	1861.8
Foundation	f1	1618	15462.4	15462.4
Infiltration	Inf	12944	5478.6	5561.3
Total heat loss	Tot	0	42892.3	43419.8
Duct loss	Duct	0	0.0	0.0
Output required	Output	0	42892.3	43419.8

Approximate Manual J Component Contributions to Peak COOLING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	wl1	313	620.6	620.6
Wall	wl2	445	882.8	882.8
Wall	wl3	277	548.5	548.5
Wall	wl3a	48	58.9	58.9
Wall	wl4	435	863.0	863.0
Window	wd1	12	734.3	734.3
Window	wd10	9	552.3	552.3
Window	wd11,12	27	1648.0	1648.0
Window	wd2	12	277.8	277.8
Window	wd3	11	684.5	684.5
Window	wd4	10	615.9	615.9
Window	wd5	8	472.1	472.1
Window	wd6	10	615.9	615.9
Window	wd7	5	178.8	178.8
Window	wd8	7	243.9	243.9
Window	wd9	13	824.0	824.0
Window	wda	8	484.1	484.1
Window	wdb	7	150.7	150.7
Window	wdc	5	187.4	187.4
Window	wdd	10	334.5	334.5
Door	dr1,2	40	479.1	479.1

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Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Door	dr3	20	239.6	239.6
Door	dr4	20	239.6	239.6
Attic	a	1618	1014.8	1014.8
Foundation	f1	1618	0.0	0.0
Infiltration	Inf	12944	1960.3	1983.1
People	People	0	276.0	276.0
Appliances	Appl	1	1200.0	1200.0
Total Sensible	TotS	0	16387.3	16410.1
Ducts	Ducts	0	0.0	0.0
Total (with ducts)	TotW	0	16387.3	16410.1
Size (tons)	Size	0	1.4	1.4
Latent Load (inf)	LatentI	0	37.5	37.9
Latent Load (occ)	LatentO	0	0.0	0.0
Latent Load (tot)	LatentT	0	37.5	37.9
Total Load	Total	0	16424.8	16448.0
Size (tons)	Size	0	1.4	1.4

Special Notes

NOTE: Heat loss and Output required are only guides to sizing equipment.
NOTE: See NEAT User's Manual for further sizing details.
NOTE: Read cautions in NEAT User's Manual related to sizing results.
NOTE: (+) in the Materials list indicates there are more related User Defined Materials.

Comments

Type	Code	Comment
Foundation	f1	The cost of insulating the sill box and treating the access was added to the cost of insulating the foundation walls. Note that not all areas may be accessible.

Retrofit Measures NOT Considered

Electric vent damper
Electric vent damper IID
Evaporative cooler
Flame retention burner
IID
Refrigerator replacement
Smart thermostat
Sun screen fabric
Sun screen louvered
Thermal vent damper
Window film
Window shading (awning)

NEAT Recommended Measures

Agency	Blue Valley Community Action	*State*	US	*Run On*	3/7/2013 7:23:25 AM	*RunID*	1362662605
Client ID	[redacted]			*Version*	8.6.0.4 (11/9/2009)	*AuditID*	-697057785
Audit Name	[redacted]			*Audit Date*	3/7/2013 7:		
Client Name				*Auditor*	Jeanne N		
Weather File	OMAHANEB.WX			*Setup Library Name*	Your Setup Library [10:17:03]		
Comment							

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating ($)	Cooling (kWh)	Cooling ($)	BaseLoad (kWh)	BaseLoad ($)	Total (MMBtu)
1	Infiltration Redctn		18.0	177	0	0	0	0	18.0
2	Low Flow Showerheads		0.0	0	0	0	2747	92	9.4
3	Foundation Ins.	F3	1.1	11	0	0	0	0	1.1
4	Lighting Retrofits	LT1	0.0	0	0	0	1544	124	5.3
5	DWH Tank Insulation		0.0	0	0	0	413	14	1.4
6	DWH Pipe Insulation		0.0	0	0	0	314	11	1.1
7	Attic Ins. R-19	A	3.5	34	0	0	0	0	3.5
8	High Eff Furnace	HS1	21.2	207	0	0	0	0	21.2
9	Ext and storm A		0.0	0	0	0	0	0	3.9
10	Ext and storm B		0.0	0	0	0	0	0	3.9
			43.8				5018		

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	Low Flow Showerheads		92	30	38.4	30	38.4
2	Foundation Ins.	F3	11	29	6.0	59	22.5
3	Lighting Retrofits	LT1	124	57	3.8	116	13.2
4	DWH Tank Insulation	WHY WAS THIS NOT DONE?	14	55	2.8	171	9.8
5	DWH Pipe Insulation		11	63	1.8	234	7.7
6	Attic Ins. R-19	(A) WHY DIDN'T THIS GET DONE?	34	335	1.6	568	4.1
7	High Eff Furnace	HS1	207	1710	1.5	2278	2.2
8	Ext and storm A		38	550	1.0	2828	1.9
9	Ext and storm B	SIR'D SHOULD BE BILLED TO ENERGY EFFICIENCY	38	550	1.0	3378	1.8

Materials

Index	Material	Type	Quantity	Units

1	Attic Insulation	Blown Cellulose - R-19	450 SqFt
2	Compact Fl.	13 Watt	6 Each Lamp
3	DHW Tank Insulation		1 Each
4	DHW Pipe Insulation		1 Each
5	Low Flow Shower Heads		1 Each
6	Foundation Wall Insulation	Fiberglass Batts - R-13	48 SqFt
7	High Eff. Furnace (not used)	65 kBtu/h NG Existing, 43 - 60 kBtu/h NG Post	1 Each
8	ext and storm A		1 Each
9	ext and storm B		1 Each

Pre/Post Retrofit Energy and Loads

	Pre Retrofit		*Post Retrofit*	
	Heating	*Cooling*	*Heating*	*Cooling*
Annual load (MBtu/yr)	53.7	28.6	39.7	26.5
Annual Energy (MBtu/yr)	87.0	0.0	43.2	0.0
Heat loss/gain (kBtu/hr)	44.4	17.1	37.2	15.3
Output required (kBtu/hr)(ton)	51.1	1.7	42.7	1.5

Approximate Manual J Component Contributions to Peak HEATING Load

Component Type	*Component Name*	*Area or Volume (Inf)*	*Pre Retrofit Load (Btu/h)*	*Post Retrofit Load (BTU/h)*
Wall	WL1	84	1773.8	1773.8
Wall	WL1 A	209	1429.9	1429.9
Wall	WL2	264	1808.8	1808.8
Wall	WL3	334	2285.4	2285.4
Wall	WL4	305	2087.5	2087.5
Window	Wd 2-1,2-2	14	1085.4	1085.4
Window	Wd 2-3,2-4	14	1085.4	1085.4
Window	Wd 5,6	14	1110.0	1110.0
Window	Wd 8	11	817.8	817.8
Window	Wd 9,10,11	32	2453.3	2453.3
Window	WD1,2	14	1110.0	1110.0
Window	WD12,13	21	1608.8	1608.8
Window	Wd3,4	16	578.9	578.9
Window	Wd7	6	222.3	222.3
Door	A	18	645.8	645.8
Door	B	17	610.0	610.0
Attic	A	450	2273.6	1019.8
Attic	FA1	160	362.7	362.7
Attic	FA2	160	336.9	336.9
Attic	FA3	320	740.6	740.6
Foundation	F1	683	6527.1	6527.1
Foundation	F2	130	1242.3	1242.3
Foundation	F3	108	1032.1	1032.1
Infiltration	Inf	10696	11182.0	5189.6

Audit Name: [redacted] *Client:* [redacted] *Date:* 3/7/2013

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Total heat loss	Tot	0	44410.4	37164.2
Duct loss	Duct	0	6661.6	5574.6
Output required	Output	0	51072.0	42738.9

Approximate Manual J Component Contributions to Peak COOLING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	WL1	84	445.7	445.7
Wall	WL1 A	209	359.3	359.3
Wall	WL2	264	454.5	454.5
Wall	WL3	334	574.3	574.3
Wall	WL4	305	524.6	524.6
Window	Wd 2-1,2-2	14	1042.9	1042.9
Window	Wd 2-3,2-4	14	1042.9	1042.9
Window	Wd 5,6	14	399.6	399.6
Window	Wd 8	11	294.4	294.4
Window	Wd 9,10,11	32	2357.4	2357.4
Window	WD1,2	14	595.1	595.1
Window	WD12,13	21	862.5	862.5
Window	Wd3,4	16	946.9	946.9
Window	Wd7	6	128.4	128.4
Door	A	18	162.3	162.3
Door	B	17	153.3	153.3
Attic	A	450	1122.9	524.3
Attic	FA1	160	186.5	186.5
Attic	FA2	160	172.9	172.9
Attic	FA3	320	379.8	379.8
Foundation	F1	683	0.0	0.0
Foundation	F2	130	0.0	0.0
Foundation	F3	108	0.0	0.0
Infiltration	Inf	10696	2442.8	1301.8
People	People	5	1224.0	1224.0
Appliances	Appl	1	1200.0	1200.0
Total Sensible	TotS	0	17072.9	15333.3
Ducts	Ducts	0	0.0	0.0
Total (with ducts)	TotW	0	17072.9	15333.3
Size (tons)	Size	0	1.4	1.3
Latent Load (Inf)	LatentI	0	2564.3	1366.5
Latent Load (occ)	LatentO	0	1150.0	1150.0
Latent Load (tot)	LatentT	0	3714.3	2516.5
Total Load	Total	0	20787.2	17849.9
Size (tons)	Size	0	1.7	1.5

Special Notes

NOTE: Read cautions in NEAT User's Manual related to sizing results.
NOTE: Heat loss and Output required are only guides to sizing equipment.
NOTE: See NEAT User's Manual for further sizing details.

Audit Name: [redacted] *Client:* [redacted] *Date:* 3/7/2013

NOTE: Read cautions in NEAT User's Manual related to sizing results.
NOTE: (+) in the Materials list indicates there are more related User Defined Materials.

Comments

Type	*Code*	*Comment*
Wall	WL1	cant do has knob n tube
Attic	A	60.00 access
Foundation	F1	Basement
Foundation	F2	c space inaccessible

Retrofit Measures NOT Considered

Electric vent damper
Electric vent damper IID
Evaporative cooler
Flame retention burner
IID
Refrigerator replacement
Smart thermostat
Sun screen fabric
Sun screen louvered
Thermal vent damper
Window film
Window shading (awning)

APPENDIX C: Calculations for Energy Reductions

Assumptions:

- Natural gas reductions: 5797 therms total
- Electric reductions: 94286 kWhs total
- 79 homes took part in the study
- GHG conversion based on Nebraska conversion factor (e.g., $MTCO_2e$ from the 2014 EPA Pollution Prevention Programs GHG Calculator spreadsheet, as noted below)
    - For each 1,000 therms saved, 5.32 Metric Tons of Carbon Dioxide is reduced
    - For each 1,000 kWh saved, 1.086 Metric Tons of Carbon Dioxide is reduced
- Assume electric price of $0.088/kWh
    - Source: *Electric Data Browser* (http://www.eia.gov/electricity/data/browser/) Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.
- Assume natural gas price of $0.900/therm
    - Source: *Rankings: Natural Gas Residential Prices, April 2015* U.S. Energy Information Administration.

Calculations:

Natural gas cost savings

= (5797 therms/year) x ($0.900/therm) = **$5217.30/year**

= ($5217.30/year) / (79 homes) = **$66.04/home-year**

Electric cost savings

= (94286 kWh/year) x ($0.088/kWh) = **$8297.17/year**

= ($8297.17/year) / (79 homes) = **$105.03/home-year**

Total savings

= ($5217.30/year) + ($8297.17/year) = **$13514.46/year**

= ($66.04/home-year) + ($105.03/home-year) = **$171.07/home-year**

GHG emission reductions

= (5797 therms/year) x (5.32 MTCO2e/1000 therms) = 30.8 MTCO2e/year

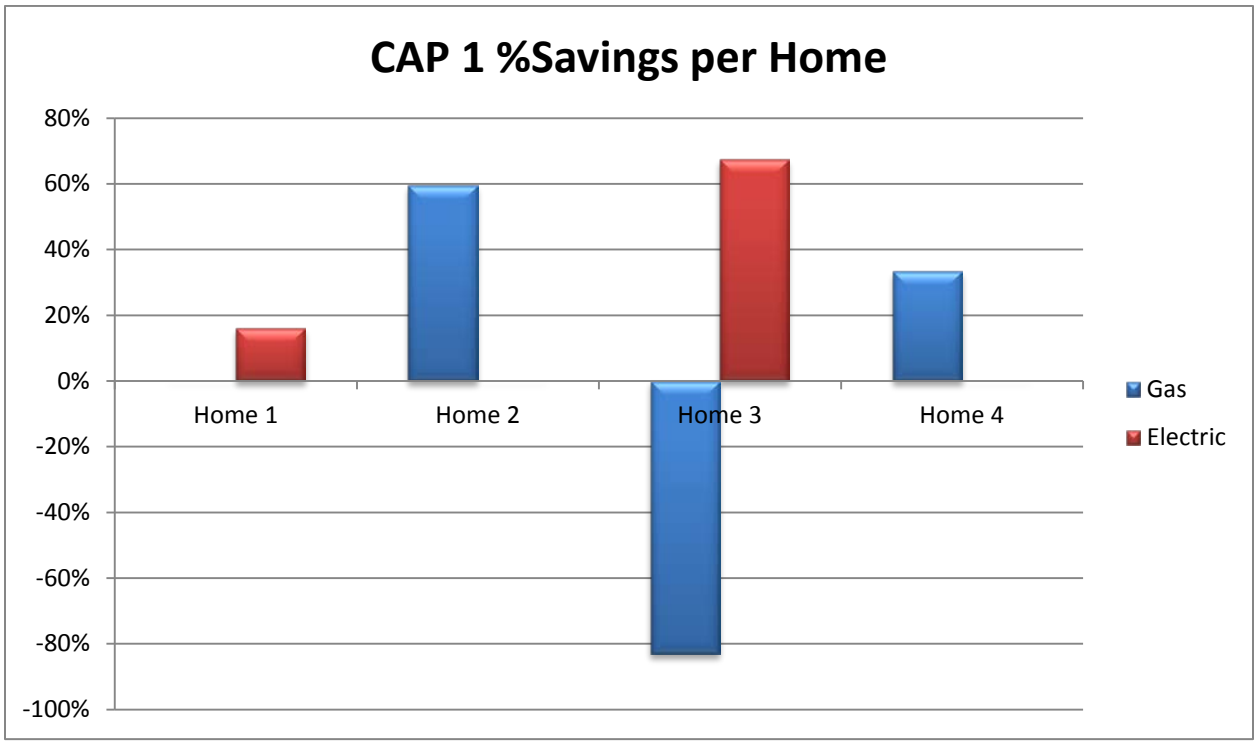
= (94286 kWh/year) x (1.086 MTCO2e/1000 kWh) = 102.4 MTCO2e/year

= (30.8 MTCO2e/year) + (102.4 MTCO2e/year) = **133.2 MTCO2e/year**

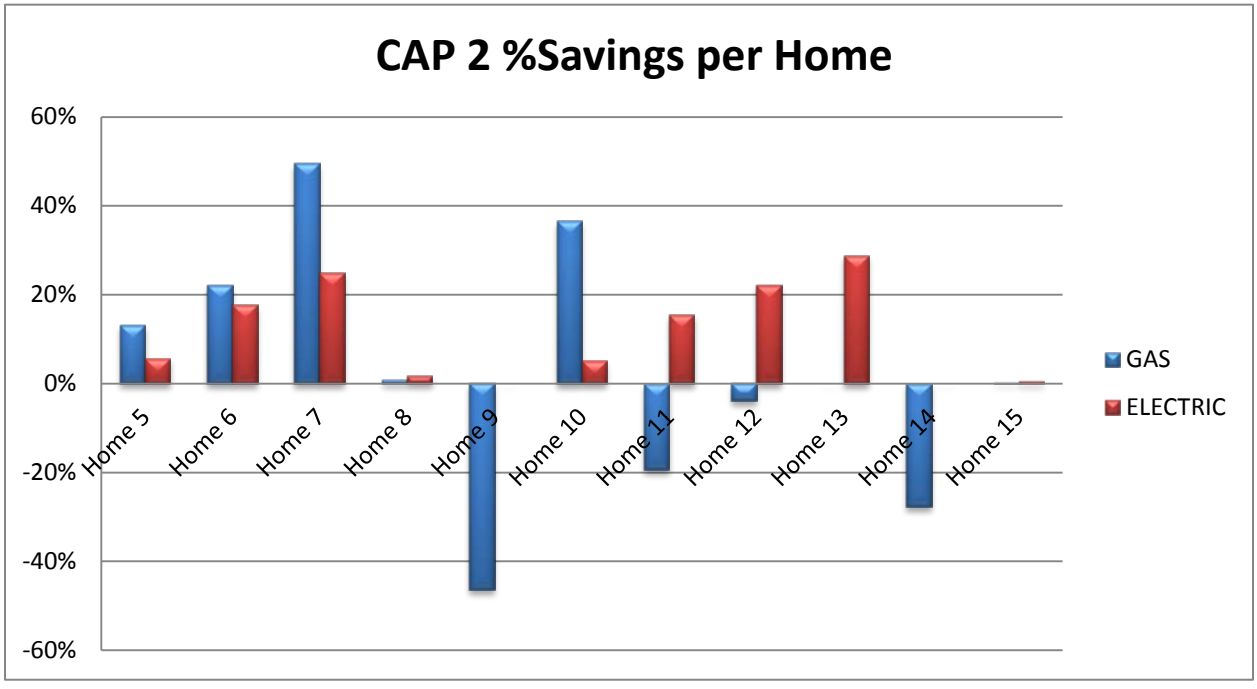
= (133.2 MTCO2e/year) / (79 homes) = **1.69 MTCO2e/home-year**

APPENDIX D: Energy Savings per Community Action Partnership

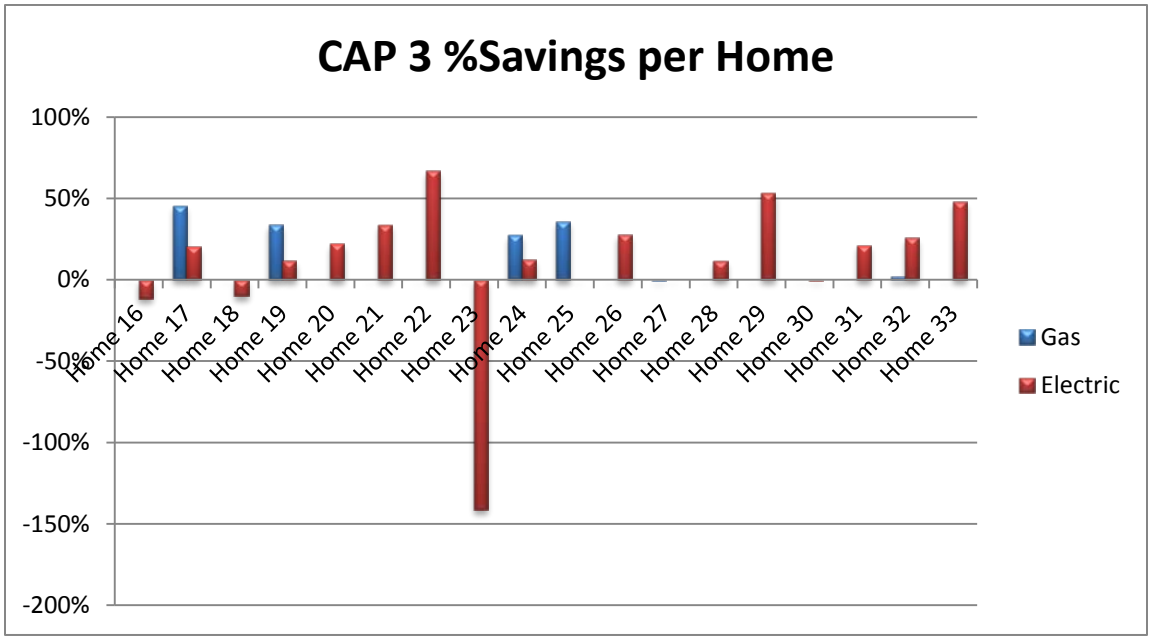
CAP 1												
					GAS				ELECTRIC			
	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 1	CAP 1	Frame	$2,665.48	$194.99	-	-	-	-	12711	10678	2033	16%
Home 2	CAP 1	Frame	$1,816.77	$165.67	944	383	561	59%	-	-	-	-
Home 3	CAP 1	Frame	$3,584.32	$44.09	228	417	-189	-83%	15587	5097	10490	67%
Home 4	CAP 1	Frame	$1,902.70	$580.72	830	553	277	33%	-	-	-	-
				Totals	2002	1353	649		28298	15775	12523	
					Total % Savings:			32%	Total % Savings:			44%



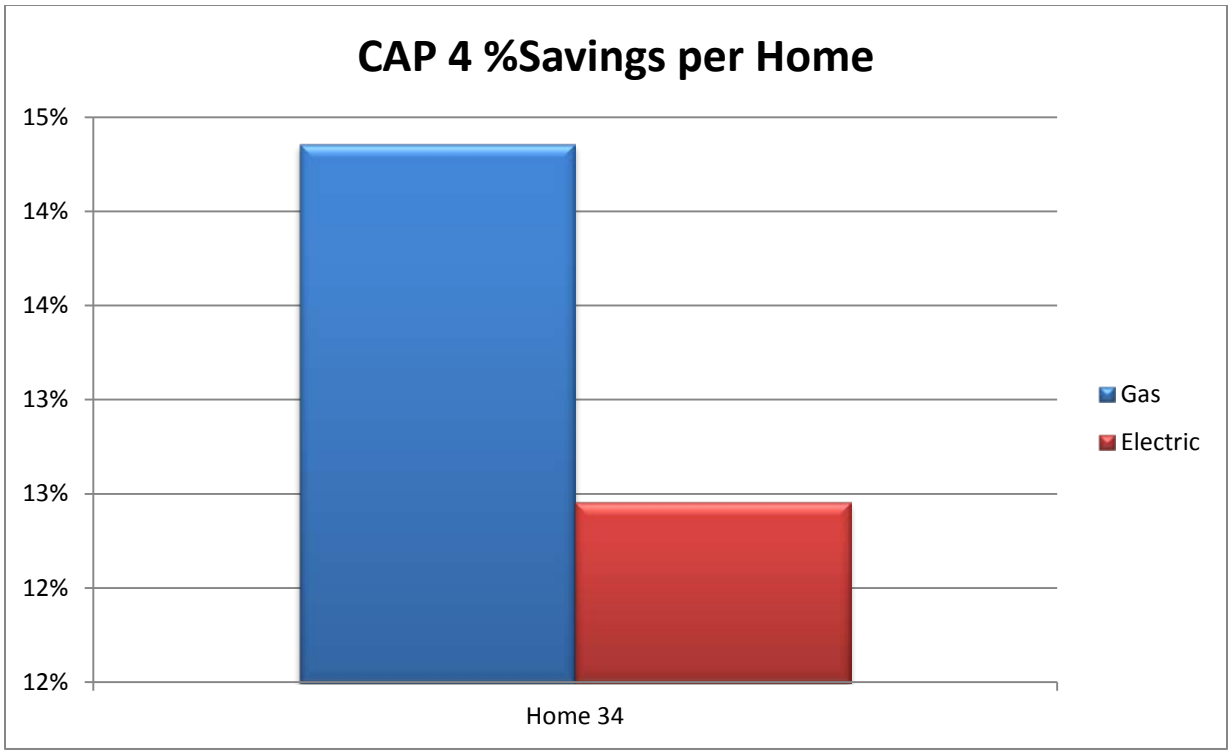
CAP 2												
					GAS				ELECTRIC			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 5	CAP 2	Frame	$4,704.81	$595.00	1582	1374	208	13%	14404	13572	832	6%
Home 6	CAP 2	Mobile	$766.40	$2,582.00	1116	870	246	22%	9543	7839	1704	18%
Home 7	CAP 2	Frame	$2,123.00	$1,045.00	708	358	350	49%	4307	3229	1078	25%
Home 8	CAP 2	Frame	$2,630.00	$1,230.00	695	689	6	1%	15230	14953	277	2%
Home 9	CAP 2	Frame	$4,193.00	$130.00	382	559	-177	-46%	-	-	-	-
Home 10	CAP 2	Frame	$3,817.64	$634.00	818	518	300	37%	3793	3593	200	5%
Home 11	CAP 2	Frame	$4,842.20	$1,040.50	336	401	-65	-19%	13198	11146	2052	16%
Home 12	CAP 2	Mobile	$1,903.30	$2,790.00	429	446	-17	-4%	13063	10174	2889	22%
Home 13	CAP 2	Mobile	$4,415.60	$1,972.29	689	689	0	0%	15452	10988	4464	29%
Home 14	CAP 2	Mobile	$0.00	$1,128.00	527	673	-146	-28%	-	-	-	-
Home 15	CAP 2	Frame	$1,956.00	$275.00	541	540	1	0%	8859	8815	44	0%
				Totals	7823	7117	706		97849	84309	13540	
					Total % Savings:			9%	Total % Savings:			14%



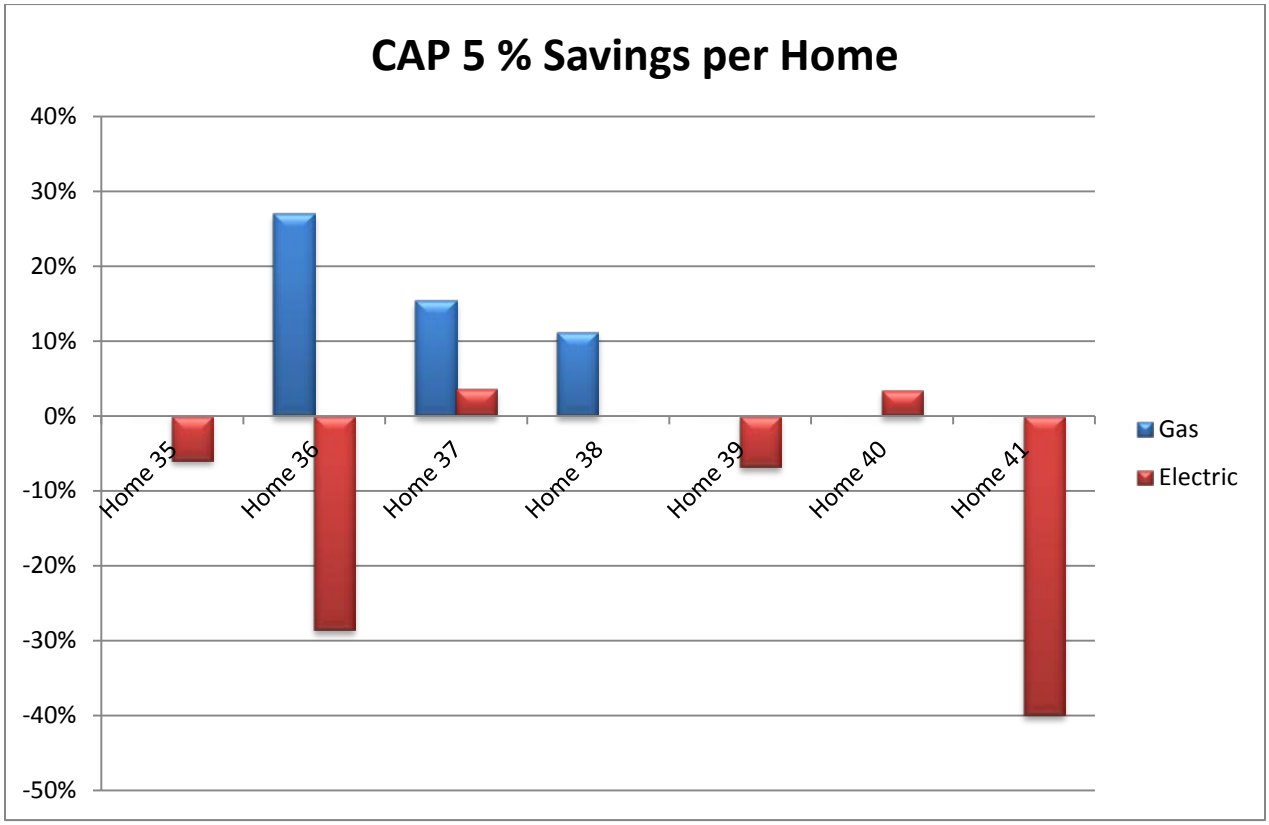
CAP 3												
					GAS				ELECTRIC			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 16	CAP 3	Frame	$3,110.99	$251.69	-	-	-	-	20316	22650	-2334	-11%
Home 17	CAP 3	Frame	$3,937.50	$1,835.00	541	296	245	45%	10052	7992	2060	20%
Home 18	CAP 3	Frame	$1,671.26	$4,329.65	-	-	-	-	6560	7220	-660	-10%
Home 19	CAP 3	Frame	$1,729.66	$32.23	608	401	207	34%	10960	9646	1314	12%
Home 20	CAP 3	Frame	$4,010.12	$536.09	-	-	-	-	11398	8863	2535	22%
Home 21	CAP 3	Frame	$582.60	$4,558.45	-	-	-	-	9586	6356	3230	34%
Home 22	CAP 3	Frame	$3,911.41	$101.46	-	-	-	-	20780	6834	13946	67%
Home 23	CAP 3	Frame	$211.17	$1,426.72	-	-	-	-	8097	19524	-11427	-141%
Home 24	CAP 3	Frame	$623.30	$34.15	657	478	179	27%	2759	2404	355	13%
Home 25	CAP 3	Mobile	$837.79	$5,014.21	593	378	215	36%	-	-	-	-
Home 26	CAP 3	Frame	$885.71	$228.21	-	-	-	-	24959	18037	6922	28%
Home 27	CAP 3	Mobile	$1,018.92	$1,701.30	857	862	-5	-1%	-	-	-	-
Home 28	CAP 3	Frame	$906.84	$9.39	-	-	-	-	28864	25530	3334	12%
Home 29	CAP 3	Frame	$1,751.41	$4,622.07	-	-	-	-	12482	5845	6637	53%
Home 30	CAP 3	Frame	$4,733.90	$1,598.78	-	-	-	-	8312	8362	-50	-1%
Home 31	CAP 3	Mobile	$2,091.48	$305.16	-	-	-	-	22151	17378	4773	22%
Home 32	CAP 3	Mobile	$1,200.07	$365.84	741	723	18	2%	21998	16278	5720	26%
Home 33	CAP 3	Frame	$5,930.72	$103.81	-	-	-	-	35080	18168	16912	48%
				Totals	3997	3138	859		254354	201087	53267	
					Total % Savings:			21%	Total % Savings:			21%



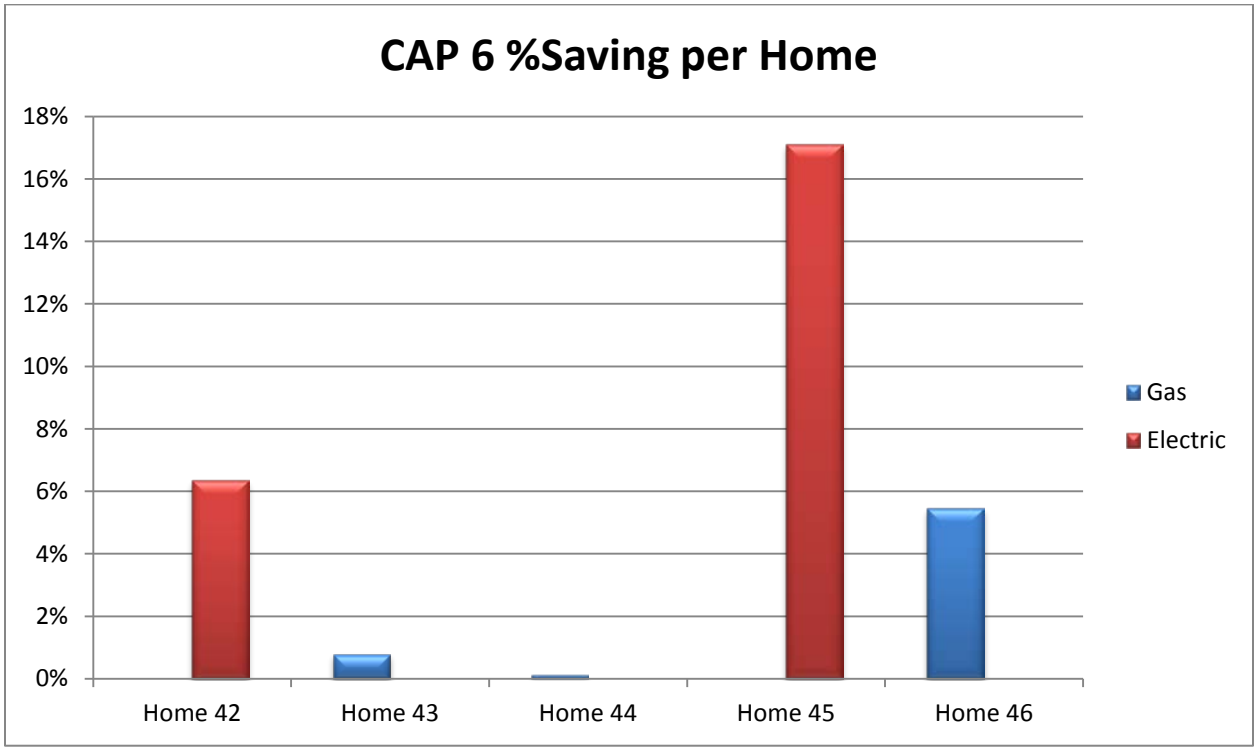
CAP 4												
					GAS				ELECTRIC			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 34	CAP 4	Frame	$880.63	$2,572.52	606	519	87	14%	6561	5744	817	12%
					Total % Savings:			14%	Total % Savings:			12%



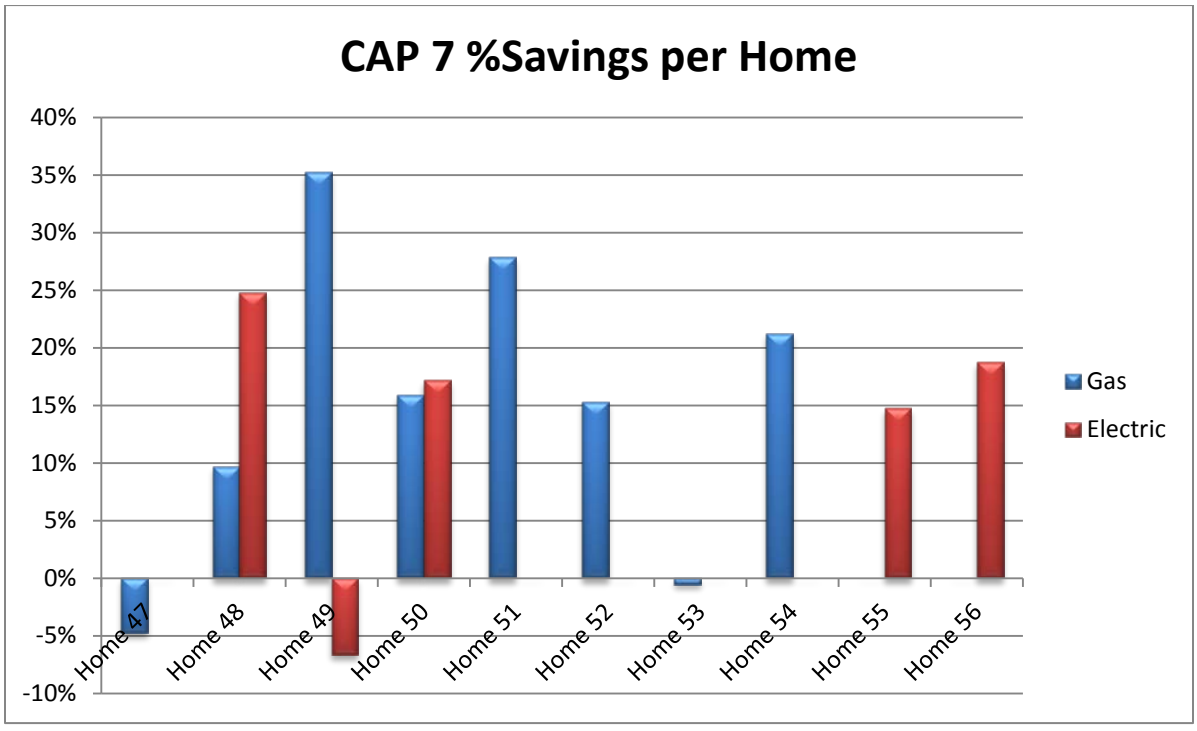
CAP 5												
					GAS				ELECTRIC			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 35	CAP 5	Frame	$5,738.64	$229.80	-	-	-	-	18668	19771	-1103	-6%
Home 36	CAP 5	Frame	$4,592.74	$84.82	722	527	195	27%	4098	5268	-1170	-29%
Home 37	CAP 5	Frame	$794.59	$3,121.10	363	307	56	15%	11241	10841	400	4%
Home 38	CAP 5	Frame	$106.57	$29.90	684	608	76	11%	13564	13556	8	0%
Home 39	CAP 5	Frame	$1,632.74	$102.73	-	-	-	-	16964	18106	-1142	-7%
Home 40	CAP 5	Frame	$239.70	$3.90	-	-	-	-	24276	23442	834	3%
Home 41	CAP 5	Frame	$596.79	$56.57	-	-	-	-	8049	11259	-3210	-40%
				Totals	1769	1442	327		96860	102243	-5383	
					Total % Savings:			18%	Total % Savings:			-6%



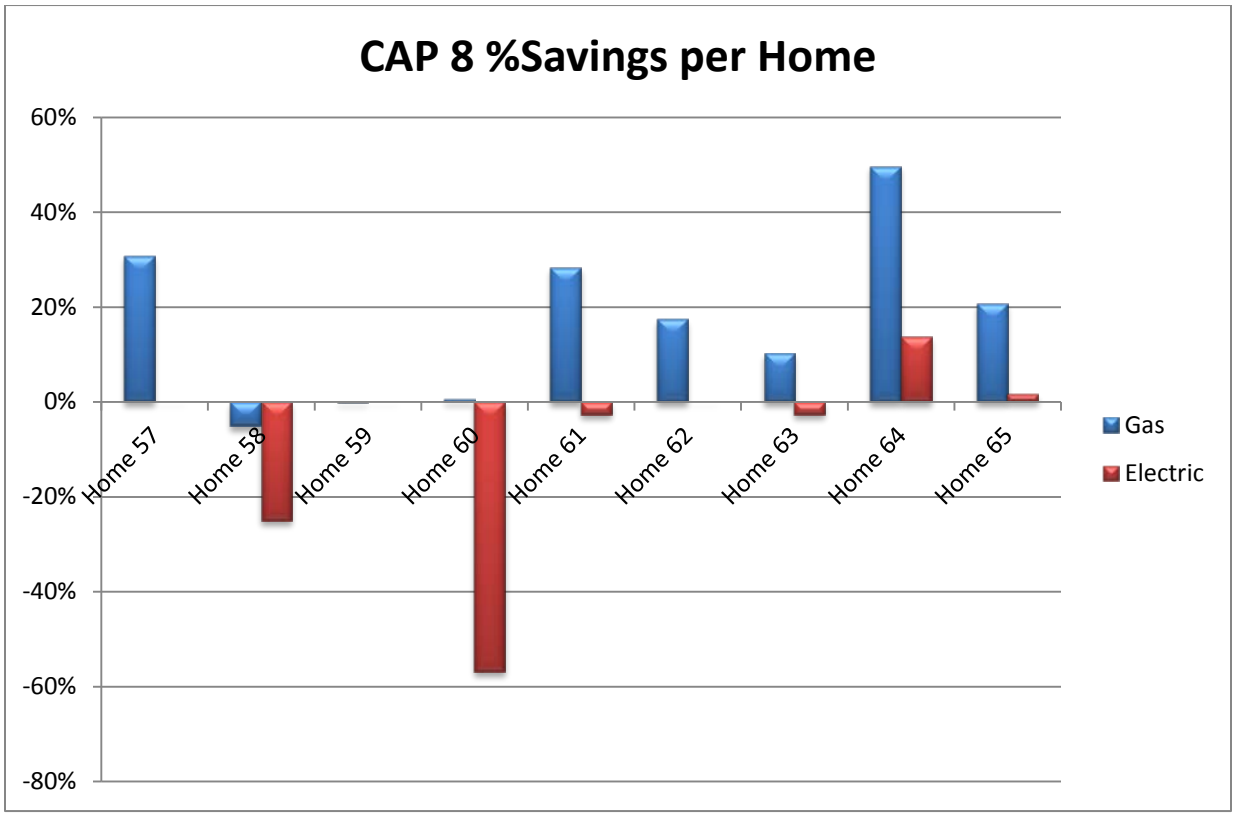
CAP 6												
					GAS				ELECTRIC			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 42	CAP 6	Frame	$1,421.69	$73.07	-	-	-	-	29476	27605	1871	6%
Home 43	CAP 6	Frame	$699.37	$178.20	1014	1006	8	1%	-	-	-	-
Home 44	CAP 6	Mobile	$330.98	$4,599.41	905	904	1	0%	-	-	-	-
Home 45	CAP 6	Frame	$1,641.28	$60.97	-	-	-	-	14364	11906	2458	17%
Home 46	CAP 6	Frame	$809.38	$145.79	459	434	25	5%	-	-	-	-
				Totals	2378	2344	34		43840	39511	4329	
					Total % Savings:			1%	Total % Savings:			10%



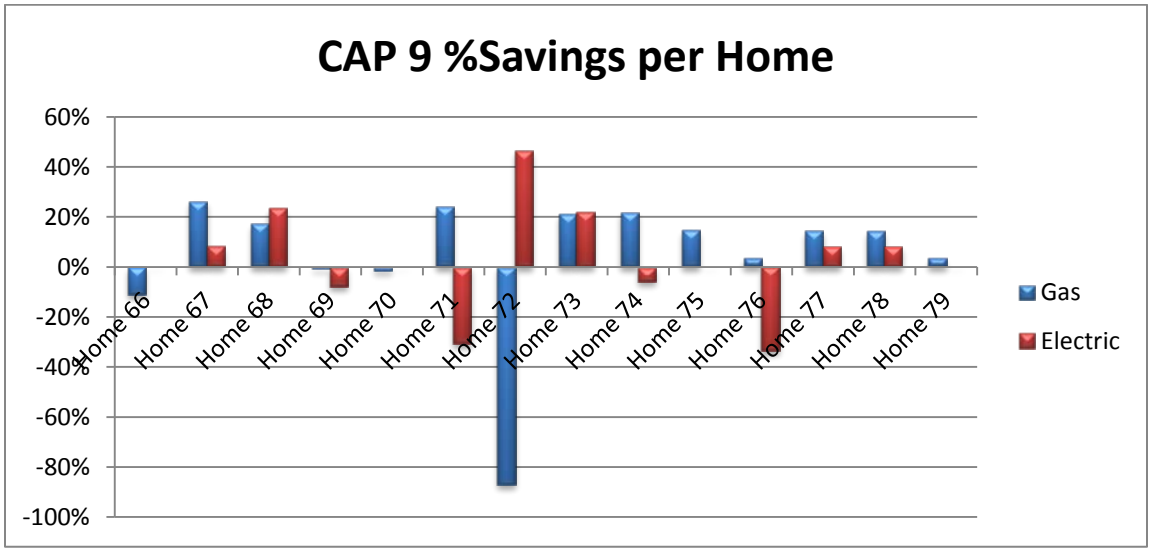
CAP 7												
					GAS				ELECTRIC			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 47	CAP 7	Mobile	$18.43	$21.51	613	642	-29	-5%	-	-	-	-
Home 48	CAP 7	Frame	$4,547.30	$37.44	557	503	54	10%	23253	17484	5769	25%
Home 49	CAP 7	Frame	$5,026.30	$31.97	702	455	247	35%	2885	3076	-191	-7%
Home 50	CAP 7	Frame	$474.44	$37.54	1546	1301	245	16%	15593	12917	2676	17%
Home 51	CAP 7	Frame	$2,969.75	$55.52	919	663	256	28%	-	-	-	-
Home 52	CAP 7	Frame	$2,253.40	$44.91	379	321	58	15%	-	-	-	-
Home 53	CAP 7	Frame	$386.85	$38.16	784	788	-4	-1%	-	-	-	-
Home 54	CAP 7	Frame	$6,872.10	$59.91	1487	1171	316	21%	-	-	-	-
Home 55	CAP 7	Frame	$6,174.77	$3.73	-	-	-	-	33199	28308	4891	15%
Home 56	CAP 7	Frame	$9,516.76	$15.00	-	-	-	-	25592	20799	4793	19%
				Totals	6987	5844	1143		100522	82584	17938	
					Total % Savings:			16%	Total % Savings:			18%



CAP 8												
					GAS				ELECTRIC			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 57	CAP 8	Frame	$2,151.66	$20.50	1253	868	385	31%	-	-	-	-
Home 58	CAP 8	Mobile	$626.61	$1,704.82	625	657	-32	-5%	5744	7184	-1440	-25%
Home 59	CAP 8	Frame	$213.56	$772.13	749	751	-2	0%	-	-	-	-
Home 60	CAP 8	Frame	$342.28	$1,004.50	812	808	4	0%	10608	16644	-6036	-57%
Home 61	CAP 8	Frame	$4,749.95	$1,178.00	599	429	170	28%	4764	4895	-131	-3%
Home 62	CAP 8	Frame	$1,130.00	$4,049.00	523	432	91	17%	-	-	-	-
Home 63	CAP 8	Frame	$400.97	$1,593.00	621	558	63	10%	14074	14456	-382	-3%
Home 64	CAP 8	Frame	$4,121.06	$182.00	800	402	398	50%	5043	4346	697	14%
Home 65	CAP 8	Frame	$1,604.01	$2,941.82	635	503	132	21%	6285	6185	100	2%
				Totals	6617	5408	1209		46518	53710	-7192	
					Total % Savings:			18%	Total % Savings:			-15%



CAP 9												
					GAS				ELECTRIC			
Home	Agency	Building Type	Total Weatherization Cost	Total Health and Safety Cost	Pre NAC (therms/yr)	Post NAC (therms/yr)	NAS (therms/yr)	% Savings	Pre NAC (kWh/yr)	Post NAC (kWh/yr)	NAS (kWh/yr)	% Savings
Home 66	CAP 9	Frame	$3,053.01	$828.30	557	618	-61	-11%	-	-	-	-
Home 67	CAP 9	Frame	$520.79	$5,213.66	824	607	217	26%	8779	8061	718	8%
Home 68	CAP 9	Frame	$715.87	$903.00	548	452	96	18%	4225	3241	984	23%
Home 69	CAP 9	Frame	$1,588.92	$1,190.03	1039	1047	-8	-1%	6077	6547	-470	-8%
Home 70	CAP 9	Frame	$109.78	$94.44	966	981	-15	-2%	-	-	-	-
Home 71	CAP 9	Frame	$2,033.80	$1,500.88	1121	849	272	24%	6160	8054	-1894	-31%
Home 72	CAP 9	Mobile	$1,302.37	$1,626.87	553	1034	-481	-87%	19481	10402	9079	47%
Home 73	CAP 9	Frame	$2,314.51	$132.83	1029	814	215	21%	8616	6735	1881	22%
Home 74	CAP 9	Frame	$3,723.02	$84.38	1406	1095	311	22%	15081	15942	-861	-6%
Home 75	CAP 9	Frame	$1,667.02	$1,227.76	693	591	102	15%	-	-	-	-
Home 76	CAP 9	Frame	$2,176.33	$1,778.88	2178	2105	73	3%	17373	23204	-5831	-34%
Home 77	CAP 9	Frame	$1,836.70	$1,352.62	487	416	71	15%	3382	3102	280	8%
Home 78	CAP 9	Frame	$1,757.81	$24.12	991	850	141	14%	6816	6255	561	8%
Home 79	CAP 9	Frame	$3,039.32	$89.50	949	917	32	3%	-	-	-	-
				Totals	13341	12376	965		95990	91543	4447	
					Total % Savings:			7%	Total % Savings:			5%



NebGuides

Summer 2015

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IANR NebGuide Nebraska Lincoln

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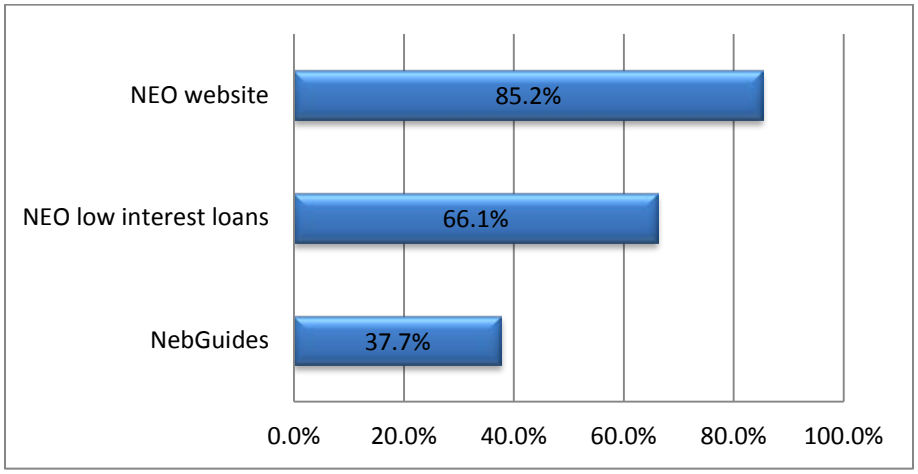
Know how. Know now.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

An analysis of the University of Nebraska-Lincoln's NebGuides along with the Nebraska Energy Office's programs and services was conducted in order to determine the use and awareness of these items. This project was on behalf of UNL Extension in partnership with the Nebraska Energy Office. This was a two-fold process. The first step was to obtain data for analysis and the second was to provide more information on the topics of discussion. In order to obtain data for analysis, a survey was created and sent out via email to Extension Educators throughout the state of Nebraska. This was a short survey made up of five multiple choice questions and two short answer questions. After being made aware of NebGuides and the programs of the Nebraska Energy Office, through the initial survey, a follow-up email providing more detailed information regarding the Nebraska Energy Office's key programs and services was then sent out as well. Figure 4 summarizes the Extension Educators' overall awareness based upon survey results.

Figure 4



One brief survey did not allow for a particularly in-depth analysis of the previously mentioned topics. It did, however, accomplish to provide a good initial breakdown. This project had a fairly broad scope with the main goal being to determine previous and increase future awareness, which the survey and follow-up managed to accomplish.

PROJECT DESCRIPTION

NebGuides are online publications that are meant to help inform people on a wide variety of general information and topics. These guides are written and published by specialists and educators in the University of Nebraska-Lincoln's Institute of Agriculture and Natural Resources department. Some of the topics include crop production, gardening, managing finances, energy efficiency, and much more. For the purpose of this project, however, we focused on the energy efficiency and weatherization NebGuides. This includes six NebGuides (G2230-G2235) that were created in partnership with the Nebraska Energy Office in 2014. Table 9 below lists each guide along with its name and a brief description. The goal for this project was to determine the effectiveness of these interactive tools in educating the public and define ways in which to increase Extension Educators' as well as the public's awareness of the NebGuides and some of the key programs and services provided by the Nebraska Energy Office. To accomplish this, a survey was drafted and dispersed to Extension Educators throughout the state of Nebraska via email. The survey titled *Nebraska Extension, Nebraska Energy Office Cooperation Survey,* was made up of seven questions varying between multiple choice and short answer types. A copy of the survey that was sent out can be found in Appendix B. A follow up email giving more detailed information regarding the Nebraska Energy Office's services and programs was then sent out a few days later to further increase awareness of these topics.

Table 9

Number	Title	Topic
G2230	Home Efficiency: Refrigerators	Refrigerators consume a significant amount of energy. Consider how you're using your unit(s) and whether it's more economical to replace with an energy-efficient model.
G2231	Home Efficiency: Air Sealing	Cracks and gaps around windows, doors, and the foundation of a home waste energy and cost money. Filling unwanted openings with the proper sealant will increase energy efficiency.

G2232	Energy-Efficient Lighting	A publication to help homeowners reduce lighting costs by choosing the energy-efficient bulb that's right for different locations within the home. Money-saving tips and a video are included.
G2233	Home Efficiency: Insulation	Properly installed insulation can help keep heat in during winter months. This publications explains options for insulation and provides tips for other energy-saving measures.
G2234	Home Efficiency: Homeowners and Energy Codes	Understanding energy codes helps homeowners make wise decisions when choosing energy efficient products, such as insulation and windows, for their new or existing home.
G2235	Home Efficiency: Energy Efficiency	Energy efficiency improvements often pay for themselves through reduced energy bills. This publication describes several methods you can use to calculate the potential savings.

Table 1: Home Efficiency NebGuides. Copies of these guides can be found in Appendix A.

SUMMARY OF RESULTS

At the time of assessment, the final number of completed surveys came to 62. While there was still a significant portion of Extension Educators who did not complete the survey, gathering 62 responses was enough to obtain a general analysis of the use and awareness of NebGuides as well as the programs and services provided by the Nebraska Energy Office.

Extension Educators indicated that there is not an abundance of home energy efficiency inquiries. However, survey results show that over 24% do receive at least a few questions on this topic each year. This shows that energy efficiency information is needed and therefore NebGuides G2230-G2235 have the potential to be quite useful to educators. As expected, however, nearly 40% of Extension Educators were not aware that the NebGuides existed. Figure 5 and Figure 6 show the results of questions 1 and 2 respectively from the survey.

Figure 5

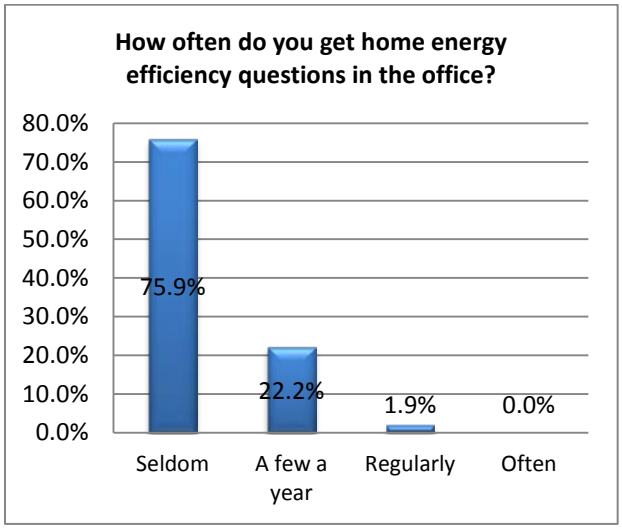
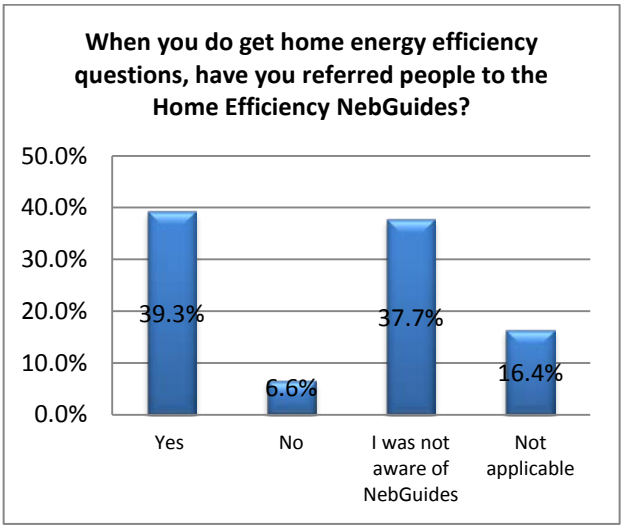


Figure 6



Awareness of the programs and services provided by the Nebraska Energy office was lower than that of the NebGuides. 41 of the total 62 people reported that they did not know the NEO offers low interest loans for energy efficiency and renewable energy projects. A larger portion of 52 out of the total 62 had never visited or referred clients to the Nebraska Energy Office website. This was determined by the results of the final survey question. Figure 7 and Figure 8 show the results of survey questions 6 and 7 respectively.

Figure 7

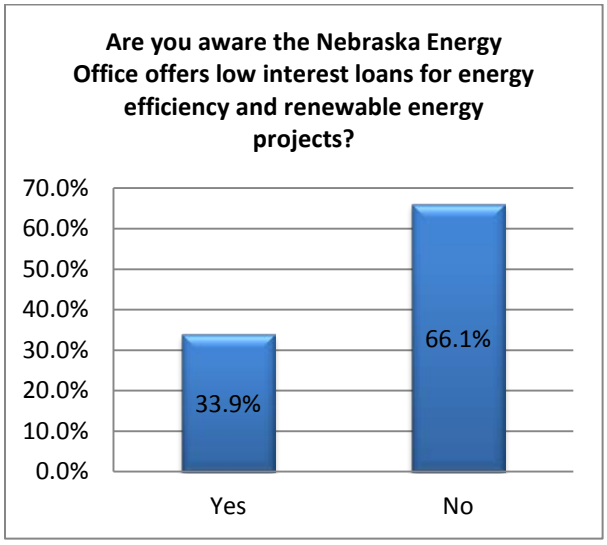
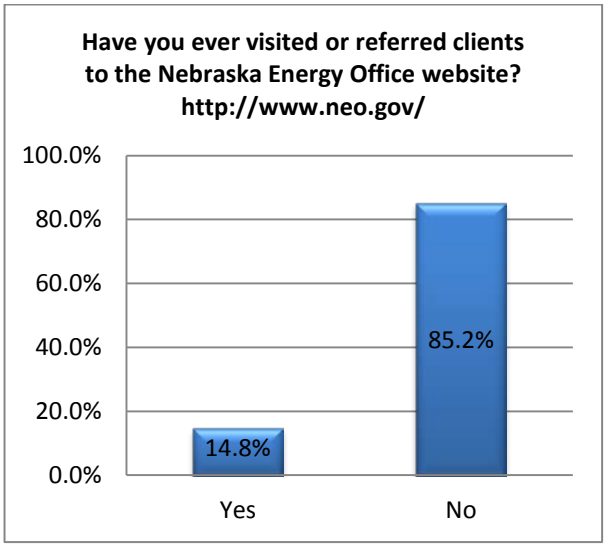


Figure 8



Question 3 was a short answer question asking participants to input the resources they use to answer any home energy questions they might receive. There were a total of 28 varying responses to this question. The most common answers were first: refer the question to other extension staff and second: online searches. A few responses indicated that some Extension Educators were not aware of good resources to answer home energy questions; with one respondent saying “I struggle with this greatly”. This indicates that increasing awareness of both NebGuides and the Nebraska Energy Office’s programs and services could have a positive impact on Extension Educators along with the general public.

APPENDICES

APPENDIX A: NebGuides G2230-G2235

APPENDIX B: Nebraska Extension, Nebraska Energy Office Cooperation Survey

APPENDIX A: NebGuides G2230-G2235

IANR NebGuide
University of Nebraska–Lincoln Extension, Institute of Agriculture and Natural Resources
Know how. Know now.
G2230

Home Efficiency: Refrigerators

F. John Hay, Extension Educator – Energy
Lynn Chamberlin, Nebraska Energy Office

Refrigerators consume a significant amount of energy. Consider how you're using your unit(s) and whether it's more economical to replace with an energy-efficient model.

Like an old friend, your old refrigerator sits out in the garage faithfully chugging away, but sucking up enough power to light up a small town.

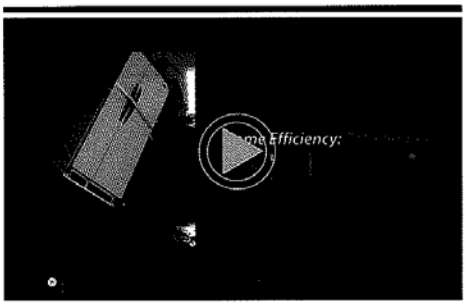
Refrigerators and freezers can consume nearly a sixth of all electricity in a typical American home, using more energy than any other single household appliance (*Figure 1*). Although it may be difficult to believe, that old friend that has been running faithfully since the 1980s — or earlier — may be adding over $140 a year to your electric bill; in the case of old chest freezers, $108 a year.

Figure 1. Refrigerators and freezers, especially older models, are a major energy user in homes.

Keep in mind, appliances have two price tags: one is the purchase price you pay at the store, and the other is the operating cost paid month after month, year after year, in the form of your electric bill.

When looking for ways to reduce your home electrical bill, consider how you use your refrigerator(s) and freezer(s). If you have a second unit in your basement or garage, answer these questions:

- What do you store in it?
  Are you paying an additional $9-12 each month to keep some drinks or fishing worms cool?



https://www.youtube.com/watch?v=Q_hQ0DVQFpU

- How old is it?
  If it is 8 years old or older you could save 40 percent of your energy use by replacing it with a new model. If it is less than 5 years old, you will need to research the benefits of replacing the unit.
- How full is it?
  Are you paying monthly to run a partially full or nearly empty freezer? Can you use the second unit seasonally and unplug it when it is not needed?

Fortunately, appliances have become much more efficient over the past couple of decades. While there is still room for improvement, today's models use 60 percent less electricity on average than 20-year-old models. If you replace an old, inefficient refrigerator or freezer with a new, more efficient model, the new unit can easily pay for itself just from the energy savings alone.

Shopping Tips

Some things to keep in mind when considering purchasing a new, efficient refrigerator:

- Compare the Energy Guide labels and consider the cost savings that ENERGYSTAR®-qualified models provide.

- 16- to 20-cubic-foot models with top or bottom freezers are the most efficient sizes and styles. If you can't live without something larger or a side-by-side model, find the most efficient model available.
- Automatic ice makers and through-the-door dispensers can increase energy use by 14 to 20 percent.

Remember Rebates and Recycling

Numerous federal, state, and local programs offer rebates for purchasing high efficiency or ENERGY STAR appliances, as well as for recycling your old unit (*Figure 2*).

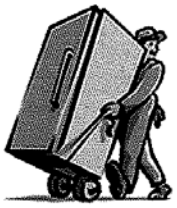


Figure 2. Before hauling an old refrigerator or freezer to the curb, check to see if there's a rebate for recycling it.

This publication has been peer reviewed.

Index: Consumer Education
Energy Conservation
Issued April 2014

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University of Nebraska–Lincoln Extension educational programs abide with the nondiscrimination policies of the University of Nebraska–Lincoln and the United States Department of Agriculture.

NebGuide

University of Nebraska–Lincoln Extension, Institute of Agriculture and Natural Resources

Know how. Know now.

G2231

Home Efficiency: Air Sealing

F. John Hay, Extension Educator — Energy
Lynn Chamberlin, Nebraska Energy Office

Cracks and gaps around windows, doors, and the foundation of a home waste energy and cost money. Filling unwanted openings with the proper sealant will increase energy efficiency.

Big air leaks in homes waste energy and money. Typically these leaks waste between 10 and 25 percent of a home's heating energy, and the holes and gaps can allow dust, moisture, pollutants, noise, insects, and rodents to enter the home.

To keep heating costs down during cold Nebraska winters, it helps to seal cracks and unwanted openings in your house to prevent drafts that displace precious heat. Warm air will naturally move to a cooler space, so if your house is not well sealed, heat will escape to the cold outdoors. As the warm air escapes, cold outside air is also pulled in through cracks around the foundation and near doors, windows, and other openings to replace heated air being lost.

Since warm air also rises, cracks and openings in the ceiling are a major concern. This air movement pattern is called the **stack effect** (*Figure 1*).

Poorly sealed houses act like giant chimneys and the greater the temperature difference between outside and inside, the faster heat moves up and out. Winter winds also speed the process. You can stop this great heat escape by sealing up your house. However, before beginning be sure to correct any moisture or indoor air quality problems in your house, because air-sealing could make them worse. It's also very important to make sure all combustion appliances such as furnaces and water heaters are working correctly and are properly vented.

https://www.youtube.com/watch?v=u_VYxPx_C38

Blower Door Tests and What They Tell You

A blower door is a device that depressurizes a home and actually measures the home's air leakage under pressure. A blower door test reveals whether your home has air leaks and provides an overall tightness measure of your house (*Figure 2*). It is basically a large fan that pulls air out of your house. As it pulls the air out, the technician can accurately measure air tightness and locate air leaks.

You can conduct your own air leak test on a windy day using your hand. Dampen your hand and hold it around closed windows, doors and other suspect places. A slight leak will make your hand feel very cool.

Winter

Figure 1. Cold air enters through cracks and openings around windows, doors, and the foundation, while warm air rises and escapes through cracks and openings in the ceiling and roof.

Outgoing Air
Inward Leaking Air

Figure 2. A blower door test measures air leakage and identifies where the home has leaks.

Caulk, Foam, and Weatherstripping: Basic Air-Sealing Materials

How efficiently you are able to seal air leaks depends on the size and location of the leaks and in choosing the right material for the job. Plug larger holes with pieces of drywall or cardboard. Or, stuff the holes with plastic bags, similar to a garbage bag, filled with glass fiber insulation scraps. For most openings, caulking, sealants, and weatherstripping are the most appropriate solutions.

Caulk is a semi-solid, toothpaste-like substance you apply into gaps no wider than 3/8 inch where different building materials meet, such as along a wall and the foundation. Hardware and building supply stores carry many varieties of caulk. Most often, caulking comes in tubes and is applied by using either a caulking gun (*Figure 3*) or squeezing by hand.

Figure 3. A caulking gun can be used to apply caulk.

Caulk is also available in card or rope form and applied with your fingers. For sealing cracks and holes in a climate like Nebraska's, select a quality product that seals well in both cold temperatures and in the heat of summer. Ask a store salesperson for help in choosing the right caulk for the job, and carefully follow the product directions. You'll need different types of caulk for different surfaces on the inside and outside of your house. Some caulk is waterproof, some not; some can be painted, some not; some expands, some does not. Generally, higher-end caulk seals better, lasts longer, and isn't much more expensive than the bargain varieties. Air sealing is one area in which you don't want to scrimp on materials, because a poorly sealed crack is still a crack.

Weatherstripping Options for Doors

Foam sealants are commonly used to fill larger gaps of up to 1 inch. Once applied, they expand to fill and seal the space and, like caulk, they harden as they dry. The two most common types are urethane and latex foam, both of which are available in cans at hardware and building supply stores. Differences between them regarding drying time and cleaning requirements should be taken into consideration when purchasing.

Weatherstripping eliminates gaps between movable parts when they are closed such as around the perimeters of exterior doors and operable windows. Weatherstripping can be made of metal, foam, rubber, vinyl, or felt and is often sold by the foot, or in pre-packaged window/door kits. If possible, always try to match the product that originally came with the door or windows — the finished result will look its best and likely be the most effective. Ask a store salesperson for help in selecting the right product for your job. Some materials are nailed or tacked on, others applied with self-adhesive tape. Well-installed weatherstripping will be slightly compressed when doors and windows are closed.

Start at the Top

Start by sealing gaps between your roof or attic and the living space below. Attention to this area will save the most on your heating bill. Every opening in the ceiling is a potential "chimney" and heat escape route. Check around electrical wires, light fixtures, recessed can lights, chimneys, stove flues, ductwork, plumbing vent pipes, and along the tops of walls.

To walk around in unfinished attics, lay boards on top of the joists, because the ceiling won't support your weight. Wear a dust mask and gloves in case you have to move or roll insulation back to look for leaks. Dirty spots on your insulation will generally indicate an air leak. In some old homes, partition walls from below open into the attic space. These large openings can be sealed by stuffing them with plastic bags filled with glass fiber insulation. Chimneys and stove flues require special attention. They must be sealed using heat-resistant caulk for small gaps. For larger openings, also add a sheet metal collar to help in sealing. Treat the attic hatch as if it is an outside door and apply weatherstripping around it and add insulation to the attic-side surface.

Seal and Insulate Ductwork

If you have a forced air heating system, it pays to seek out leaks in both the supply and return ducts in attics and crawl spaces. Make sure all the pieces are properly connected. With the furnace fan operating, run your hand over the duct seams/joints to feel for air leaks. Holes in supply ducts will blow air out of the system, and gaps in return ducts will suck air into the system. Plug any leaks you find with foil duct tape (not gray Duct Tape), or better yet, use water-based mastic coupled with glass fiber mesh tape. Once the leaks are fixed, insulate ducts located in unheated areas with foil-faced glass fiber duct insulation. Just wrap the insulation around the duct and secure it into place.

Tackle the Low Spots

Now you're ready to seal up those places where cold air can get in — around window and door frames and between your living space and unheated basement or crawl space. You can use the same methods and materials as you used in the attic: weatherstrip around doors and operable windows, and seal gaps with caulk, foam, or drywall. Again, make sure to use heat resistant products around chimneys and stove flues. You also can buy inexpensive foam gaskets that fit behind electrical outlet and light switch cover plates. If you have a fireplace, be sure the damper is closed when you're not using it, and seal it up tighter if you don't use it much. Be careful down in the basement or crawl space because it is possible to do *too much* tightening around your home's foundation. All combustion appliances, such as gas furnaces, water heaters, and ranges, need fresh air to operate properly; too-tight homes may lack adequate air supply for combustion appliances. Lack of combustion air can cause furnaces to produce carbon monoxide and chimneys to backdraft. Contact a heating contractor for assistance in determining just how tightly to seal.

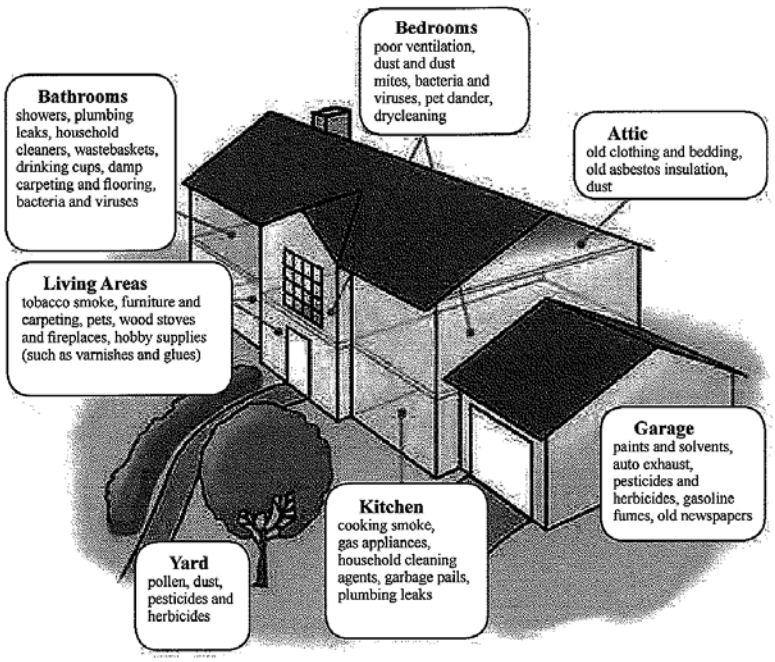

Figure 4. Common sources of household indoor air pollutants

Indoor Air Quality

Air exchange between the home and outdoors is essential for good indoor air quality (*Figure 4*). This air exchange generally occurs through unintentional air leakage (especially in existing, older homes) or through a mechanical ventilation system. The amount of air leakage into a home can vary based on winds and stack effect, over-ventilating homes during cold windy weather and underventilating them during mild, calm, weather. Contact a heating contractor for assistance in determining whether mechanical ventilation is needed in your home.

To remove moisture and odors, kitchens and bathrooms should have exhaust fans vented to the outdoors. Clothes dryers should always be vented to the outdoors too, because their exhaust contains moisture, lint, and chemicals from fabrics and soap.

Moisture itself isn't a pollutant, but excessive moisture encourages mold growth, and mold spores can cause respiratory ailments.

Air-Sealing Brings Many Benefits

No matter who does the work, you or a contractor, the time and money spent on appropriate air-sealing will provide many returns, especially when coupled with attic, wall, and floor insulation. Making your home energy-efficient will not only lower your heating bills, but also keep your home warmer in the winter, cooler in the summer, and cleaner because less dust will blow in. Now that's an added bonus anyone can appreciate!

Resources

Nebraska Energy Assistance Network: Weatherization
http://www.youtube.com/watch?v=ow7Fsi8IsuQ&list=TL-xm83SCC4y0

More Nebraska Energy Assistance Network Videos
http://www.youtube.com/user/NEANvideo

This publication has been peer reviewed.

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NebGuide

University of Nebraska–Lincoln Extension, Institute of Agriculture and Natural Resources

Know how. Know now.

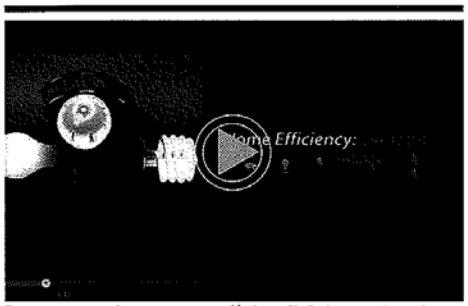
G2232

Energy-Efficient Lighting

F. John Hay, Extension Educator — Energy
Lynn Chamberlin, Nebraska Energy Office

A publication to help homeowners reduce lighting costs by choosing the energy-efficient bulb that's right for different locations within the home. Money-saving tips and a video are included.

Here's an interesting energy fact: Only about 10 percent of the energy used by a regular incandescent light bulb goes toward producing light. The other 90 percent of the power is wasted as heat. In comparison, energy-efficient lights produce higher percentages of light than heat with the electricity they consume. As a result, they can provide the same amount of light as standard bulbs while using much less energy. Since lighting typically consumes about 25 percent of home's baseload electricity use, it represents a big area for potential savings.



Learn more about energy-efficient lighting options in this short video.

https://www.youtube.com/watch?v=_ich-LjdqdU

Compact Fluorescent Lights (CFLs)

CFLs offer great potential for energy savings. They use one-quarter to one-third the energy of incandescent bulbs and produce the same amount of light. They last 10 times longer than incandescent bulbs and screw into a standard light socket. This makes them a great option to use in hard-to-reach fixtures to save yourself some precarious trips up a ladder. CFLs can save you 60 percent or more on lighting costs, so they are most cost effective when used in the light fixtures used most often and for the longest time.

Though you may not notice a resemblance at first, they use the same technology as the long, white tube lights you're used to seeing in offices and schools (*Figure 1*). Manufacturers have developed multiple ways to shrink the energy benefits of fluorescent lighting into products that fit into conventional light sockets, hence the name "compact fluorescents."

Figure 1. Compact fluorescent bulbs like the one on the right use a fraction of the energy of incandescent bulbs like the one on the left. Both bulbs shown here are 60 watt equivalent, yet the CFL uses only about 18 watts.

You do need to keep in mind that CFLs are not appropriate for all home lighting needs. Some bulbs are sensitive to temperature and humidity and should not be used in some environments, and not all CFLs can be used with dimmer or three-way switches. *Read carefully all of the characteristics of the bulb listed on the package prior to purchase.*

Standard Tube Fluorescent Lighting

Standard tube fluorescent lights have dramatically improved in the past 10 years. The newer, more efficient tubes have a smaller diameter than the old ones and produce a warmer, more natural color of light, in addition to being more efficient. The skinnier T-8 tubes fit in standard fixtures and can improve fluorescent lighting efficiency by about 15 percent. New T-8 tube-type fluorescent fixtures feature electronic ballasts, which eliminate flicker and increase efficiency beyond what a T-8 tube with a standard ballast will produce. Some electronic ballasts even allow dimming.

Many models of new T-8 fixtures and lamps provide a pleasing enough color of light to use in the living areas of a home. They are a great replacement option for the inefficient

multibulb fixtures found above many bathroom mirrors and in laundry or basement rooms. Installing a specially designed dimmer for the fixture is an extra-nice touch. Dimmable fluorescent fixtures also work well for indirect lighting, often installed in a wall-mounted valance that allows light to bounce off the ceiling.

Light Emitting Diode (LED) Lamps

LED lighting uses light-emitting diodes as their source for illumination. The LEDs are a semiconductor device that converts electricity to light by using the movement of electrons. LED bulbs are available that can be screwed into traditional lamps and light fixtures and consume much less energy than incandescent (80-90%) and CFL lamps (15-25%) (*Figure 2*). They have a very long life of about 50,000 hours, which equates to over 17 years with 8 hours of use a day.

Figure 2. LED bulbs are long lasting and safe but are sensitive to heat and unsteady electrical current.

LED lighting contains no mercury or other toxins, emits no UV light, doesn't attract bugs, and doesn't generate much heat. But they do have some disadvantages: Currently, they are more expensive than the other technologies, and they can be sensitive to heat and unsteady electrical current, which can reduce their lifespan.

Halogen Lighting

Halogen bulbs are actually incandescent bulbs with halogen gas inside the glass. The added gas results in about 30 percent more light for the same amount of electricity, and the light quality is brighter and whiter. These bulbs last 2,000 to 4,000 hours. Be aware of safety concerns with halogen lamps. Tests conducted by the Consumer Product Safety Commission showed that some halogen bulbs can start fires if they come in contact with or are too close to combustible materials. These bulbs can reach temperatures ranging from about 970°F to 1,200°F. In contrast, a 150 watt incandescent bulb operates at a temperature of about 340°F, and a 75 watt bulb operates at about 260°F. Some types of halogen bulbs do operate at lower temperatures.

Lighting Tips

No matter what type of light bulbs you choose, you'll be guaranteed to save energy if you put into practice these common sense tips:

- Turn lights off when you're not using them.
- Take advantage of natural light from windows whenever possible.
- Don't use more light than you need.
- Focus the light on where it is needed most.
- Regularly dust your light bulbs and fixtures to prevent dirt build-up.

This publication has been peer reviewed.

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Know how. Know now.

G2233

Home Efficiency: Insulation

F. John Hay, Extension Educator — Energy
Lynn Chamberlin, Nebraska Energy Office

Properly installed insulation can help keep heat in during winter months. This publications explains options for insulation and provides tips for other energy-saving measures.

Keeping warm in poorly insulated homes costs so much because the heat doesn't stay in the home very long. Warm air produced by your heating system naturally wants to go to cold areas or surfaces. As a result, heat travels right through your home's walls, floors, and roof. This is called heat loss, and to compensate for the heat loss, the furnace will need to operate more, costing you money.

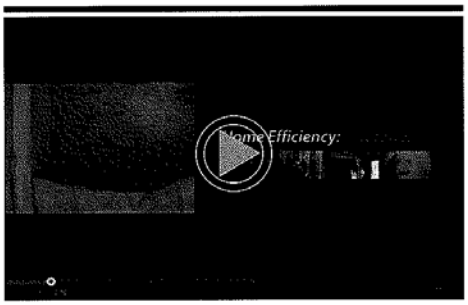
Insulation materials placed in walls, floors, and the under the roof slows heat loss. During the winter, insulation keeps the heat in, and during the summer, insulation works to keep your house cooler by keeping the heat out. If you can afford it, increasing insulation R-values beyond recommended levels is a wise choice.

Resistance is Key

The ability of insulation material to reduce heat flow is measured in terms of "resistance" or "R-value." It is most often measured per inch of material. The higher the R-value, the better the insulation properties of the material used. In Nebraska, it is recommended that the attic of an existing home be insulated between a R-38 and a R-49, floors to R-30, and exterior walls to R-13. Achieving these R-values depends on the type and thickness of insulation installed. For example, fiberglass batt insulation has an R-value of around 3.4 per inch of insulation, so one 3½-inch batt will insulate a wall cavity to about R-12. The R-value of extruded polystyrene board insulation is R-5 per inch, so just 2 inches of that material has close to the same insulation effectiveness as the fiberglass.

Insulation Types

Different types of insulation have different uses. It's important to select the right type of insulation for the job you're doing and to install it according to manufacturer's instructions so it will be as effective as possible.



https://www.youtube.com/watch?v=mfrXaWyQ1UY

The easiest time to install insulation is when your home is under construction, but it also can be added to most existing houses.

Insulation can be purchased in four basic forms:

1. Batts or blankets
2. Loose-fill
3. Rigid board
4. Foamed-in-place

Batts or Blankets. Insulation batts or blankets consist of fibers made from spun rock, slag, or glass. Glass fiber, the most common insulation, is made from glass and has an R-value of 2.2 to 3.2 per inch. Rock or mineral wool, made from rock or slag, has an R-value of 3.1 per inch.

Batts are cut to specific lengths, and blankets come in long "cut-it-yourself" rolls. Both types are available in thicknesses that range from 1-12 inches and are wide enough to fit into a standard 16-inch or 24-inch wall cavity opening, depending on your insulation needs. Batts and blankets work well when the space you want to insulate is an unfinished, framed-in area. Common applications include insulating unfinished walls, open attics, and basement or crawl space ceilings. You can buy batt and roll insulation with a built-in vapor retarders made of kraft paper, or you can buy it "unfaced" (without a vapor retarder) and install one separately if needed. A vapor re-

tarder helps prevent moisture infiltration and absorption. Moisture absorbed into insulation lessens its effectiveness. Both glass-fiber and mineral wool are non-flammable, but their vapor retarders aren't, so they must be covered with a fireproof material such as sheetrock. It is also important not to compress batt or blanket insulation into a tight space. The insulation relies on tiny air pockets to slow heat flow, and crushing these pockets decreases the insulation's effectiveness.

Loose Fill. This type of insulation comes in bags and can be made from cellulose (shredded newsprint or wood fibers), glass-fiber and mineral wool. The R-values range from 2.2 per inch for glass-fiber to 3.7 per inch for cellulose fiber. For maximum R-value effectiveness, it's important to install loose fill insulations to the proper density. Cellulose, glass-fiber and mineral wool loose-fill insulations are most commonly installed by a professional who blows it into finished walls and open or finished attic spaces. By applying special adhesives to loose-fill insulation, unfinished wall spaces can also be insulated. The adhesives assure that the insulation will not settle in the space.

Rigid Board. Rigid board insulations are made from a wide range of plastic materials, including expanded polystyrene (R 4.0 to 4.5 per inch), extruded polystyrene (R 5.0 to 5.5 per inch), polyurethane (R 6 to 7.5 per inch), and polyisocyanurate (R 6 to 7.5 per inch). Because of its ability to resist moisture damage, polystyrene rigid board insulations are commonly used in basement and crawl space walls and around slab foundations. Any rigid board products can be used to insulate cathedral ceilings and insulation sheathing under exterior siding. Many rigid board insulations are flammable and must be covered with a fire-resistant material such as sheetrock.

Foamed-in-Place. Insulation is also available in a foam form that can be sprayed into walls or roof cavities. Foam insulations are often denoted as open-cell or closed-cell which refers to their density. Differing densities generally impact the R-value per inch and the vapor transmitting qualities of the insulation. The most common is a polyurethane product that when foamed-in-place has an R-value of about 6 per inch.

Advantages of foamed-in-place insulations include excellent air sealing and vapor control, and excellent insulation qualities.

General Guidelines

- **Seal first, then insulate.** Adding insulation to your home's attic, walls, or floors will not be effective if heat can easily travel through cracks and holes between framing members and around windows and doors. Seal all major cracks and openings before insulating.
- **Ensure adequate ventilation.** Adding insulation increases the need for ventilation, especially in attics and crawl spaces. Pay close attention to ventilation and or vapor barrier requirements for these areas.

Where to Insulate

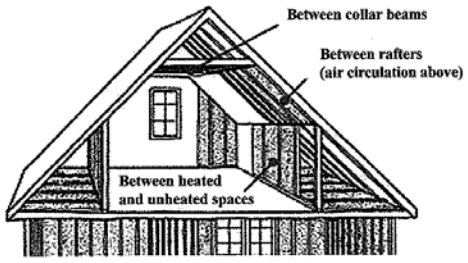
Because warm air naturally rises, the attic or roof area of your home should be a first priority for insulating. Insulation reduces the upward flow of heat, keeping it inside your home longer. That means you'll stay warmer, your heating system will not come on as often, and you can reduce your utility costs.

In Nebraska's cold climate, insulating existing attics to an R-value of between 38 and 49 is recommended. Both glass fiber and loose-fill cellulose are commonly used to insulate attics. Twelve inches of the glass fiber batt insulation achieves R-38, and about 10½ inches of cellulose will do the trick. *How much insulation is in your attic?*

Attic/Roof Types

How your attic should be insulated depends on how your roof is built. Common attic/roof types are:

- **Unfinished Attic.** In these homes, the attic is not part of the living space. You can often get into the attic by ladder through a hatch usually located in a hallway or closet ceiling. Unfinished attics are generally the easiest type to insulate; the insulation goes between the framing members (joists) of the attic floor, which is also your living area's ceiling. Capable do-it-yourselfers can tackle this job with advice from a professional. Rolls of glass fiber or loose-fill cellulose have been the insulation of choice for most do-it-yourself jobs. This publication primarily deals with steps you can take to add insulation to your unfinished attic.
- **Finished Attic.** A portion of these attics are living spaces. As a result, insulation should be placed in the exterior walls (called kneewalls), the entire ceiling and the outer floor areas that are not part of the living space. This type of attic insulation project often requires the use of several insulation products.



- **Flat, Vaulted, or Cathedral Ceilings.** These types of ceilings don't have attics above them, and due to little or no space to add insulation, it may be impossible to add insulation to this roof type. If there is space, the insulation must be blown or placed between the interior

ceiling and the exterior roof. However, it is very important that these construction types be well-ventilated and sealed to prevent moisture problems. This type of work often requires the expertise of a contractor.

Adding Insulation to Unfinished Attic

Here are the steps either you or a weatherization contractor should take to insulate or add insulation to an unfinished attic:

1. **Be an attic detective.** Go into the attic with a flashlight and a dust mask to investigate. **CAUTION: If you find vermiculite insulation in your attic, DO NOT PROCEED. Vermiculite was mined in the U.S. before 1990 and much of it came from a mine that was contaminated with asbestos. Since vermiculite may contain asbestos, always have it tested before continuing.**

   Construct a makeshift walkway by laying boards on top of the joists, because the ceiling below won't support your weight. Measure the amount of insulation present and determine its type. It is most likely mineral or rock wool, glass fiber, or cellulose fiber. You can take a sample to your local building materials supplier if you are unsure. If there is already insulation up there and it's dry and evenly spread out, you can leave it alone and, if needed, add more insulation on top. You can put batt insulation over existing loose-fill or vice versa. Just make sure that the new insulation doesn't have a vapor retarder which would trap moisture inside the old insulation. If the existing insulation is or has been wet, find and correct the moisture problem before doing any insulating. It could be caused by a leaky roof or too much air leaking up from your living space. When warm air from your house rises into the attic, it also carries with it large amounts of moisture. When the moisture hits the cold surfaces of your attic, it can condense and cause a number of problems — wet insulation that doesn't insulate well, mold growth, and damage to sheetrock and other building materials. To help control moisture, make sure bathroom and kitchen vents are not vented directly into the attic. They should be vented to the outside, through the roof.

2. **Electrical.** Check all wiring and electrical junction boxes to assure wiring is not exposed and boxes are appropriately covered. Many old homes have a two-wire system referred to as "knob and tube wiring" (*Figure 1*). This type of wiring should not be covered with insulation.

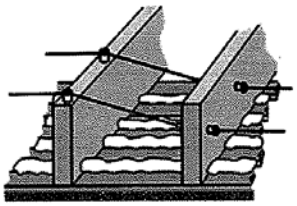


Figure 1. Knob and tube wiring

3. **Seal air leaks.** Insulating *won't* save you much money or keep you much warmer unless you first seal all the air (and moisture) passageways between your living space and your attic. Common air leakage spots include the tops of interior and exterior walls, around pipes and heating ducts, light fixtures, and wires. Conventional caulking methods work fine, though special care should be taken around chimneys and plumbing stacks that may require special types of caulk (ask your local material supplier). You also should weatherstrip, seal, and secure the attic hatch door, treating it as you would a door to the outside.

4. **Ensure enough ventilation.** Proper ventilation is another key to a successful attic insulation job. It lets your attic breathe, ridding it of moisture in the winter, and keeping it cooler in summer. If your attic has a vapor retarder, you need 1 square foot of free vent area for every 300 square feet of attic floor area. Without a vapor retarder, you need twice as much ventilation — 1 square foot of vent for every 150 square feet of floor. Vents should be located on opposite ends of the attic, with some near the top and others near the bottom to allow for good cross-ventilation. Talk with a contractor about which types of vents would be best for your attic.

5. **Remove possible moisture sources.** Bathroom fans that are vented into the attic area carry large amounts of warm, hot air into a very cold space during Nebraska winters. This excess moisture can condense on any number of surfaces in the attic and contribute to mold growth, insulation damage, and roof rot. Make sure all exhaust fans are vented to the outside of the attic.

6. **Insulation.** Now you're ready to either roll out the batts or install the loose-fill. You may want to use some of both, putting batts in the straight-a-ways and loose-fill in the nooks and crannies. Buy batts wide enough to snugly fit between the attic framing members. First fill the joist spaces, and then roll out a second layer on top, perpendicular to the first (*Figure 2*). Be sure to place the batts as close together as possible. If you opt for loose-fill insulation, make sure to install it level. If you plan to add loose-fill above the height of the joists, attach marked wooden sticks to the joists to serve as depth markers.

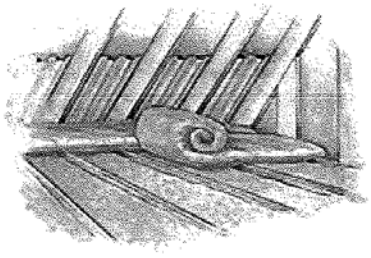


Figure 2. Batt insulation added to an unfinished attic

As you add insulation, it's important to not block any combustion air supply source or any ventilation openings, especially in the eaves. Ventilation chutes can be created during the insulation job to prevent vents from being blocked off. Also, keep insulation at least 3 inches away from recessed light fixtures, chimneys, fan motors, and flues to reduce fire danger. Do this by surrounding the objects with a sheet metal barrier that extends at least 4 inches above the finished insulation level. If you have a water heater, furnace, or knob and tube wiring in your attic, consult a professional for information on insulating around these obstacles. Whatever insulation type you choose, follow the manufacturer's directions carefully and don't unwrap the insulation until you get it up in the attic. Also, since you'll be spending time in a dusty space, wear a respirator dust mask, work gloves, and protective clothing. It's a dirty job, but well worth doing!

This publication has been peer reviewed.

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Know how. Know now.

G2234

Home Efficiency: Homeowners and Energy Codes

F. John Hay, Extension Educator — Energy
Lynn Chamberlin, Nebraska Energy Office

Understanding energy codes helps homeowners make wise decisions when choosing energy efficient products, such as insulation and windows, for their new or existing home.

Nebraska's new homeowners are entitled to homes that meet minimum state and national standards for energy efficiency. The adoption of the Nebraska Energy Code helps ensure the efficient design and construction of new and, in some cases, renovated residential and commercial buildings. The energy code forms part of the overall building code that is adopted by state and local government and establishes the *minimum* energy requirements. Homeowners, especially those building new homes, go *beyond* these minimum requirements during construction because installing additional insulation at that time is very cost effective, and those costs can be rolled into the mortgage. Keep in mind, local code jurisdictions can exceed the requirements of the Nebraska Energy Code so discuss any local requirements with your builder or local code authority.

Energy codes are important because they:

- **Save you money.**
  Buying a home is likely the most expensive investment that you will make in your lifetime. Before buying, think about how much it will cost to operate the home. Did you know that the average U.S. homeowner spends $2,175 on utility costs per year? That's over $180 per month. Buildings constructed to meet energy codes use less energy, which reduces utility bills and puts money back into your pocket.
- **Protect you and your family.**
  Homes built to the energy code protect you and your family from high utility bills and below-standard construction. Builders must comply with the Nebraska Energy Code as stringently as they comply with other building codes that protect life, health, and safety.

https://www.youtube.com/watch?v=PsURzf_eNmY

- **Are a cost-effective investment.**
  It's more cost-effective to build a home that meets the energy code, than try to improve energy efficiency later through expensive retrofits. When the cost of the efficiency investments are spread out over the term of a standard mortgage, owners usually realize net savings within the first year. Would you rather spend a few dollars more on your monthly mortgage payments while saving $20 dollars or more on your utility bills or spend money on an energy retrofit a few years down the line?
- **Reduce pollution and increase reliability.**
  Constructing buildings that waste energy needlessly make power plants work harder and put additional stress on the electric grid. Buildings that meet the energy code requirements reduce pollution, improve grid reliability, and help to make your utility costs more predictable.

Would you buy a gallon of milk without checking the expiration date? Or a car without checking the miles-per-gallon? Then why would you buy a home without checking the monthly utility bill? Taking a little time to consider the

energy efficiency of a home (new or existing construction) that you are contemplating purchasing can save you a lot of money and discomfort in the future. **Before you buy, do your research.**

- In the case of an existing home, ask the current residents how much they pay each month for electricity and heating fuel.
- If it's a new home, ask the builder if the home has an ENERGYSTAR® rating or to have the energy efficiency features explained.

Using a Home Energy Code Guide and Checklist, such as the one provided at *http://www.greenerchoices.org/pdf/Home_Energy_Code_Checklist.pdf*, gives you the power to ensure that your home is well-built, will save you money and, in the case of new construction, meets the minimum requirements of the Nebraska Energy Code. This checklist does not cover every aspect of the energy code, but it explains the requirements that are easiest to understand and see in a home after construction is complete. This information will help you to determine whether a home likely meets the energy code or what upgrades may be needed when renovating an existing home.

Insulation

Insulation levels in a home have a large impact on heating and cooling costs. A properly insulated home allows it to be maintained at a comfortable temperature while using less energy. There are different types of insulation used in both new construction and energy retrofits:

- **Batt or blanket** insulation can be made of a variety of products including glass fiber or rock or mineral wool. The batts come in lengths and widths ready for installation. Blankets, however, come in rolls that are cut to specific needs. The R-value of batt or blanket insulation is printed on the face of the product to allow for easy verification.
- **Loose-fill** insulation comes in bags. It can be made from cellulose, glass fiber, or mineral wool. Loose-fill insulation needs to be installed to a proper density and depth to provide an appropriate R-value. In the case of new construction, the Nebraska Energy Code requires that the R-value and blown depth of loose-fill insulation be easily marked and available for verification and inspection.
- **Rigid board** insulation comes in a wide range of materials including expanded polystyrene, extruded polystyrene, polyurethane, and polyisocyanurate. Rigid boards have a high ability to resist moisture and are commonly used in the basement or crawl space walls around the foundation. The R-value of insulation is printed on the face of the product to allow for easy verification.
- **Foamed-in-place** insulation is sprayed into or onto the surface of the walls and is most commonly made of polyurethane material. It generally comes in different densities that provide different R-values. Foamed-in-place insulation has excellent air sealing and insulation qualities. Ask for documentation on the R-value and density of any foamed-in-place insulation to confirm that appropriate code-required R-values are met.

All insulations are measured by R-value per inch. The higher the R-value, the better the insulated value of the material will be. More information can be found at *http://energy.gov/energysaver/articles/types-insulation.*

Windows, Skylights, and Doors

The Nebraska Energy Code requires windows, doors, and skylights in new buildings to meet a minimum efficiency standard. That standard for windows and doors is currently a minimum U-value of 0.35. The U-value or U-factor is an indicator of how well a window or door resists heat transfer. The lower the U-value, the lower the heat transfer and the better the insulating value. The minimum U-Value for skylights is 0.60.

In new homes, confirm these requirements are met for windows and skylights by asking for documentation, such as copies of the window label, showing the U-factor and solar heat gain coefficient (SHGC). Some manufacturers label their windows with serial numbers or other data that can be used to obtain information on the efficiency rating. Look for trademarks and codes etched into the corner of the window glass and/or paper or metal labels that may be attached to the window sill, header, or tracks on the sides. If the builder cannot provide documentation, contact the customer service department of the window manufacturer to confirm the efficiency of the product installed.

In existing homes, examine the condition of the windows and estimate their U-value. U-factors generally range from 0.2 (very little heat loss) to 1.2 (high heat loss). Single-pane windows have a U-factor of about 1.0, double-paned windows about 0.5, and high-performance double-paned windows about 0.25.

The code does exempt up to 15 square feet of window from the efficiency requirement to allow specialty glazing and other options.

Basements and Crawl Spaces

Get under the house and look at the crawl space. Either the floor over the crawl space should be insulated or the crawl space walls should be insulated. Insulation should be attached securely without gaps.

Attic and Crawl Space Doors

Check the attic access and crawls space hatch/door. These can be a major source of air leakage in the home, creating high utility bills and uncomfortable drafts. The hatch or door should be weatherstripped and insulated. They should be well-made so they are airtight when closed. (Test by closing door or hatch on a piece of paper. Can the paper be pulled out when the hatch/door is closed?) The insulation should be attached so that it won't be damaged or become loose when the hatch or door is used.

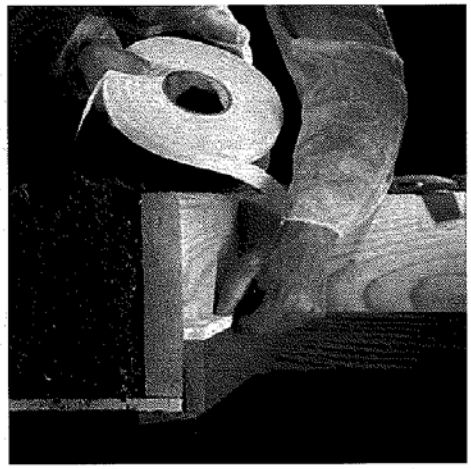


Figure 1. Insulating joints and seams with the proper product can reduce energy loss and energy costs.

Air Leakage

Look for sources of air leakage into and out of the home. Air leakage is often responsible for 10-30 percent or more of total energy loss. All joints, seams, and penetrations between the inside and outside of the home should be sealed (*Figure 1*). Typically, caulk, gaskets, spray foam, or weatherstripping is used to seal these air leaks.

Check whether leaks have been sealed by looking at where phone lines, electrical lines, plumbing, and other services enter the house. Are the holes plugged with caulk or other sealants? What about the holes in the attic floor where pipes, wires, and ducts lead to the rooms below? Are they sealed with foam, caulk, or other materials to prevent airflow?

Open the cabinets under the kitchen sink, under the kitchen island, under bathroom sinks, etc., and see where pipes lead to the floor below or out through walls. Are the spaces around the pipes filled with caulk, foam, or other materials to prevent airflow?

In the basement, look at places where pipes and wires lead to unheated or uncooled areas. Are these holes sealed as well?

Check where pipes and ducts pass up through an unheated or uncooled basement ceiling to the floor above. Are there gaps and spaces that create drafts and waste energy, or are they sealed tightly?

Why Do Air Leaks Matter?

If a home is not properly sealed, dirt, dust, and moisture enter the home and can lead to a variety of respiratory problems including asthma and allergies. Did you know that up to 40 percent of the air you breathe on the first floor of our home comes from the basement or crawl space?

One way that home builders can demonstrate that they've sealed air leaks in a new home is to have a blower door test done. Ask whether a blower door test was conducted on the home and, if so, request a copy of the results.

NOTE: The Nebraska Energy Code requires blower door testing in new homes unless the air sealing in the home was inspected. Having a home professionally inspected and/or tested for air leakage is an important safeguard for consumers. Alternatively, tested air leakage must be less than "seven air changes per hour (ACH) when measured with a blower door at a pressure of 33.5 pounds per square foot (33.5 psf) or 50 pascals (50 Pa)." To standardize the test for different homes and different parts of the country, the equipment used for the test is set at a standardized pressure level (33.5 psf or 50 Pa). Very efficient homes may have leakage rates of only 0.6 to 2.5 ACH with a pressure of 50 Pa.

For more information on blower door testing visit *http://www.greenbuildingadvisor.com/blogs/dept/musings/blower-door-basics*.

Lighting

Lighting has an enormous impact (approximately 12 percent) on the energy use in homes. The energy code requires that the builder put high efficiency light bulbs in at least 50 percent of the lighting fixtures that are hardwired into the home. Some examples of hardwired fixtures include lighting in kitchens and bathrooms, recessed lighting, hallway lights, and exterior lights next to the front door and garage door. High efficiency bulbs can include compact fluorescents, high-efficiency halogens, and LEDs. If the bulbs look like standard incandescent bulbs, ask the builder whether the energy efficiency lighting requirement has been met.

Thermostat

Programmable thermostats can generate annual energy savings of 10 percent. A home with a forced-air furnace heating system must have a programmable thermostat installed. The thermostat must be capable of controlling the heating and cooling systems on a daily schedule to maintain different temperature setpoints at different times of the day. The average cost of a programmable thermostat ranges from $30-50.

Fireplaces

Generally speaking, fireplaces often *reduce* the energy efficiency of a home. The national model code requires that the doors of wood-burning fireplaces have gaskets to help make them airtight.

For more information visit *http://www.woodheat.org/maintenance.*

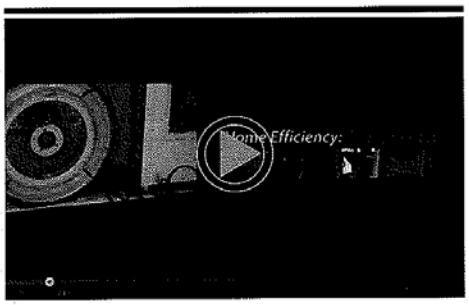
Ductwork

Leaky ducts can be responsible for 10-30 percent of energy loss in a home. To avoid this, leaks should be sealed and ducts should be insulated and tested when running through unheated or uncooled areas.

Unless the attic is heated and cooled, when ductwork runs through attic space, it must be insulated to a minimum of R-8. Look at the label on the ductwork insulation to find out what R-level it is.

All ducts and air handlers should also be sealed with mastic (a special type of caulk that is easily visible). Duct tape *isn't* sufficient.

In addition, the energy code requires that the entire duct system be tested for leaks if any part of the ductwork is located in unheated or uncooled spaces. Leaky ducts are a major source of energy loss, which means this requirement is extremely valuable in making homeownership affordable month after month. If there is ductwork in an unheated or uncooled space, ask for a copy of the report documenting the duct testing.



https://www.youtube.com/watch?v=p-w8TRq20KI

During construction or renovation of your home, it is important to be active in the process. Good communication with your home builder is key to making sure that your home meets minimum energy code requirements. It also will help you know what features make your home efficient and how to appropriately operate them to achieve their maximum energy saving potential.

Definitions

R-value— A measure of the insulating quality of a material. A higher R-value indicates a greater ability to insulate a space, preventing heat transfer through the material.

U-factor (U-value) — A measure of the flow of heat through an insulating or building material. The lower the U-value, the better the insulating ability.

Solar Heat Gain Coefficient (SHGC) — A measure of a window or door's ability to block heat transfer into the home from sunlight. SHGC is expressed as a number between 0 and 1.0. A low SHGC (like 0.40) indicates a window or door that transmits low amounts of heat and will keep rooms cooler on a sunny day.

This publication has been peer reviewed.

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Index: Consumer Education
Energy Conservation
Issued April 2014

NebGuide

University of Nebraska–Lincoln Extension, Institute of Agriculture and Natural Resources

Know how. Know now.

G2235

Home Efficiency: Energy Efficiency

F. John Hay, Extension Educator — Energy
Lynn Chamberlin, Nebraska Energy Office

Energy efficiency improvements often pay for themselves through reduced energy bills. This publication describes several methods you can use to calculate the potential savings.

https://www.youtube.com/watch?v=dFilJcT9Yzg

Understanding Energy Efficiency Improvement Calculations

People considering investing in energy efficiency improvements in their homes expect the investment to lower energy bills, so it is only natural for them to ask whether an improvement is a good investment. It's a simple question that often leads to additional, more complex questions and considerations.

- How long do they expect to live in the home?
  Most people are more likely to invest in home energy improvements if they plan to stay in their home for a long time.
- Do they anticipate future energy increases?
  If the cost of energy rises, home energy improvements prove to be a better investment.
- What is the life expectancy of the improvement they are contemplating?
  Improvements with a long life, like attic insulation, are generally a better investment than the purchase of equipment like a new water heater with a shorter life span.
- Will the improvement increase the value of the home?
- Are there maintenance costs associated with the improvement?
- Do they value the environmental benefits associated with reduced energy use, even if the cost of achieving that goal is high?
- Do they value the comfort improvement that often accompanies energy efficiency improvements?

Some of the answers to these questions are quantifiable, others can be estimated, and some can't be quantified at all — all of which adds to the confusion and misunderstandings often associated with calculating the savings that can be associated with energy efficiency improvements.

First, any large energy efficiency improvement(s) or weatherization project(s) should begin with an energy audit. Most energy audits are designed to help determine which improvements make economic sense and which don't. A well-done audit can accurately predict which home improvements will create an energy savings and what amount of savings can be achieved. Deciding what energy efficiency improvements to make is most easily done based on the results of an accurate audit. Contact your local utility for energy audit options.

Investment Options

Once you have a listing of possible energy efficiency improvements, the estimated cost to complete the work,

and the estimated energy cost savings, you will be ready to consider investment options:

Simple Payback

A ***simple payback*** calculation is based on the dollars saved on utility bills and the length of time it takes to recover the cost of making the energy saving improvements. For example: Suppose that it takes $695 to insulate your home's attic and it will save $358 a year in energy costs (roughly $30 per month). Dividing the improvement cost by the monthly utility savings ($695 ÷ $30) indicates the cost of insulation will be recovered in 23.17 months, a little less than two years. After that, the $30 a month is money in your pocket.

Cash Flow Analysis

If you are borrowing the money to pay for the energy efficiency improvements, a ***cash flow analysis*** probably makes more sense than a simple payback calculation, and it can be completed fairly easily with an interest calculator.

A cash flow analysis can be used if making improvements to your existing home or for considering whether to include energy improvements in a new home. For example, you are considering installing a $5,000 efficiency upgrade into a new home and rolling the cost into your mortgage. Since you know your mortgage interest rate and term, it's fairly easy to calculate the annual cost to borrow $5,000. If it's a 20-year mortgage at 5 percent interest, the cost to borrow $5,000 is $33.00 per month, or $396 per year. If the $5,000 improvement saves you only $350 per year on your energy bill, then borrowing money to pay for the improvement doesn't work out on a cash-flow basis. But if the $5,000 improvement saves you at least $397 a year on your energy bills, then the improvement is "cash flow positive" from day one. If the cost of energy increases, your cash flow position improves. Other factors can be integrated into a cash flow analysis including inflation considerations and future maintenance costs.

Net Present Value

Unlike simple payback and cash flow analysis, ***net present value*** takes into account the fact that the value of money changes with time — $10 today won't be worth $10 five years from now. To compare cash flows that occur in different years, you *discount* the cash flows for each year of the life of the improvement. When all of the cash flows have been discounted, you total the discounted values and determine the net present value of the improvement. If the net present value is greater than zero, the proposed investment would be considered profitable. One of the problems with net present value calculations is that we don't really know what the discount rate should be over time, since it's hard to anticipate future inflation or future interest rates. Like many other factors, the discount rate is basically a guess.

Return on Investment

To determine a project's ***return on investment,*** calculate the annual *net* cash flow, which is the sum of the present values of the anticipated cash flows divided by the number of years under consideration. Once you know the return on investment for a proposed energy improvement, you can compare the investment with a more conventional investment vehicle such as an investment in U.S. government bonds. However, you do have to keep in mind, a typical cash investment doesn't have a limited life span or annual maintenance cost like some energy efficiency investments can.

This publication has been peer reviewed.

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Index: Consumer Education
Energy Conservation
Issued April 2014

APPENDIX B: Nebraska Extension, Nebraska Energy Office Cooperation Survey

Nebraska Extension, Nebraska Energy Office Cooperation Survey

1. How often do you get home energy efficiency questions in the office?

- Seldom
- A few a year
- Regularly
- Often
- Other (please specify)

_____

_____

2. When you do get home energy efficiency questions, have you referred people to the Home Efficiency NebGuides? (G2230 - G2235)

- Yes
- No
- I was not aware of the NebGuides
- Not applicable

3. What resources do you use to answer the home energy questions?

4. How often do you get farm energy efficiency questions in the office?

- Seldom
- A few a year
- Regularly
- Often
- Other (please specify)

5. What resources do you use to answer farm energy questions?

6. Are you aware the Nebraska Energy Office offers low interest loans for energy efficiency and renewable energy projects?

- Yes
- No

7. Have you ever visited or referred clients to the Nebraska Energy Office website? http://www.neo.ne.gov/

- Yes
- No

Done

Dollar and Energy Saving Loans

Summer 2015

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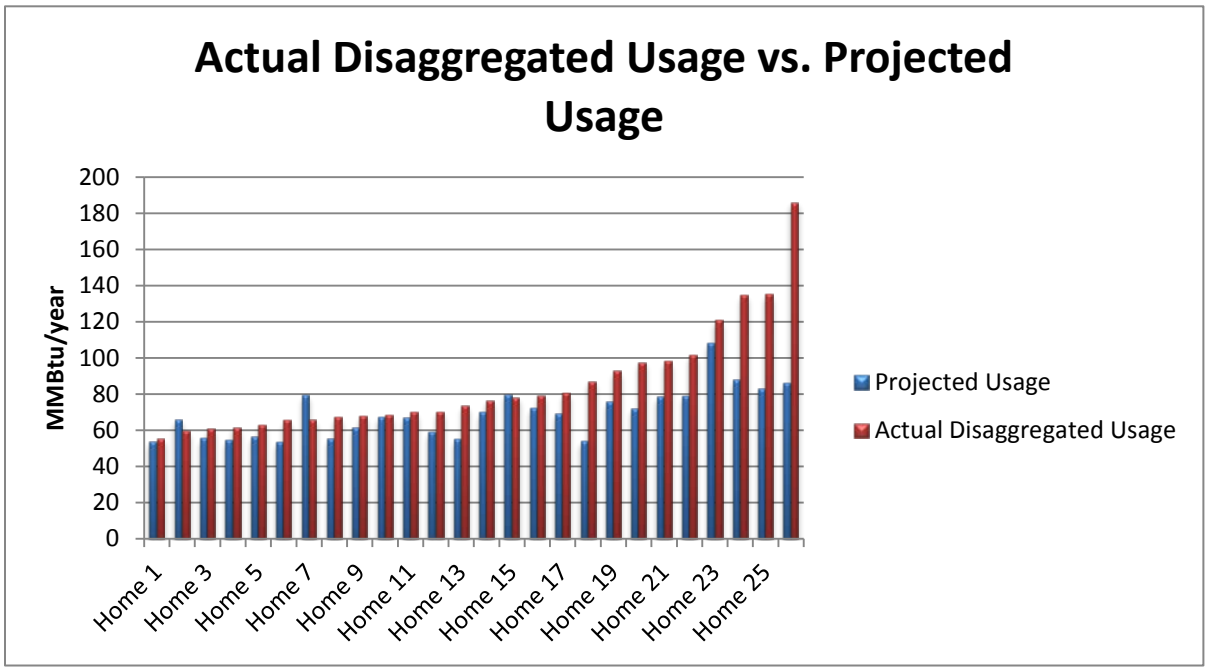
EXECUTIVE SUMMARY

The Nebraska Energy Office has a Dollar and Energy Saving Loans program which offers low interest loans for building/system improvements as well as new construction projects that aim to be energy efficient and reduce energy consumption. This study focused on Energy Efficient Housing Loans which are available for new residential home construction projects. The Nebraska Energy Office's goal was to determine how the homes that received Energy Efficient Housing Loans performed based on energy standards. A total of 26 homes were included in the study. In order to perform this assessment energy consumption was collected for each home from utility bills from August 2012 through September 2013. This data was then normalized and compared to the energy each home was projected to use based on ratings done before the construction occurred. There were three homes that performed better than what was estimated while the remaining 23 out of the 26 homes performed more poorly than projected. Refer to Figure 9 for the comparison between the actual disaggregated usage and the estimated usage.

Figure 9



PROJECT DESRIPTION

The Nebraska Dollar and Energy Saving Loans are offered statewide by the Nebraska Energy Office and the state's lending institutions. They offer loans for improvements to current buildings or systems as well as for new building projects. There are several different loan amounts and categories available. A table from the NEO website showing the different loan amounts and categories available for improvement projects can be found in Appendix A. To see the loan amounts and types available for new construction projects, refer to Appendix B.

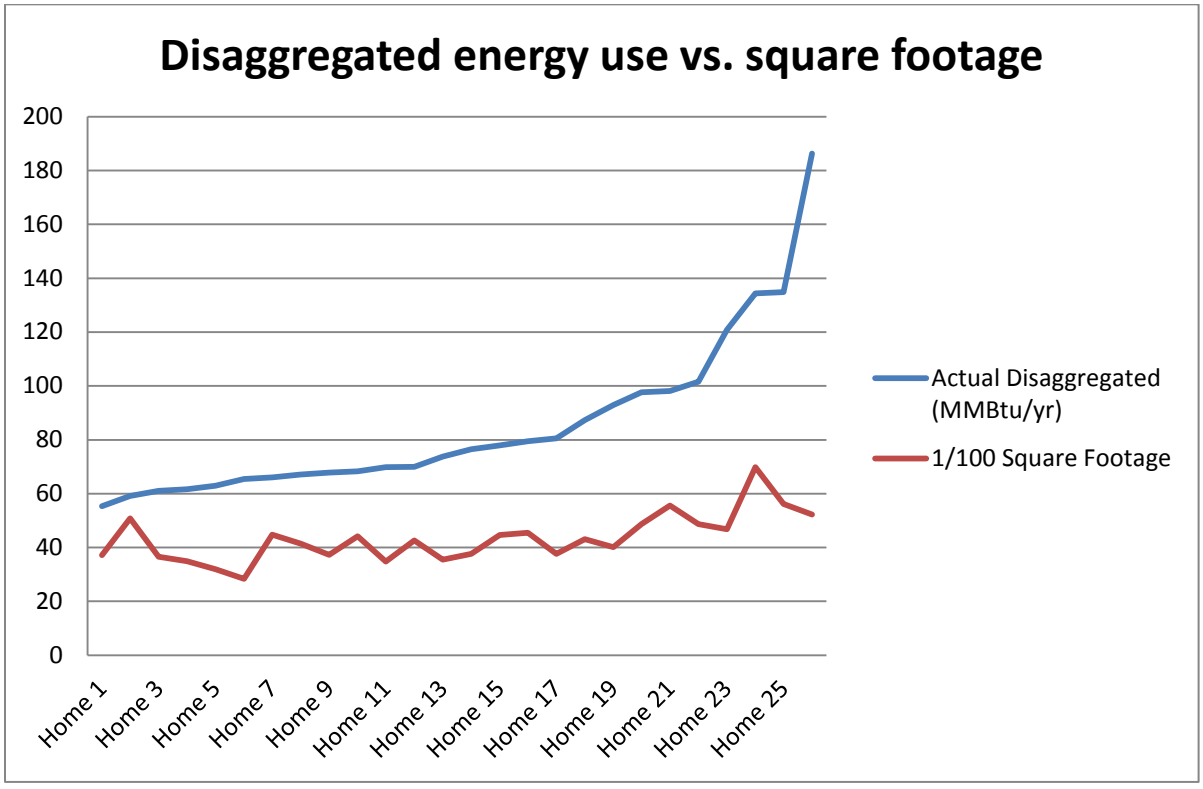
This project was focused on loans for new construction; specifically Energy Efficient Housing Loans. These are loans offered through the Nebraska Energy Office for homes in Nebraska which will be built to ENERGY STAR, Five Star Plus standards and obtain a qualifying HERS (Home Energy Rating System) Rating Score. Qualification for both the ENERGY STAR, Five Star Plus and the HERS Rating Score is based off the home's construction drawings and specifications and performed by a certified professional.

The goal of this project was to assess homes, after the construction was completed, that had received Energy Efficient Housing Loans. This was done by using disaggregated energy consumption data to determine the total usage for a 12 month period. This consumption was then compared to the projected energy consumption based off the ratings that were done previous to the construction of the home. REM/*Rate* – (Residential Energy Analysis and Rating Software v14.4.1) is a program that raters use in order to determine HERS scores. This program was also used to obtain all the data necessary for this particular analysis. The necessary data includes the estimated consumption, disaggregated consumption, actual consumption, square footage of each home, and the IECC (International Energy Conservation Code) 2003 Energy Consumption Compliance. Examples of each of these documents can be found in Appendix C through Appendix E.

SUMMARY OF RESULTS

There were a total of 26 homes involved in this assessment. All but two homes fell within the 2003 IECC Energy Consumption Compliance. The two homes that did not comply with this standard had the first and second largest consumption amounts overall. Both of these homes ranked in the top four based on their size in square footage. Figure 10 shows the correlation between the Disaggregated Energy Use and the square footage of each home. The square footage is divided by 100 to allow for the scaling of the graph to work well. From the graph it can be seen that these two factors are directly proportional; meaning that the larger the house, the more energy it will consume. However, the correlation between the two in this study is not particularly strong.

Figure 10



The main purpose behind this project was to determine how well the actual disaggregated consumption data matched the projected consumption that was estimated prior to the home being built. Three of the 26 homes that were studied had actual energy consumption amounting to lower than the estimated energy consumption, while the remaining 23 used greater than the original projected amount. Figure 11 on the following page shows the relationship among the 2003 IECC Energy Consumption Compliance amount, projected energy consumption, actual disaggregated energy use, and each home's square footage. There is a very strong relationship from the square footage to the projected energy usage and the 2003 IECC amount. This was expected due to the fact that both the projected and the 2003 compliance numbers were obtained based off the home's construction plans which takes into account the square footage.

The disaggregated usage falls somewhere between the projected and the 2003 compliance for 21 out of the 26 homes. This means that over 80% of the homes in this study are in compliance with the 2003 code but this same 80% are still using more consumption than was projected. The percent increase of the actual disaggregated consumption usage from the projected consumption usage can be seen in Figure 12. Table 10 lists the data for each home in this study. These numbers were obtained from REM/*Rate* – (Residential Energy Analysis and Rating Software v14.4.1) and they are sorted according to the disaggregated usage. Refer to Appendix C-E for examples of the REM/*Rate* reports from which the data from Table 10 was pulled.

Table 10

Home	2003 IECC (MMBtu/yr)	Projected (MMBtu/yr)	Actual Disaggregated (MMBtu/yr)	Actual Usage (MMBtu/yr)	Square Footage
Home 1	88.9	53.8	55.4	52.9	3718
Home 2	96.4	66	59.2	59	5078
Home 3	79.9	55.6	61.1	61.1	3660
Home 4	87	54.4	61.6	62.3	3493
Home 5	86.5	56.7	62.9	61.9	3196
Home 6	81.1	53.5	65.5	62.7	2832
Home 7	100.8	79.1	66	66.3	4479
Home 8	86.2	55.4	67.1	65.7	4146
Home 9	91.6	61.7	67.8	67.5	3727

Home 10	93.7	67	68.3	67	4418
Home 11	90.8	67.4	69.8	69.9	3480
Home 12	89.8	58.6	70	69.9	4262
Home 13	80.6	55	73.8	73	3551
Home 14	98.2	69.8	76.5	74.1	3765
Home 15	106.9	80.1	77.9	78.5	4470
Home 16	109.5	72.1	79.5	80	4550
Home 17	97.6	69.4	80.5	76.8	3759
Home 18	93.3	53.7	87.3	86.1	4310
Home 19	95.2	75.9	92.9	93	4014
Home 20	112	72.3	97.7	96.9	4873
Home 21	126.7	78.8	98.1	95.7	5559
Home 22	112.6	79	101.6	69.7	4865
Home 23	136.9	108.1	120.8	145.4	4676
Home 24	145.2	88.1	134.4	126.2	6986
Home 25	121.4	83.1	134.9	129.4	5614
Home 26	121.7	86.1	186.3	182.8	5224

Figure 11

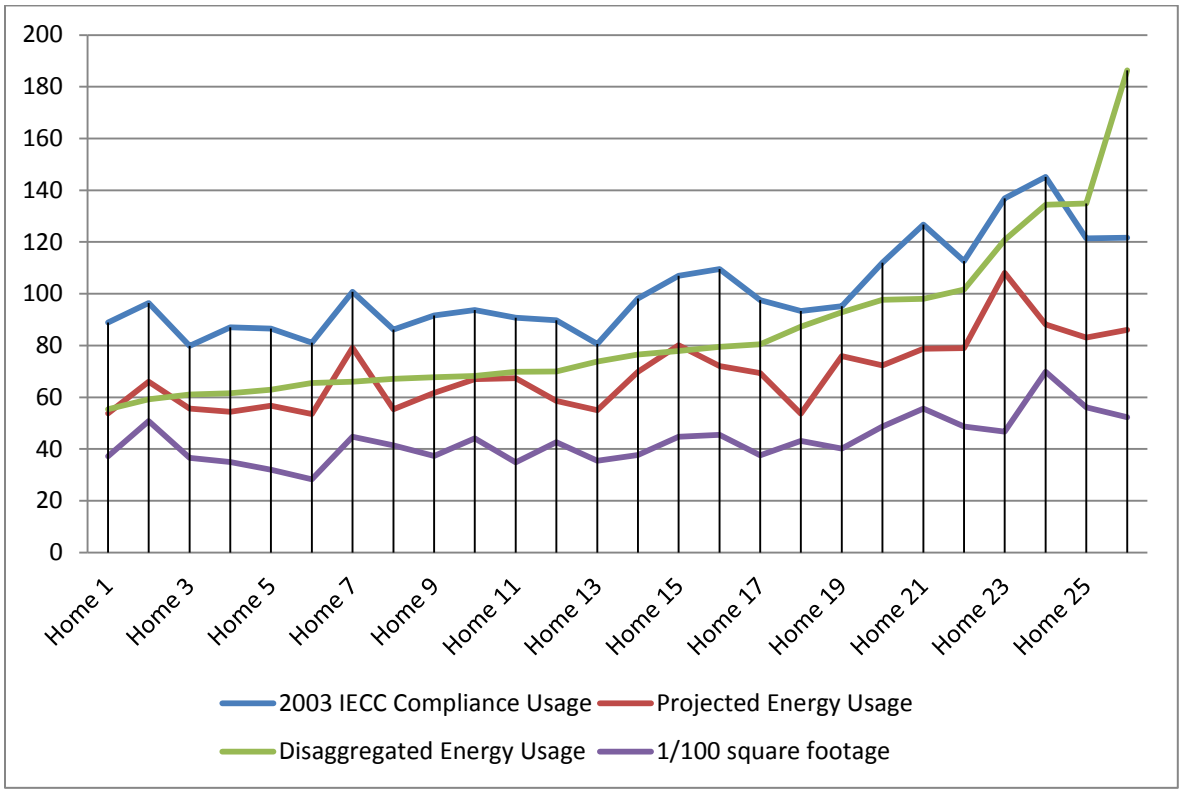
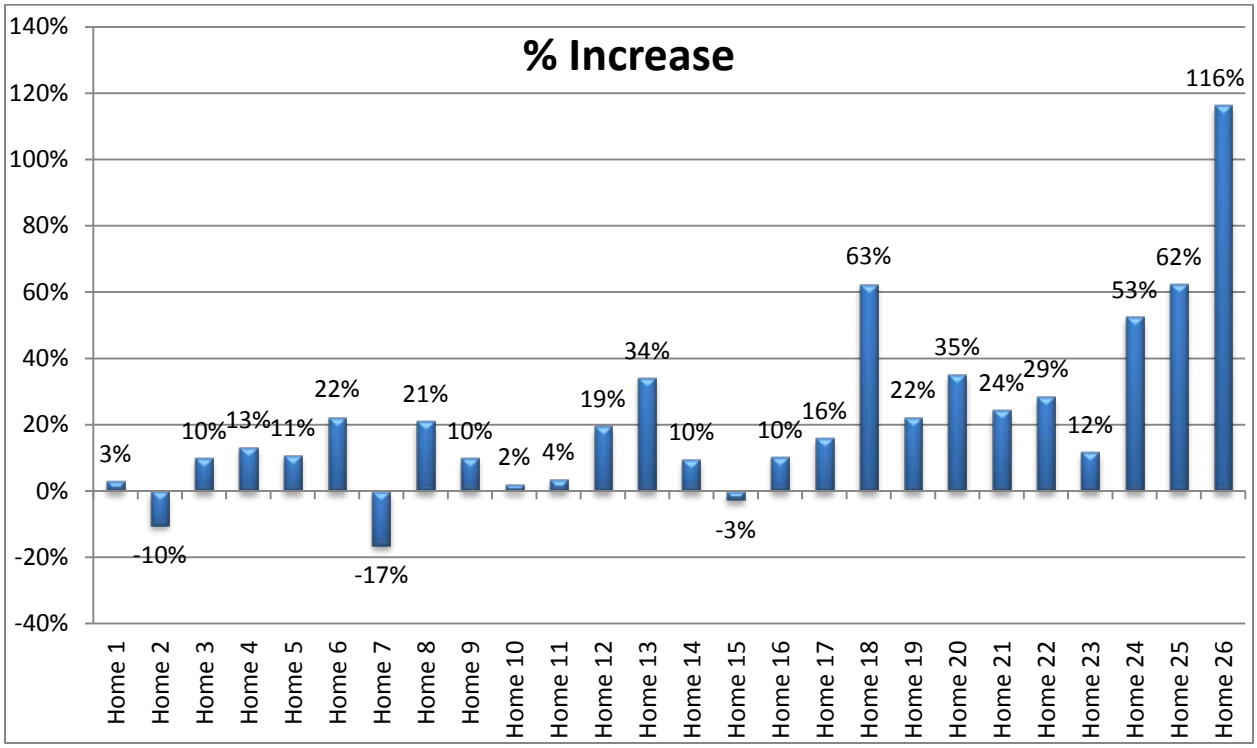


Figure 12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APPENDICES

APPENDIX A: Loan Categories

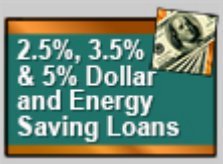
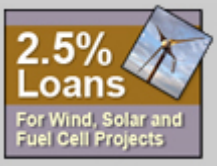
APPENDIX B: New Construction Loan Categories

APPENDIX C: 2003 IECC Energy Consumption Compliance report

APPENDIX D: Utility Bill Analysis report

APPENDIX E: Home Energy Rating Certificate report

Appendix A: Loan Categories

 **Loan Categories** Qualifying projects exceeding maximum loan amount and term will be considered on a case-by-case basis and will be subject to an additional 1/2 % funding fee at the time of closing.	**Borrower Maximums for Home, Building or System Energy Improvements**		
	 Not all lenders may offer the 2.5% or 3.5% rate. Check with your lender for availability. Find a Lender	 List of NPPD Customers Not all lenders may offer a 1.5% rate. Check with your lender for availability. Find a Lender	 Not all lenders may offer a 2.5% rate. Check with your lender for availability. Find a Lender
One and Two Family Dwellings (including rural properties)	$100,000	$100,000 Individually Metered Only	Wind Photovoltaic Fuel Cell $125,000 Solar Hot Water Heating $14,000
Multi-family Dwellings with 3 or more units, 1-3 stories tall	$250,000	$250,000 Individually Metered Only	Wind Photovoltaic Fuel Cell $125,000 Solar Hot Water Heating: $14,000
ENERGY STAR® Partners A federal partnership for businesses, manufacturers and institutions to improve energy performances in their facilities and operations.	$750,000	Not Available	Wind Photovoltaic Fuel Cell $125,000 Solar Hot Water Heating $14,000
• Businesses • Manufacturers	$750,000	Not Available	Wind Photovoltaic

• Institutions • Non-Profits • Multi-Family Buildings 4 Stories or more • Agricultural Buildings			Fuel Cell $125,000 Solar Hot Water Heating $14,000
Farm and Ranch Operations (Borrowers must produce $1,000 + of agricultural products in a calendar year)	$750,000	Not Available	Wind Photovoltaic Fuel Cell $125,000 Solar Hot Water Heating $14,000
• Local governments • All political subdivisions, except state government Qualified Energy Conservation Bonds	$750,000	Not Available	Wind Photovoltaic Fuel Cell $125,000 Solar Hot Water Heating $14,000
Public School Districts School Districts can get 1% Loans. Find out more Qualified Energy Conservation Bonds	$750,000	Not Available	Wind Photovoltaic Fuel Cell $125,000 Solar Hot Water Heating $14,000
Telecommunications Projects	$250,000	Not Available	Not Available
Dedicated Alternate Fuel Projects	$750,000	Not Available	Not Available
ENERGY STAR® Certified Home Electronics	$25,000	Not Available	Not Available
ENERGY STAR® Certified Office Electronics	$50,000	Not Available	Not Available

APPENDIX B: New Construction Loan Categories

Type of Loan	Maximum Loan Amount	Type of Construction
2.5% Financing forNew Home Construction Pre-Sold Homes	$417,000 or the cost of construction whichever is less, up to the appraised value of the home as completed, with lender approval based on loan program guidelines and lender's credit underwriting standards.	Nebraska residents for ENERGY STAR®, Five Star Plus single family detached dwellings which will be the home owner's primary residence with a qualifying HERS Rating score, to be located in Nebraska with Energy Office's written approval of the plan prior to applying for a building permit, if required, and any construction or ground breaking.
Long Term Permanent Financing at Reduced Rates	$417,000 or the cost of construction whichever is less, up to the appraised value of the home as completed, with lender approval based on loan program guidelines and lender's credit underwriting standards.	Nebraska residents for ENERGY STAR®, Five Star Plus single family detached dwellings which will be the home owner's primary residence with a qualifying HERS Rating score, to be located in Nebraska with Energy Office's written approval of the plan prior to applying for a building permit, if required, and any construction or ground breaking, and the home once it is completed.

APPENDIX C: 2003 IECC Energy Consumption Compliance report

2003 IECC Energy Consumption Compliance

Property
[redacted]

Weather:Lincoln, NE

Organization
Building Performance Co.
785-787-0180
Chad Robinson

Builder
[redacted]

HERS
Confirmed
11/20/2013
Rating No:412012
Rater ID:3352143

Annual Energy Consumption	MMBtu/yr	
	2003 IECC	As Designed
Heating	37.0	13.4
Cooling	9.5	1.9
Water Heating	13.1	10.4
Lights and Appliances	21.7	25.0
Photovoltaics	-0.0	-0.0
Total	81.3	50.7

This home MEETS the annual energy consumption requirements of Section 402 of the 2003 International Energy Conservation Code based on 6379 heating degree-days. In fact, this home surpasses the requirements by 37.6%.

Building Shell

Ceiling w/Attic	R60g1,2x6,24oc,blw****** U=0.017
Sealed Attic	None
Vaulted Ceiling	R60 G3 Vaulted****** U=0.032
Above Grade Walls	R-23G3,Sid,2x6,16oc*0* U=0.067
Found. Walls(Cond)	R-19 Finished****** R=19.0
Found. Walls(Uncond)	None
Floors	R-19 U=0.059
Slab Floors	Uninsulated No Cover* U=0.663

Window Type	27-18******
Window	U-Value: 0.270, SHGC: 0.180
Window/Wall Ratio	0.13
Infiltration Type	Blower door test
Infiltration	Htg: 1269 Clg: 1269 CFM50
Duct Leakage to Outside	28.00 CFM @ 25 Pascals
Total Duct Leakage	2142.00 CFM @ 25 Pascals

Mechanical Systems

GSHP	Htg: 52.2 kBtuh, 4.3 COP. Clg: 23.6 kBtuh, 22.3 EER, with Desuperheater.
Water Heating	Conventional, Elec, 0.92 EF.
Programmable Thermostat	Heat=Yes; Cool=Yes
Ventilation System	Exhaust Only: 110 cfm, 110.0 watts.

In accordance with the IECC, building inputs such as setpoints, infiltration rates, and window shading may have been changed prior to calculating annual energy consumption.

APPENDIX D: Utility Bill Analysis report

Utility Bill Analysis

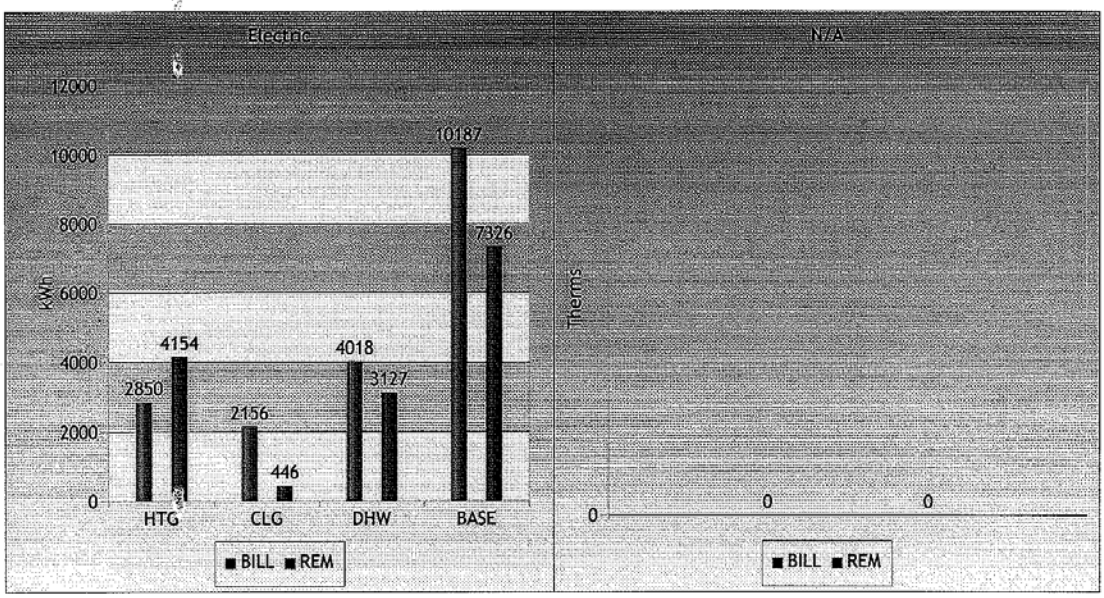
Property
[redacted]

Auditor
Building Performance Co.
785-787-0180
Chad Robinson

Utility Dates
9/2012 - 8/2013

Weather:Lincoln, NE

Weather Station
[redacted]



Estimated Utility Bill Disaggregation

End-uses estimated from the utility bill disaggregation regression are weather normalized when being compared to REM simulation results.

END-USE	FUEL	UNITS	CONSUMPTION	COST ($/Year)
Space Heating (Fuel)	N/A	N/A	--	--
Space Heating (Electric)	Electric	kWh	2850	313
Space Cooling	Electric	kWh	2156	237
Hot Water	Electric	kWh	4018	442
Gas Appliances	N/A	N/A	--	--
Baseload	Electric	kWh	10187	1121
Total	All Fuels	MMBtu	66	2113

Utility Bill Analysis

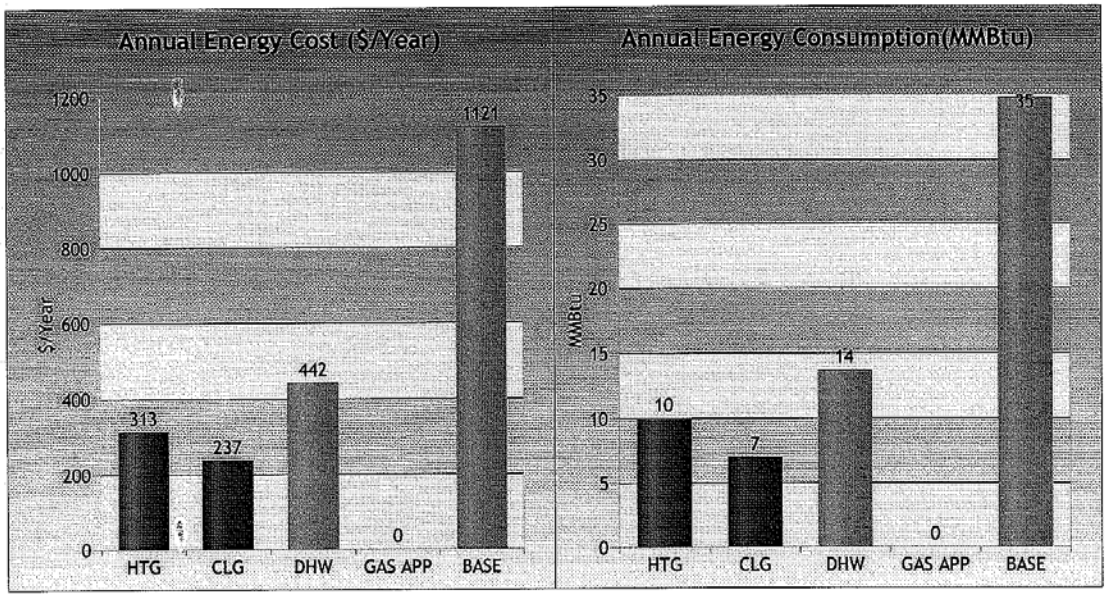
Property
[redacted]

Auditor
Building Performance Co.
785-787-0180
Chad Robinson

Utility Dates
9/2012 - 8/2013

Weather:Lincoln, NE
[redacted]

Weather Station



Utility Bill Analysis

Property
[redacted]

Auditor
Building Performance Co.
785-787-0180
Chad Robinson

Utility Dates
9/2012 - 8/2013

Weather:Lincoln, NE
[redacted]

Weather Station

Average Daily Temperatures (deg F)												
	SEP 2012	OCT 2012	NOV 2012	DEC 2012	JAN 2013	FEB 2013	MAR 2013	APR 2013	MAY 2013	JUN 2013	JUL 2013	AUG 2013
1	78.00	59.00	46.00	48.00	13.00	14.00	25.00	32.00	45.00	59.00	65.00	73.00
2	78.00	53.00	44.00	48.00	24.00	32.00	26.00	35.00	42.00	60.00	67.00	73.00
3	77.00	62.00	40.00	48.00	22.00	32.00	35.00	43.00	41.00	62.00	69.00	70.00
4	82.00	50.00	47.00	41.00	25.00	31.00	36.00	45.00	40.00	68.00	72.00	69.00
5	71.00	41.00	42.00	42.00	24.00	40.00	27.00	51.00	49.00	63.00	75.00	77.00
6	69.00	36.00	48.00	46.00	22.00	46.00	30.00	59.00	57.00	62.00	77.00	78.00
7	63.00	39.00	41.00	35.00	30.00	34.00	40.00	57.00	57.00	60.00	82.00	74.00
8	63.00	36.00	52.00	30.00	29.00	29.00	46.00	57.00	59.50	65.00	81.00	69.00
9	60.00	43.00	52.00	27.00	34.00	41.00	47.00	48.00	62.00	66.00	83.00	71.00
10	71.00	44.00	60.00	17.00	34.00	38.00	29.00	34.00	58.00	67.00	75.00	68.00
11	79.00	56.00	31.00	31.00	39.00	31.00	24.00	33.00	48.00	78.00	74.00	75.00
12	66.00	44.00	31.00	42.00	19.00	33.00	27.00	39.00	49.00	74.00	79.00	75.00
13	59.00	63.00	38.00	37.00	14.00	37.00	25.00	41.00	66.00	66.00	82.00	69.00
14	62.00	55.00	45.00	36.00	16.00	33.00	44.00	54.00	80.00	76.00	75.00	66.00
15	60.00	57.00	44.00	39.00	23.00	21.00	48.00	40.00	72.00	74.00	74.00	67.00
16	68.00	67.00	38.00	31.00	38.00	23.00	34.00	44.00	71.00	76.00	79.00	69.00
17	55.00	59.00	49.00	28.00	34.00	40.00	37.00	41.00	73.00	75.00	79.00	68.00
18	54.00	48.00	52.00	36.00	42.00	32.00	31.00	34.00	72.00	71.00	82.00	66.00
19	70.00	43.00	48.00	32.00	40.00	18.00	38.00	37.00	69.00	74.00	81.00	75.00
20	59.00	49.00	45.00	20.00	17.00	15.00	28.00	35.00	67.00	78.00	75.00	80.00
21	61.00	64.00	61.00	17.00	13.00	22.00	27.00	55.00	58.00	85.00	78.00	82.00
22	50.00	60.00	50.00	26.00	18.00	12.00	31.00	43.00	56.00	79.00	81.00	77.00
23	51.00	54.00	28.00	13.00	21.00	19.00	34.00	32.00	63.00	73.00	72.00	80.00
24	57.00	51.00	32.00	11.00	11.00	31.00	27.00	42.00	60.00	77.00	70.00	84.00
25	66.00	39.00	36.00	8.00	32.00	30.00	28.00	49.00	70.00	79.00	72.00	85.00
26	60.00	32.00	21.00	5.00	38.00	28.00	27.00	55.00	75.00	79.00	66.00	86.00
27	57.00	33.00	26.00	13.00	40.00	33.00	40.00	55.00	70.00	74.00	62.00	86.00
28	56.00	43.00	32.00	19.00	39.00	30.00	43.00	64.00	71.00	74.00	62.00	83.00
29	58.00	52.00	43.00	16.00	35.00		49.00	68.00	70.00	71.00	63.00	83.00
30	61.00	43.00	43.00	28.00	17.00		59.00	68.00	67.00	66.00	71.00	85.00
31		43.00		28.00	6.00		46.00		65.00		72.00	82.00

Home Energy Rating Certificate

Property

[redacted]

HERS

Rating Type:	Confirmed	Certified Energy Rater:	Chad Robinson
Rating Date:	11/20/2013	Rating Number:	412012
Registry ID:	155844891		

HERS Index: 48

General Information

Conditioned Area	2832 sq. ft.	House Type	Single-family detached
Conditioned Volume	26027 cubic ft.	Foundation	Conditioned basement
Bedrooms	3		

Mechanical Systems Features

Ground-source heat pump:	Electric, Htg: 4.3 COP. Clg: 22.3 EER, w/DSH.
Water Heating:	Conventional, Electric, 0.92 EF, 85.0 Gal.
Duct Leakage to Outside	28.00 CFM25
Ventilation System	Exhaust Only, 110 cfm, 110.0 watts
Programmable Thermostat	Heat=Yes; Cool=Yes

Building Shell Features

Ceiling Flat	R-60.0	Slab	R-0.0 Edge, R-0.0 Under
Sealed Attic	NA	Exposed Floor	R-19.0
Vaulted Ceiling	R-60.0	Window Type	U-Value: 0.270, SHGC: 0.180
Above Grade Walls	R-23.0	Infiltration Rate	Htg: 1269 Clg: 1269 CFM50
Foundation Walls	R-19.0	Method	Blower door test

Lights and Appliance Features

Percent Interior Lighting	100.00	Range/Oven Fuel	Electric
Percent Garage Lighting	0.00	Clothes Dryer Fuel	Electric
Refrigerator (kWh/yr)	609	Clothes Dryer EF	3.01
Dishwasher Energy Factor	0.84	Ceiling Fan (cfm/Watt)	0.00

Estimated Annual Energy Cost

Use	MMBtu	Cost	Percent
Heating	18.1	$264	21%
Cooling	4.2	$43	3%
Hot Water	10.0	$236	19%
Lights/Appliances	25.0	$564	46%
Photovoltaics	-0.0	$-0	-0%
Service Charges		$121	10%
Total	**57.3**	**$1227**	**100%**

Criteria

This home meets or exceeds the minimum criteria for the following:

TITLE
Company
Address
City, State, Zip
Phone #
Fax #

Chapter 3

Discussion of Impacts

OVERVIEW

The work accomplished over the summer has provided the Nebraska Energy Office with an assessment of their Weatherization Assistance Program, a report on the effectiveness of NebGuides throughout the state, and an analysis of their Dollar and Energy Saving Loans. In order to provide a thorough and finalized assessment of the Weatherization Assistance Program to NEO, energy consumption from weatherized homes was collected and analyzed in order to determine energy, cost, and environmental savings/impacts. The completion of the NebGuides project included drafting a survey along with and informational follow-up and then dispersing it to Extension Educators throughout Nebraska. The Dollar and Energy Saving Loans analysis required the comparison of actual energy consumption to projected energy consumption in order to asses if the homes are living up to the suggested standards. Below is a summary of the impacts of each project.

WEATHIZATION ASSISTANCE PROGRAM

The Weatherization Assistance Program has many possible positive impacts which include cost savings, energy savings, pollution reductions, and health and safety benefits. Through gathering and assessing the energy consumption data, quantifiable impacts have been determined to a fairly high accuracy. There was a wide range of savings seen from the homes being analyzed. With some having large reductions in energy usage and others having large increases in consumption. The overall savings, however, amounted to a 13% savings in natural gas usage and a 12% savings in electric consumption. The non-energy impacts included 133.2 $MTCO_2e$/year being reduced and a total savings of $13514.46/year for the occupants of the 79 homes that were a part of this study. When analyzing these savings many factors must be

taken into account. These factors include the initial condition of the home, the weatherization measures taken, and the homeowner's habits.

NEBGUIDES

The main impact of the NebGuides project was increased awareness and education. The purpose behind the creation of the guides was to help inform the general public on common topics that effect many people. The survey created gave great insight into the current use of the NebGuides as well as the Nebraska Energy Office's programs. The results of the survey showed that a relatively low number of people were aware of the NebGuides as well as NEO's programs. The survey along with the informational follow-up email increased the Extension Educators awareness of these topics. With this information at hand, Educators can relay it on to help inform the public as well. While the main impact of this project is public education, informing people of weatherization and energy saving practices could be the foundation for energy, environmental, and cost savings as well.

DOLLAR AND ENERGY SAVING LOANS

The assessment of the Dollar and Energy Savings Loans program was needed in order to define how the homes that received Energy Efficient Housing Loans were performing. The Nebraska Energy Office was interested in determining if the homes that were receiving loans were also living up to the estimated standards. This study found that over 80% of homes consumed more energy than was projected. But over 90% of the homes being studied had energy usage amounts that were in compliance with the 2003 IECC Energy Consumption Compliance amount.

IMPACT FORMS

P2 Metrics: Individual Opportunity Impacts

Intern Information (your name, email, phone #): **Sadie Erdmann, sadie_erdmann@hotmail.com, (605) 661-9033**		
Visitation Date(s): **Summer 2015**		Assistance Mode: **SB**
Company Name and Location: **Nebraska Energy Office 521 S 14th St., Suite 300 Lincoln, NE 68508**		
Company Contact, Position, Email & Phone #: **Jack Osterman, Financing Division Chief, john.osterman@nebraska.gov, (402) 471-2817**		
Report Title: **Weatherization Assistance Program**		
Description: **Asses the Weatherization Assistance Program to determine its impacts**		
Expected recurring years of benefit (if more than five years, write >5): **>5**		
Cost Savings (note in report narrative what is included in each)		**Energy**
Savings ($/yr): **$13514.46**		Electricity Reduced (kWh): **94286**
Initial Cost ($):		Other Energy (Type, Quantity, Units): **5797 therms**
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (include GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type): **133.2 MTCO2e/year**
(Note: **Hazardous Material**=process input supplies and feedstocks that are toxic or hazardous, e.g. chemicals, solvents, pesticides. **Hazardous Waste**=state and/or federally listed hazardous or toxic wastes or wastes meeting the criteria for ignitability, toxicity, corrosivity, or reactivity.)		
Releases & Intangible/Indirect Benefits		
Releases Prevented (avg. #):		Material Prevented from Release:
How much will be prevented from release (lbs.)?		Where would release have gone?
Safety Benefit Category Number: **3** (1. Eliminate the hazard; 2. Reduce the level or quantity of the hazard; 3. Provide a method to reduce human exposure; 4. No safety benefit)		
What is the hazard? **Old or faulty heating/cooling equipment or systems**		
Number of employees prevented from exposure:		
Additional Indirect/Intangible Benefits: **Provided knowledge to NEO regarding their Weatherization Assistance Program**		

Comments:	
For each of the savings/benefits for the above opportunity description, select the source(s) of data that was used to come up with the values. Select from the following list and include a brief description with it. NOTE: If calculations are made to quantify the impact, include them in an appendix to the assessment report.	
1a. Bills	1b. Metered/measured by business
1c. Metered/measured by intern	
2a. Indirect methods (wattage, # dumpsters, etc.)	2b. Estimate by experienced client staff
3a. Use of external calculation tool/published industry standard (list tools; appears to be peer reviewed)	3b. Outside expert opinion for input (list expert or ref. source)
4a. Estimate by inexperienced client staff	4b. Use of external calculation tool/published industry standard (list tools; unclear if peer reviewed)
Cost Savings: 3b (energy rate) (source: Energy Information Administration) (based off energy calculations)	**Energy: 1a (energy consumption)**
Hazardous Materials:	**Water Use:**
Hazardous Waste:	**Water Pollutions:**
Solid Waste:	**Air Emissions: 3a (GHG Calculator) (based off energy calculations)**
Releases:	

P2 Metrics: Individual Opportunity Impacts

Intern Information (your name, email, phone #): **Sadie Erdmann, sadie_erdmann@hotmail.com, (605) 661-9033**		
Visitation Date(s): **Summer 2015**		Assistance Mode:
Company Name and Location: **Nebraska Energy Office 521 S 14th St., Suite 300 Lincoln, NE 68508**		
Company Contact, Position, Email & Phone #: **Jack Osterman, Financing Division Chief, john.osterman@nebraska.gov, (402) 471-2817**		
Report Title: **NebGuides**		
Description: **Survey Extension Educators regarding NebGuides and NEO's programs**		
Expected recurring years of benefit (if more than five years, write >5): **>5**		
Cost Savings (note in report narrative what is included in each)		**Energy**
Savings ($/yr):		Electricity Reduced (kWh):
Initial Cost ($):		Other Energy (Type, Quantity, Units):
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (include GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type):
(Note: **Hazardous Material**=process input supplies and feedstocks that are toxic or hazardous, e.g. chemicals, solvents, pesticides. **Hazardous Waste**=state and/or federally listed hazardous or toxic wastes or wastes meeting the criteria for ignitability, toxicity, corrosivity, or reactivity.)		
Releases & Intangible/Indirect Benefits		
Releases Prevented (avg. #):		Material Prevented from Release:
How much will be prevented from release (lbs.)?		Where would release have gone?
Safety Benefit Category Number: (1. Eliminate the hazard; 2. Reduce the level or quantity of the hazard; 3. Provide a method to reduce human exposure; 4. No safety benefit)		
What is the hazard?		
Number of employees prevented from exposure:		
Additional Indirect/Intangible Benefits: **Increased awareness of topics and public education impacts**		
Comments:		

For each of the savings/benefits for the above opportunity description, select the source(s) of data that was used to come up with the values. Select from the following list and include a brief description with it. NOTE: If calculations are made to quantify the impact, include them in an appendix to the assessment report.
1a. Bills 1b. Metered/measured by business 1c. Metered/measured by intern 2a. Indirect methods (wattage, # dumpsters, etc.) 2b. Estimate by experienced client staff 3a. Use of external calculation tool/published industry standard (list tools; appears to be peer reviewed) 3b. Outside expert opinion for input (list expert or ref. source) 4a. Estimate by inexperienced client staff 4b. Use of external calculation tool/published industry standard (list tools; unclear if peer reviewed)

Cost Savings:	**Energy:**
Hazardous Materials:	**Water Use:**
Hazardous Waste:	**Water Pollutions:**
Solid Waste:	**Air Emissions:**
Releases:	

P2 Metrics: Individual Opportunity Impacts

Intern Information (your name, email, phone #): **Sadie Erdmann, sadie_erdmann@hotmail.com, (605) 661-9033**		
Visitation Date(s): **Summer 2015**		Assistance Mode:
Company Name and Location: **Nebraska Energy Office 521 S 14th St., Suite 300 Lincoln, NE 68508**		
Company Contact, Position, Email & Phone #: **Jack Osterman, Financing Division Chief, john.osterman@nebraska.gov, (402) 471-2817**		
Report Title: **Dollar and Energy Saving Loans**		
Description: **Asses the Loan program to determine if it is meeting the projected energy usage amounts**		
Expected recurring years of benefit (if more than five years, write >5): **>5**		
Cost Savings (note in report narrative what is included in each)		**Energy**
Savings ($/yr):		Electricity Reduced (kWh):
Initial Cost ($):		Other Energy (Type, Quantity, Units):
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (include GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type):
(Note: **Hazardous Material**=process input supplies and feedstocks that are toxic or hazardous, e.g. chemicals, solvents, pesticides. **Hazardous Waste**=state and/or federally listed hazardous or toxic wastes or wastes meeting the criteria for ignitability, toxicity, corrosivity, or reactivity.)		
Releases & Intangible/Indirect Benefits		
Releases Prevented (avg. #):		Material Prevented from Release:
How much will be prevented from release (lbs.)?		Where would release have gone?
Safety Benefit Category Number: **4** (1. Eliminate the hazard; 2. Reduce the level or quantity of the hazard; 3. Provide a method to reduce human exposure; 4. No safety benefit)		
What is the hazard?		
Number of employees prevented from exposure:		
Additional Indirect/Intangible Benefits: **Provided knowledge to NEO regarding their loan program for energy efficient housing**		
Comments:		

For each of the savings/benefits for the above opportunity description, select the source(s) of data that was used to come up with the values. Select from the following list and include a brief description with it. NOTE: If calculations are made to quantify the impact, include them in an appendix to the assessment report.
1a. Bills 1b. Metered/measured by business 1c. Metered/measured by intern 2a. Indirect methods (wattage, # dumpsters, etc.) 2b. Estimate by experienced client staff 3a. Use of external calculation tool/published industry standard (list tools; appears to be peer reviewed) 3b. Outside expert opinion for input (list expert or ref. source) 4a. Estimate by inexperienced client staff 4b. Use of external calculation tool/published industry standard (list tools; unclear if peer reviewed)

Cost Savings:	**Energy:**
Hazardous Materials:	**Water Use:**
Hazardous Waste:	**Water Pollutions:**
Solid Waste:	**Air Emissions:**
Releases:	

P2 Metrics: Management Report Impacts

Intern: **Sadie Erdmann**	
Visitation Dates: **Summer 2015**	Assistance Mode: **SB**
Company Name and Location: **Nebraska Energy Office 521 S 14th St., Suite 300 Lincoln, NE 68508**	
Company Contact, Position, & Phone #: **Jack Osterman, Financing Division Chief, john.osterman@nebraska.gov, (402) 471-2817**	
Report Title: **Weatherization Assistance Program**	
Number of general and/or program improvement suggestions in management report: **0**	
Number of specific P2 suggestions in management report: **0**	
Number of specific P2 suggestions that are quantified: **0**	
Number of specific P2 suggestions that include a safety benefit: **0**	
Number of specific P2 suggestions that have the potential to reduce/eliminate releases: **0**	
Number of total hours spent on project: **approx. 300**	

Cost Savings (note in report narrative what is included in each)		**Energy**
Savings ($/yr): **$13514.46**		Electricity Reduced (kWh): **94286**
Initial Cost ($):		Other Energy (Type, Quantity, Units): **5797 therms**
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (include GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type): **133.2 MTCO2e/year**

(Note: **Hazardous Material**=process input supplies and feedstocks that are toxic or hazardous, e.g. chemicals, solvents, pesticides. **Hazardous Waste**=state and/or federally listed hazardous or toxic wastes or wastes meeting the criteria for ignitability, toxicity, corrosivity, or reactivity.)

Releases	
Releases Prevented (avg. #):	Material Prevented from Release:
How much will be prevented from release (lbs.)?	Where would release have gone?

Additional Questions:

Did the client report implementing/establishing a P2/sustainability/environmental policy within the last three years?

NO

If yes, how so? Explain.

Did the client report establishing a P2/sustainability/environmental team to address P2 within the last three years?

NO

If yes, how so? Explain.

Did the client report establishing some form of an environmental management system (EMS), 15001, other certifications, etc. within the last three years? **NO**

If yes, how so? Explain.

Describe and summarize safety benefits suggested:

Reducing energy usage reduces indoor air pollution which increases occupant's health. Also fixing or replacing old or faulty heating and cooling equipment reduces the risk of fires or other potential mishaps.

Describe and summarize benefits that will reduce regulatory burden:

N/A

Describe benefits that are preventative such as spill containment:

N/A

Total Greenhouse Gas Emissions Reduced (and how calculated):

133.2 MTCO2e/year (calculated using a GHG Calculator, source: 2014 EPA Pollution Prevention Programs GHG Calculator spreadsheet, based on: U.S. EPA, 2011 Climate Registry Default Emission Factors)

Describe other potential benefits specific to this management report:

This has increased the Nebraska Energy Offices knowledge regarding their Weatherization Assistance Program. It provided them with a comparison of the homes' actual energy consumption compared to the projected energy consumption.

Comments:

P2 Metrics: Management Report Impacts

Intern: Sadie Erdmann	
Visitation Dates: Summer 2015	Assistance Mode: SB
Company Name and Location: **Nebraska Energy Office 521 S 14th St., Suite 300 Lincoln, NE 68508**	
Company Contact, Position, & Phone #: **Jack Osterman, Financing Division Chief, john.osterman@nebraska.gov, (402) 471-2817**	
Report Title: **NebGuides**	
Number of general and/or program improvement suggestions in management report: **0**	
Number of specific P2 suggestions in management report: **0**	
Number of specific P2 suggestions that are quantified: **0**	
Number of specific P2 suggestions that include a safety benefit: **0**	
Number of specific P2 suggestions that have the potential to reduce/eliminate releases: **0**	
Number of total hours spent on project: **approx. 40**	

Cost Savings (note in report narrative what is included in each)		**Energy**
Savings ($/yr):		Electricity Reduced (kWh):
Initial Cost ($):		Other Energy (Type, Quantity, Units):
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (include GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type):

(Note: **Hazardous Material**=process input supplies and feedstocks that are toxic or hazardous, e.g. chemicals, solvents, pesticides. **Hazardous Waste**=state and/or federally listed hazardous or toxic wastes or wastes meeting the criteria for ignitability, toxicity, corrosivity, or reactivity.)

Releases	
Releases Prevented (avg. #):	Material Prevented from Release:
How much will be prevented from release (lbs.)?	Where would release have gone?

Additional Questions:

Did the client report implementing/establishing a P2/sustainability/environmental policy within the last three years?

NO

If yes, how so? Explain.

Did the client report establishing a P2/sustainability/environmental team to address P2 within the last three years?

NO

If yes, how so? Explain.

Did the client report establishing some form of an environmental management system (EMS), 15001, other certifications, etc. within the last three years?

NO

If yes, how so? Explain.

Describe and summarize safety benefits suggested:

There are no safety benefits associated with this management report

Describe and summarize benefits that will reduce regulatory burden:

N/A

Describe benefits that are preventative such as spill containment:

N/A

Total Greenhouse Gas Emissions Reduced (and how calculated):

N/A

Describe other potential benefits specific to this management report:

Specific benefits to this management report include increasing the awareness of NebGuides and the Nebraska Energy Office's programs. It increased Extension Educators awareness of the topics which will therefore create public education impacts as well

Comments:

P2 Metrics: Management Report Impacts

Intern: **Sadie Erdmann**	
Visitation Dates: **Summer 2015**	Assistance Mode: **SB**
Company Name and Location: **Nebraska Energy Office 521 S 14th St., Suite 300 Lincoln, NE 68508**	
Company Contact, Position, & Phone #: **Jack Osterman, Financing Division Chief, john.osterman@nebraska.gov, (402) 471-2817**	
Report Title: **Dollar and Energy Saving Loans**	
Number of general and/or program improvement suggestions in management report: **0**	
Number of specific P2 suggestions in management report: **0**	
Number of specific P2 suggestions that are quantified: **0**	
Number of specific P2 suggestions that include a safety benefit: **0**	
Number of specific P2 suggestions that have the potential to reduce/eliminate releases: **0**	
Number of total hours spent on project: **approx. 50**	

Cost Savings (note in report narrative what is included in each)		**Energy**
Savings ($/yr):		Electricity Reduced (kWh):
Initial Cost ($):		Other Energy (Type, Quantity, Units):
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (include GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type):

(Note: **Hazardous Material**=process input supplies and feedstocks that are toxic or hazardous, e.g. chemicals, solvents, pesticides. **Hazardous Waste**=state and/or federally listed hazardous or toxic wastes or wastes meeting the criteria for ignitability, toxicity, corrosivity, or reactivity.)

Releases	
Releases Prevented (avg. #):	Material Prevented from Release:
How much will be prevented from release (lbs.)?	Where would release have gone?

Additional Questions:

Did the client report implementing/establishing a P2/sustainability/environmental policy within the last three years?

NO

If yes, how so? Explain.

Did the client report establishing a P2/sustainability/environmental team to address P2 within the last three years?

NO

If yes, how so? Explain.

Did the client report establishing some form of an environmental management system (EMS), 15001, other certifications, etc. within the last three years?

NO

If yes, how so? Explain.

Describe and summarize safety benefits suggested:

There are no safety benefits associated with this management report

Describe and summarize benefits that will reduce regulatory burden:

N/A

Describe benefits that are preventative such as spill containment:

N/A

Total Greenhouse Gas Emissions Reduced (and how calculated):

N/A

Describe other potential benefits specific to this management report:

This has increased the Nebraska Energy Offices knowledge regarding their Energy Efficient Housing Loans. It provided them with a comparison of the homes' actual energy consumption compared to the projected energy consumption. This may cause future homes that receive Energy Efficient Housing Loans to be built to stricter standards, therefore reducing energy consumption.

Comments:

P2 Metrics: Entire Final Report Impacts

Intern: **Sadie Erdmann**	Assistance Mode: **SB**

Number of general and/or program improvement suggestions in entire final report: **0**
Number of specific P2 suggestions in entire final report: **0**
Number of specific P2 suggestions that are quantified: **0**
Number of specific P2 suggestions that include a safety benefit: **0**
Number of specific P2 suggestions that have the potential to reduce/eliminate releases: **0**

Number of total projects: **3**	Number of total hours spent on projects: **approx. 380**

Number of clients reporting adoption of a P2/sustainability/environmental policy within the last three years: **0**
Number of clients reporting establishing a P2/sustainability/environmental team within the last three years: **0**
Number of clients reporting adopting some form of an EMS, 15001, other certifications, etc. within the last three years:

Cost Savings (note in report narrative what is included in each)	**Energy**
Savings ($/yr): **$13514.46**	Electricity Reduced (kWh): **94286**
Initial Cost ($):	Other Energy (Type, Quantity, Units): **5797 therms**

Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):

Hazardous Waste	**Solid Waste**	**Air Emissions (include GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type): **133.2 MTCO2e/year**

(Note: **Hazardous Material**=process input supplies and feedstocks that are toxic or hazardous, e.g. chemicals, solvents, pesticides. **Hazardous Waste**=state and/or federally listed hazardous or toxic wastes or wastes meeting the criteria for ignitability, toxicity, corrosivity, or reactivity.)

Releases	
Releases Prevented (avg. #):	Material Prevented from Release:
How much will be prevented from release (lbs.)?	Where would release have gone?

Additional Indirect/Intangible Benefits: **Provided knowledge to NEO regarding their program and services**

Education Related P2 Benefits	
Total number of people spoken with informally about P2: **approx. 100**	
Total number of formal public presentations: **0**	Total number of people attending the formal presentations: **NA**

Media Related P2 Benefits		
Newsletter (# of articles): **1**		People reached through newsletter: **approx. 100**
Newspaper (# of articles): **0**		Circulation or audience of newspaper(s): **NA**
Radio Broadcasts (# of broadcasts): **0**	Time (min.): **NA**	# audience: **NA**

TV Broadcasts (# of broadcasts): **0**	Time (min.): **NA**	# audience: **NA**

Additional Questions:

Describe and summarize safety benefits suggested:

The Weatherization Assistance Program has safety benefits associated with it: reducing energy usage reduces indoor air pollution which increases occupant's health. Also fixing or replacing old or faulty heating and cooling equipment reduces the risk of fires or other potential mishaps.

Describe and summarize benefits that will reduce regulatory burden:

N/A

If yes, how so? Explain.

Describe benefits that are preventative such as spill containment:

N/A

Total Greenhouse Gas Emissions Reduced (and how calculated):

133.2 MTCO2e/year (calculated using a GHG Calculator, source: 2014 EPA Pollution Prevention Programs GHG Calculator spreadsheet, based on: U.S. EPA, 2011 Climate Registry Default Emission Factors)

Describe other potential benefits:

This project has increased the Nebraska Energy Office's knowledge regarding their Weatherization Assistance Program, Energy Efficient Housing Loans, and NebGuide usage.

Other Comments:

Appendices

APPENDIX A: Useful Contact People

APPENDIX B: Sanitized Report

APPENDIX C: Business's Impression of NDEQ

APPENDIX D: Affirmation of Client Discussion Regarding Business Information

APPENDIX E: Typical Pollution Prevention Presentation

APPENDIX A: Useful Contact Information

Lynn Chamberlin

Building Program Specialist

Nebraska Energy Office

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Jack Osterman

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Business Relations

Source Gas

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Phone: (402) 756-3099

Katie Southwick

Field Support Associate

Black Hills Energy

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Phone: (402) 437-1771

APPENDIX B: Sanitized Report

Not applicable to this report

APPENDIX C: Business's Impression of NDEQ

There was no interaction with the NDEQ regarding this project

P3 Intern Client Impressions of NDEQ-2015

1. **What are the general impressions your clients have of the NDEQ staff they come in contact with?**

N/A

2. **What services would your clients like NDEQ to provide to them?**

N/A

3. **How can NDEQ improve upon services provided?**

N/A

4. **What do your clients think is the most important environmental issue facing Nebraska?**

N/A

APPENDIX D: Affirmation of Client Discussion Regarding Business Information

APPENDIX D

Affirmation of Discussion with Client(s) Regarding Business Information

This document confirms that **(INSERT NAME OF INTERN)** has spoken to each of his/her business clients about how the Partners in Pollution Prevention (P3) program will handle information about the business in the reports and/or presentations produced for the P3 program. Below are listed the names of the business clients, the person with whom the discussion was held, the date of the discussion, and if any exceptions to the P3 program policy for handling business information were requested.

	Business Name	Contact person and title	Date of Discussion	Were exceptions requested? Yes or No
1	NEBRASKA STATE ENERGY OFFICE	JOHN S. OSTERMAN FINANCING & BUS. CHIEF	8/7/2015	YES
2				
3				
4				
5				
6				

If a client requests any exceptions to the P3 policy for handling business information, the details of those exceptions are listed below and included in an appendix to the individual management report for that client. The complete documentation of the exception must include what specific information is involved and how that information may or may not be used.

NOT TO USE SOCIAL SECURITY NUMBERS OF PROGRAM APPLICANTS OR FEDERAL TAXPAYER IDENTIFICATION NUMBERS, OR NAMES IN ANY REPORTS OF THE PROGRAM APPLICANTS.

APPENDIX E: Typical Pollution Prevention Presentation

Slide 1

Nebraska Energy Office

P3 Internship Program
Summer 2015
Prepared by: Sadie Erdmann

Slide 2

Funding

- US DOE State Energy Extension Partnership (SEEP)
  - Grant #EE0005466

Slide 3

Company Background

- Government agency
- Established 1973
- Motto: to promote the efficient, economic and environmentally responsible use of energy

Slide 4

Weatherization Assistance Program

- provides weatherization services to low-income households
- Purpose is to reduce energy consumption
- Impacts
  - Health, safety, and well-being
  - Economic
  - Environmental

Slide 5

Blower Door Test

Slide 6

Training Session

Source:http://waptac.org/Tools/Weatherization-Presentations-101002D301.aspx

Slide 7

NebGuides

- online publications meant to inform on a wide variety of topics
- six energy efficiency NebGuides (G2230-G2235)
- Surveyed Extension Educators throughout NE

Slide 8

Impacts

- Public education
- Provide NEO knowledge of programs

Summary of Impacts		
	Total	Per Home
Energy Impacts		
Natural Gas Energy Savings (therm/year)	5,797	73
Electric Energy Savings (kWhs/year)	94,286	1,194
Economic Impacts		
Natural Gas Cost Savings ($/year)	$5,317.30	$66.04
Electric Cost Savings ($/year)	$8,297.17	$105.03
Total Cost Savings ($/year)	$13,614.47	$171.07
Environmental Impacts		
Natural Gas Emission Reductions (MTCO2e/yr)	30.8	0.39
Electric Emission Reductions (MTCO2e/yr)	102.4	1.30
Total Emission Reductions (MTCO2e/yr)	133.2	1.69