

Schuyler Loan Program

Analysis of Energy Savings

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Nebraska Energy Office

Introduction

Schuyler city government and its Energy Commission have operated a 3.6 percent energy conservation loan program for homes, businesses, nonprofits and government buildings since 1987. To date 10 commercial and 106 residential loans have been made. The loan pool was capitalized with \$178,007 in Exxon funds and \$199,500 from local lenders. As loans are repaid additional loans are made as possible. The program is scheduled to continue making loans through 1997.

Data Analysis

Monthly energy consumption and cost data was collected for 63 residential and 9 commercial loans to estimate the success of the program in terms of energy savings, dollar savings on energy bills, and environmental impacts. This information along with the total cost of the work done through the program was used to estimate the economic impact of the program.

Of the 63 loans for which data were collected, 38 were found suitable for estimating natural gas savings and 20 were found suitable for estimating electricity savings. Of the 25 loans not suitable for estimating natural gas savings, 10 had ownership and/or occupancy changes, 1 replaced a fuel oil furnace with a natural gas furnace, 1 replaced a propane furnace with a more efficient model, and 13 loans financed only air conditioning equipment. Of the 43 loans not suitable for estimating electricity savings, 10 had ownership and/or occupancy changes, 3 loans replaced only the furnace, and electricity consumption for 30 loans could not be evaluated because of weather.

All energy consumption and cost data were adjusted to reflect consumption and costs in a "normal" weather year. A study of the percent savings relative to the change in cooling degree days, revealed that when cooling degree days in the post project year fell below 50% of the cooling degree days in the pre-project year, savings estimates became very unreliable. Thus 30 loans were found unsuitable for estimating electricity savings.

Estimates obtained from the 38 loans for natural gas savings and the 20 loans for electricity savings were then used to estimate savings for each of the residential loans.

The commercial loans were processed in a similar manner.

Natural Gas Savings

The loans were divided into 5 categories to estimate natural gas savings. These loan categories are:

1. replaced a natural gas furnace with a more efficient model
2. all other projects affecting natural gas consumption (i.e., insulation, windows, doors, water heater, etc.)
3. natural gas furnace replacement in combination with other projects which affect natural gas consumption
4. air conditioning project only (assumed to have no impact on natural gas consumption)
5. fuel switching project (fuel oil to natural gas furnace, natural gas furnace to heat pump, etc. -- these results are reported in the fuel switching section)

Total adjusted natural gas consumption for the 38 residences evaluated for the 12 months prior to completion of the loan financed work was 45,550 therms at a cost of \$21,440. Total estimated savings was 9,228 therms of natural gas at a cost of \$4,908 annually. On average, these homes consumed 1,199 therms of natural gas prior to program participation and saved 243 therms (or \$129) annually. For these 38 loans, natural gas consumption was reduced 20.26%.

Of these 38 loans, 25 included the replacement of an old natural gas furnace with at least an 80% efficient (22 were 90% or higher) natural gas furnace and possibly the replacement or installation of air conditioning equipment (assumed to not affect natural gas consumption). These homes used on average 1,211 therms of natural gas in the year prior to program participation and saved an average of 267 therms (or \$142) annually. For these 25 loans, natural gas consumption was reduced 22.04%.

Seven of these 38 loans financed other projects such as insulation, window replacements, water heater replacement, etc., but did no furnace work. These homes used on average 1,123 therms of natural gas in the year prior to program participation and saved an average of 50 therms (or \$25) annually. For these 7 loans, natural gas consumption was reduced 4.42%.

The remaining 6 loans financed both furnaces and other projects. These homes used on average 1,236 therms of natural gas in the year prior to program participation and saved an average of 358 therms (or \$196) annually. For these 6 loans, natural gas consumption was reduced 29.79%.

These impacts of the Schuyler Loan Program on natural gas consumption are summarized

in Table 1 below:

Table 1. Average Natural Gas Savings per Loan

Description of Category	No. of Loans	Prior Use	Therms Saved	% Saved	\$ Saved
Furnace Project only (or with AC)	25	1,211	267	22.04	142
Furnace Project and Others	6	1,236	358	29.79	196
No Furnace Project (only Others)	7	1,123	50	4.42	25
All loans affecting natural gas	38	1,199	243	20.26	129

Electricity Savings

The loans were divided into three groups to estimate electricity savings. The first group includes all homes which are heated by an energy source other than electricity, such as natural gas, propane, or fuel oil. The second group includes all homes which are heated by electricity. The third group includes those homes which switched to or from electricity for heating (these results are included in the fuel switching section). Each group was then further divided into categories based on the types of projects funded. For those categories with fewer than 4 loans, information from the analyses of the Lincoln Energy Conservation Interest Subsidy and Rebate Program and the Dollar and Energy Saving Loan Program was incorporated into this analysis to arrive at an estimate of the percentage of electricity saved.

Group 1, homes heated by an energy source other than electricity contain 19 loans for analysis. This group was divided into the following categories for analysis:

1. replaced central air conditioner with a more efficient model
2. all other projects affecting electricity consumption (i.e., insulation, windows, doors, etc.)
3. central air conditioner replacement in combination with other projects
4. upgrade room air conditioner to central air conditioner
5. upgrade from room to central air conditioning in combination with other projects
6. furnace project only (assumed to have no impact on electricity consumption)

Total adjusted electricity consumption for the 19 residences evaluated for the 12 months prior to the completion of the loan financed work was 234,251 kWh at a cost of \$12,122. Total estimated savings was 16,131 kWh of electricity at a cost of \$893 annually. On average these homes consumed 12,329 kWh of electricity prior to program participation and saved 849 kWh (or \$47) annually. For these 19 loans, electricity consumption was reduced 6.89%.

Results for the categories listed above are summarized in Table 2. The percentage of energy savings for those categories marked by an asterisk (*) was determined by including information from the analyses of the Dollar and Energy Savings Loan Program and the Lincoln Energy Conservation Interest Subsidy and Rebate Program.

Table 2. Average Electricity Savings per Loan

Description of Category	No. of Loans	Prior Use	kWh Saved	% Saved	\$ Saved
Central AC replaced only	11	13,063	1,112	8.51	62
Central AC replaced and Others *	1	13,381	1,254	9.37	69
Room to Central AC only	4	11,389	140	1.23	8
Room to Central AC and Others *	2	10,345	243	2.35	13
Other Projects (no AC) *	1	12,724	212	1.67	12
All loans affecting electricity	19	12,423	776	6.25	43

Group 2, all electric homes received 4 of the loans in the study. Only one of these loans had consumption data suitable for analysis. The results from this loan and results from the Dollar and Energy Savings Loan Program and the Lincoln Energy Conservation Interest Subsidy and Rebate Program found savings of 31.17% when both the heating and cooling systems were replaced and average savings of 1.45% for all other projects. These homes used an average of 35,346 kWh annually prior to participation in one of the loan programs.

All Other Residential Savings

A few loans involved replacing a propane furnace or a fuel oil furnace with a more efficient model using the same fuel or switching to a natural gas furnace. Since adequate data does not exist to evaluate these loans separately, consumption and savings were assumed to be equivalent to the natural gas furnaces documented above.

Savings from Commercial Loans

The ten commercial loans to date are very different in nature and provide a number of problems to estimate energy savings. Five of the business owners indicated that changes in operating hours and/or procedures had been made due to the energy improvements. In all cases these changes reduced the potential energy savings that might have been realized. Additionally, one building had been vacant for part of the year prior to making the improvements. Where possible these factors were adjusted for in estimating energy savings. The same adjustments for weather conditions were made as in the residential loans. Conservatively, the annual estimated energy savings for the commercial loans are 40,766 kWh of electricity and 7,911 therms of natural gas. In monetary terms, the loans save about \$6,187 annually in energy bills. Energy consumption was reduced by 11.78%.

Total Loan Program Benefits

The total annual energy savings from the Schuyler Energy Conservation Program are summarized in Table 3 below:

Table 3. Summary of Energy Savings

Sector	# of Loans	Electricity Savings (kWh)	Natural Gas Savings (therms)	Propane Savings (gallons)	Heating Oil Savings (gallons)	Total Savings (mill. Btu)
Residential	106	81,403	14,476	279	3,702	2,850.6
Commercial	10	40,766	7,911	--	--	1,223.2
Total	116	122,169	22,387	279	3,702	4,073.8

In addition to reducing their energy consumption and thus their energy bills, loan participants are also benefitting society because of the reduction in greenhouse emissions resulting from their reduced energy use. The total reduction in greenhouse gas emissions due to the Schuyler Loan Program are:

Sulfur Dioxide	568 pounds
Nitrous Oxides	1,194 pounds
Carbon Dioxide	204 tons

Among the economic impacts from the Schuyler Energy Conservation Loan Program is the estimated \$21,075 annual savings to loan participants on their energy bills. Also, based on an analysis for the Dollar and Energy Savings Loan Program, it is estimated that the economic activity generated by the work financed by the loans and 10 years of savings on energy bills will support 8.4 job-years of employment and \$185,000 in added wage and salary compensation. Averaged over the 10 years, the economy will sustain a net improvement of 0.84 jobs each year for the 10-year period. Wage and salary income will increase by an average of \$18,500 each year for 10 years. It is expected that these benefits will contribute a total of \$300,000 to the Nebraska Gross State Product over the 10-year period, or an average of \$30,000 annually.

It should be noted that these are probably conservative estimates of the economic benefits, since many of the projects funded have an expected life of more than 10 years.