

**Response of
Interstate Power and Light Company
to
OFFICE OF CONSUMER ADVOCATE
Data Request No. 15**

Docket Number: EEP-08-1
Date of Request: May 16, 2008
Response Due: May 23, 2008
Information Requested By: Jennifer Easler
Date Responded: May 23, 2008
Author: Lisa Pucelik
Author's Title: Product Manager
Author's Telephone No.: (319) 786-4283
Subject: Outreach, Education and Training
Reference: 2009-2013 Energy Efficiency Plan, Page(s) 137

Data Request No. 15

How does IPL calculate savings of 345,000 kWh, 2,000 therms, and 2.2 million gallons of water attributable to the LivingWise Program? Explain how IPL determines the savings to be directly attributable to this program.

Response

The school-based energy education program, LivingWise, is evaluated on an annual basis by the program administrator, The Cadmus Group (formerly known as Quantec, LLC).

As part of the program, students complete a survey about the installation of the efficiency measures included in the LivingWise kit and the adoption of energy-saving behaviors. Based on installation rates and other information provided by the students, The Cadmus Group calculates impacts and provides a report of program results on an annual basis.

The LivingWise program is a joint collaboration with Aquila, and results are traditionally detailed in a combined report. For the purposes of this data request, IPL requested a revised report be created to reflect only the IPL results. This report, dated May 21, 2008, is enclosed as OCA Data Request No.15, Attachment A.

It is worthwhile to report that one of the conclusions of the Cadmus group is that the annual per participant benefits of the program in terms of home energy bill savings is estimated to be about \$84, while the program per participant cost is the one-time expenditure of \$50.

It is also worthwhile to note what is not in the report. There is no attempt in the evaluation to estimate the indirect benefits of participants implementing other measures prompted by the LivingWise program, for instance, the benefits of the added CFLs that participants purchase after installing the one CFL from the LivingWise kit.

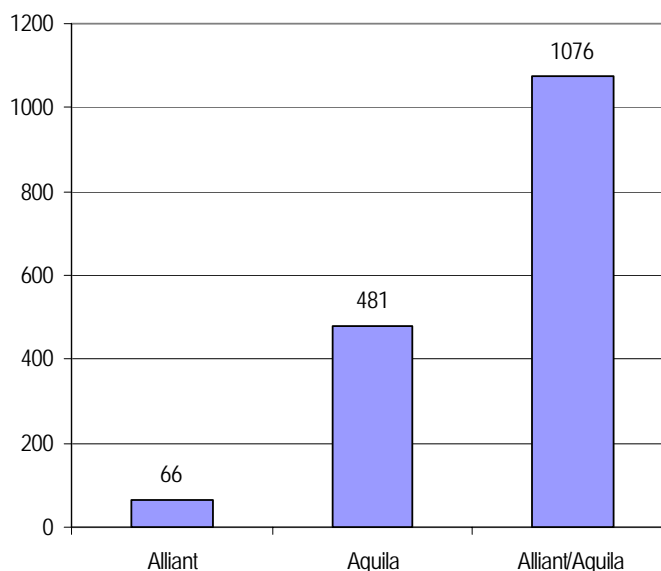


Date: May 21, 2008
To: Lisa Pucelik, Alliant Energy
From: Jamie Drakos
Re: School-Based Energy Education – 2006–2007

This memorandum reports the results for Alliant’s Iowa LivingWise Program (Program) for the 2006–2007 year. The Program is a school-based energy education initiative sponsored by both Aquila and Alliant Energy. The savings generated by the Alliant portion of the Program are detailed at the end of this memo.

During the 2006–2007 year, 1,623 students participated. Figure 1 shows the number of participants from each of the utility service areas. In addition, 33 teachers also participated. As teachers did not complete the survey, however, they are not included in the figure below.

Figure 1. LivingWise Participants



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Student Learning

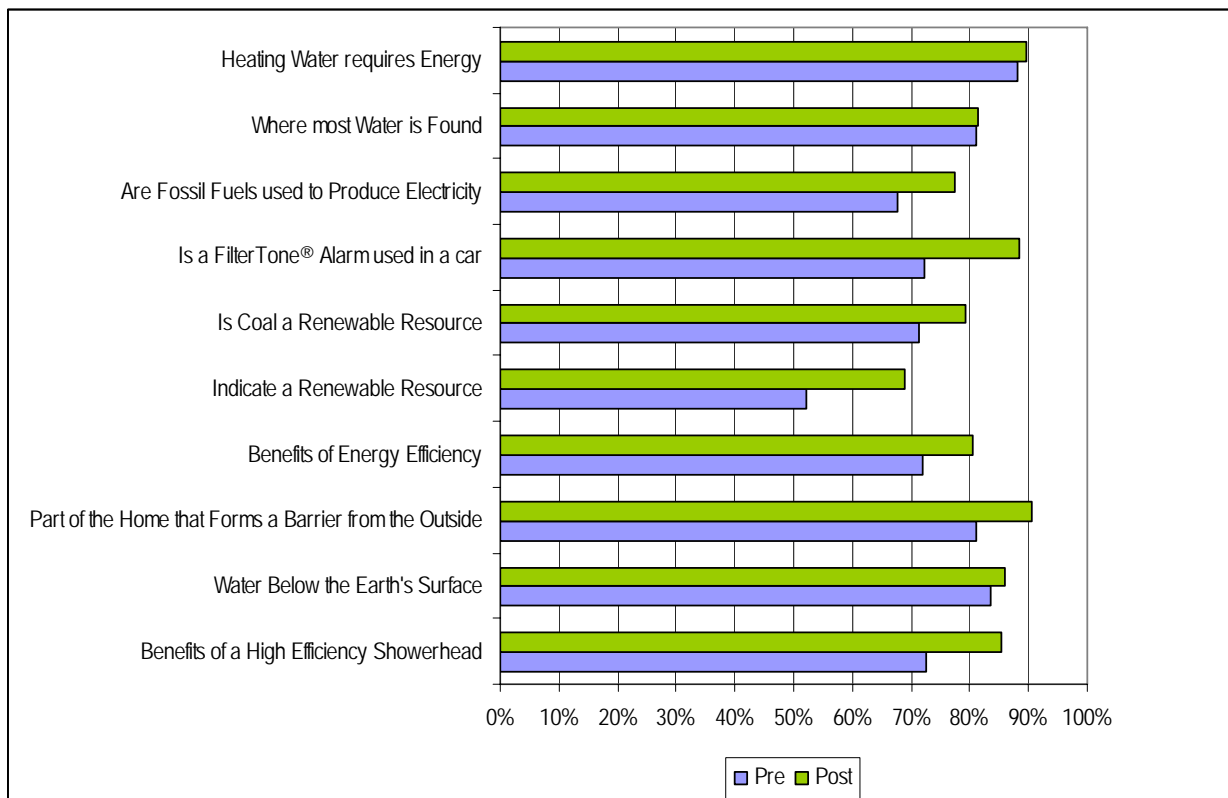
Participating teachers distributed energy-saving kits and guided students through a series of in-class and at-home assignments designed to:

- Increase knowledge and awareness of energy production and use;
- Promote adoption of resource-saving actions; and
- Familiarize students with the contents of the energy-saving kit measures and encourage installation of the measures in students' homes.

In measuring the program's general impact on students' understanding of energy and energy-efficiency concepts, students were given a pre- and post-test before and after Program delivery (Figure 2). Students answered multiple choice or true/false questions.

On average, the number of correct answers increased by 9% across the various areas of inquiry.

Figure 2. Pre- and Post-Test Results



Energy-Saving Actions

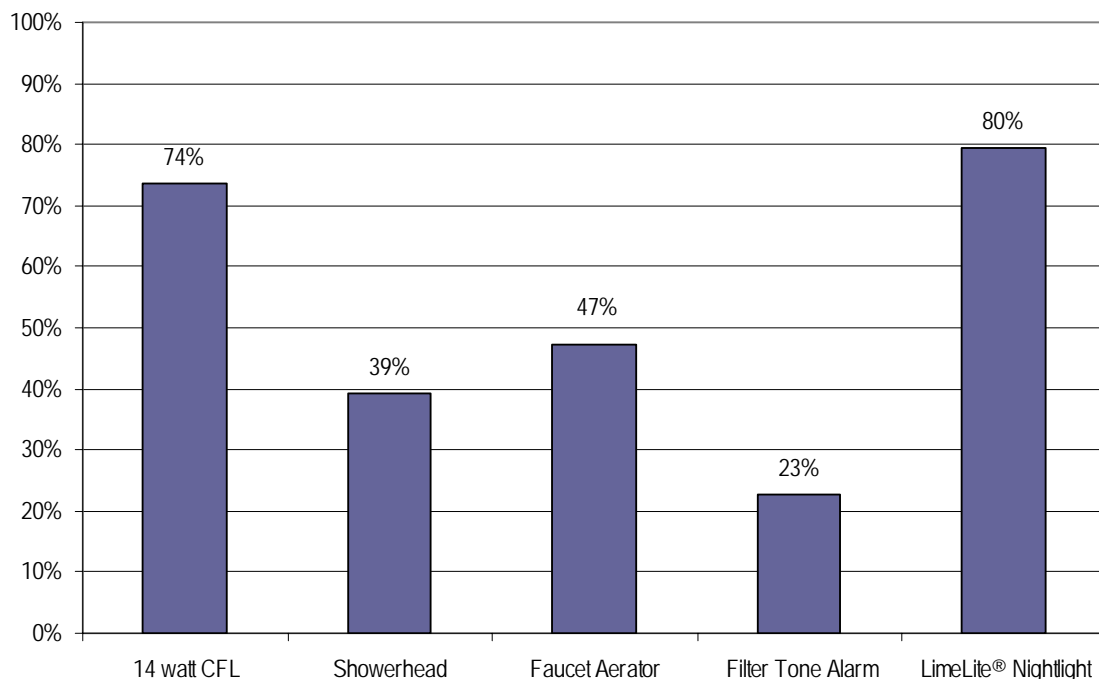
Program participants received a LivingWise Kit with energy savings measures including:

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- 14-Watt compact fluorescent lamp (CFL)
- High-efficiency showerhead
- Faucet aerator
- Filter Tone™ alarm
- Electroluminescent LimeLite® Nightlight

Students completed a survey to report on the installation of the efficiency measures included in the kit and the adoption of energy-saving behaviors. Figure 3 shows the installation rate of different kit measures as reported by students.

Figure 3. Measure Installation Rates



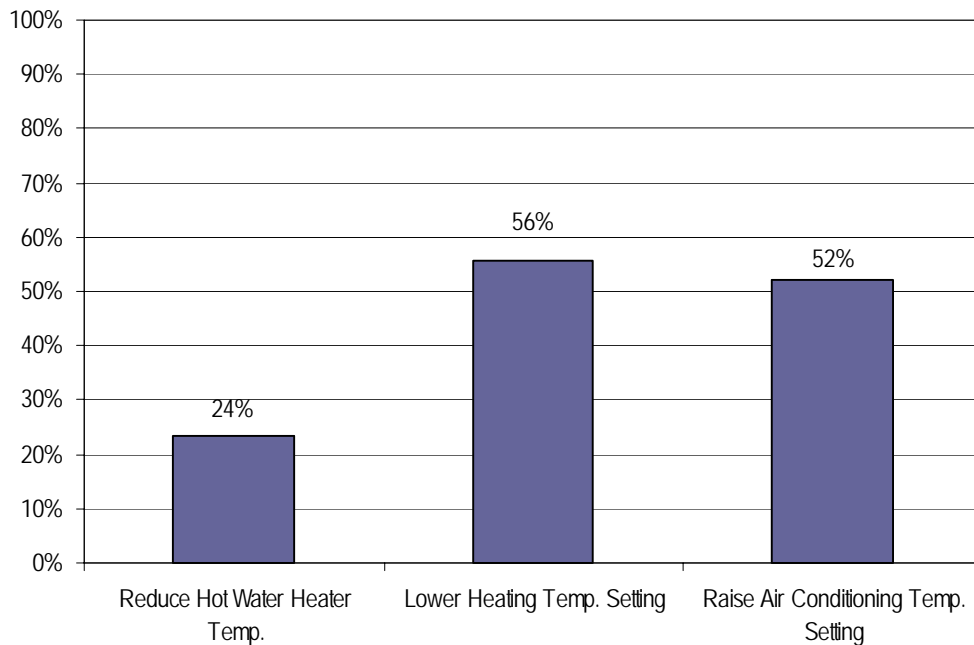
The kit also included several measurement cards designed to measure the temperature settings of heating and cooling systems, refrigerators and freezers, and water heaters. Participants were encouraged to adjust thermostat and temperature settings to the following energy-saving levels:

- Heating – 68°F during the day and 60°F at night
- Cooling – 78°F during the day and 82°F at night
- Water Heater – between 120°F and 130°F

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Teachers encouraged students to work with their parents and other family members to install the measures and adopt the recommended temperature settings. Figure 4 shows the percentage of students making temperature adjustments.

Figure 4. Temperature Adjustment Rates



Savings for an average participant and the overall Program were based on measure installation. For the 1,083 students returning surveys, we estimated their savings based on reported installation rates. Non-responding participant savings were estimated at an installation rate equal to one-half that of respondents.

Calculation of Impacts

Impacts were calculated for each of the measures and energy-saving behaviors based on the installation rates and other information provided by the students. These calculations, showing the installation rates and impact of respondents, are detailed below.

Participant Characteristics. Participants were asked to provide key demographics and household characteristics used to determine savings. The provided information is shown in Table 1.¹

¹ Participants indicated whether they heated their homes with natural gas or with electricity. The saturation of electric furnaces versus electric radiant heating was estimated at 66%, based on results from the 2006–2007 Iowa Energy Wise Program.

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Table 1. Participant Characteristics

Characteristic Information		Value
Occupancy	Adults per Household	2.2
	Children per Household	2.8
	Total Occupants	5.0
Type of Space Heating	Electric Furnaces	4%
	Natural Gas Furnaces	71%
	Other Electric	2%
	Other	23%
Type of Water Heating	Electric	42%
	Natural Gas	58%
Home Characteristics	Built Before 1992	62%
	Own Home	81%

Compact Fluorescent Lamp. Students were asked to provide the wattage of the bulb replaced by the 14 Watt CFL and the number of hours the light was on during a typical day. Students told us the average wattage of the replaced bulb was 69 Watts and the light was on an average of 2.8 hours per day. Average savings per participant were calculated using the following formula:

$$\frac{\left[\begin{array}{c} \text{Installation} \\ \text{rate} \end{array} \right] * \left[\begin{array}{c} \text{Average hours/} \\ \text{day} * 365 \text{ days} \end{array} \right] * \left[\begin{array}{c} \text{Wattage replaced} \\ - \text{Wattage CFL} \end{array} \right]}{1,000}$$

Based on this, average savings from the CFL are 41 kWh per year.

High-Efficiency Showerhead. The installation of high-efficiency showerhead resulted in water, electric, and natural gas savings for Program participants. Program savings from the showerhead were calculated in two steps, as follows.

First, Program participants were asked to determine the flow rate of their existing showerhead in gallons per minute (GPM) using the flow rate measurement bag included in the kit. Annual water savings per participant from the installation of the high-efficiency showerhead were calculated as:

$$\left[\begin{array}{c} \text{Average reported pre water flow (GPM)} \\ - \\ \text{average reported post water flow (GPM)} \end{array} \right] * \left[\begin{array}{c} \text{No. showers/ week} * \\ \text{minutes per shower} * \\ \text{weeks} \end{array} \right]$$

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The average pre-installation water flow rate was 2.1 GPM; the average post-installation water flow rate was 1.5 GPM. Thus, Program kWh savings from the showerhead measure were calculated as:

$$\left[\begin{array}{l} \text{Installation rate}^* \\ \text{percent w/ electric} \\ \text{water heat} \end{array} \right] * \left[\begin{array}{l} \text{Annual} \\ \text{water} \\ \text{savings/} \\ \text{participant} \\ \text{(gallons)} \end{array} \right] * \left[\begin{array}{l} 8.33 \text{ lbs./gallon} * 45^\circ\text{F}\Delta T \\ \hline 3,413 * \text{water} \\ \text{heater efficiency} \\ (0.90) \end{array} \right]$$

Likewise, therm savings were calculated as:

$$\left[\begin{array}{l} \text{Installation rate}^* \\ \text{percent w/ natural} \\ \text{gas water heat} \end{array} \right] * \left[\begin{array}{l} \text{Annual} \\ \text{water} \\ \text{savings/} \\ \text{participant} \\ \text{(gallons)} \end{array} \right] * \left[\begin{array}{l} 8.33 \text{ lbs./gallon} * 45^\circ\text{F}\Delta T^2 \\ \hline 100,000 * \text{water} \\ \text{heater efficiency} \\ (0.60) \end{array} \right]$$

Average participant savings from the high-efficiency showerhead were 136 kWh and 9.5 therms.

Faucet Aerator. Savings from the faucet aerator included in the kit were based on the minutes of use per day (an average of 15 minutes was reported by students) and the reduction in flow rate (0.7 GPM).³ Further, we considered the installation rate (47%) and the proportion of customers with natural gas and electric water heating.⁴

Savings from the faucet aerator were estimated at 73 kWh and 5.1 therms per participant.

Filter Tone Alarm. The filter tone alarm created savings when the alarm alerted a resident to change the filter. Significant build-up on the filter created pressure, activating the alarm. We estimate savings resulting from more regular filter replacement to be 2% of the base energy consumption for heating.⁵

² Assuming a 45°F temperature increase from groundwater temperature for showers. A Btu = the energy required to raise 1 lb. of water 1°F.

³ Students did not report faucet aerator flow rates. We used an average pre-installation flow rate of 2.0 GPM as reported by participants in the 2006–2007 Iowa Energy Wise Program. Reported post-installation flow rates from the same program were 1.3 GPM.

⁴ We assumed a 30°F temperature differential from groundwater temperature for sink usage.

⁵ The Energy Information Administration reports 6517 kWh and 722 therms average usage for heating in the Iowa climate zone.

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Given the fuel shares for space heating of Program participants, and the 23% measure installation rate (as reported by participants), average savings from the filter tone alarm were 1 kWh and 2.1 therms.

Electroluminescent (EL) LimeLite® Nightlight. The Resource Action kit included a 0.03W EL nightlight to replace an existing 7-Watt light. Eighty percent of participants indicated they installed the nightlight. To calculate savings, we needed to factor in how many students had replaced an existing unit. We assumed 58% of students installing the electroluminescent nightlight replaced a pre-existing unit.⁶ The resulting savings were calculated as follows:

$$\frac{\left[\begin{array}{l} \text{Installation rate*} \\ \text{percent replacing} \\ \text{existing lights} \end{array} \right] * \left[\begin{array}{l} \text{8hrs/ day *} \\ \text{365 days} \end{array} \right] * \left[\begin{array}{l} \text{7W - .03W} \end{array} \right]}{1,000}$$

Average savings from the EL nightlight were 9 kWhs.

Temperature Adjustment. The LivingWise Kit provided a water heater temperature card and an air thermometer strip to assist participants in adjusting the temperatures of their water heaters and space heating equipment.

The percent of participants making adjustments, the average adjustment, and the resulting energy savings are summarized in Table 2.

⁶ Quantec’s evaluation of the Washington Energy Education in Schools 2006–2007 program showed 58% of students installing a LimeLite® Nightlight replaced an existing nightlight. Other students used the LimeLite® in place of turning on a bathroom or hall light at night.

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Table 2. Equipment/Appliance Setting Adjustments

Water Heating Temperature	Installation Rate	Reduction in Temp °F ⁷	% Savings/°F	Saturation	Average Savings (unit/year)
Electric Savings	24%	10	.40%	42%	11 kWh
Gas Savings				58%	1.1 therms
Heating Temperature	Installation Rate	Reduction in Temp °F	% Savings/°F ⁸	Saturation	Average Savings (unit/year)
Electric Savings	56%	4	2.0%	6%	20 kWh
Gas Savings				70%	20.5 Therms
Cooling Temperature	Installation Rate	Increase in Temp °F	% Savings/°F	Saturation	Average Savings (unit/year)
Electric Savings	52%	4	2.0%	99%	71 kWh

Savings for the average responding participant are shown in Table 3 below.

Of 1,623 participants, we received 1,083 completed student surveys. The response rate of 67% is an improvement from last year's response rate of 47%. For students not completing a survey, we estimate installations to be one-half that of respondents. We estimate, overall, the average responding participant will generate savings detailed in Table 3. We accounted for respondents and non-respondents and determined average savings for a program participant as detailed in Table 4.

⁷ This reported reduction in temperature is less than the 11.7°F reduction reported by energy education participants in "Indiana Energy Assistance Program Energy Education Pilot: 2003–2004 Program Year Process and Impact Evaluation."

⁸ The US Department of Energy, Energy Efficiency and Renewable Energy division, estimates 3% in energy savings results for every one degree reduction in heating temperature.

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Table 3. Average Responding Participant Annual Savings⁹

Average Responding Participant			
Measure	Electric (kWh)	Gas (Therms)	Water (gallons)
CFL	41		
Showerhead	136	9.5	2,634
Faucet Aerator	73	5.1	1,823
Filter Tone Alarm	1	2.1	-
LimeLite® Nightlight	9	-	-
Adjust Hot Water Heater	11	1.1	-
Adjust Heating	20	20.5	-
Adjust Air Conditioning	71	-	-
<i>Total</i>	<i>362</i>	<i>38.3</i>	<i>4,457</i>
<i>Cost Savings</i>	<i>\$35.37</i>	<i>\$56.70</i>	<i>\$8.94</i>
<i>Total Per Participant Savings</i>		<i>\$101.01</i>	

Table 4. Average Participant Annual Savings

Average Participant			
Measure	Electric (kWh)	Gas (Therms)	Water (gallons)
CFL	34		
Showerhead	113	7.9	2,196
Faucet Aerator – Kitchen	61	4.3	1,520
Filter Tone Alarm	1	1.8	
LimeLite® Nightlight	8		
Adjust Hot Water Heater	9	0.9	
Adjust Heating	17	17.1	
Adjust Air Conditioning	59		
<i>Total</i>	<i>302</i>	<i>31.9</i>	<i>3,716</i>
<i>Cost Savings</i>	<i>\$29.51</i>	<i>\$47.29</i>	<i>\$7.45</i>
<i>Total Per Participant Savings</i>		<i>\$84.25</i>	

Based on average participant savings, accounting for both respondent and non-respondent installation rates, we calculated Program-generated savings. These savings are included in Table 5.

⁹ Cost savings calculated with the January 9, 2007, EIA published 2006 electric rates of 9.77¢ per kWh and a 6-month average natural gas rate beginning April 2006 of \$1.48 per therm for the state of Iowa.

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Table 5. Program Annual Savings

Program Savings			
Measure	Electric (kWh)	Gas (Therms)	Water (gallons)
CFL	55,527	-	-
Showerhead	184,008	12,827	3,564,298
Faucet Aerator	98,823	6,927	2,466,635
Filter Tone Alarm	1,461	2,868	-
LimeLite® Nightlight	12,285	-	-
Adjust Hot Water Heater	14,991	1,515	-
Adjust Heating	26,952	27,710	-
Adjust Air Conditioning	96,117	-	-
Total	490,164	51,847	6,030,933
Cost Savings	\$47,889.02	\$76,756.36	\$12,094.12
Total First Year Program Savings		\$136,739.50	

These Program savings were calculated for Alliant based on participation, installation rates, and fuel saturations in each service area. The numbers of participants for each fuel type are shown in Table 6.

Table 6. Alliant Participants

Electric	Natural Gas
1,142	66

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Table 7. Alliant Program Savings

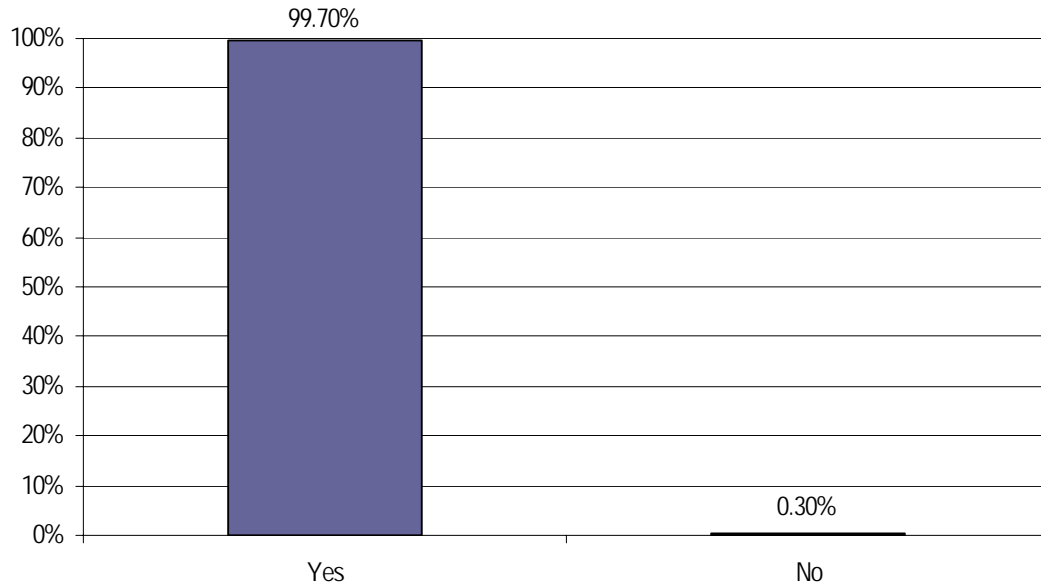
kWh	Therms	Water
344,897	2,108	2,244,414

Program Satisfaction

LivingWise retained a high satisfaction level with participants. More than 99% (99.7%) of students indicated they liked the Program.

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Figure 5. Students that Liked the LivingWise Program



Further, 69% of students said they involved their families in the program, sharing educational messages and installing measures. Sixty-five percent of the students indicated the program helped them change the way they used water, and 80% stated the Program helped them change the way they used energy in their homes.

Conclusions

LivingWise continues to be successfully implemented in Iowa schools. The Program teaches future generations about energy-efficient behaviors and tools, while providing immediate savings for families. Overall, participating households experienced annual bill savings of over \$84 compared to a program cost of \$50 per participant.