COST/BENEFIT EVALUATION RESULTS

for the

TARGETED ENERGY EFFICIENCY PROGRAM

in

Kentucky Power Company

Program Period: January 2003 - December 2004

Resource Planning & Economic Forecasting
Corporate Planning & Budgeting Department
American Electric Power

August, 2005

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I. COST/BENEFIT EVALUATION

Results:

Cost/benefit analyses of DSM programs may be performed using either a historical basis or a prospective basis. From a historical basis, actual costs and load impacts for DSM programs participants during a historical period (such as the first year of a program) are utilized to assess the net benefits. The net benefits may be calculated over a 20-year period for the first year's participants. These are after-the-fact analyses that could be utilized to determine the cost-effectiveness of previous activity, but may not by representative of the future and therefore, should not be the basis for DSM program decision-making.

Cost/benefit analyses from a prospective basis anticipate future DSM program participation, costs and impacts. These analyses expand upon actual field experience (cost, impact, etc.) to estimate the net benefit from projected implementation in the future. The foundation of DSM program knowledge serves as a basis to estimate projected costs, impacts, etc. The real value of field experience is applying what has been learned to guide decisions on future DSM program implementation. Cost/benefit analyses were performed on the TEE Program for the "All Electric" participants sector and also for the "Base Load" participants sector.

The benefit/cost ratios for the 2003 – 2004 Targeted Energy Efficiency Program are significantly higher than the benefit/cost ratios seen in previous program evaluations. The primary drivers for the increased B/C ratios were increased fuel costs and increased emission rates. A decrease in On Peak and Off Peak system sales utilization negatively affected the B/C ratios for the program.

The 2002 and 2005 input data files were examined and later compared to determine which files had significant impacts (greater than 0.1 impact) on the B/C ratios for the program. The files

that consistently drove this magnitude of change were the marginal cost, emissions, and the system sales files. For "All Electric" Participants, based on 2002 input files, the Total Resource Cost test results for marginal costs and emission costs improved 0.43 and 1.13 respectively. The Total Resource Cost test results for system sales utilization decreased 0.14. For "Base Load" Participants, based on 2002 input files, the Total Resource Cost test results for marginal costs and emission costs improved 1.15 and 2.89 respectively. The Total Resource Cost test results for system sales utilization decreased 0.26.

TEE Program – "All Electric" Participants:

On a prospective basis, the TEE Program –"All Electric" participant sector was found to be cost effective based on the TRC and UC tests. However, the RIM test results, which are highly significant in today's environment, are negative. The Participant Test was not applicable since there was no participant cost in the program.

B/C Ratio	Economic Test
1.89	Total Resource Test
0.60	Rate Impact Measure
1.89	Utility Cost
N/A	Participant

Assumptions:

I. Program Costs (2003 $)

The cost/benefit analysis was performed using projected program costs based on the actual program costs realized in the 2003-2004 program evaluation period but adjusted to exclude any one-time costs such as: RLW evaluation cost, and energy education portion of the total CAA costs. The program duration covers from 2003-2004 with a total of 330 actual participants and 2005 with 150 projected participants. The total 2003-2004 TEE Program cost

was $316,861 including equipment/vendor, evaluation, and other miscellaneous costs. A breakdown of actual total TEE Program costs for both years are outlined in Table 1.

Table 1: Actual TEE Program Costs - All Program Participants (2003-2004)

	2003-2004
Evaluation	$ 0
Equipment/Vendor	$ 316,357
Other Costs	$ 504
Total Program Costs	**$ 316,861**

Table 2 provides an allocation of the actual TEE Program costs to the "All Electric" participants sector for cost/benefit analysis. The evaluation cost and other costs are allocated to the "All Electric" participant sector and the "Base Load" participant sector based on the actual costs for each sector.

Table 2: Actual TEE Program Costs – "All Electric" Participants (2003-2004)

	2003-2004
Evaluation*	$ 0
Equipment/Vendor	$ 305,402
Other Costs*	$ 504
Total Program Costs	**$ 305,906**

*Allocated from the actual total cost in Table 1

The projected/anticipated per participant annual program costs for the "All Electric" customers during the 2003 – 2005 period are shown in Table 3.

Table 3: Anticipated TEE "All Electric" Costs

Costs Used in Cost/Benefit Analysis	Per Participant
Administrative Costs	$ 175
Equipment/Vendor	$ 700
Evaluation Cost	$ 87
Total	**$ 962**

Additional measure/program characteristics based on the three years of the program and assumed for the cost/benefit analysis are:

A. Life of measure assumed at 14 years, with no replacement

B. 0% Freeriders

C. Administration Cost at $175 per participant

D. Average Incremental cost $700

E. Evaluation costs set at $87 per participant

F. Includes T&D loss savings of 10% for energy and 11% for demand

G. Anticipated energy impact is 1,792 kWh per participant (based on 2003-2004 Load Impact Evaluation Report prepared by RLW Analytics).

H. Anticipated winter demand impact is 0.605 kW per participant. Anticipated summer demand impact is 0.122 kW per participant.

TEE Program – "Base Load" Participants:

On a prospective basis, the TEE Program – "Base Load" sector was found to be cost effective based on the TRC and UC tests. However, the RIM test results, which are highly significant in today's environment, are negative. The Participant Test was not applicable since there was no participant cost in the program.

B/C Ratio	Economic Test
4.99	Total Resource Test
0.77	Rate Impact Measure
4.99	Utility Cost
N/A	Participant

Assumptions:

I. Program Costs (2003 $)

The total 2003-2004 actual TEE Program cost for the "Base Load" participants was $10,955 including actual equipment/vendor costs, allocated evaluation, and other miscellaneous expenses. A breakdown of actual "Base Load" participants program costs for both years are outlined in Table 4.

Table 4: Actual TEE Program Costs – "Base Load" Participants (2003-2004)

	2003-2004
Evaluation*	$ 0
Equipment/Vendor	$ 10,955
Other Costs*	$ 0
Total Program Costs	**$ 10,955**

*Allocated from the actual total cost in Table 1

The projected/anticipated per participant annual program costs for the "Base Load" customers for the period 2003 – 2005 period are shown in Table 5. The program duration covers from 2003-2004 with a total of 158 actual participants and 2005 with 75 projected participants.

Table 5: Anticipated TEE "Base Load" Costs

Costs Used in Cost/Benefit Analysis	Per Participant
Administrative Costs	$ 50
Equipment/Vendor	$ 51
Evaluation Cost	$ 12
Total	**$ 113**

Additional measure/program characteristics based on the three years of the program and assumed for the cost/benefit analysis are:

A. Life of measure assumed at 13 years, with no replacement

B. 0% Freeriders

C. Administration Cost at $50 per participant

D. Average Incremental cost $51

E. Evaluation costs set at $12 per participant

F. Includes T&D loss savings of 10% for energy and 11% for demand

G. The anticipated energy impact is 553 kWh per participant (based on 2003-2004 Load Impact Evaluation Report prepared by RLW Analytics).

H. Anticipated winter demand impact is 0.081 kW per participant. Anticipated summer demand impact is 0.049 kW per participant.

Total TEE Program:

The total costs and benefits of the TEE Program, as a whole, can be calculated by totaling the component costs and benefits from "All Electric" participants and "Base Load" participants. Results are shown below. On a prospective basis, the TEE Program, as a whole, was cost effective based on the TRC and UC tests. However, the RIM test results, which are highly significant in today's environment, are negative. The Participant Test was not applicable since there was no participant cost in the program.

B/C Ratio	Economic Test
2.05	Total Resource Test
0.62	Rate Impact Measure
2.05	Utility Cost
N/A	Participant

EVALUATION REPORT

for the

RESIDENTIAL HIGH EFFICIENCY HEAT PUMP MOBILE HOME (HEHP-MH) PROGRAM

in

Kentucky Power Company

Program Period: January 2003 - December 2004

Resource Planning & Economic Forecasting
Corporate Planning & Budgeting Department
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I. EXECUTIVE SUMMARY

This report summarizes the results of the process and market evaluation, load impact evaluation, and cost/benefit evaluation for the years 2003-2004 of Kentucky Power Company's (KPCo or Company) Residential High Efficiency Heat Pump - Mobile Home (HEHP-MH) Program. The HEHP-MH Program, initiated by Kentucky Power's DSM Collaborative, has been successfully implemented in the Kentucky Power's service area since 1996. In September 2002, the Kentucky Public Service Commission (KPSC or Commission) approved a three-year extension of the program through 2005. This report presents the results of program evaluation for the period (2003–2004) of program implementation, while supporting the proposal for the continuation of the program beyond 2005.

KPCo's major goals for the HEHP-MH Program were: (1) to reduce energy consumption of electrically heated mobile homes, (2) to assist and encourage mobile home owners to improve heating, ventilation, and air conditioning (HVAC) efficiency by installing high efficiency heat pumps, (3) to increase customer satisfaction and services, and (4) to reduce AEP - Kentucky's long-range peak demand.

The program evaluation for this time period was based on program participants' pre and post HVAC installation data from the 2002 study, demographic data, rebate information, billing analysis, and the information obtained from the 2002 customer follow-up surveys. The HEHP-MH Program was found to be cost-effective based on the Total Resource Cost (TRC), Utility Cost (UC) and Participant (P) economic tests. The Program has significantly reduced participants' electric consumption. During the evaluation period (2003-2004) of program implementation, Kentucky Power promoted the HEHP-MH Program mainly through HVAC

dealers. The Company has successfully secured 150 participants through HVAC dealers during the evaluation period.

Kentucky Power's DSM Collaborative agreed to utilize the follow-up survey conducted by MQA Research during June 2002 as a basis for projecting customer satisfaction and freeridership. The follow-up survey results indicated high levels of satisfaction among the participants with their new heat pumps, with the heat pump installer and the program rebate level. Approximately nine out of ten of the program participants said they were "very satisfied" with these different aspects of the program. The survey also indicated approximately 34% to 48% of the program participants were freeriders.

Based on a previous study, the estimated load impacts for the average 2003-2004 program participant was an annual energy savings of 4,401 kWh, a winter peak demand reduction of 2.97 kW, and summer peak demand reduction of 0.14 kW. The HEHP-MH total net annual energy saving was estimated to be 572 MWh (including 10% Transmission and Distribution Loss Savings and estimated 48% of program freeriders, based on two years of actual and one year of estimated participation. The total net demand reduction was estimated to be 386 kW in winter and 18 kW in summer (including 11% Transmission and Distribution Loss Savings and 48% of program freeriders.)

II. TECHNOLOGY DESCRIPTION

Kentucky Power Company's HEHP-MH Program was designed to promote a more efficient HVAC system for mobile home owners. Approximately one third of all the Company's electric space heating residential customers live in mobile homes. Many of these mobile homes are heated and cooled by relatively inefficient HVAC systems. A significant gain in efficiency can be obtained by upgrading these HVAC systems with high efficiency heat pumps, which exceed USDOE minimum efficiency standards (split-system 11.0 SEER and 7.2 HSPF; package system 10.0 SEER and 6.8 HSPF).

Air Source Heat Pump

A heat pump is a high efficiency year-round heating and cooling system which operates entirely on electricity. The system is called a heat pump because it pumps or moves heat from one area to another. The basic components of a heat pump are: a compressor; circulating fluid (refrigerant); and two heat exchangers, one outside and one inside. In winter, heat is extracted from cold outdoor air even when the temperature is well below freezing. The heat is absorbed by the refrigerant, and then is pumped through the compressor to the indoor coil (heat exchanger) where the refrigerant releases its heat to the indoor air. Since there is less heat available at low outdoor temperatures, the heat pump system includes a supplemental resistance heater that automatically provides additional heat when the outdoor air temperature is too low for the heat pump compressor to supply the home's total heating demand. In the summer, the heat is absorbed by the refrigerant in the indoor coil from the circulating indoor air. The heat-laden refrigerant from the indoor coil is pumped to the outdoor coil where the heat is transferred to the outdoor air.

The heat pump system is the most efficient way to heat and cool electrically. The most significant energy savings are obtained during the heating season since it utilizes the "free" heat that already exists in the outdoor air. The heat pump energy efficiency is determined by the seasonal energy efficiency ratio (SEER) for summer and the heating seasonal performance factor (HSPF) for winter, where these are defined as follows:

$$\text{SEER} = \frac{\text{Total Cooling Provided During Cooling Season (Btu)}}{\text{Total Energy Consumed by the System (Watt Hours)}}$$

$$\text{HSPF} = \frac{\text{Total Heating Provided During Heating Season (Btu)}}{\text{Total Energy Consumed by the System (Watt Hours)}}$$

III. PROGRAM DESCRIPTION

The HEHP-MH Program was designed to encourage mobile home owners in the Kentucky Power service area to upgrade their electric heating system with a high-efficiency heat pump. Eligible customers could receive up to $400 toward installing a heat pump having SEER and HSPF ratings exceeding U.S. Department of Energy efficiency standards. All applicants were accepted on a first-come first served basis.

Program Promotion

During the evaluation period (2003-2004) of program implementation, the program participants were secured mainly through the local HVAC dealer network and by "word-of-mouth" (program participants telling their neighbors and friends about the program). The Company was successful in securing a total of 150 program participants during the years of 2003 - 2004. Table 1 summarizes the participation each year.

Table 1: Annual Participation

Year	Total
2003	63
2004	87
Total	**150**

Program Incentive

A customer incentive of $400 approved by KPCo's Demand Side Management Collaborative was maintained during the 2003-2004 evaluation period. To increase participation levels, on August 4, 2003, the DSM Collaborative approved the payment of a $50 incentive to the HVAC dealer for each high efficiency heat pump installation.

Program Load Impact Estimation

Initially, a heat loss/heat gain analysis (American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)-based) of the existing structure along with an estimated annual electricity usage of the existing heating/cooling system was performed on the program participants. Another analysis was completed using the new heat pump equipment to estimate annual electricity usage. The data required to perform the heat loss/heat gain analysis can be collected through an energy audit or direct metering of the program participants' home and/or HVAC equipment. For the evaluation period (2003-2004), no new energy audits were performed on the 2003-2004 program participants. Instead, the heat loss/heat gain estimates were developed by performing regression analyses on a sample of energy audit data from previous Kentucky Mobile Home Heat Pump program participants. The regression models were used to estimate heat gain, heat loss and the amount of baseload for each 2003-2004 program participant based on participant's mobile home characteristics. This procedure provided the Company with a comparison energy usage estimate for the existing heating/cooling system with the new heat pump without spending additional funds on the energy audit and/or load research metering. Additionally, specific actual billing data, demographic and HVAC data were collected in a previous study to aid in program evaluation.

IV. DATA COLLECTION

Several aspects of the HEHP-MH Program needed to be evaluated in order to determine the program's overall cost-effectiveness, which included market potential and penetration, customer satisfaction, success of delivery mechanism, dealer performance, load impact and program costs. The results from the 2000 AEP Eastern States Residential Customer Survey conducted in the summer of 2000 served as a basis to define the potential market segments, and future penetration of the program. In addition, a follow-up survey of 50 randomly selected participants in Kentucky Power service area was conducted by MQA Research (MQA) in June 2002. The follow-up survey was used as a basis to determine why customers chose to participate in the program and to provide information used to estimate freeriders and snapback effects among participants. The survey was also used to determine customer satisfaction with the performance of new heat pump operation, the service performed by the heat pump dealer or contractor, and overall satisfaction with the rebate level of the program. Key results pertaining to residential electric heating mobile home market in Kentucky Power service area developed from AEP 2000 Residential Customer Survey are presented in Appendix A. The results from the follow-up survey are presented in Appendix B.

For all participants, key participant information regarding the size and type of mobile home, and characteristics of previous heating and cooling systems were collected through the installation incentive form developed by Kentucky Power to be used by HVAC dealers at the time of the new heat pump installation (see Exhibit 1).

Appendix C provides the data summarization of the information collected at the time of installation. Appendix D includes an energy audit form. This data was collected and used in the

previous program evaluation to calculate the heat gain/heat loss of the mobile home to ensure the heat pump was sized correctly and to estimate the annual energy savings for a sample of program participants. For the evaluation period (2003-2004), no additional energy audits were performed on the new program participants. Instead, the previous collected energy audit data included energy audits for 127 customers from the previously implemented Residential Smart Mobile Home Heating System Upgrade Program (1993 in Ashland, Kentucky) and 10 program participants in the year of 1996 were used to conduct regression analyses. The regression models were developed, based on the size of mobile home, to estimate heat gain, heat loss and the amount of baseload for 2003-2004 program participants. Appendix E shows the heat loss, heat gain and baseload regression equations developed. Additionally, energy consumption of participants for the twelve months preceding the heat pump installation was retrieved from the Company's billing history database in a previous study. This information, along with heat gain/heat loss calculations from the regression analysis and weather data on heating and cooling degree days obtained from the National Oceanic and Atmospheric Administration, were used to develop the final estimates of the load impact of the HEHP-MH Program. Information collected in the follow-up survey served as a basis to estimate freeriders and snapback effects.

V. PROCESS AND MARKET EVALUATION

Process Analysis

The process analysis of the HEHP-MH Program utilized the installation data, recruitment tracking data, and the 2002 follow-up survey results to evaluate the delivery mechanism, promotional effectiveness, and customer satisfaction.

Delivery Mechanism: Kentucky Power Company utilized the Comfort Assured HVAC Dealers and the Company DSM program coordinator to administer the program.

Promotional Effectiveness: Based on the 2002 follow-up survey, the Comfort Assured dealers and mobile home salesman were the main sources for the program awareness to the participants making up 52% and 10%, respectively. Additionally, 30% of the participants indicated that they first became aware of the program through friends or relatives. Therefore, "word-of-mouth" was still an effective source of information on the HEHP-MH Program.

Customer Satisfaction: As participants indicated in the survey, overall satisfaction with the HEHP-MH Program was exceptionally high, with 84% of the respondents indicating that they are very satisfied with the rebate level provided by the program. More than nine out of ten (92%) of the respondents indicated that they were "very satisfied" with the performance of the high efficiency heat pump. When asked about the service provided by the heat pump installer, 86% of the participants indicated they were "very satisfied".

Market Analysis

In the analysis of the marketing of the HEHP-MH Program, the product awareness, effectiveness of incentives, freeridership and market potential were examined.

Heat Pump Awareness: Customer's awareness of the product, which is a heat pump, is very high. 82% of the participants had planned on purchasing and installing a high efficiency heat pump prior to participating in the program.

Effectiveness of Incentives: Only 26% of the participants said the HEHP-MH Program prompted them to replace their HVAC system sooner than they had planned. Participant's HVAC system replacement resulted from Kentucky Power Company's rebate of $400 offered toward the cost of a new heat pump. However, when participants were asked how likely they would have been to install a heat pump if there was not a rebate, about one-half (48%) said they are very likely to install a heat pump without a rebate. In addition, almost all participants (94%) are either very satisfied (84%) or somewhat satisfied (10%) with the rebate level, indicating the incentive level is not a concern to the program participants. As recommended in the 2000-2001 evaluation, the rebate was reduced from $500 to $400 beginning January 1, 2003.

Freeridership: To identify the freeriders, which were customers who had planned to install a heat pump in the absence of this program, some cross tabulations of survey questions were necessary. It was assumed that a customer who had planned on purchasing and installing a high-efficiency heat pump prior to hearing about the HEHP-MH Program and did not replace the heat pump sooner than planned and likely or very likely to install a heat pump without a rebate, was a freerider in the program and likely to install a heat pump if there was not a rebate. Based on this assumption, 48% of participants were identified as freeriders in this program. The percentage of Clearly Freeriders (those freeriders who indicated very likely to install a heat pump without rebate) is estimated to be 34%.

Market Potential: A majority of participants cited "to save money" (30%) or "needed a new cooling or heating system" (30% and 20%, respectively) as the main reason for participating

in the HEHP-MH Program and they also indicated high awareness of the heat pump and a high satisfaction with the heat pump performance. Therefore, it was concluded that there is a significant market potential for this program.

VI. IMPACT EVALUATION

Findings

Based on two-years (2003-2004) of HEHP-MH Program with 150 participants, the net total HEHP-MH Program's annual energy savings was estimated to be 572 MWh (which includes 10% Transmission and Distribution loss savings and 48% of program freeriders). From the previous study, each participant experienced an average energy savings of 4,401 kWh at the meter. The net total demand reduction was 386 kW in winter and 18 kW in summer (including 11% Transmission and Distribution loss savings and 48% of program freeriders). These impacts resulted from demand reductions per participant as determined in a previous study of 2.97 kW and 0.14 kW at the meter in winter and summer, respectively. Table 2 summaries the entire HEHP-MH program load impacts.

Table 2: Average Load Impacts for HEHPMH Program

	Participant
Annual Energy Savings/Participant	4,401 kWh(1)
Winter Demand Reduction/Participant	2.97 kW(1)
Summer Demand Reduction/Participant	0.14 kW(1)
Net Total Annual Energy Savings	572,130 kW(2)
Net Winter Demand Reduction	386 kW(3)
Net Summer Demand Reduction	18.2 kW(3)

(1) Data used from prior study
(2) Includes 10% Transmission and Distribution loss
(3) Includes 11% Transmission and Distribution Loss Savings

The snapback effect was investigated in a previous study by analyzing the follow-up survey from participants' responses to the questions regarding the temperature setting of their thermostat for their existing HVAC system for heating and cooling compared to the temperature setting with their new heat pump. On average, the participant reported a slight decrease in the

heating thermostat for their heat pump (73.4°F) compared to the setting for their old electric furnace (71.9 °F). Also, the participant reported a slight increase in cooling thermostat setting (from 71.3 °F to 72.4 °F). The differences in heating and cooling thermostat temperature settings were incorporated in the impact evaluation.

Energy Impact Analysis

When performing the pre-installation energy audit of the participant's mobile home, Company Marketing representatives used the Comfort Assured Load Calculator (CALC) software program, developed in house, to perform an engineering estimate of the total energy requirement of the home. CALC is an energy audit analysis software program, based on ASHRAE industry standards, that uses home thermal characteristics, local weather conditions, and HVAC system performance characteristics, to estimate the energy consumption of electric space heating and cooling systems. During the evaluation period, no new energy audits were performed on the 2003-2004 program participants. The key inputs to the program include heat loss/heat gain and baseload estimates were developed from performing regression analyses on a sample of energy audit data from previous Kentucky Mobile Home Heat Pump program participants. The program, with estimated heat loss/heat gain and baseload developed from regression analysis, was used to estimate the energy usage of the customer's existing electric central furnace, existing central air conditioning, and new high efficiency heat pump systems (Table 3). Based on program requirements, in the cases where customers did not have air conditioning, it was assumed that the customer would have installed a standard efficiency central air conditioner (10 SEER) in the absence of the high-efficiency heat pump.

The estimated energy consumptions from the CALC analysis of the existing electric central furnace with air conditioning was compared to that of the new high-efficiency heat pump

to determine the anticipated energy savings for each participant during the winter and summer seasons. The result of the analysis was input into a database to calculate the average percentages of energy savings for each participant. The engineering estimates from the heat loss/heat gain analysis from a previous study are shown in Tables 3 through 5.

Table 3: Average Energy Consumption-Based on Engineering Estimate

	Pre-Installation Electric Furnace	Post-Installation High Efficiency HP
Heating	11,318 kWh	7,072 kWh
Cooling	2,313 kWh	2,188 kWh
Base Load	8,895 kWh	8,895 kWh
Total	**22,526 kWh**	**18,155 kWh**

Table 4: Percentage of Total Consumption Based on Engineering Estimate

	Pre-Installation Electric Furnace	Post-Installation High Efficiency HP
Heating	50.2%	39.0%
Cooling	10.3%	12.0%
Base Load	39.5%	49.0%

Table 5: Average Energy Saving kWh/Participant Based on Engineering Estimate

	Electric Furnace / Central AC To High Efficiency Heat Pump
Heating	4,246
Cooling	125
Total	**4,371**

In order to further refine the energy savings estimate per participant, the average percentage of calculated energy savings was applied to each participant's pre-installed billing energy consumption. The pre-installation monthly energy consumption of participants was retrieved from a billing history tape. The average annual central air conditioning usage for many participants was estimated, since, in a previous study, 22.7% of participants did not have air conditioning and 27.3% had some type of window air conditioning prior to installation of the heat pump. However, these participants had indicated that they were planning to add central air conditioning in the near future. From the engineering analysis, it was determined that approximately 10.3% of the total energy usage of the mobile home was central air conditioning usage (assuming a standard SEER 10). Therefore, the average annual billing usage of customers with no air conditioning and customers with window air conditioning had to be adjusted upward to simulate the energy usage of central air conditioning, as shown in Table 6. The average adjustment factor for participants with no air conditioning was 11.5% and for participants with window air conditioning was 7.6%. In addition, the average annual pre-installation heating and cooling usage was weather-normalized to represent average weather conditions in the Kentucky Power service area. Table 6 shows the normalized pre-installation consumption for the cooling and heating seasons for an average participant.

The percentage of energy savings of the previous heating system and standard efficiency air conditioning system versus the new heat pump system was applied to the normalized consumption to arrive at an adjusted engineering estimate savings for each participant in the HEHP-MH Program (see Table 6). Based on the previous study, the average total energy savings was 4,401 kWh of which 4,275 kWh was heating savings and 126 kWh was cooling savings.

Table 6: Average Energy Consumption-Based on Pre-Installation Billing Data

	Electric Furnace
Average Billed Usage	
Without AC	19,938 kWh
With Central AC (Package)	24,500 kWh
With Central AC (Split)	24,930 kWh
With Window AC	18,699 kWh
Average Adjusted Billed Usage*	
Without AC	22,237 kWh
With Window AC	20,117 kWh
Average Billed Usage	
With AC	22,172 kWh
Percentage of Usage for Each Season	
Heating	50.2%
Cooling	10.3%
Seasonal Billed Usage	
Heating	11,025 kWh
Cooling	2,341 kWh
Weather Normalized Seasonal Billed Usage	
Heating	11,394 kWh
Cooling	2,329 kWh
Base Load	8,895 kWh
Total	**22,618 kWh**
Percentage of Seasonal Energy Savings	
Heating	37.5%
Cooling	5.3%
Estimate of Seasonal Energy Savings	
Heating	4,275 kWh
Cooling	126 kWh
Total	**4,401 kWh**

*After Adjustment for Air Conditioning Usage

Therefore, the estimate of the post-installation total energy usage of the total mobile home under normal weather conditions is equal to the weather normalized pre-installation billing usage minus the estimated energy savings of 4,401 kWh or equal to 18,217 kWh as shown in Table 7. It was also assumed that the base load usage remained the same for the pre- and post-installation periods.

Table 7: Average Energy Consumption-Based on Pre-Installation Billing Data

	High Efficiency Heat Pump
Estimate of Post-Installation Usage	
Heating	7,119 kWh
Cooling	2,203 kWh
Base Load	8,895 kWh
Total	**18,217 kWh**
% of Estimated Annual Usage	
Heating	39.1%
Cooling	12.1%
Base Load	48.8%

Demand Impact Analysis

The demand reduction, due to the installation of a high efficiency heat pump, was estimated based on AEP internal studies that made a comparison of load characteristics between a high efficiency heat pump system and an electric central furnace with air conditioning. These studies had incorporated information gathered from AEP system-wide heat pump end-use metering data, including KPCo data. The seasonal demand reductions are estimated based on seasonal load factors derived from these studies. These seasonal load factors were applied to the seasonal energy savings for the HEHP-MH Program to determine the heating and cooling demand reductions. The results are summarized in Exhibit 2.

VII. COST/BENEFIT EVALUATION

Results

Cost/benefit analyses of DSM programs may be performed using either a historical basis or a prospective basis. From a historical basis, actual costs and load impacts for DSM programs participants during a historical period (such as the first year of the program) are utilized to assess the net benefits. The net benefits may be calculated over a 20-year period for all participants. These are after-the-fact analyses that could be utilized to determine the cost-effectiveness of previous activity, but may not by representative of the future and therefore, should not be the basis for DSM program decision-making.

Cost/benefit analyses from a prospective basis anticipate future DSM program participation, costs and impacts. These analyses expand upon actual field experience (cost, impact, etc.) to estimate the net benefit from projected implementation in the future. The foundation of DSM program knowledge serves as a basis to estimate projected costs, impacts, etc. This is the real value of field experience: applying what has been learned to guide decisions on future DSM program implementation.

The benefit/cost ratios for the 2003 - 2004 Mobile Home Heat Pump Program are significantly higher than the benefit/cost ratios seen in previous program evaluations. The primary drivers for the increased B/C ratios were increased fuel costs and increased emission rates. A decrease in On Peak and Off Peak system sales utilization negatively affected the B/C ratios for the program.

The 2002 and 2005 input data files were examined and later compared to determine which files had significant impacts (greater than 0.1 impact) on the B/C ratios for the program.

The files that consistently drove this magnitude of change were the marginal cost, emissions, and the system sales files. Based on 2002 input files, the Total Resource Cost test results for marginal costs and emission costs improved 1.29 and 2.87 respectively. The Total Resource Cost test results for system sales utilization decreased 0.38.

On a prospective basis, the HEHP-MH Program is found to be cost effective based on the TRC, UC and Participant tests. However, the RIM test results are highly significant in today's environment, are negative.

B/C Ratio	Economic Test
5.53	Total Resource Test
0.75	Rate Impact Measure
4.42	Utility Cost
3.49	Participant

Assumptions

A. Program Costs (2003$)

The cost/benefit analysis was performed using projected program costs based on the actual program costs realized in the first-year of the program but adjusted to exclude any one-time costs such as load research meters and contracted electrician costs. The program evaluation covers the period from 2003-2004 with a total of 150 participants. The total HEHP-MH Program costs were $65,200 including promotional/administrative, customer incentives, dealer incentives, evaluation and other miscellaneous costs over the two-year implementation between 2003 to 2004.

A breakdown of actual program costs for the entire two-year is outlined in Table 8.

Table 8: Actual Program Costs

	2003-2004
Promotional and Administrative	$ 0
Evaluation	$ 0
Customer Rebates	$ 60,100
Dealer Rebates	$ 5,100
Other	$ 0
Total Program Cost	**$ 65,200**

The anticipated program costs used in the cost/benefit on per participant basis are shown in Table 9.

Table 9: Anticipated Costs

Costs Used in Cost/Benefit Analysis	Per Participant
Promotional and Adminstrative	$ 20
Evaluation Cost (including AEP Labor)	$ 26
Contractor	$ 450
Total	$ 496

Additional measure/program characteristics based on the first-year of the program and assumed for the cost/benefit analysis are:

A. Life of a heat pump assumed at 15-years, with no replacement

B. 48% of participants were freeriders

C. Average rebate of $400 to the customer

D. Average rebate of $50 to the dealer

E. Average Incremental cost to the participant $600

F. Includes T&D loss savings of 10% for energy and 11% for demand

The assumed load impacts are identical to those described in Section VI.

Exhibit 1: Data Collection Form

HIGH EFFICIENCY/ HEAT PUMP/MOBILE HOME

A DEMAND -SIDE M .MENT PROGRAM

Mobile Home Dimension _____ X _____
Width Length

☐☐☐--☐☐ --☐☐☐☐
SOCIAL SECURITY NUMBER

_____
Customer Name (As shown on S.S. Card)

_____
Service Address
(Residence where Heat Pum p Is Installed no P.O. Box)

☐☐☐-☐☐☐-- ☐☐☐--☐
ACCOUNT NUMBER

_____
Mailing Address (P.O./R.R. Box/Street City , Zip)

HVAC Dealer Use Only

Existing Equipment

AIR CONDITIONERS

Type: Air Conditioning

☐ Central Split

☐ Central Package

☐ Window Units

Total Cooling Capacity _____ BTUH _____ Tons

Manufacturer Model #

_____ _____

_____ _____

ELECTRIC FURNACE

Manufacturer Size (KW)

_____ _____

New DSM Equipment

Type: Heat Pump

☐ Split ☐ Packaged

COOLING CAPACITY

Total Cooling Capacity _____ BTUH _____ Tons

Supplement al Heat _____

Manufacturer _____

Outdoor Unit: Model # _____

Indoor Unit Model # _____

_____ SEER _____ HSPF

NOTE: This equipment must meet the following minimum DSM efficiency requirements

SPLIT SYSTEM 11.0 SEER AND 7.2 HSPF

PACKAGED SYSTEM 10.0 SEER AND 6.8 HSPF

I verify that the above information is correct and lunderstand that the rebate I receive is considered taxable income by the IRS.

Customer Signature _____

Date _____

I verify that the existing equipment Is currently being used to space condition the customer's residence at the above address and that the newdemand side management (DSM) equipment will replace the customer's existing equipment.

HVAC Dealer Signature _____ Date _____ Do you have a KY HVAC License? (Must be to qualify) Yes No License No. _____

HVAC Dealer _____

Mailing Address _____

_____

Federal Tax ID Number _____

Social Security Number _____

Exhibit 2: Average Demand Reduction

Exhibit 2
Average Demand Reduction

Kentucky Power Company
High Efficiency Heat Pump Mobile Home Program
Average Energy Consumption of a Mobile Home
2003-2004 Average Demand Reduction

AEP Previous Studies

Winter Load Factor = 0.283
Summer Load Factor = 0.254

For HEHPMH Program

Winter Demand Reduction = $\frac{\text{Winter Energy Saving (kWh)}}{\text{Winter Load Factor x Hours in Winter Seasons}^{(1)}}$

Summer Demand Reduction = $\frac{\text{Summer Energy Savings (kWh)}}{\text{Summer Load Factor x Hours in Summer Seasons}^{(2)}}$

Therefore

Winter Demand Reduction = $\frac{4{,}275 \text{ kWh}}{0.283 \text{ x } 5{,}088 \text{ hours} = 2.97 \text{ kW}}$

Summer Demand Reduction = $\frac{126 \text{ kWh}}{0.254 \text{ x } 3{,}672 \text{ hours} = 0.14 \text{ kW}}$

(1) Winter season is October through April
(2) Summer season is May through September

Appendix A: AEP 2000 Residential Customer Survey Results

Appendix A

Kentucky Power Company
Kentucky Mobile Home Heating/Cooling Replacement Market Characteristics
Based on AEP 2000 Residential Customer Survey

Market Size & Penetration of Electric Heat Pump

Market Size

Percent of Mobile Home Replaced	
Heating System in Last 2-Years	7.9% (3,160 Customers)
Percent of Mobile Home Replaced	
Cooling System in Last 2-Years	8.0% (3,190 Customers)
Total Mobile Home	
Heating/Cooling Replacement Market	13.7% (5,480 Customers)
Percent of Mobile Home Considering	
Replacing or Adding Central AC	
Within the next 3-Years	8.1% (3,230 Customers)

Penetration of Heat Pump in Mobile Home Heating/Cooling Replacement Market

Electric Heat Pump	23.6%
Electric Central Furnace & Central AC	37.5%
Electric Central Furnace & Window AC	11.6%
Electric Central Furnace & No AC	0.0%
Non-Electric Central Furnace & Central AC	14.9%
Other	12.4%

Appendix A

Kentucky Power Company
Kentucky Mobile Home Heating/Cooling Replacement Market Characteristics
Based on 2000 AEP Residential Customer Survey

Market Characteristics:

Location of Home

City or Urban	20.7%
Suburban	3.2%
Town or Village	8.9%
Rural Non-Farm	58.1%
Farm	9.1%

Size of Home

Under 1200 sq. ft.	26.3%
1201 - 2000 sq. ft.	27.9%
2001 - 3000 sq. ft.	5.5%
Over 3000 sq. ft.	0.0%
Do Not Know	40.3%

Education Level

Grade School	35.5%
Some High School	19.3%
Completed High School	21.2%
Some College or Technical College	8.6%
Completed College	9.1%
Do Not Know	6.3%

Appendix A

Kentucky Power Company
Kentucky Mobile Home Heating/Cooling Replacement Market Characteristics
Based on 2000 AEP Residential Customer Survey

Market Characteristics

Income Level

Under $20,000	70.5%
$20,001 - $30,000	5.9%
$30,001 - $40,000	8.4%
$40,001 - $50,000	0.0%
$50,001 - $60,000	3.5%
$60,001 - $70,000	8.6%
$70,001 - $80,000	3.2%
Over $80,000	0.0%

Natural Gas Available

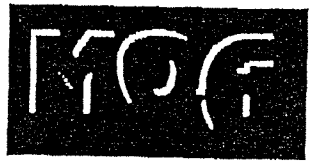
Yes	44.9%
No	39.8%
Do Not Know	15.3%

Appendix B: Follow-up Survey Results

Kentucky Power

Mobile Home
High Efficiency Heat Pump
Customer Survey

Conducted by:



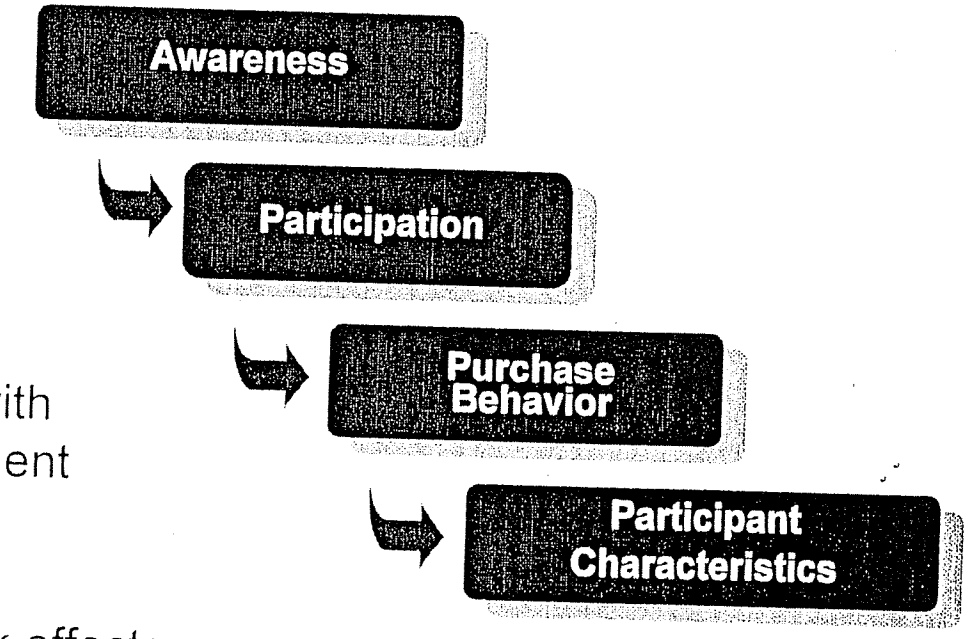
June 2002

Contents

Introduction

Research Objectives

- To gauge program awareness.
- To understand reasons for participation in the mobile home high efficiency heat pump program.
- To measure customer satisfaction with equipment performance, the equipment installer, and the rebate level.
- To measure Freerider and Snapback effects.



Introduction

Methodology

- Telephone interviews were conducted with 50 participants in the Mobile Home High Efficiency Heat Pump Program.
- Respondents were randomly recruited for participation in the study.
- The questionnaire was pre-tested for accuracy on May 22, 2002.
- Interviews were conducted May 28 through June 3, 2002.
- Interviews were conducted by MQA Research, Inc.

Introduction

Representative Nature of Results

- Respondents were randomly recruited for participation of the study. Interviews were attempted on various days and at a variety of times in order to reach respondents at convenient times and maximize use of the sample.

- Based on information provided by Kentucky Power, survey respondents are representative of the overall population. A comparison of respondent characteristics to the population is outlined below:

AREA	Population	Sample
11	41%	48%
12	34%	36%
13	3%	2%
14	1%	0%
15	1%	2%
16	17%	10%

TAR	Population	Sample
15	12%	12%
17	1%	0%
22	85%	86%

N.B. Percentages in tables do not sum to 100% as some participants were not identified by AREA or TAR.

Awareness and Participation

Key Findings

Awareness

- Approximately one-half (52%) of participants in the mobile home heat pump program indicated that they first became aware of the program through the heat contractor with whom they worked.

- Nearly one in three participants (30%) learned about the heat pump program through a family member or friend. Indeed, a few participants anecdotally commented that they purchased a heat pump based heavily on favorable experiences reported by family members or friends.

- Less frequent avenues for learning about the heat pump program include mobile home representatives (10%), television (4%) and newspaper (2%).

Participation

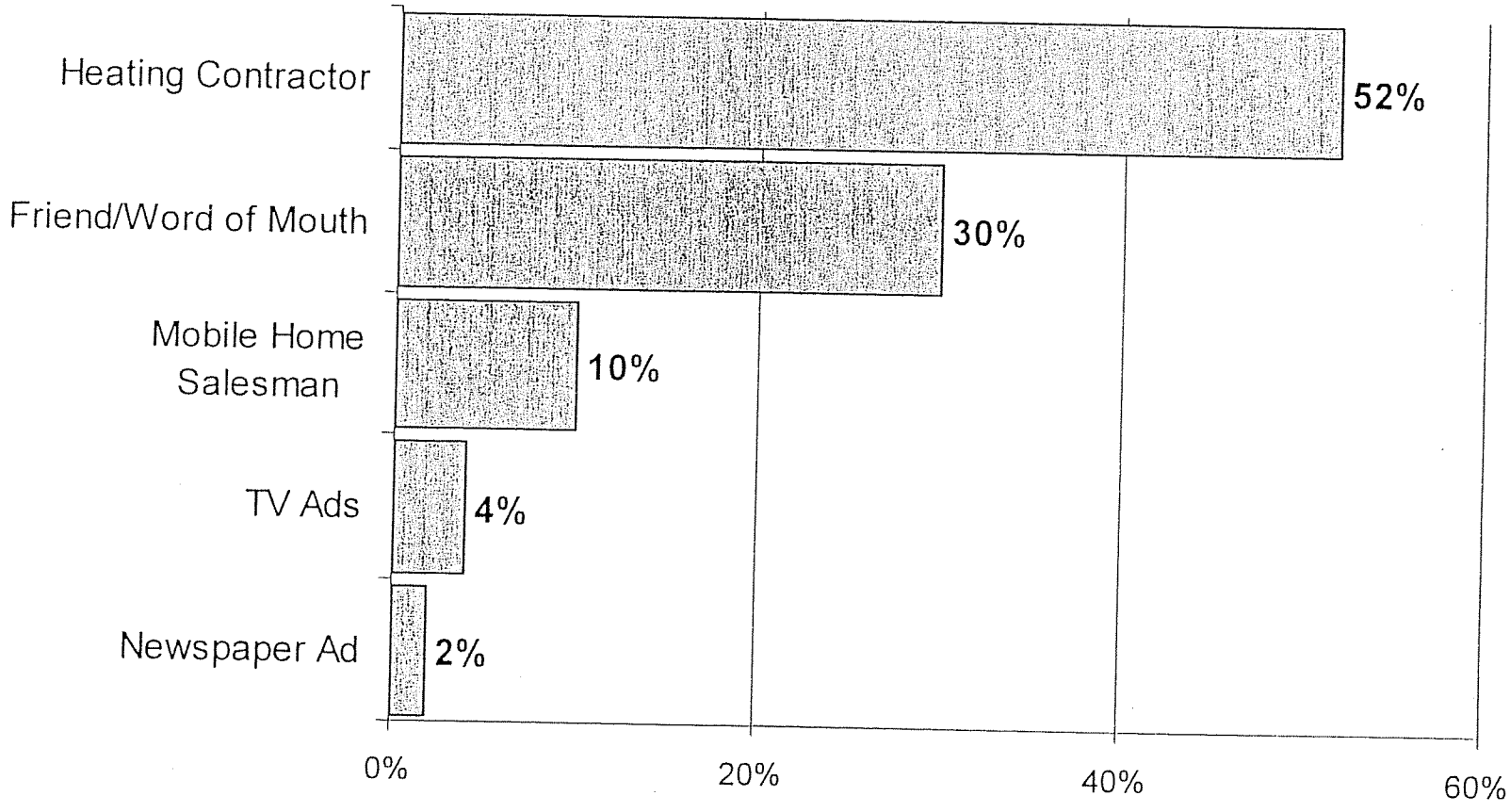
- The main reason indicated by participants as to why they chose to participate in the mobile home heat pump program was because they needed a new system. One-half of participants chose the heat pump program either because they needed a new cooling system (30%) or because they needed a new heating system (20%).

- Nearly one in three participants (30%) reported that they participated in the program in order to save money.

- Two in ten reported participation for other reasons including: to incur energy savings (10%); experience with heat pumps (4%); to receive a good deal (2%); and to have one system that heats and cools (2%).

How Became Aware Of Heat Pump Program

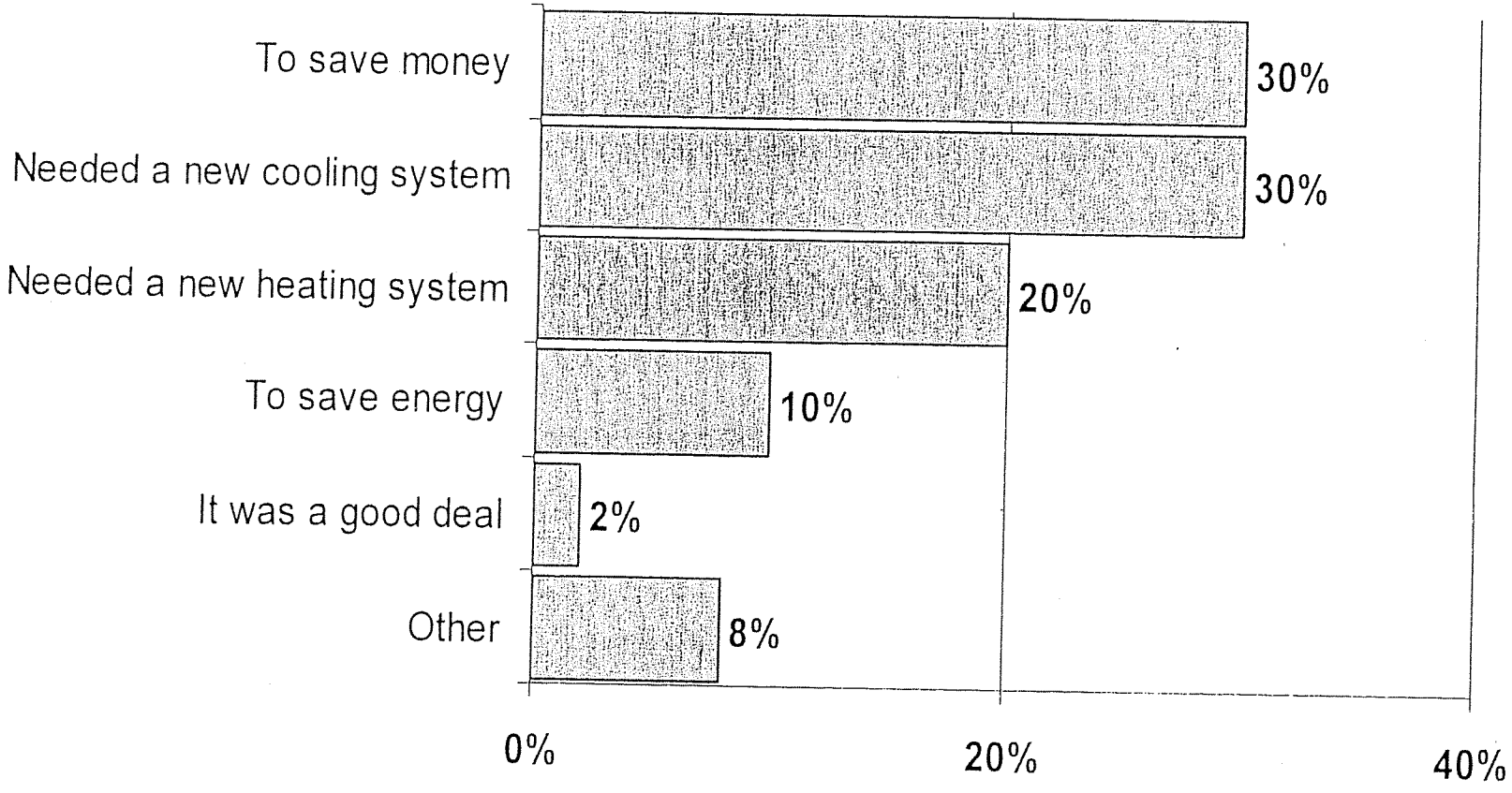
(Q1. How did you first become aware of the mobile home heat pump program?)



(n = 50)

Main Reason For Participation In Heat Pump Program

(Q2. What was the main reason why you participated in the heat pump program?)



(n = 50)

Purchase Information

Key Findings

Dealer Comparison

- Four of every ten participants (43%) reported that the dealer who sold them their high efficiency heat pump offered a comparison between the high efficiency heat pump and a standard efficiency heat pump or other unit. Nearly one-half of participants (46%), however, reported that no comparison was made – the dealer only discussed the high efficiency heat pump.

Personal Comparison

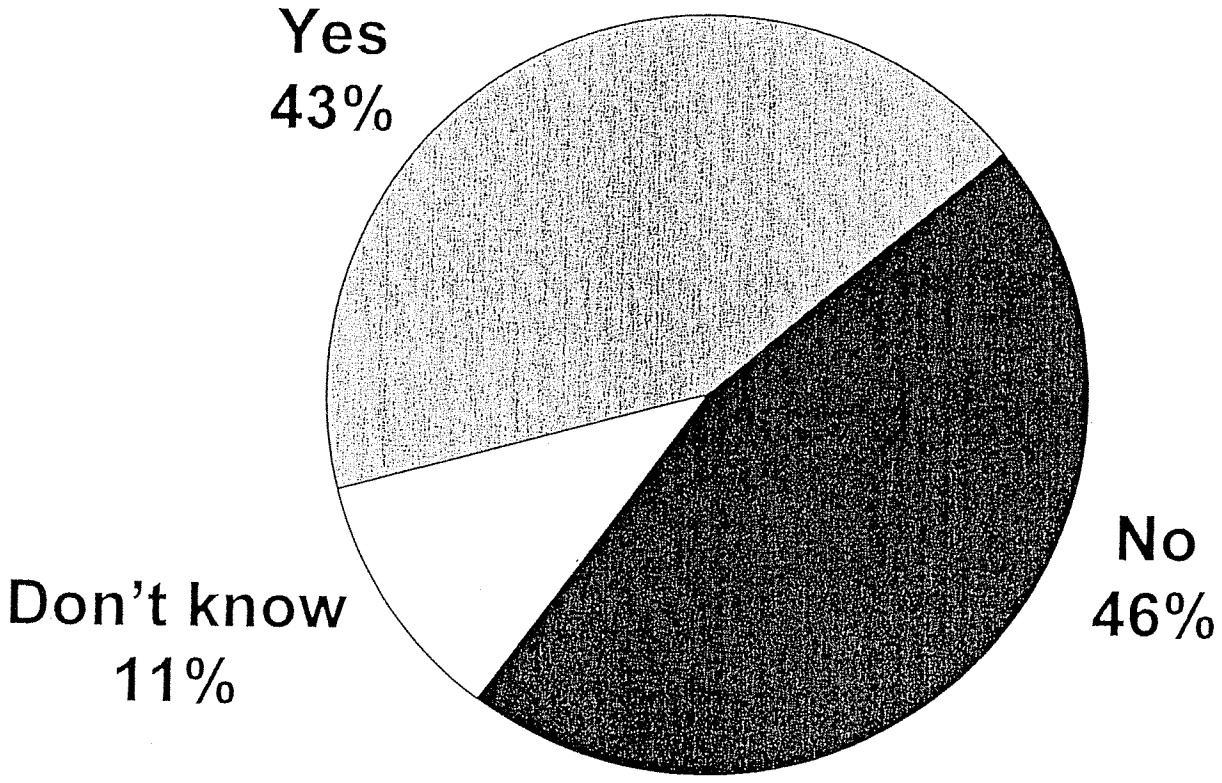
- Three of every four participants who reported that the dealer did not offer any comparison suggested that they collected information on their own that allowed for a comparison between the high efficiency heat pump and another unit.

Dealer Influence

- All of the participants (6 in total) who reported that the dealer did not offer a comparison and they did not seek a comparison on their own also reported that they purchased a high efficiency heat pump based solely on the recommendation of the dealer.

Dealer Comparison

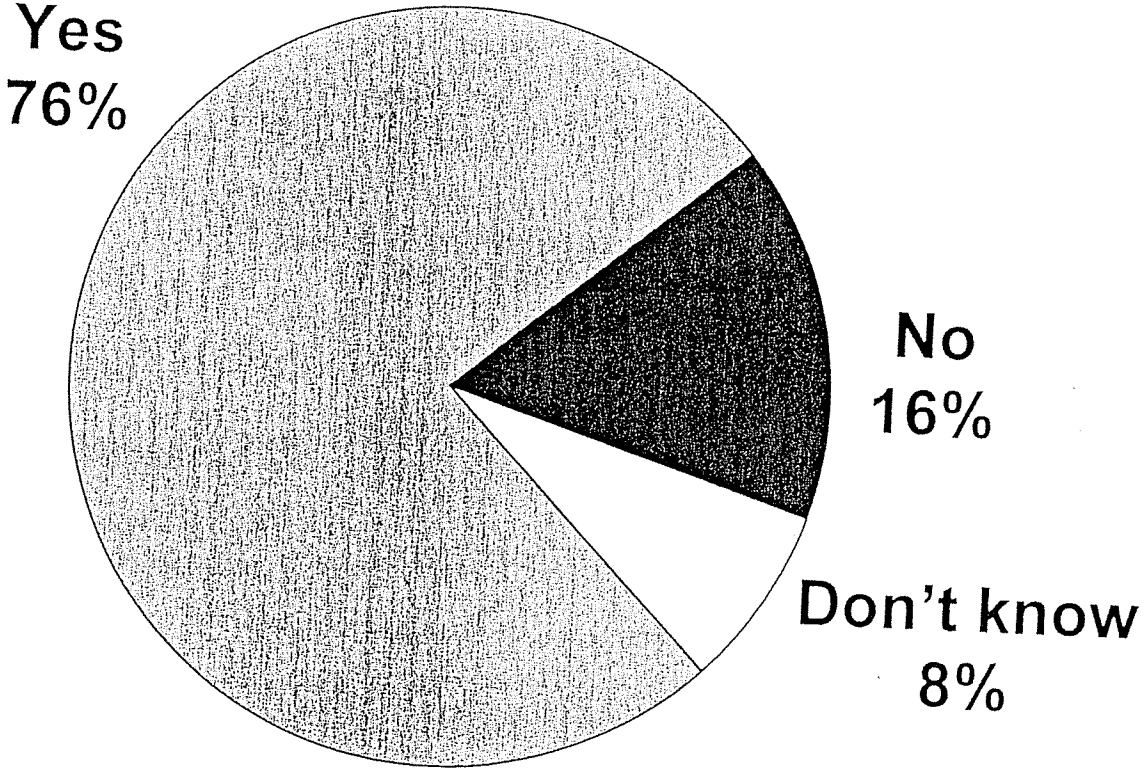
(Q4. Did the dealer who sold you your heat pump explain to you the difference between purchasing a high efficiency heat pump versus purchasing a standard efficiency heat pump or another heating and cooling unit?)



(n = 44)

Personal Comparison

(Q5. Did you already know about the heat pump or did you find information about the cost and operational differences between a high efficiency heat pump and a standard efficiency heat pump or other unit?)



(Question asked of participants who did not receive a comparison from the dealer)

(n = 25)

Purchase Behavior

Key Findings

Purchase Plans

- Eight in ten participants (82%) in the mobile home heat pump program suggested that they planned on purchasing a heat pump even prior to participating in the program. Approximately one participant in every ten (12%) had not planned on a heat pump prior to participating in the program.

Purchase Intent

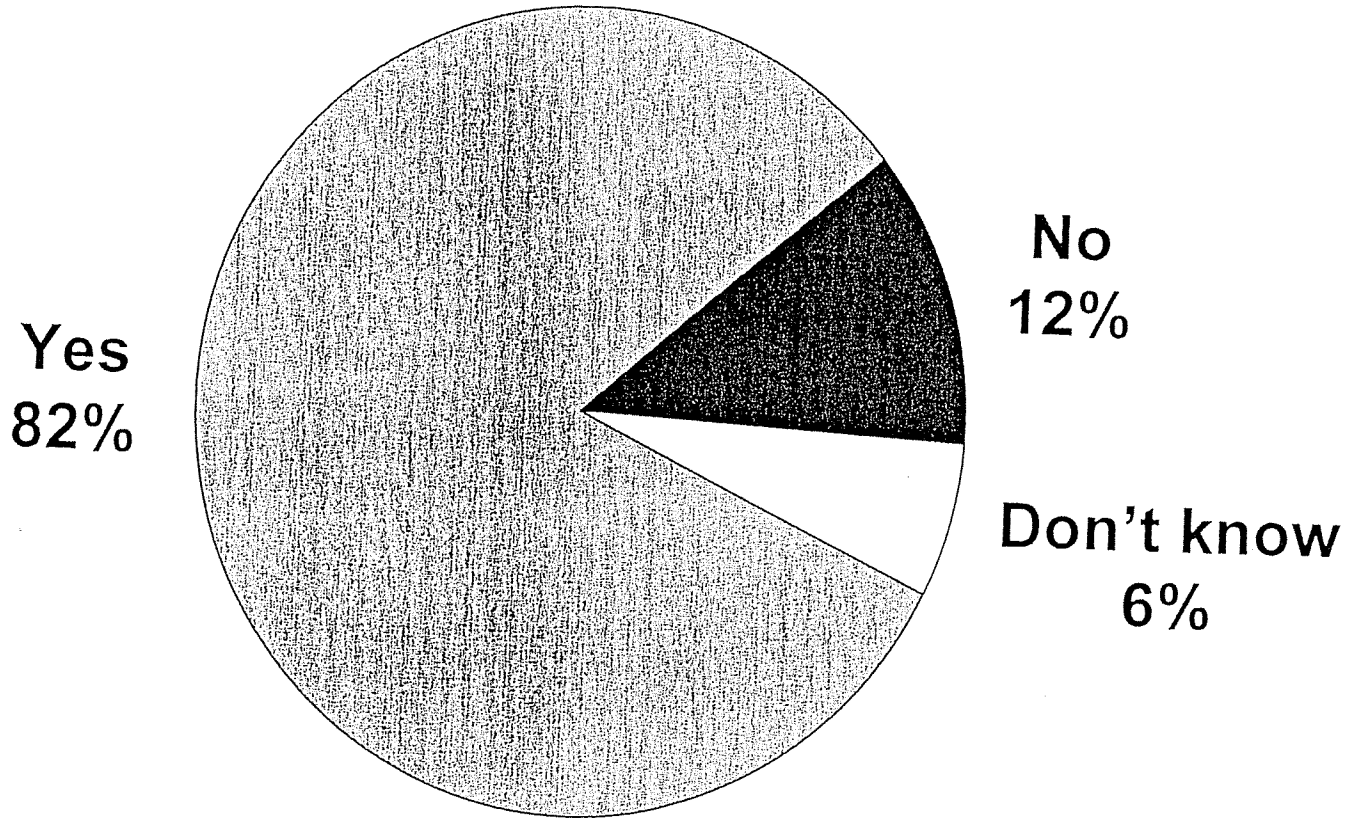
- Three of every four participants (74%) reported that they were likely to purchase a heat pump even without a rebate, including approximately one-half (48%) who reported being very likely to purchase a heat pump, even if there was no rebate.

Timing

- Three of every four participants (74%) installed their new heat pump when they expected. However, approximately one in four participants (26%) reported that they replaced their old heating or cooling system sooner than they expected – due to the mobile home heat pump program.

Planned On Purchasing / Installing High Efficiency Heat Pump

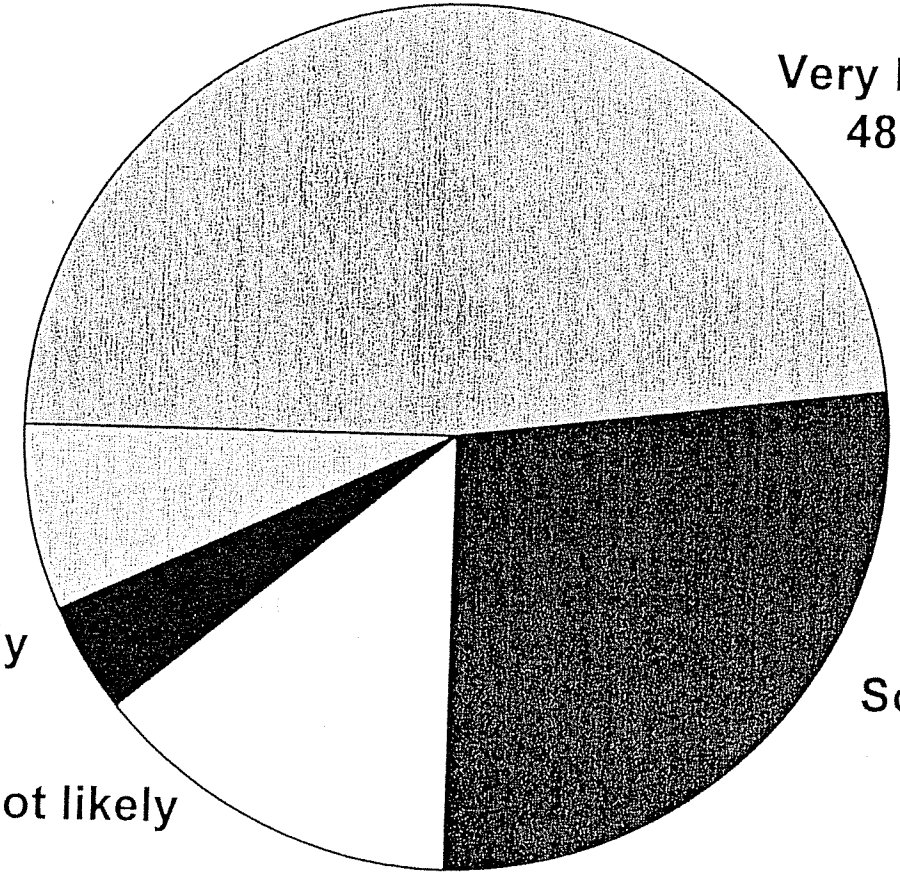
(Q3. Prior to participating in the mobile home heat pump program, had you planned on purchasing and installing a high efficiency heat pump?)



(n = 50)

Likelihood Of Installing Heat Pump If There Wasn't A Rebate

(Q16. How likely would you have been to install a high efficiency heat pump if there wasn't a rebate?)



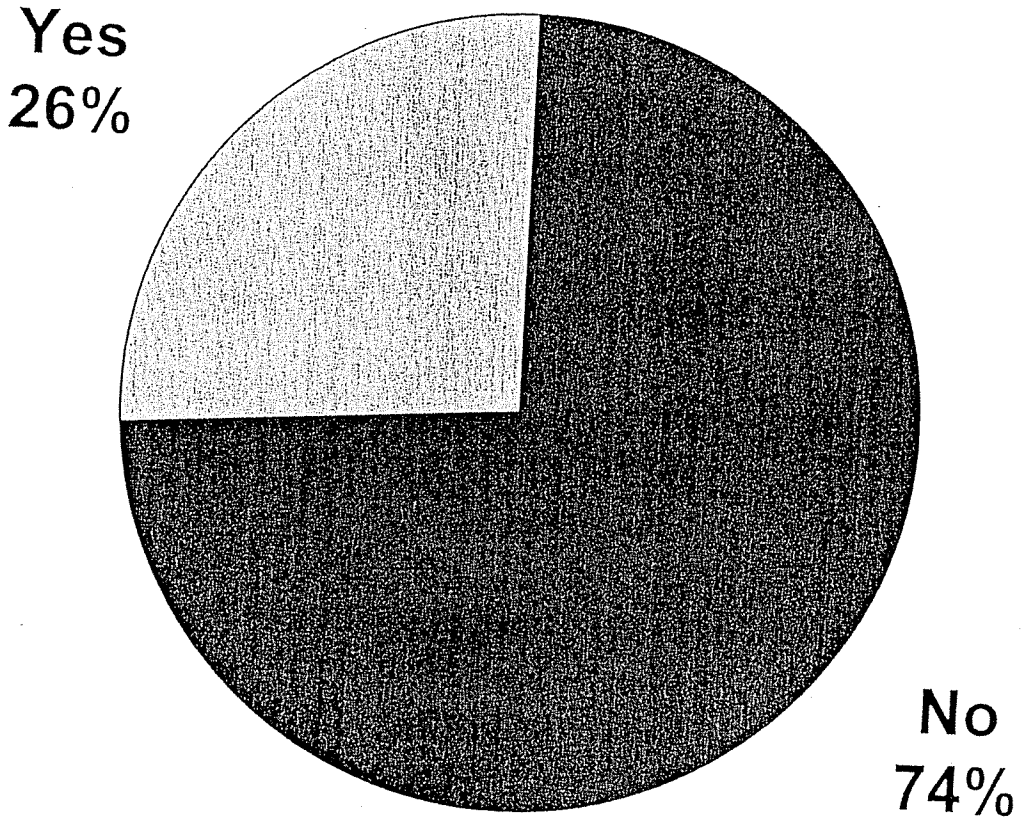
(Mean = 4.74)

(Mean based on a 5 point scale where 5 = Very likely and 1 = Not at all likely)

(n = 50)

Replaced Heating Or Cooling System Sooner Than Planned

(Q7. Did you replace your old heating or cooling system sooner than you had planned because of the mobile home heat pump program?)



(n = 50)

Satisfaction

Key Findings

Installation Satisfaction

- All of the participants in the mobile home heat pump program expressed satisfaction with the service that they were provided by their installer, including approximately six of every seven participants (86%) who reported being very satisfied with the service.

Performance Satisfaction

- Nearly all participants reported being satisfied with the performance of their heat pump. Overall, approximately nine of every ten participants (92%) in the heat pump program reported being very satisfied with the performance of their new heat pump and a few participants (6%) reported being somewhat satisfied.

- The one participant in the heat pump program who expressed dissatisfaction with the performance of the heat pump indicated that the reasons for dissatisfaction are that energy bills have increased and the heat pump has not been properly working for a period of time. This participant, incidentally, did not have a cooling system prior to installing a heat pump.

Key Findings

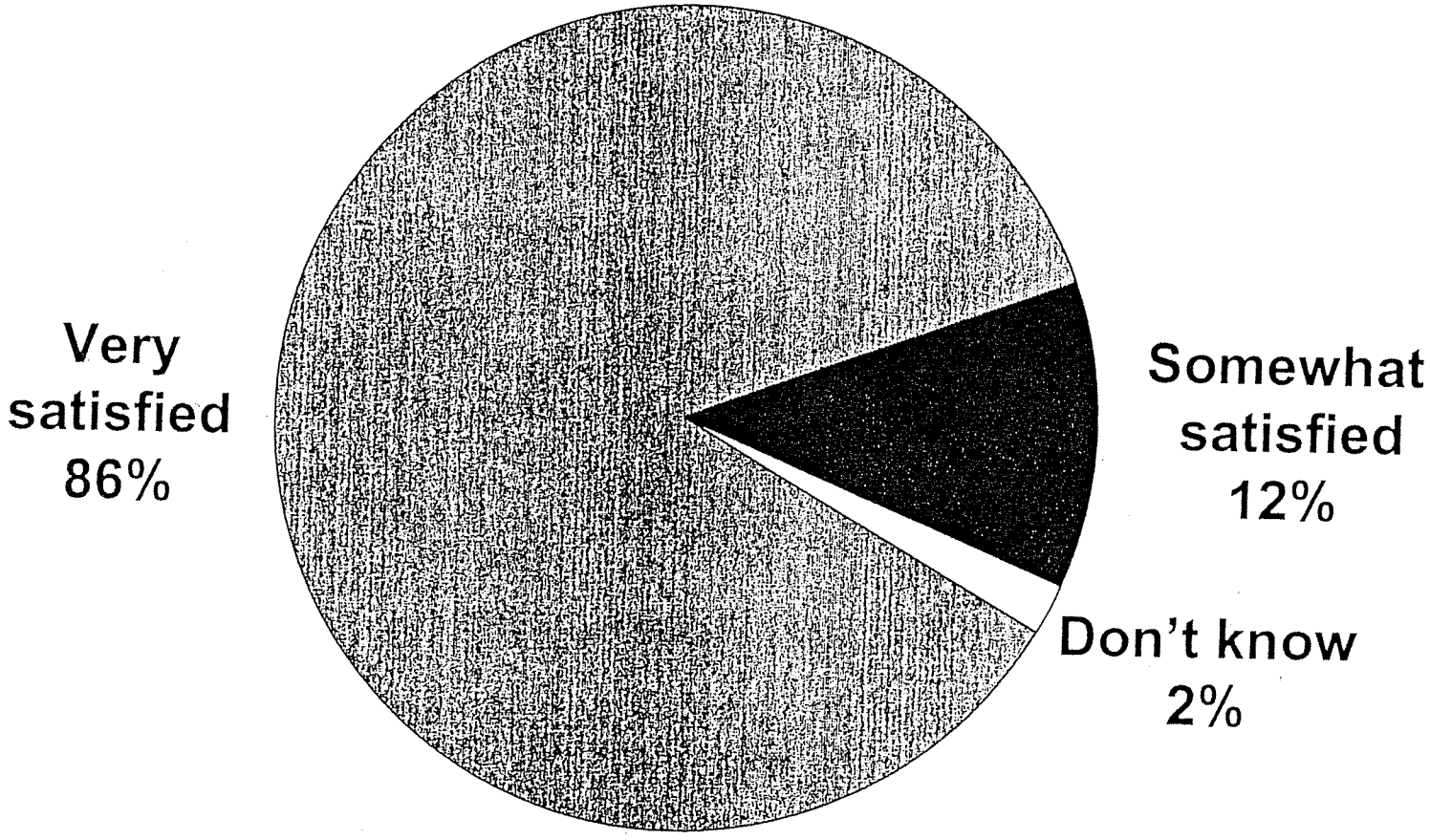
Rebate Satisfaction

- Nearly all (94%) of the mobile home heat pump participants reported that they are satisfied with the level of rebate which they were afforded, including just over eight in ten participants (84%) who reported being very satisfied with their rebate.

- While no participant reported dissatisfaction, one participant (2%) reported no satisfaction or dissatisfaction regarding the amount.

Satisfaction With Service Provided By Installer

(Q10. How satisfied were you with the service provided by the installer?)



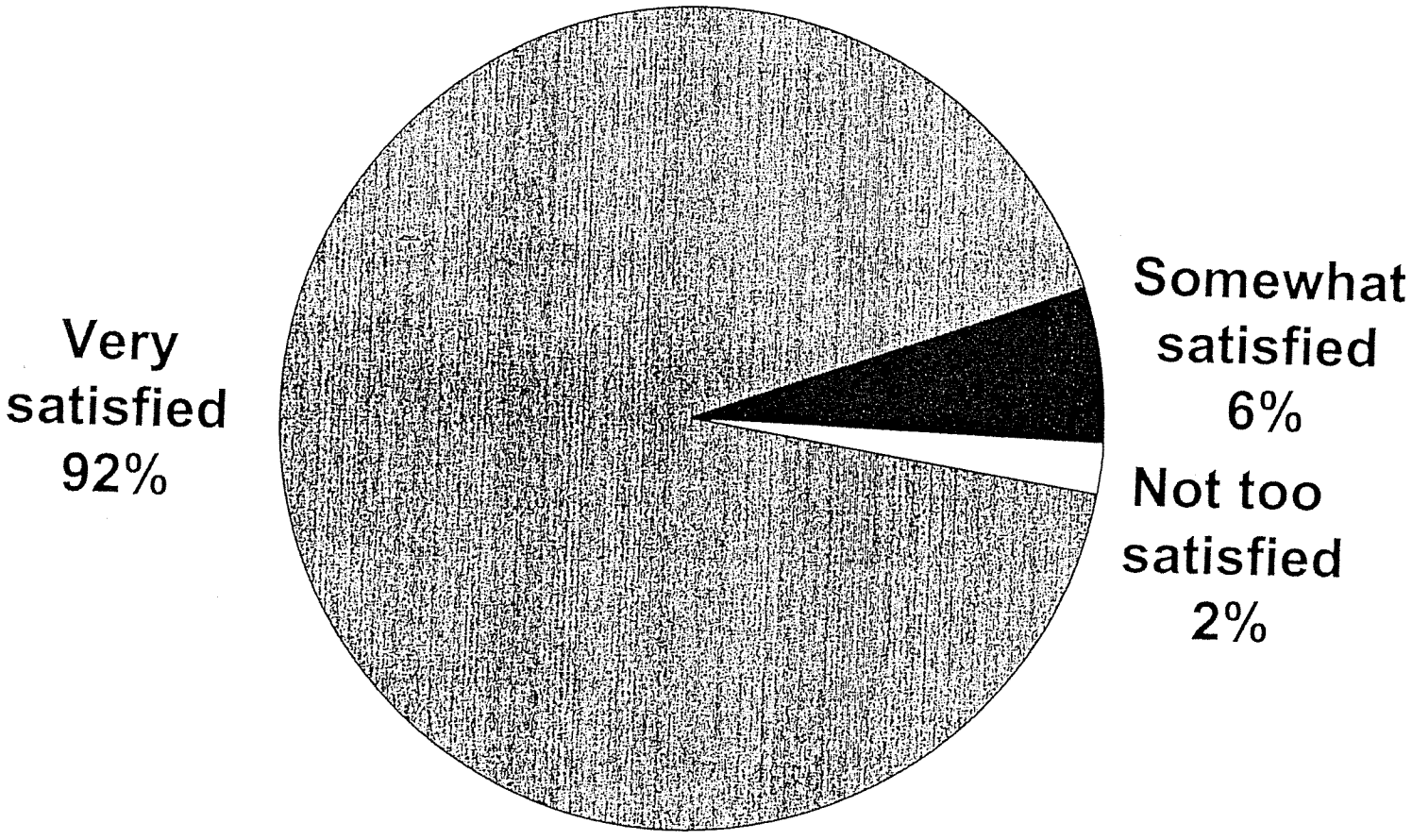
(Mean = 4.88)

(Mean based on a 5 point scale where 5 = Very satisfied and 1 = Not at all satisfied)

(n = 50)

Satisfaction With Heat Pump Performance

(Q8. How satisfied are you with the performance of the high efficiency heat pump?)



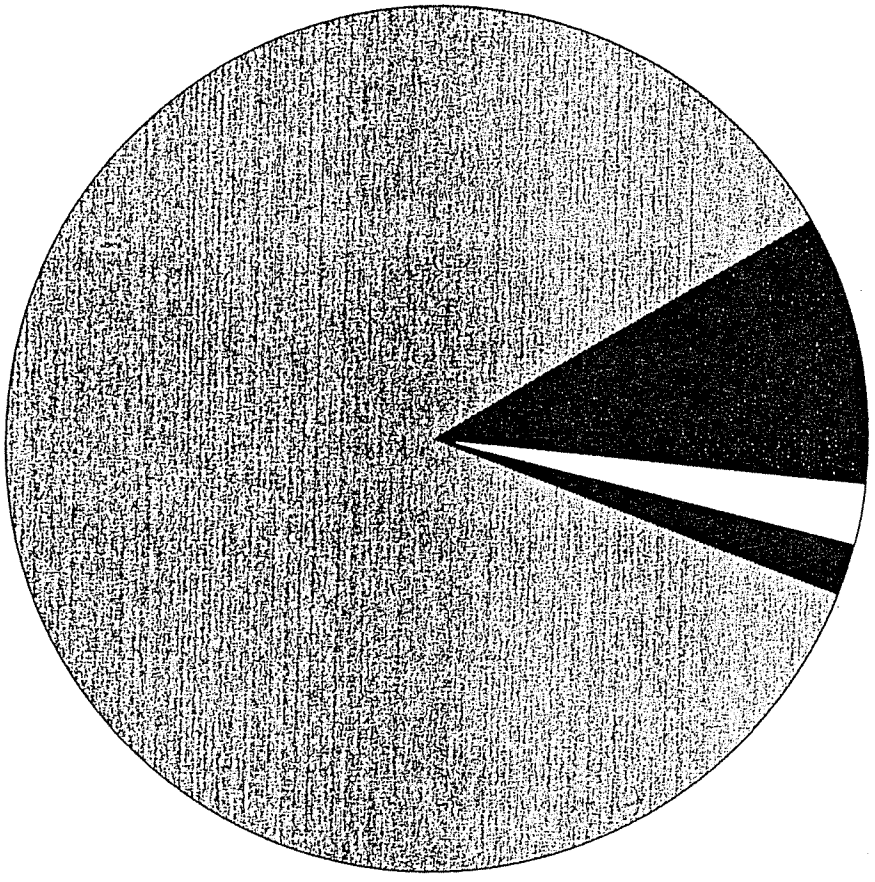
(Mean = 4.88)

(Mean based on a 5 point scale where 5 = Very satisfied and 1 = Not at all satisfied)

(n = 50)

Satisfaction With Rebate Level

(Q17. How satisfied are you with the rebate level that you were provided?)



(Mean = 4.85)

(Mean based on a 5 point scale where 5 = Very satisfied and 1 = Not at all satisfied)

(n = 50)

Heating and Cooling Settings

Key Findings

Old Heating Setting

- While nearly one-quarter of program participants (22%) reported that they don't know what their heating setting was, just over two in five (44%) reported that their old heating system was set to heat at between 71 degrees and 75 degrees. Nearly two in ten participants (16%) keep their home at a cooler heat setting of 70 degrees or below, while about as many (18%), heated at a setting of 76 degrees or warmer.

Heat Pump Heat Setting

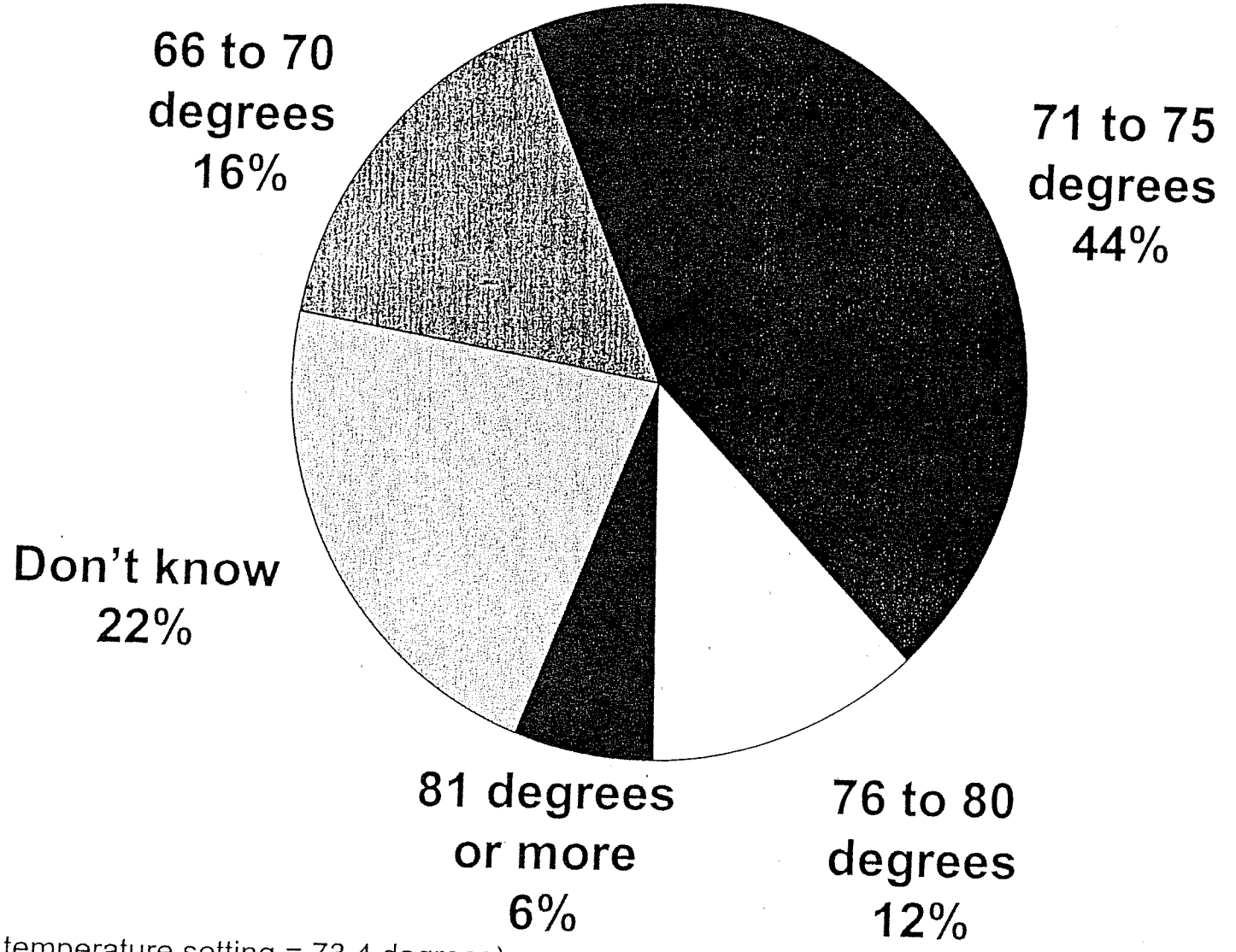
- One-half of program participants (52%) reported that the heating temperature setting for their heat pump is between 71 degrees and 75 degrees. Just over one in ten (12%) reported that they keep their heat pump set at a heating temperature of more than 75 degrees, while nearly two in five (36%) have their heat pump set at 70 degrees or lower.

Heat Setting Changes

- Just over one in four heat pump program participants (28%) provided settings to indicate that they keep their heat pump set at a lower temperature for heating than they needed with their old heating system. By contrast, just over one in ten participants (14%) indicated that they keep their heat pump set at a higher heating temperature than at which they set their old heating system.

Temperature Setting - Old Heating System

(Q12. What was the temperature setting for your old heating system?)

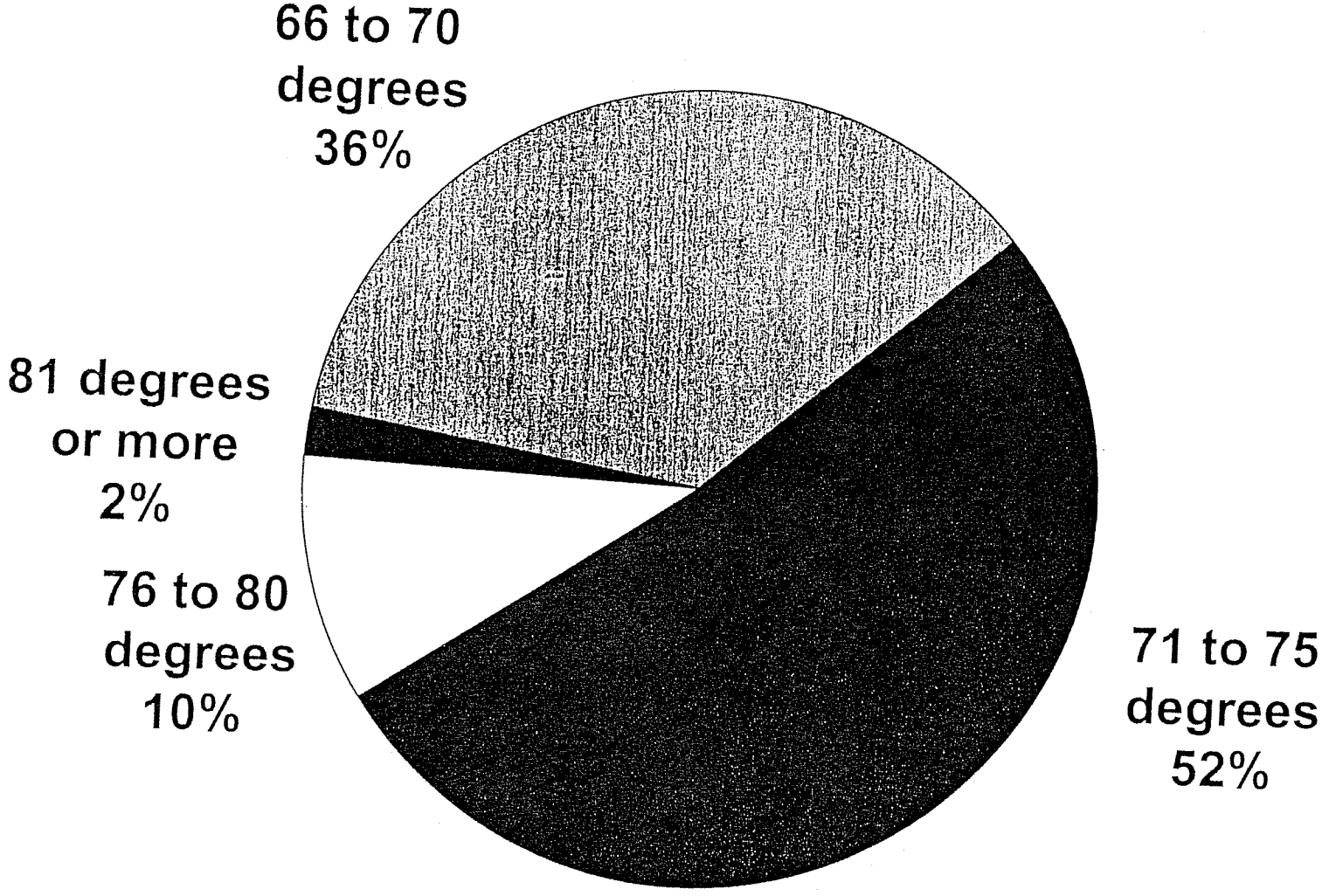


(Average temperature setting = 73.4 degrees)

(n = 50)

Heating Temperature – New Heat Pump

(Q13. What is the heating temperature setting for your new heat pump?)



(Average temperature setting = 71.9 degrees)

(n = 50)

Key Findings

Old Cooling Setting

- While just over one in ten heat pump program participants (14%) reported that they don't know what their old cooling system temperature setting was, two in ten (22%) reported that their old system was set to cool at 70 degrees or lower. Approximately one in ten participants reported that they kept their old setting at 71 degrees to 75 degrees (14%) or between 76 degrees and 80 degrees (10%).

- One-third of heat pump program participants (34%) had window air conditioners prior to their heat pump. Moreover, a few (6%) reported that they had no air conditioning.

Heat Pump Cooling Setting

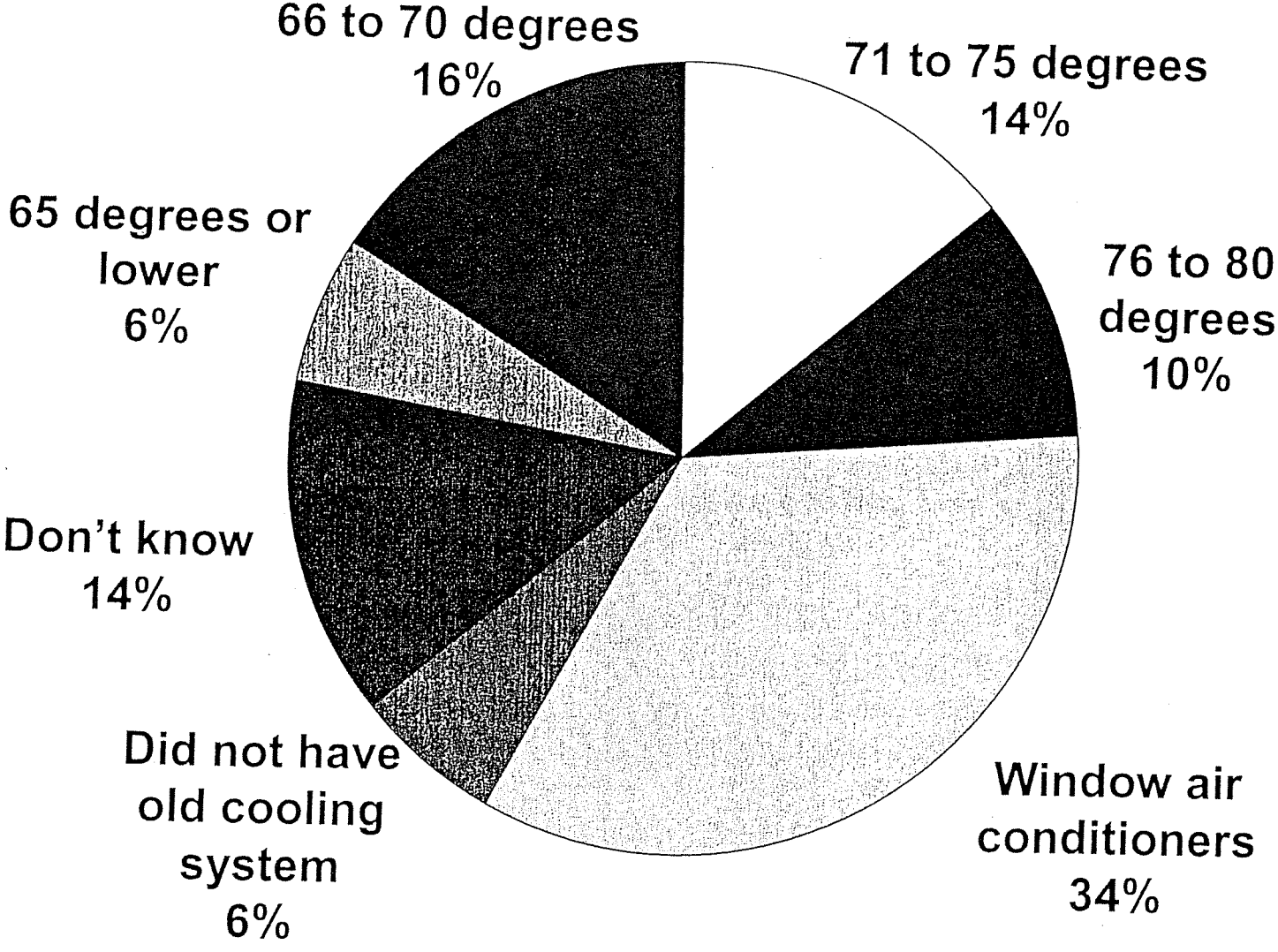
- Nearly one-half of program participants (46%) reported that the cooling temperature setting for their heat pump is between 71 degrees and 75 degrees. Two in ten (20%) keep their heat pump set at a cooling temperature of more than 75 degrees, while nearly three in ten (28%) have their heat pump set to cool at 70 degrees or lower.

Heat Setting Changes

- Two of every ten heat pump program participants who had a cooling system prior to their heat pump (21%) provided settings to indicate that they keep their heat pump set at a higher temperature for cooling than they needed to with their old cooling system. By contrast, just approximately one in ten (12%) indicated that they keep their heat pump set at a lower cooling temperature than at which they set their old system.

Temperature Setting – Old Cooling System

(Q14. What was the temperature setting for your old cooling system?)

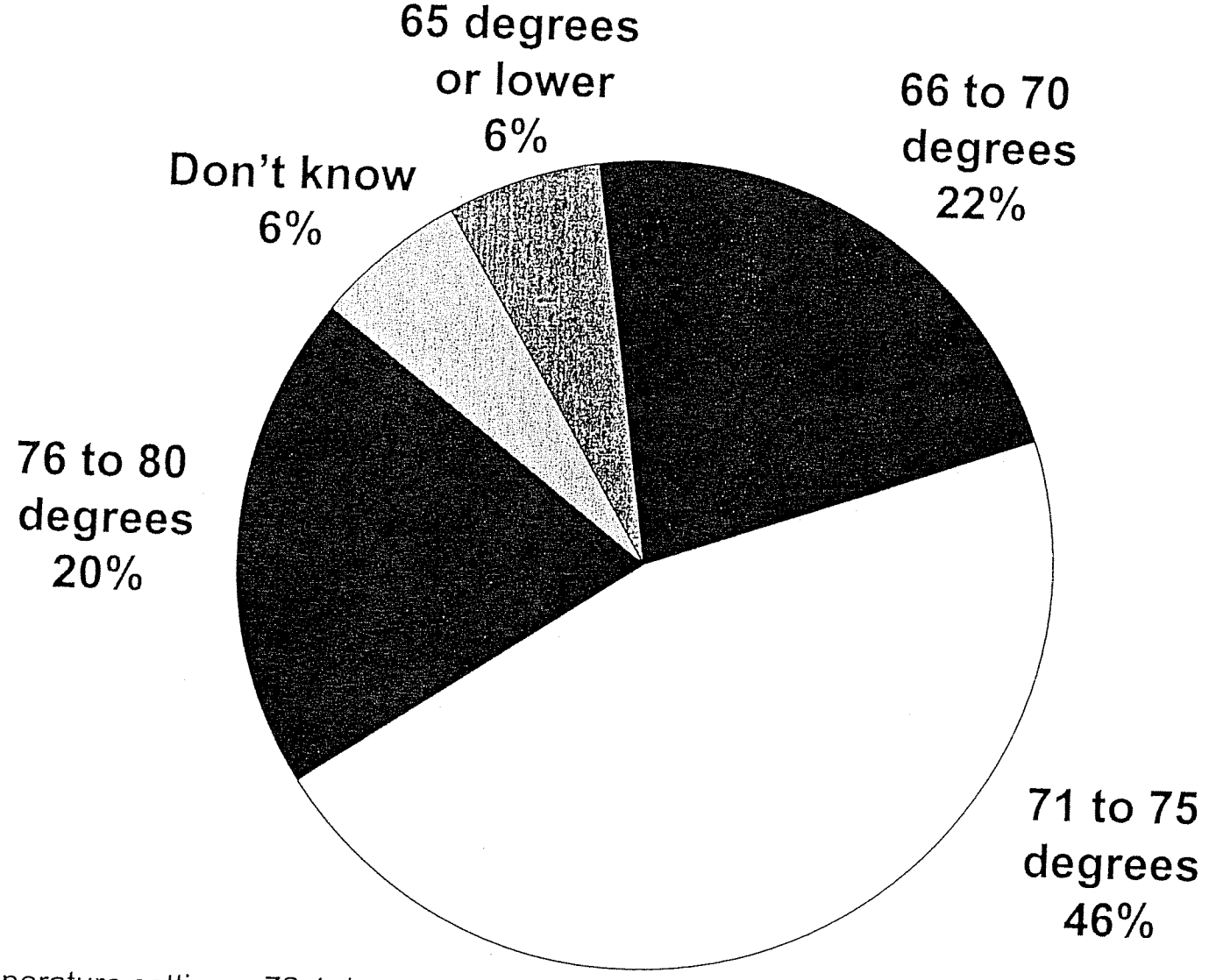


(Average temperature setting = 71.3 degrees)

(n = 50)

Cooling Temperature – New Heat Pump

(Q15. What is the cooling temperature setting for your new heat pump?)



(Average temperature setting = 72.4 degrees)

(n = 50)

Heat Pump Costs

Key Findings

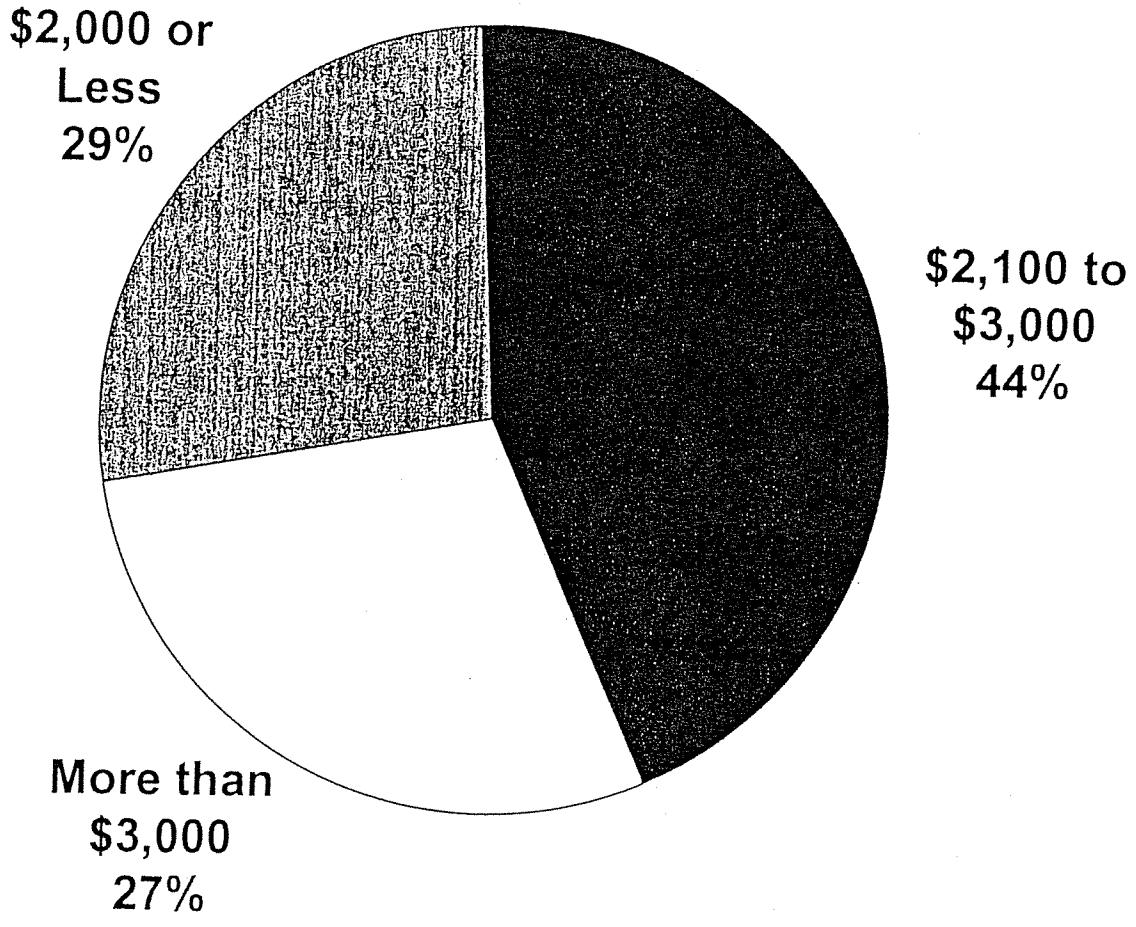
Installation costs

- Excluding the rebate, reported total out of pocket cost to mobile home heat pump program participants averaged $2,687.50.

- Three participants in ten (29%) reported that their out of pocket cost for installation was between $1,200 and $2,000. Just over two of every five participants (44%) reported that the cost to them was between $2,100 and $3,000. Just over one in four (27%) reported out of pocket installation costs of more than $3,000.

Installation Costs

(Q19. How much did you pay for your new heat pump?)



(Mean = $2,687.50 / Low = $1,200 / High = $5,500)

(n = 41)

Issues of Note

Issues of Note

Observations

- Contractors and word of mouth are the key ways in which knowledge about the Heat Pump Program is spread. Contractors play a major role in promoting the program, but participants who discuss their experiences are strong links to communicating the program.

- There are no obvious issues or concerns with the contractors, quality of installation, or performance of heat pump.

- Heat pumps are performing as efficiently or even better for participants than did their old system. Indeed, one in four participants suggested that the heat pump heats more efficiently than did their old system and six of ten indicated that the heat pump heats as well as their old system. Moreover, one in five suggested that their heat pump cools more efficiently than did their old system, while nearly seven in ten indicated that their new heat pump cools about as efficiently as did their old system.

- The rebate level is not a concern to program participants.

Issues of Note

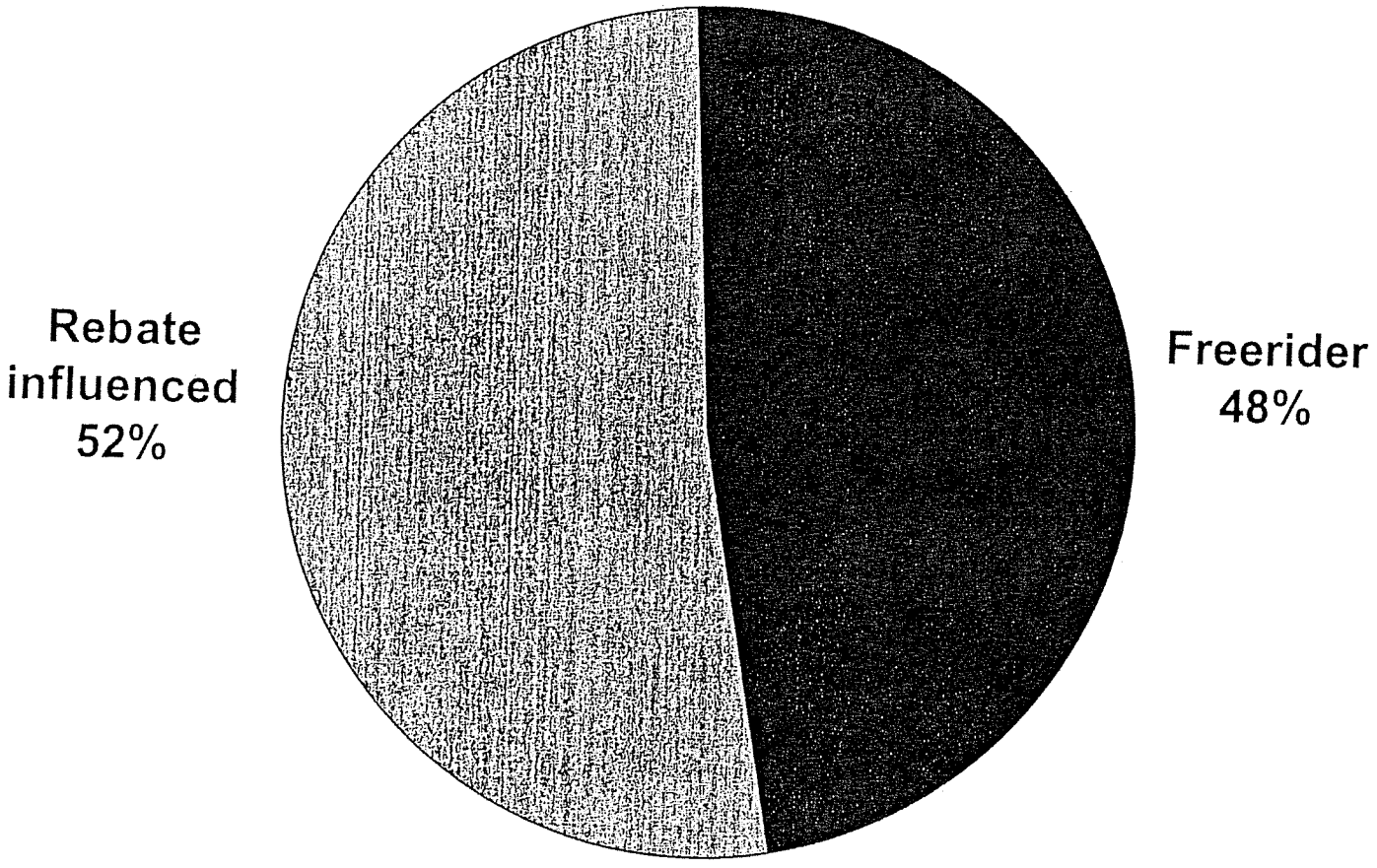
Freeriders

- Many participants in the heat pump program are classified as freeriders as three in four participants reported that they would have installed a heat pump even if there was no rebate. Coupled with this, three in four participants replaced their old system when they planned.

- While the base of freeriders is high, it is reflective of awareness and purchase behavior: one-half of participants reported that they participated in the program because they needed a new system. This, linked with a program where one-half of participants learn of the program through a contractor likely explains much of the reason for freeriders: They need a new system, are committed to purchasing one, and their contractor offers them a rebate.

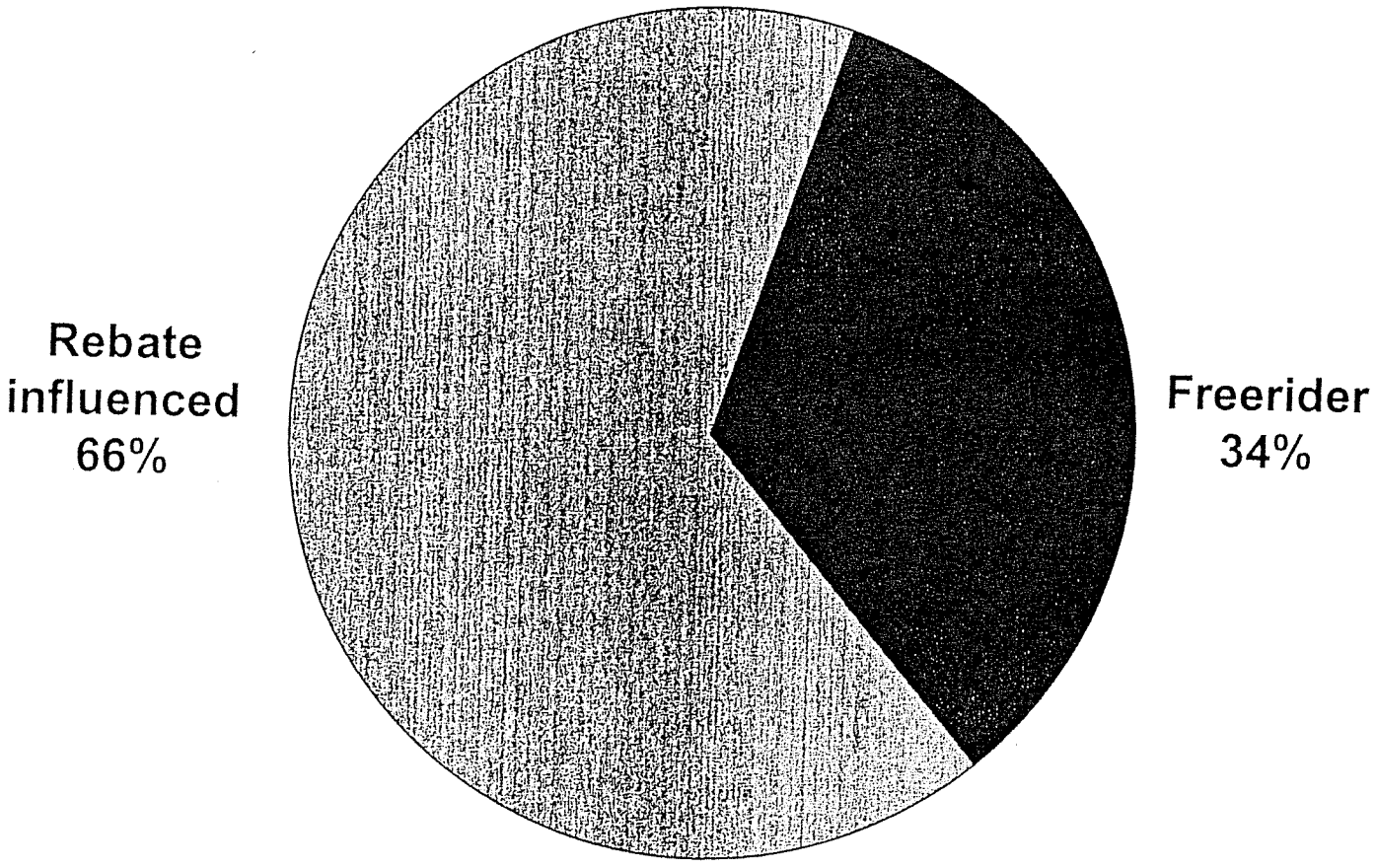
- Responses that are more in line with program goals are favorable indications that four of every ten participants select a heat pump as a way to save money or save energy. And regardless of their individual motivations, saved money to a consumer is saved energy to a community. Moreover, the rebate seems to move some consumers to action sooner than planned as one in four participants reported that they installed a heat pump sooner than they were planning on replacing their own system.

Freeriders



(Freerider = planned on heat pump; replaced as needed; likely to buy even without rebate) (n = 44)

Clearly Freeriders



(Clearly Freerider = planned on heat pump; replaced as needed; very likely to buy even without rebate)

(n = 44)

Appendix C: Data Summarization of Installation Information Form

Appendix C

Tabulation of Data from Installation Information Form

I. Summarization of Data Regarding Previous HVAC System

A. Size - Connected Heating Load (kW)

<10	2.3%
10	16.0%
11-14	6.9%
15	55.0%
16-19	7.6%
20	9.9%
>20	2.3%

B. Previous Space Cooling Type

Central Split	23.3%
Central Packaged	26.7%
Window Air Conditioning	27.3%
No Air Conditioning	22.7%

C. Size Air Conditioning Ton

<=1	8.6%
1.5 to 2	16.2%
2.5 to 3	63.8%
>3	11.4%

D. Size of Mobile Home (Average Size 1,221 sq. ft.)

< 700	1.4%
700 - 800	14.5%
800 - 1000	28.3%
1000 - 1200	10.3%
1200 - 1400	10.3%
1400 - 1600	14.5%
1600 - 1900	11.7%
> = 1900	9.0%

Appendix C

Tabulation of Data from Installation Information Form

II. Information Regarding New Heat Pump Installation

A. Size - Ton

2	1.3%
2.5	14.0%
3	61.3%
3.5	14.7%
4	8.0%
5	0.7%

B. SEER

10	55.3%
11	13.3%
11.1 - 11.9	2.0%
12	20.7%
>12	8.7%

C. HSPF

<6.8	0.7%
<=6.8	45.4%
6.9 - 7.5	32.0%
7.6 - 8.0	19.3%
>8.0	3.3%

Appendix C

Tabulation of Data from Installation Information Form

D. Brand

American Standard	11.4%
Carrier	13.4%
Coleman	2.0%
Ducane	0.7%
Goodman	7.4%
Heil	4.0%
Janitrol	2.0%
Lennox	10.1%
Nordyne	0.7%
Payne	8.7%
Tempstar	10.1%
Trane	29.5%

E. Type of Heat Pump

Split System	36.7%
Packaged	63.3%

Appendix D: Audit Input Form

2003 HIGH EFFICIENCY HEAT PUMP - MOBILE HOME
DEMAND SIDE MANAGEMENT PROGRAM
($400 REBATE LEVEL)

Agreement #	Customer Name	Address	City	Account #	Old Unit A/C Type	Old Unit A/C Tons	Old Unit A/C BTUH	Manufacturer Electric Furnace	Electric Furnace KW	Customer Data	HVAC Dealer Data	Received Data	Accts. Payable Data	Check Mailed Data	New Unit Size	New Unit Manufacturer	System	SEER	HSPF	BID COST	Mobile Home Dimension	Post MACCS	POST W/O
MH-03-1	Seward, Louis W.	270 Pinson Branch Rd	Pikeville	0326005269	3	1.5	18,000	Miller	10	12/27/2002	12/27/2002	01/02/2003	01/02/2003	01/15/2003	3	Lennox	1	11.1	7.2	$0	12X65	y	
MH-03-2	Lewis, John A.	1575 Upper Chloe Crk	Pikeville	0370004196	3	2.0	25,000	Coleman	14	01/16/2003	01/16/2003	01/23/2002	01/23/2002	02/06/2003	3	Payne	2	10	6.8		28X50	y	
MH-03-3	Smith, Hoyt B.	1744 Left Frk Joe's Crk	Pikeville	0330005250	2	3.0	36000	Coleman	15	01/27/2003	01/27/2003	02/03/2002	02/03/2002	02/17/2003	3	Payne	1	12	7.6		24X56	y	
MH-03-4	Campbell, Jeffrey	50764 Hwy 194 E	Stopover	0344700158	1	3	36000	Intertherm	17	01/30/2003	01/30/2003	02/04/2003	02/04/2003	02/17/2003	3	Payne	1	12	7.6		28X68	y	
MH-03-5	Kinney, Michael	165 Canterbury Hollow	Grayson	0398500037	1	2.5	30000	Intertherm	10	01/22/2003	01/22/2003	02/10/2003	02/10/2003	02/18/2003	3	Coleman	1	12	8.5		14X72	y	
MH-03-6	Lucas, Eugene	1864 Thornton Road	Thornton	0328000325				Coleman	10	02/06/2003	02/06/2003	02/13/2002	02/13/2002	03/04/2003	3	Tempstar	2	10	7.2		12X52	y	
MH-03-7	Tackett, Freddie	911 Three Mile Road	Jenkins	0325500278	2	3	36000	Intertherm	20	01/21/2003	01/21/2003	02/17/2003	02/17/2003	03/04/2003	3	Trane	1	11	7.2		14X70	y	
MH-03-8	Barker, Herschel	1712 Stone Coal Road	Pikeville	0318059340	2	3	36000	Miller	15	02/11/2003	02/11/2003	02/17/2003	02/17/2003	03/04/2003	3	Payne	1	12	7.6		28X48	y	
MH-03-9	Sammons, Myrtle	79 Greer Branch	East Point	0368631290						02/12/2003	02/12/2003	02/17/2003	02/17/2003	03/04/2003	3	Am Standard	2	10	6.8		14X65	y	
MH-03-10	Little, Kevin L.	1962 Hooper Br	Melvin	0375705590	2	3	36000	Heil	15	03/07/2003	03/07/2003	03/14/2003	03/14/2003	03/26/2003	2.5	Payne	2	10	6.8		12X60	y	
MH-03-11	Hall, Kenneth	357 Penny Street	Pikeville	0348318440	1	3	36000	Intertherm	15	03/12/2003	03/12/2003	03/17/2003	03/17/2003	03/28/2003	3	Payne	1	12	7.6		28X48	y	
MH-03-12	Slone, Fayetta	Hwy 979	Teaberry	0308887520	1	4	48000	Coleman	15	02/25/2003	02/25/2003	03/20/2003	03/20/2003	04/03/2003	3.5	Lennox	1	11	8		27X64	y	
MH-03-13	Blanton, Bonnie	49 Goble Lane	Van Lear	0374100415	3			Coleman	10	04/01/2003	04/01/2003	04/07/2003	04/07/2003	04/16/2003	2.5	Carrier	2	10	6.8		14X70	y	
MH-03-14	Dugan, Brenda	73 Sky Harbor Rd	Hager Hill	0389500830	2	3	36000	Coleman	15	04/01/2003	04/01/2003	04/07/2003	04/07/2003	04/16/2003	3	Lennox	1	11	7.2		14X70	y	
MH-03-15	Bates, Billie Joyce	1060 Bill Moore Br	Whitesburg	0320201976						02/19/2003	02/19/2003	04/07/2003	04/07/2003	04/16/2003	2	Nordyne	1	12	7.2		14X70	y	
MH-03-16	Collinsworth, Kenneth	881 Pt 1107	Van Lear	0380100415	1	3	36000	Coleman	23	04/04/2003	04/04/2003	04/04/2003	04/18/2003	05/02/2003	4	Carrier	1	13.2	8		28X60	y	
MH-03-17	Belcher, Jerry	55 Belcher Lane	Elkhorn city	0361700840	3	2	24000	Intertherm	15	03/01/2003	03/01/2003	04/22/2003	04/25/2003	05/08/2003	3	Tempstar	2	10	6.8		12X65	y	
MH-03-18	Fuller, Mildred Sue	Miller Branch	Fedscreek	0376100954	2	3	36000	Coleman	15	04/18/2003	04/18/2003	04/22/2003	04/25/2003	05/09/2003	3	Tempstar	2	10	7		28X54	y	
MH-03-19	Dewire, Judy	9615 KY Hwy 825	Paintsville	0387467300				Coleman	15	04/25/2003	04/26/2003	04/30/2003	04/30/2003	05/09/2003	3.5	Am Standard	1	13	8.9		14X70	y	
MH-02-20	McClanahan, Victor	700 E Patty Loveless Dr	Elkhorn City	0328700840	3	1.5	18000	Intertherm	15	04/18/2003	04/18/2003	04/30/2003	04/30/2003	05/09/2003	2.5	Tempstar	2	10	6.8		12X70	y	

Appendix E: Regression Equations

Appendix E

Kentucky Power Company
High Efficiency Heat Pump Mobile Home Program

Results of Regression Analysis of Heat Loss, Heat Gain and Base Load

A. Estimated Heat Loss Regression Equation: HL = 13,565 + 14.14528 * MHSize

Where:

HL = Estimated Design Heat Loss in Btu/hr

MHSize = Actual Size of Mobile Home in Square Feet

R-Square of the Regression = .68

B. Estimated Heat Gain Regression Equation: HG = 6,430 + 11.26623 * MHSize

Where:

HL = Estimated Design Heat Gain in Btu/hr

MHSize = Actual Size of Mobile Home in Square Feet

R-Square of the Regression = .61

C. Estimated Heat Gain Regression Equation: BaseLoad = 4,823 + 3.60213 * MHSize

Where:

BaseLoad = Estimated Base Load of the Mobile Home in kWh

MHSize = Actual Size of Mobile Home in Square Feet

R-Square of the Regression = .88