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The Pacific Northwest Residential Consumer: Perceptions and Preferences of Home Heating Fuels, Major Appliances, and Appliance Fuels

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THE PACIFIC NORTHWEST RESIDENTIAL CONSUMER:
PERCEPTIONS AND PREFERENCES OF HOME HEATING
FUELS, MAJOR APPLIANCES, AND APPLIANCE FUELS

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EXECUTIVE SUMMARY

In 1983 the Bonneville Power Administration contracted with the Pacific Northwest Laboratory (PNL) to conduct an analysis of the marketing environment for Bonneville's conservation activities. Since this baseline residential study, PNL has conducted two follow up market research projects: Phase II in 1985, and Phase III, in 1988.

In this report we examine the respondents' perceptions, preferences, and fuel switching possibilities of fuels for home heating and major appliances. To aid in effective target marketing, the report identifies market segments according to consumers' demographics, life-cycle, attitudes, and opinions.

PERCEPTIONS AND PREFERENCES FOR HOME HEATING FUELS

Household perceptions of four major heating fuels and eight attributes of heating fuels are examined in the report. Household respondents rated safety as the most important attribute for a heating fuel to have. Safety was followed by dependability, economy, and efficiency. Households perceived all eight of the attributes to be very important for a heating fuel to possess. However, wood and fuel oil users rated the nonpolluting attribute lower than electricity and natural gas users.

Of the four heating fuels examined, household respondents perceived electricity in the most positive light across all eight attributes, closely followed by natural gas. Distinguishing attributes of electricity are safety, cleanliness, and convenience. Natural gas is perceived to be more inexpensive and efficient. Fuel oil's greatest liability is perceived to be its cost. Wood's greatest liabilities are convenience and safety.

The respondents' perceptions of several of the attributes of electricity, natural gas, wood, and fuel oil were found to vary across heating fuel types, geographic region, smart shopper attitudes, and household life-cycle segments.

The findings on consumer perceptions of heating fuels and heating fuel attributes are useful in directing utility marketing programs. The attitudes of selected market segments can be modified with promotion strategies to

shift their perceptions about a fuel. For example, if the switching of electricity to natural gas is of concern, marketing programs emphasizing the most positive aspects of electricity and the most negative aspects of natural gas can be directed to those consumer segments most likely to switch fuels.

FUEL SWITCHING POTENTIAL FOR HOME HEATING FUELS

The two most preferred heating fuels are electricity and natural gas. A comparison of respondents' present heating fuel and their preferred heating fuel reveals more of a potential for switching from electricity to natural gas. However, in any given year very little fuel switching actually occurs. The long replacement life of heating furnaces creates a situation where only three to four percent of households replace their furnace in any given year. Of this percent, not all homeowners switch their heating fuel. Of the home-owners interviewed, only three percent switched primary heating fuels for reasons other than a change of residence.

Though little switching of primary heating fuels has occurred, in the long run, a small percentage of homes switching away from electricity each year will lead to electricity losing a large proportion of its market share. Where heating fuel switching is a concern, it is important to carefully study the reasons for customer preference for natural gas and develop a marketing program to begin neutralizing the long term loss of electricity's market share through fuel switching.

Influencing the fuel type of new residences will have the most effect on a fuel's market share in the long run. Since little fuel switching occurs, encouraging the use of electricity in new residences will ensure electricity's long term market share. Comparing the heating fuel type of homes with the year they were constructed indicates a trend towards the increased installation of natural gas as a primary heating fuel. Whereas wood heat experienced a growth in new residence installation during the seventies and the early eighties, it is presently being installed in fewer new homes.

THE PRIMARY HEAT WOOD USER

In Western Washington, Western Oregon, and Eastern Washington/Northern Idaho/Western Montana, the proportion of wood users is around 17%. Only 7% of the respondents in Eastern Oregon/Southern Idaho use wood for home heating.

Wood users perceive wood to be more economical, more dependable, safer, more comfortable, more efficient, more convenient, and more pleasing to the sense of smell than do users of other fuels. Wood users' primary reason for using the fuel is its low cost.

The potential of consumers switching to wood from electricity is smaller than the potential for switching to natural gas. Approximately 10% of those households using electricity prefer wood as a primary heating fuel. Twenty-three percent of wood users reported preferring electricity as a primary heating fuel. If the switching of electricity to wood is a concern, the reasons for wood use and the perceptions of the attributes of wood suggest developing a program that emphasized all the costs of using wood, including the non-monetary costs.

APPLIANCE FUEL CHOICE

Electricity is the most used and preferred fuel for cooking, water heating, and clothes drying. Very little switching of appliance fuels occurs without a change of residence. Seventy-eight percent of those homeowners that have switched cooking fuels, changed from natural gas to electricity. Sixty-one percent of those homeowners that have switched water heating fuels, also changed from natural gas to electricity.

HEAT PUMPS

Only 4% of the homeowners reported having a heat pump. Forty-three percent of the homeowners reported being familiar with the heat pump system. Innovative homeowners and homeowners using electricity as a heating fuel were found to be more familiar with heat pump systems.

The two most often mentioned advantages and disadvantages of the heat pump were the same. A heat pump's efficient and reliable operation is the

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most mentioned advantage and its inefficiency and lack of reliability is the second most mentioned disadvantage. The economical operation of the heat pump is the second most mentioned advantage and its expensive operation is the most mentioned disadvantage.

The low familiarity with heat pumps and the misperceptions about them suggest that a communication program be developed to address two issues: 1) increasing the heat pump awareness of homeowners, and 2) correcting the inaccurate perceptions consumers have about heat pumps.

THE WATER HEATER MARKET AND WATER HEATER MARKETING PROGRAMS

Four percent of the homeowners reported presently being in the market for a water heater. However, 26% of homeowners' water heaters are over 12 years old. Awareness of present water heater marketing programs is low among homeowners. However, respondents do feel utilities should be involved in programs promoting energy conservation investments and the most preferred incentives for purchasing a water heater are discounted prices and cash rebates. The low awareness of water heater marketing programs and the long replacement life of water heaters suggest that utilities might consider focusing their resources on marketing programs for retailers and not the final consumer.

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1.0 INTRODUCTION

To develop the necessary information base for conservation planning,
program design, and marketing, the Bonneville Power Administration contracted
in 1983 with the Pacific Northwest Laboratory (PNL) to analyze the marketing
environment for Bonneville's conservation activities. Under the project, a
baseline residential conservation marketing study was completed. In
addition, market segment studies were conducted for heat pump and solar water
heaters and energy-efficient new homes.

The goal of studying the market environment is to aid in designing and
implementing cost-effective conservation programs, including marketing.
Understanding consumers' motivations, perceptions, and attitudes towards
energy efficiency and programs promoting energy efficiency is a key to pro-
moting participation in such programs. Effective marketing also involves
identifying definitive market segments. Once identified, information is then
targeted to the specific segments through appropriate access channels. Tar-
get marketing makes more efficient use of program dollars.

The 1983 baseline study involved telephone interviews with a stratified
random sample of 2000 households in Bonneville's service territory. The
study assessed household attitudes toward energy conservation, perceptions of
institutions, conservation actions taken and investments made, and household
media habits. The results were published in RMH Research, Inc. (1984) and
compared with results from other studies (Fang 1985).

In 1985, PNL followed up this baseline study with Phase II of the Analy-
sis of the Marketing Environment for Bonneville's Conservation Activities.
For Phase II, 1058 telephone surveys were completed. A stratified random
sample of the Bonneville's service territory was drawn. The objectives of
Phase II were, "to track changes in consumer attitudes, interests, and opin-
ion between 1983 and 1985; to identify more refined segments of the residen-
tial conservation market in terms of attitudes, interests, and opinions; and
to test hypotheses concerning consumer conservation actions and investment

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behaviors" (Ivey et al. 1987, p. 1.2). The study produced a series of reports on tracking, segmentation, fuel switching, and financing of energy investments.

1.1 PHASE III - SURVEY AND SAMPLE DESCRIPTION

This report is concerned with Phase III of the Analysis of the Marketing Environment for Bonneville's Conservation Activities. Phase III differs from Phase I and Phase II in that it emphasized fuel choice, perceptions of heating fuels, fuel preferences, and fuel switching. Phase III also differs in its study design. It consists of two surveys: a tracking survey and a fuels survey.

The tracking survey addresses most of the issues covered in Phase II. The tracking data were collected via a stratified random sample of Bonneville's service territory. The results of the tracking survey are discussed in Schultz and Bailey (1988).

The sample for the study, which is the subject of this report, is representative of the Bonneville's electric utility customer districts only, not the entire Pacific Northwest.

The sampling frame for the study consists of a clustered random sample of approximately 1000 residential households. Fifty random samples of enough telephone numbers to ensure 20 completed interviews were selected via a random digit dialing process from within all the zip codes in Bonneville's electric utility customer districts. The probability of any one sample being selected was based on the 1980 household populations within each zip code. The more populated the zip code area, the greater the likelihood that a sample would be drawn from it. This sampling methodology was chosen over a simple random sample to reduce the expense of collecting local data to compare with the survey data in future research efforts.

The sample was chosen to be representative of Bonneville's electric utility customer districts. By nature, telephone survey data are biased towards the views of those people more likely to complete telephone interviews. A 50% to 60% response rate is common for telephone marketing surveys. Variability in response rates is generally dependent on the efforts

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made with follow-up contacts, and the relevance of the survey to the people being interviewed (Kalton 1987). For this study, a three call-back procedure was employed. The initial refusal rate was 44%. The termination rate was 10%.

The low response rate was probably partially due to the length and the detailed nature of the survey questions. Also, the subject of the survey is not an interesting topic to most households. It is difficult to accurately assess what groups of people are not represented by the data because there is no data for them. Although the response rate is low, the data do represent a large proportion of Bonneville's service territory.

1.2 ORGANIZATION OF REPORT

To facilitate the readability and usefulness of this report, it covers the most interesting and relevant findings. It is not an inclusive discussion of the statistics used or a presentation of every possible finding. Its focus is identifying differences among segments of the population which are useful in understanding household fuel consumption.

The major findings of the study are found in Chapter 2.0. In Chapter 3.0, the respondents are described in terms of segments. Five segmentation schemes appear throughout the report: geographic region; present heating fuel; life-cycle; and two attitude segmentation schemes, "innovators" and "smart shoppers." Chapter 4.0 examines consumer perceptions of electricity, gas, and wood. It discusses eight characteristics of home heating fuels, the importance of each of the attributes to consumers, and the attributes consumers associate with each fuel. Chapter 5.0 addresses the fuel switching issue. The respondents' present heating fuel type is compared with their preferred heating fuel type and the potential for fuel switching is discussed in light of past fuel switching behavior. Chapter 6.0 examines wood users more closely. Their perceptions of wood and their reasons for using wood are discussed. Other wood issues included are the amount of wood burned, the cost of wood use, and the decline of wood use.

Present fuels, preferred fuels, and fuel switching among appliances is reported in Chapter 7.0. Chapter 8.0 is concerned with the heat pump market.

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Likes and dislikes, likelihood of purchasing a heat pump, and heat pump market segments are reviewed. Chapter 9.0 discusses the water heater market and respondents' awareness of marketing programs. Detailed statistical discussions of the analysis are included in the appendices.

2.0 MAJOR FINDINGS

This report's objectives are to examine the perceptions, preferences, and fuel switching possibilities for home heating and major appliance fuels. Issues relating to heat pumps and water heater marketing programs are also covered.

2.1 PERCEPTIONS OF HEATING FUELS

The respondents were asked to consider eight heating fuel attributes: cost, efficiency, dependability, convenience, safety, cleanliness, comfort, and odor. The large majority of the respondents feel that each of the eight attributes are important for a heating fuel to possess. While very little difference separates the importance ratings of the attributes, the safety of a heating fuel is considered to be the most important attribute. Convenience was rated the least important attribute for a heating fuel to possess. Wood and fuel oil users rated the importance of a nonpolluting fuel lower than respondents did for other heating fuels.

In general, consumers perceived the various heating fuels differently. Overall, across the eight attributes in the study, the respondents perceived electricity in the most positive light, followed by natural gas, wood, and fuel oil. There were no significant differences found between the overall perceptions of wood and fuel oil.

Electricity is perceived to be safe, non-polluting, and convenient. However, it is also perceived to be one of the most expensive fuels. Natural gas is perceived to be inexpensive and efficient. It is perceived to provide a more comfortable heat than the other fuels. Its greatest liability is its perceived level of safety. Wood and fuel oil are perceived to be the most polluting fuels. Both of these fuels are not perceived as positively as electricity and natural gas. Fuel oil's greatest liability is the perception of its cost. Wood's greatest liabilities are being inconvenient and not being as safe as the other fuels.

There are differences in the perceptions of the fuels between market segments. Generally, the users of a specific fuel rate their fuel higher in

terms of the eight fuel attributes. Respondents possessing smart shopper attitudes perceive natural gas to be less safe and less convenient than do other respondents. They also rate the convenience of electricity lower than do other respondents. Differences in the perceptions of the fuels also exist across geographic region and between household life-cycle segments.

The most frequently mentioned reason for using any particular fuel was that the fuel was already installed in the home. The second most frequently mentioned reason was that the fuel was less expensive. Most people do not appear to take an active part in choosing their primary heating fuel, and of those who do, the perceived economy of the fuel is a major reason for using that fuel.

The findings on consumer perceptions of heating fuels and heating fuel attributes are useful in directing utility marketing programs. The attitudes of selected market segments can be modified with promotion strategies to shift their perceptions about a fuel. For example, if the switching of electricity to natural gas is of concern, marketing programs emphasizing the benefits of electricity can be directed to those consumer segments most likely to switch fuels. Marketing could be used to change the perception of electricity as being expensive, or that, like gas, it is efficient.

2.2 FUEL SWITCHING OF HOME HEATING FUELS

The potential for fuel switching is examined in terms of the respondents present heating fuel and their preferred heating fuel. From this comparison, the greatest potential for switching is from electricity to natural gas. Natural gas users are the most satisfied with their present heating fuel.

Electricity and natural gas are the two most preferred fuels among the respondents. The most often mentioned reason for preferring any heating fuel, except for electricity, was low cost. The most often reported reason for preferring electricity was the fuel's cleanliness.

Reported past fuel switching indicates that very little fuel switching has occurred. Only six percent of the homeowners surveyed had switched heating fuels in the past two years. Of this six percent, half switched because they changed residences.

Though little switching of primary heating fuels has occurred, in the long run, a small percentage of homes switching away from electricity each year will lead to electricity losing a large proportion of its market share. Where heating fuel switching is a concern, it is important to carefully study the reasons for customer preference for natural gas and develop a marketing program to begin neutralizing the long term loss of electricity's market share.

Influencing the fuel type of new residences will have the most effect on a fuel's market share in the long run. Since little fuel switching occurs, encouraging the use of electricity in new residences will ensure electricity's long term market share. Comparing the heating fuel type of homes with the year they were constructed indicates a trend towards the increased installation of natural gas as a primary heating fuel. Whereas wood heat experienced a growth in new residence installation during the seventies and the early eighties, it is presently being installed in fewer new homes.

2.3 A PROFILE OF WOOD USERS

Forty-nine percent of wood user households consist of adults living together with no children. Most wood users (68%) live in Western Washington; the fewest live in Eastern Oregon/Southern Idaho. Within each region, wood users account for around 17% of the households, except for Eastern Oregon/ Southern Idaho. Generally, wood users are satisfied with wood heat, however electricity is the most preferred fuel for those not satisfied with wood heat.

The most mentioned reason for wood use is the low cost of the fuel. Sixty-four percent of the wood users gathered all of their wood themselves and the average price per cord for wood users who paid for either gathering it themselves or having it delivered was $46. Wood users perceive wood to be more economical, more dependable, safer, more comfortable, more efficient, more convenient, and more pleasing to the sense of smell than do the rest of the respondents. Wood users perceive the fuel to be more polluting than do other respondents, but they rate the importance of a nonpolluting fuel lower.

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The average amount of wood burned in the 1987-88 heating season was
3.8 cords per household. The wood users reported the amount of wood burned
in the 1987-88 was approximately the same amount burned the previous heating
season. However, from 1985 to 1987 wood use as a primary heating declined
from 29% to 22% of households in the Northwest.

The potential of consumers switching to wood from electricity is smaller
than the potential for switching to natural gas. Approximately 10% of those
households using electricity prefer wood as a primary heating fuel. Twenty-
three percent of wood users reported preferring electricity as a primary
heating fuel. If the switching of electricity to wood is a concern, the
reasons for wood use and the perceptions of the attributes of wood suggest
developing a program that emphasized all the costs of using wood, including
the non-monetary costs.

2.4 MAJOR APPLIANCE FUELS

The predominant fuel for the respondents' cooking stoves, water heaters,
and clothes dryers is electricity. Among homeowners, electricity is also the
most preferred fuel for these major appliances. Of the three appliances,
natural gas is most often used and preferred for water heaters. Twelve
percent of the households have a natural gas water heater and 27% reported
preferring a gas water heater.

Fuel switching of major appliances is generally dependent on a change of
residence. Thirty-eight percent of the homeowners surveyed had switched
their cooking fuels. Sixty-two percent of the responses explaining the
reasons for the switch, mentioned building a new home. Another 15% mentioned
the fuel being present when they moved in. Of the 25% of homeowners who
switched their water heating fuels, the most often mentioned reason for the
switch was the building of a new home (64% of responses) or the fuel already
being in the home when they moved in (16%).

Most of the fuel switching for cooking and water heating involved
switching from natural gas to electricity. For cooking stoves, 78% of the
switchers changed from natural gas to electricity; for water heaters, 61% of
the switchers changed from natural gas to electricity.

2.4

2.5 HEAT PUMPS

Only 4% (27 households) of the homeowners in the sample reported having a heat pump. Eighty-five percent owned an electric heat pump. Most of the heat pump owners are located in Western Washington and Western Oregon, respectively. No heat pump owners were located in Eastern Washington/ Northern Idaho/Western Montana.

Thirty-nine percent of homeowners not owning a heat pump reported being familiar with heat pumps. The familiarity with a heat pump system varied significantly across two of the five segmentation schemes. Homeowners with innovative attitudes and homeowners whose heating fuel is electricity are generally more familiar with heat pumps.

Homeowners that were familiar with heat pumps were asked their likes and dislikes of the system. Thirty-six percent of the responses mentioned the heat pump being efficient, reliable, and providing comfortable heat as likes. Twenty-one percent of the responses included the heat pump being perceived to be less expensive to operate as a advantage. The two most often mentioned dislikes were the same. Thirty-two percent of the responses mentioned the heat pump was not economical and 15% expressed the inefficiency and lack of reliability of the heat pump as disadvantages.

The low familiarity with heat pumps and the misperceptions about them suggest that a communication program be developed to address two issues: 1) increasing the heat pump awareness of homeowners, and 2) correcting the inaccurate perceptions consumers have about heat pumps.

2.6 THE WATER HEATER MARKET AND AWARENESS OF WATER HEATER MARKETING PROGRAMS

Most people who are in the market for a water heater are replacing a broken water heater or are concerned with the age of their present water heater. Only four percent of the homeowners reported presently being in the market for a water heater, but 26% of the homeowners' water heaters are over 12 years old. Only three percent of the homeowners leased their water heaters.

Awareness of water heater marketing programs was low among the home-
owners, even among those presently in the market for a water heater. Only
18% of the homeowners reported being familiar with a water heater marketing
program and of this 18%, 35% did not mentioned a specific program or sponsor,
but mentioned utilities, in general, as sponsors. The low awareness of water
heater marketing programs and the long replacement life of water heaters
suggest that utilities might consider focusing their resources on marketing
programs for retailers and not the final consumer.

Most of the respondents in the survey felt that utilities need to do
more than just provide electricity. Seventy-five percent of the respondents
felt utilities should offer low-interest loans or rebates for energy conser-
vation investments. Speaking of water heater programs, discounted prices and
cash rebates are the most preferred incentives for purchasing a water heater.

3.0 DESCRIPTION OF SURVEYED HOUSEHOLDS

This section introduces the five segmentation schemes that are used to describe the surveyed households; geographic region, primary heating fuel, life-cycle, innovative attitudes, and smart shopper attitudes. Figures 3.1 and 3.2 show the distribution of the primary fuel type within each of the surveyed regions and the geographic distribution of the households surveyed. The geographic region segmentation scheme consists of four regions. The primary heating fuel segmentation scheme consists of four heating fuel types.

The life-cycle segmentation scheme is created using household demographics. Families and singles have different consumer behaviors and attitudes at different stages in their lives. The life-cycle segments describe the households using combinations of the following demographic variables: household size, age of household members, and sex of household members.

A cluster analysis is used to group the households that are most alike on these variables into nine life-cycle segments. The segmentation methodology is discussed in the appendices.
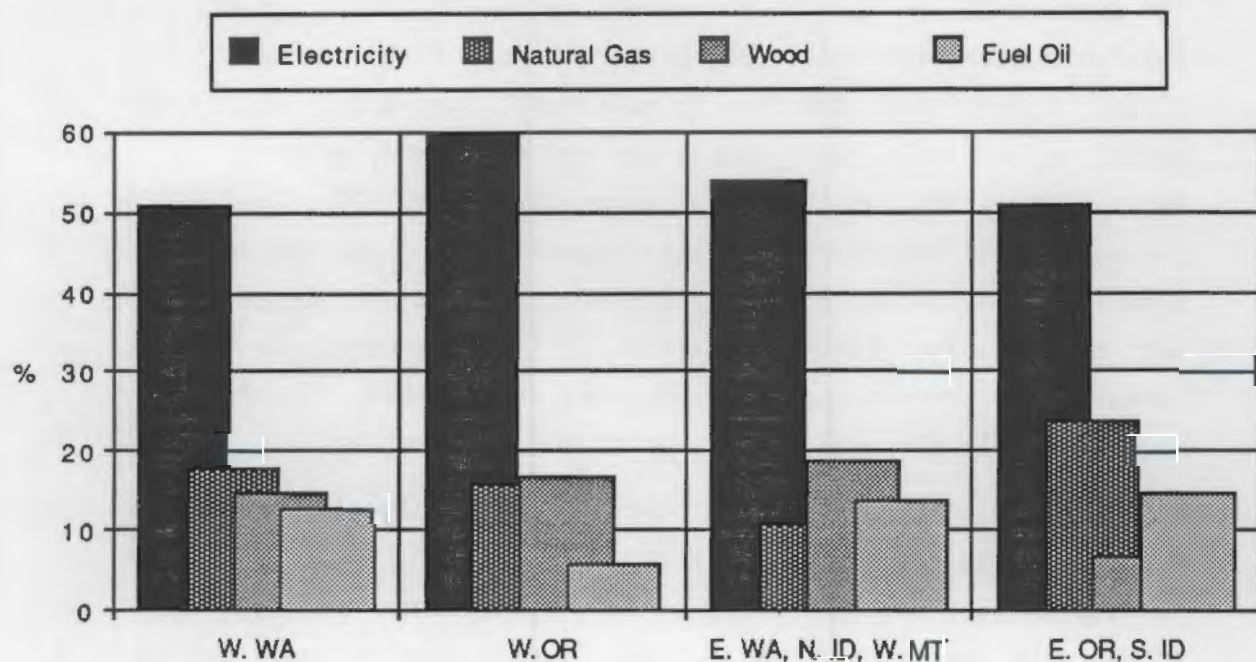
FIGURE 3.1. Primary Heating Fuel Distribution by Region

Legend:
- W. WA
- W. OR
- E. WA, N. ID, W. MT
- E. OR, S. ID

4%
8%
18%
70%
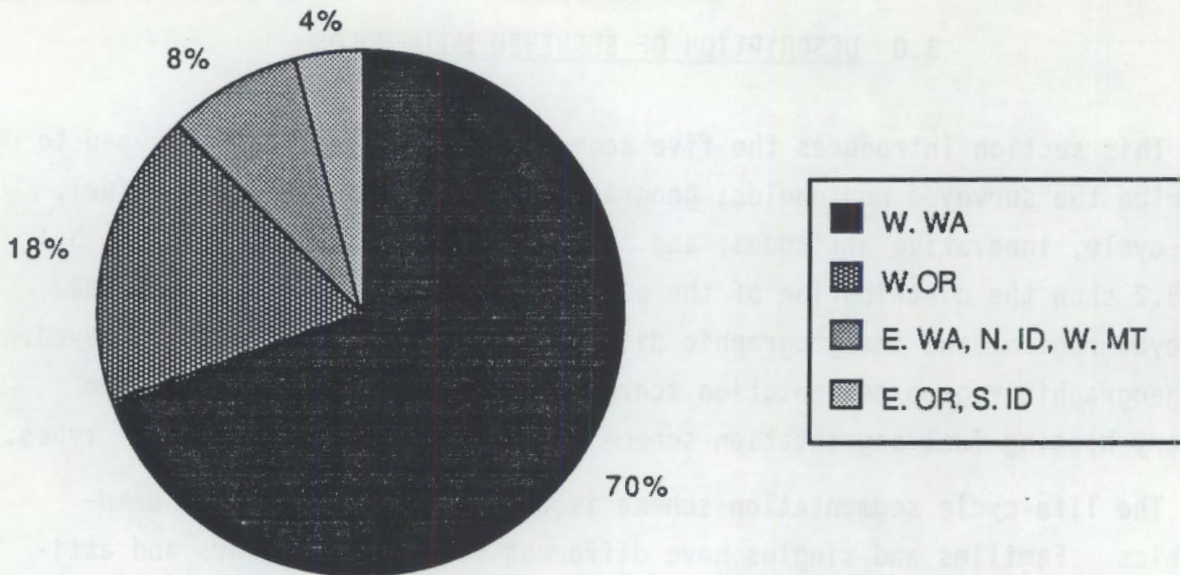
FIGURE 3.2. Geographic Distribution of Surveyed Households

The life-cycle segments are described below in terms of the previously mentioned demographic variables, annual household income, highest level of formal adult education, home ownership, and type of residence.

1. Early Career Single Adults (9%) - consists of single adults between the ages of 21 and 39. Males account for 54% of this segment, females account for 46%. They primarily rent their residences (78%). Accordingly, 64% live in multi-unit complexes. Thirty percent live in single family dwellings and 4% in mobile homes. Approximately 77% have an annual income below $30,000. Twenty-nine percent of the respondents in this segment have completed college, another 31% have completed some college, and 28% have completed high school only. Forty-two percent of the respondents in this segment have professional or management occupations. Twenty-one percent are in clerical, sales, or service occupations.

2. Middle Age Single Adults (5%) - consists of single adults between the ages of 40 and 59. Males account for 54% of this segment, females account for 46%. They primarily rent their residences (56%). The largest proportion (48%) live in single family dwellings. Forty percent live in multi-unit complexes and 10% live in mobile homes. Approximately 60% have an annual income below

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$30,000. Twenty-seven percent have completed college, 21% have completed some college, and 21% have completed just high school. Forty percent of the respondents in this segment have professional or management occupations. Twenty-three percent are in clerical, sales, or service occupations.

3. Elderly Single Adults (9%) - consists of single adults, 60 years of age and over. Males account for 13% of this segment, females account for 87%. They primarily own their residences (67%). The largest proportion (60%) live in single family dwellings. Thirty percent live in multi-unit complexes and 11% live in mobile homes. Approximately 60% have an annual income of less than $15,000. Twenty-six percent have completed some college, 32% completed high school as their highest level of education, and 23% were high school dropouts. Eighty-seven percent of the respondents in this segment are retired. Seven percent work in clerical or sales occupations.

4. Single Parents (4%) - consists of single adults with children. Male adults account for 28% of the single parents; whereas, female adults account for 72% of the single parents. Sixty-three percent of the parents are between the ages of 21 and 35, 44% between the ages of 36 and 64, and 2% over 65. Twenty-four percent of these households have pre-school children, 37% have children of primary school age, and 32% have children of secondary school age. Eighteen percent of the households have older children (18-20) living at home. These households mostly rent their residences (54%) and primarily live in single family dwellings (56%) and multi-unit complexes (30%). Approximately 70% have an annual household income below $15,000. Fifty-one percent just completed high school and 35% completed some college. The respondents' occupations varied, but the largest percentage (31%) were in professional or management occupations.

5. Adults Living Together - No Children (47%) - consists of 86% married adults with no children and 9% adult roommate households

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(<100% due to missing values). Couples between the ages of 21 and 35 make up approximately 30% of the households in this segment. Couples between the ages of 36 and 64 make up 42% of the households, and couples 65 years of age and older make up approximately 19% of the households. Most of the adult roommate households have adults between the ages of 21 and 35. Sixty-seven percent of households in this segment own their residences and 73% live in single family dwellings. Forty-four percent of the households have an annual income under $30,000. Thirty-five percent have an annual income between $30,000 and $60,000. Approximately, 36% of the households have the highest level of adult education being completed some college. Completing high school is the highest level of adult education for 19% of the households and 18% have the highest level of adult education in the household being having completed college. Twenty percent of the households have one income. The largest percentage of households has at least one retired person (24%). Twenty-one percent of the households have at least one person in the professional/management occupations.

6. <u>Late-Family-Stage Households (2%)</u> - Seventy percent of these households have no children but have three or more adults living together. The majority of the households with children have older children, high school (12-17) or college age (18-21). Of these households, the number of adults is large because a middle aged couple has adult children living in the home. Seventeen percent of the homes also have an elderly adult in them, possibly a grandparent. Approximately 13% of the households consist of 4 roommates with ages from 22 to 35. Fifty-six percent of the households own their residence and 87% live in single family dwellings. Thirty percent have an annual household income between $30,000 and $45,000. Twenty-six percent have an annual income below $30,000. Seventeen percent of the households have one wage earner. In 43% of the households, having completed some college is the highest

3.4

level of adult education. In 26%, having completed college is the highest level of adult education. The household occupations encompass almost every category.

7. <u>Middle-Family-Stage Households (19%)</u> - consists mostly of families with one to two children. Thirty-two percent of the households have pre-school age children, 37% have children of primary school age, 35% have children of high school age, and 23% have children from ages 18 to 21. Approximately 4% of the homes have elderly adults, possibly grandparents. Around 36% of the households are made up of couples between 22 and 35 and 57% are made up of middle age couples. The largest proportion (33%) of the households have an annual income between $15,000 and $30,000. Twenty-two percent have an annual income between $30,000 and $45,000, 12% between $45,000 and $60,000, and 10% make over $60,000 a year. Thirty-one percent of the households have a single wage earner. The highest level of adult education for 30% of these households is having completed some college. Twenty-four percent have a highest adult education level of completing high school, 22% reached the point of completing college, and 8% completed at least some graduate school. Around 30% of the households have respondents in the manage-rial/professional occupations; 25% had clerical/sales/service occupations.

8. <u>Large Nuclear Families (5%)</u> - consists of couples with at least three children in the home. Sixty-two percent of the households have pre-school age children, 79% have primary-school age children, 47% have high school-age children, and 11% have children between the ages of 18 and 21. Forty-three percent of the couples are between the ages of 22 and 35, and 57% are middle-age couples (36-64). Seventy percent of the households own their residence and 74% live in a single family dwelling. Around 30% of the households have an annual income between $15,000 to $30,000 and 30% between $30,000 to $45,000. Thirteen percent make below $15,000 and between $45,000 and $60,000. Fifty-three percent of the households have one income. The largest proportion of the households have a

3.5

highest adult education level of completing some college. Nineteen percent have completed high school, 27% percent have completed college, and 8% have completed some graduate school. The major occupations are professional/managerial and clerical/sales/service.

To more fully describe the households, two attitude segmentation schemes are developed, the "innovators" and the "smart shoppers." Innovators are those consumers who are more willing to try new products or programs. The smart shoppers are those consumers who shop around for the best deal and who are more interested in quality at a reasonable price. The scales used to segment the households into innovators and smart shoppers are based on the level of agreement with attitude statements and reported product purchase behavior. Those respondents scoring between a 7 and a 10 on the shopper scale are considered to be "smart shoppers." They represent 57% of the respondents. Those respondents scoring between a 13 and a 20 on the inno- vator scale are considered to be "innovators." They represent 11% of the respondents. The development of these scales are fully discussed in the appendices.

4.0 PERCEPTIONS OF HEATING FUELS AND THEIR ATTRIBUTES

Understanding what heating fuel characteristics are important to con-
sumers and how consumers perceive different heating fuels is important in
trying to understand the fuel choice decision. The discussions in this sec-
tion are directed by two hypotheses: 1) Those who use different fuel types
place different importance on fuel attributes, and 2) Consumers have differ-
ent images/perceptions of different heating fuels. This section explores
these two issues in terms of eight fuel attributes. The respondents were
asked to consider how economical, efficient, dependable, convenient, safe,
and nonpolluting specific heating fuels are. In addition, the attributes of
providing comfortable heat and not having an offensive odor were considered.

4.1 PERCEIVED IMPORTANCE OF HEATING FUEL ATTRIBUTES

The respondents were asked to rate how important it was for a heating
fuel to have each of the eight attributes. Table 4.1 shows the percentage of
respondents responding to the various levels of importance for each of the
attributes. The large majority of the respondents feel that each of the

TABLE 4.1. Respondents' Ratings of Fuel Attributes

Mean Importance Rating	Attribute	Importance of Attributes			
		Not at all Important	Not Very Important	Somewhat Important	Very Important
3.93	Safe	1.0%	1%	6%	94%
3.89	Dependable	0.1%	1%	9%	90%
3.87	Economical	0.1%	1%	10%	88%
3.86	Efficient	0.2%	1%	11%	88%
3.82	Not have an offensive odor	0.6%	2%	13%	85%
3.80	Provide comfortable heat	0.2%	2%	16%	82%
3.73	Non-polluting	1.0%	2%	19%	78%
3.71	Convenient	0.2%	3%	22%	74%

4.1

eight attributes are important for a heating fuel to possess. While very little difference separates the importance ratings of the attributes, the safety of a heating fuel is considered to be the most important attribute. Convenience is rated the least important attribute for a heating fuel to possess.

The statistical significance of the differences between the importance ratings across the five segmentation schemes was tested (see appendices). The respondents' ratings on the importance of the eight attributes were consistent across four of the five segmentation schemes. While respondents across all the primary heating fuel types thought it important that a fuel be non-polluting, fuel oil users and wood users rated this attribute less important than did electricity and natural gas users. Table 4.2 shows the mean ratings of the importance of a fuel being non-polluting for each primary fuel using group.

4.2 CONSUMER PERCEPTIONS OF HEATING FUELS

In the previous section, the importance consumers assigned to different heating fuel attributes was examined. This section investigates how respondents perceive the different heating fuels in relation to the eight attributes. Respondent ratings for each of the eight attributes, as well as, their responses to open-ended questions and their level of agreement with attitude statements.

TABLE 4.2. The Importance of a Nonpolluting Heating
Fuel, Ratings by Primary Fuel Type

Primary Fuel Type	Mean Importance Rating
Natural Gas	3.80
Electricity	3.76
Fuel Oil	3.68
Wood	3.60

4.2.1 Consumer Ratings of Fuel Attributes

Differences between the overall positive perception of the fuels is examined in this section. The respondents were asked to rate how well each of the eight attributes described four different heating fuels; electricity, natural gas, wood, and fuel oil. For each of the fuels, four of the attributes were worded in the positive and the other four in the negative. The analysis involved reverse coding the negatively worded attributes and examining the difference between the perceptions of the fuels on each of the eight attributes. The statistical significance of the differences in the perceptions of the fuels was tested (see appendices).

Table 4.3 is a pair-by-pair comparison of the mean scores for each fuel attribute on a scale from 1 (Poor Descriptor) to 4 (Good Descriptor). When the overall positive perceptions of the fuels is compared, electricity ranks the highest followed by natural gas, wood, and fuel oil. Comparing the fuels across the individual attributes, either electricity or natural gas consistently score higher than wood and fuel oil. Electricity is perceived to be safer, less polluting, more convenient, and less odorous than natural gas.

TABLE 4.3. Comparison of Means of the Positive Perception Scale, by Fuel Attribute

Fuels	Low Cost	Dependable	Safe	Nonpolluting	Comfortable Heat	Efficient	Convenient	No Offensive Odor	Overall Positive Image[a]
Gas	3.06*	3.21	2.88*	2.98*	3.45*	3.23*	3.26*	2.92*	23.22*
Electricity	2.13	3.12	3.37	3.33	3.33	3.06	3.45	3.60	24.89
Gas	3.06*	3.21*	2.88*	2.98	3.45*	3.23*	3.26*	2.92	23.22*
Wood	2.71	2.83	2.27	2.93	3.02	2.65	1.70	2.90	20.41
Gas	3.06*	3.21*	2.88	2.98*	3.45*	3.23*	3.26*	2.92*	23.22*
Oil	2.02	2.88	2.81	2.41	3.11	2.72	2.69	2.49	19.65
Electricity	2.13*	3.12*	3.37*	3.33*	3.33*	3.06*	3.45*	3.60*	24.89*
Wood	2.71	2.83	2.27	2.93	3.02	2.65	1.70	2.90	20.41
Electricity	2.13*	3.12*	3.37*	3.33*	3.33*	3.06*	3.45*	3.60*	24.89*
Oil	2.02	2.88	2.81	2.41	3.11	2.72	2.69	2.49	19.65
Wood	2.71*	2.83	2.27*	2.93*	3.02*	2.65*	1.70*	2.90*	20.41
Oil	2.02	2.88	2.81	2.41	3.11	2.72	2.69	2.49	19.65

* Significant at ≤ 0.05 level.
(a) A fuel's attribute means do not sum to its overall positive image mean due to missing values in the data.

4.3

Natural gas is perceived to cost less, to provide more comfortable heating, and to be more efficient than electricity. The dependability of electricity and natural gas is perceived to be about the same.

According to the consumers' ratings of the attributes for each fuel, fuel oil is perceived to be the most expensive fuel, the most polluting fuel, and the worst smelling fuel. Wood is perceived to be the least safe, to provide the least comfortable heat, to be the least efficient, and to be the least convenient.

4.2.2 Differences of Fuel Perceptions Across Segments

An examination of the fuel perceptions across the five segmentation schemes found a number of fuel attributes that are perceived statistically different (see appendices). The primary heating fuel segments have the greatest amount of differentiation between the respondents' perceptions of fuel attributes. Of the eight individual attributes for each of the four fuels, five attributes of electricity and one of fuel oil are similarly perceived across the fuel type segmentation. These attributes are safety, cleanliness (nonpolluting), efficiency, convenience, and non-odorous for electricity and cleanliness for fuel oil.

Table 4.4 presents the fuels and only those attributes that are perceived differently across the heating fuel types. The mean scores on each attribute are shown in the columns; differences between the four heating fuel segments are shown in the rows. For example, the mean rating of wood users for the low cost of wood is underlined in the Table, 3.48. Examining the mean scores in the same row, it is clear that wood users perceive the cost of using wood to be lower than the use of other heating fuels. Generally, the users of a specific fuel rate that fuel higher on possessing the fuel attributes listed than fuels they do not use. They perceive their primary heating fuel in a more positive light than other fuels.

A few other attributes of the different fuels are perceived differently across two more segmentation schemes. The safety and convenience of natural gas and the convenience of electricity are perceived differently between "smart shoppers" and noncomparative shoppers. Also, the cleanliness of wood

4.4

TABLE 4.4. Differences in the Perception of Fuel Attributes, by Heating Fuel Type

Heating Fuel	Attribute	Primary Heating Fuel Segment			
		Electricity	Natural Gas	Wood	Fuel Oil
NATURAL GAS	Low Cost	3.03	3.39	2.83	2.88
	Dependable	3.21	3.40	3.09	2.96
	Safe	2.76	3.32	2.78	2.73
	Non-Polluting	2.93	3.19	2.97	2.83
	Comfortable Heat	3.40	3.68	3.41	3.31
	Efficient	3.19	3.44	3.12	3.09
	Convenient	3.17	3.52	3.21	3.23
	No Offensive Odor	2.86	3.17	2.87	2.74
	Positive Image*	22.65	26.64	22.73	19.96
ELECTRICITY	Low Cost	2.27	2.00	1.90	1.94
	Dependable	3.19	3.19	2.86	3.07
	Comfortable Heat	3.43	3.17	3.16	3.39
	Positive Image	25.60	23.86	24.20	23.90
WOOD	Low Cost	2.55	2.45	3.48	2.59
	Dependable	2.77	2.61	3.33	2.71
	Safe	2.14	2.15	2.78	2.26
	Non-Polluting	2.94	3.03	2.65	3.13
	Comfortable Heat	2.94	2.80	3.58	2.83
	Efficient	2.59	2.49	3.08	2.46
	Convenient	1.59	1.60	2.14	1.55
	No Offensive Odor	2.90	2.78	3.13	2.77
	Positive Image*	19.87	19.23	24.06	19.37
FUEL OIL	Low cost	1.89	1.92	2.14	2.72
	Dependable	2.72	3.04	3.13	3.30
	Safe	2.67	2.79	1.76	3.24
	Comfortable Heat	3.01	3.06	2.73	3.53
	Efficient	2.60	2.72	2.77	3.19
	Convenient	2.49	2.74	3.03	3.28
	No Offensive Odor	2.41	2.54	2.58	3.02
	Positive Image	18.68	19.28	18.25	24.47

* A fuel's attribute means do not sum to its positive image mean due to missing values in the data.

and the convenience of fuel oil are perceived differently across the four geographic regions of the survey.

Table 4.5 and 4.6 present the mean attribute scores for each segmentation group. While both "smart shoppers" and noncomparative shoppers

TABLE 4.5. Mean Scores for Attributes That Are Perceived Differently
            Between Smart Shoppers and Noncomparative Shoppers

	Smart Shopper	Non-Comparative Shopper
Safety of Natural Gas	2.82	2.97
Convenience of Natural Gas	3.20	3.34
Convenience of Electricity	3.40	3.52

TABLE 4.6. Mean Scores for Attributes That Are Perceived Differently
            Between Regions

	Western Washington	Western Oregon	Western Montana Northern Idaho Eastern Washington	Southern Idaho Eastern Oregon
Nonpolluting, Wood	2.94	2.88	3.23	2.45
Convenience of Fuel Oil	2.75	2.42	2.80	2.58

perceived the attributes of the two fuels in a positive light, the non-comparative shoppers consistently rated the attributes of the two fuels slightly lower. The greatest regional differences in the perception of wood as a nonpolluting heating fuel is between Eastern Oregon/Southern Idaho and Western Montana/Northern Idaho/Eastern Washington. Using fuel oil is perceived to be the most convenient in Western Montana/Northern Idaho/Eastern Washington and the least convenient in Western Oregon. The respondents' perceptions of a few attributes are also differentiated by life-cycle segments. Table 4.7 presents the mean scores for each segment's rating of the attributes for the different fuels. While many of the mean scores are very close to each other, there is a pattern between the highest and the lowest mean scores. For almost every attribute presented, Elderly Single Adults have the highest mean scores and Large Nuclear Families have the lowest mean scores. The reason for this result is not clear. These two groups may be distinctly different in the manner in which they perceive fuel attributes or the pattern may be due to a response bias. Elderly people may just not rate anything as critically as those people in large families do. Further investigation is warranted.

TABLE 4.7. Mean Score for Attributes That Are Perceived Differently, by
Life-cycle Segments

	Early Career Single Adults	Middle Aged Single Adults	Elderly Single Adults	Single Parents	Adults No Kids	Family Late Stage	Family Middle Stage	Large Nuclear Families
ELECTRICITY								
Safety	3.37	3.68	3.64	3.47	3.35	3.14	3.24	3.15
Comfortable Heat	3.45	3.30	3.69	3.30	3.32	3.14	3.26	3.17
Efficiency	2.87	3.04	3.60	3.12	3.05	3.00	3.00	2.83
WOOD								
Low Cost	2.76	2.46	2.32	2.93	2.61	2.62	2.97	3.13
FUEL OIL								
Low Cost	1.98	1.80	2.57	1.91	2.05	2.25	1.90	1.79
Comfortable Heat	3.05	3.14	3.40	3.10	3.15	3.00	2.94	2.91
Efficiency	2.57	2.75	2.98	2.41	2.80	2.78	2.61	2.36

4.2.3 Consumers' Responses to Other Survey Questions

The rankings of fuel attributes indicated most respondents perceive oil
to be the most expensive heating fuel, followed by electricity, wood, and
natural gas. Table 4.7 shows the responses to questions about which fuel was
perceived to be the most expensive, the least expensive, and the most expen-
sive in 5 years as reported by respondents. While results show some support
for the results reported in Section 4.2.1, the support is mixed. As indi-
cated in Figure 4.1, electricity is perceived as the most expensive fuel,
followed by fuel oil, natural gas, and wood. From the two reported percep-
tions, fuel oil and electricity are consistently perceived to be more
expensive than natural gas and wood.

The respondents were also asked why they were using their present heat-
ing fuel type. Of those respondents living in electrically heated homes, 47%
said they used electricity because "it was already installed in the house
(47% of responses)." Approximately 16% of the responses were that elec-
tricity was less expensive than other fuels. Familiarity, availability, and
cleanliness of electricity were each mentioned around 11% of the time. Other
reasons for using electricity were its convenience (6%) and its efficiency,
reliability, and safety (6%).

4.7
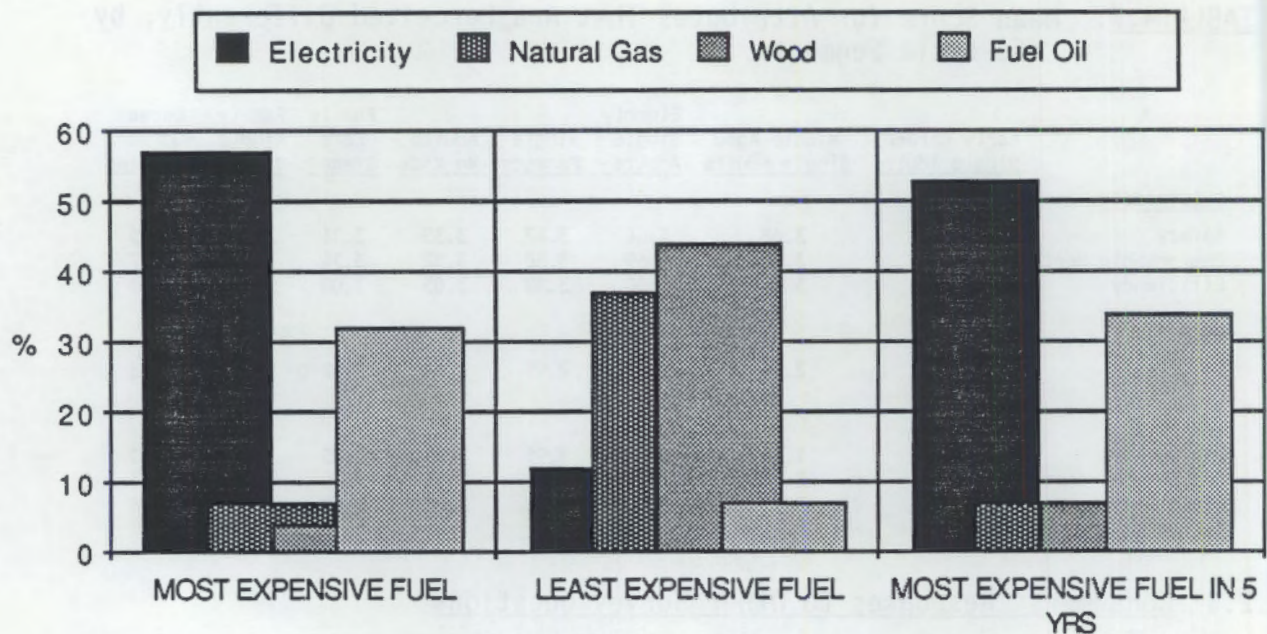
FIGURE 4.1. Perceived Expense by Fuel Type

The reason most mentioned for using natural gas as a heating fuel was that the fuel was already in the home (36%). Thirty-four percent of the responses were that natural gas was less expensive than other fuels, 13% of the responses mentioned that natural gas was a clean fuel, and 9% of the responses included natural gas' efficiency, reliability, and safety. Other reasons were the respondents' familiarity with natural gas and its convenience.

Wood users most often mentioned that wood was less expensive than other fuels (59%). Sixteen percent of the responses included the availability of and the familiarity with wood; 10% of the responses were that wood was reliable, safe, and efficient; and 8% mentioned that wood was already installed in the house. Only 3% of the responses included the aesthetics of wood heat as a reason for its use.

For fuel oil heated homes, the primary reason for its use is that it was already installed in the home (55% of the responses). Twenty-four percent of the responses mentioned that fuel oil is less expensive; 9% of the responses stated that the respondents' familiarity with and the availability of fuel

4.8

oil are reasons for their use of fuel oil; and 7% of the responses included the efficiency, safety, and reliability of fuel oil.

The most frequently mentioned reason for using any particular fuel was that the fuel was already installed in the home. The second most frequently mentioned reason was that the fuel was less expensive. Most people do not appear to take an active part in choosing their primary heating fuel, and of those who do, the perceived economy of the fuel is a major reason for using that fuel.

4.3 AN OVERVIEW OF THE PERCEPTION OF FUELS AND THEIR ATTRIBUTES

Two hypotheses directed the examination of heating fuels and their attributes: 1) Consumers of different heating fuels place different levels of importance on different attributes and 2) Consumers have different perceptions of heating fuels. Consumers using different heating fuel types do place different importance on fuel attributes, but only for the attribute of being non-polluting. The consumers of electricity and natural gas believe it is more important for a fuel to be non-polluting than the consumers of wood and fuel oil. In general, consumers do perceive the various heating fuels differently. Overall, across the eight attributes in the study, the respondents perceived electricity in the most positive light, followed by natural gas and wood/fuel oil. There were no significant differences found between the overall perceptions of wood and fuel oil.

Electricity is perceived to be safe, non-polluting, and convenient. It is perceived to be one of the most expensive fuels. Although, when asked their level of agreement with this statement, "Electricity prices are fair when you think about the cost of other things today," approximately 50% of the respondents strongly agreed or just agreed with the statement.

Natural gas is perceived to be inexpensive and efficient. It is perceived to provide a more comfortable heat than the other fuels. Respondents were asked if natural gas was the energy of the future. About the same number of respondents agreed, disagreed, and were neutral about this statement. The perceived level of safety of natural gas is its greatest liability. When

4.9

asked their level of agreement with, "The safety of natural gas is a concern to me," close to 60% of the respondents strongly agreed or just agreed with the statement.

Wood and fuel oil are perceived to be the most polluting fuels. Both of these fuels are not perceived as positively as electricity and natural gas. Fuel oil's greatest liability is the perception of its cost. Wood's greatest liabilities are being inconvenient and not being as safe as the other fuels.

5.0 FUEL SWITCHING AMONG HEATING FUELS

Once consumers have bought into a home, how likely are they to switch their primary heating fuel? The following paragraphs examine the respondents' preferences for heating fuels, the relationship between the respondents' present and preferred heating fuels, past trends in fuel switching, and possible trends in fuel switching among the surveyed households.

5.1 PREFERENCES FOR HEATING FUELS AND DIFFERENCES ACROSS SEGMENTS

Electricity and natural gas are the two most preferred heating fuels among the respondents. Approximately 70% of the respondents stated a preference for either electricity or natural gas. The percentage of respondents preferring each of these two fuels is about 35%. Fourteen percent of the respondents prefer wood as a heating fuel and 5% prefer fuel oil. Approximately 5% of the respondents had no preference.

When asked the reasons for their preference, respondents preferring electricity most often responded that electricity was an environmentally clean fuel and had no undesirable odors (31% of the responses). Twenty percent of the responses mentioned that electricity provides a comfortable heat that is quick, consistent, safe, and efficient. Less often mentioned reasons for using electricity are its availability and familiarity, its relatively inexpensive cost, and its convenience.

The most often mentioned reason for preferring natural gas as a heating fuel was it is perceived to be more economical (48% of the responses). The second most often mentioned reason was that natural gas provides a comfortable heat by heating quickly and evenly (20% of the responses). The convenience of natural gas and its ability to be used as a preferred cooking fuel were reasons mentioned less often.

The respondents that preferred wood over other heating fuels mentioned doing so because wood was less expensive than other fuels (49% of the responses). The comfort of the heat provided (21% of the responses) and the aesthetics of burning wood (14% of the responses) were the next two most often mentioned reasons. Wood's availability was also mentioned.

5.1

Of the 5% of the respondents who preferred fuel oil, the largest per-
centage did so because they felt it was less expensive than other fuels (26%
of the responses). Another 26% of the responses were covered by the respon-
dents stating that fuel oil is available and that they are familiar with fuel
oil. The comfort of the heat fuel oil provides was also mentioned approxi-
mately 26% of the time.

The statistical tests used to compare the differences in the preferences
of heating fuels between the five segmentation schemes are reviewed in the
appendices. Differences in the preference of heating fuels exist between
geographic regions, primary heating fuel types, and respondents with inno-
vative attitudes.

In Figure 5.1 the heating fuel preferences are shown by geographic
region. Electricity is the preferred fuel in three out of four of the
regions; the preference for natural gas dominates other fuel preferences in
Western Washington.

The respondents' heating fuel preferences are also segmented according
to the innovator attitude scales. While the mean scores on the innovator
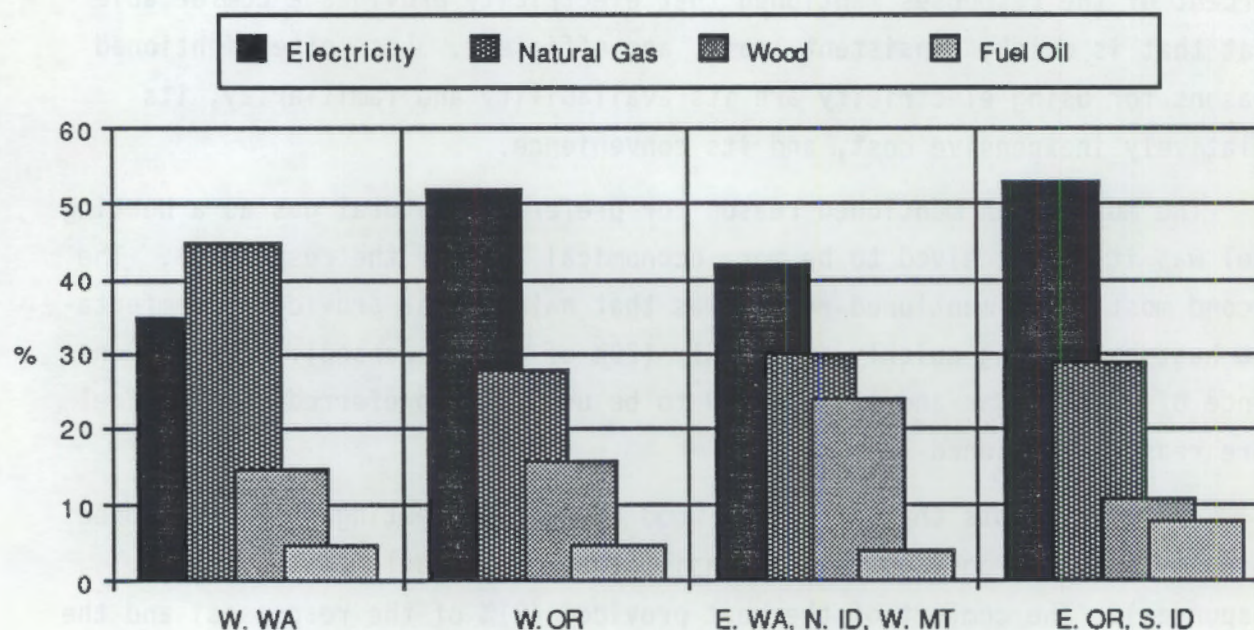
FIGURE 5.1. Percentage of Respondents in a Region Preferring
a Specific Heating Fuel

scale for the respondents preferring the different heating fuels cannot be classified as "innovator" scores, those respondents preferring natural gas have the highest mean score on the scale (see Table 5.1).. In other words, respondents preferring natural gas can be said to be more innovative than respondents preferring the other fuel types.

The segmentation of the respondents' preferred heating fuel by their present heating fuel is covered in depth in the following section.

5.2 PRESENT VERSUS PREFERRED HEATING FUEL

Figure 5.2 compares the respondents' present heating fuel type with their preferred heating fuel type. This comparison was also made for those respondents who reported having natural gas available. For the most part, the relationship between respondents' present and preferred heating fuel type remains consistent across the availability of natural gas. Natural gas is available for approximately 56% of the surveyed households.

It appears that those households that use natural gas are the most satisfied with their present heating fuel. Also, according to preference alone, there appears to be more of a potential for electrically heated households to switch to natural gas than for natural gas homes to switch to electricity.

5.3 PAST AND POTENTIAL FUEL SWITCHING

Although Figure 5.2 indicates a potential for more homes to switch to natural gas from electricity, the results presented do not take into

TABLE 5.1. Respondents Mean Innovator Score, by Preferred Heating Fuel

Preferred Heating Fuel	Mean Innovator Score
Electricity	8.65
Natural Gas	9.25
Wood	9.06
Fuel Oil	8.76
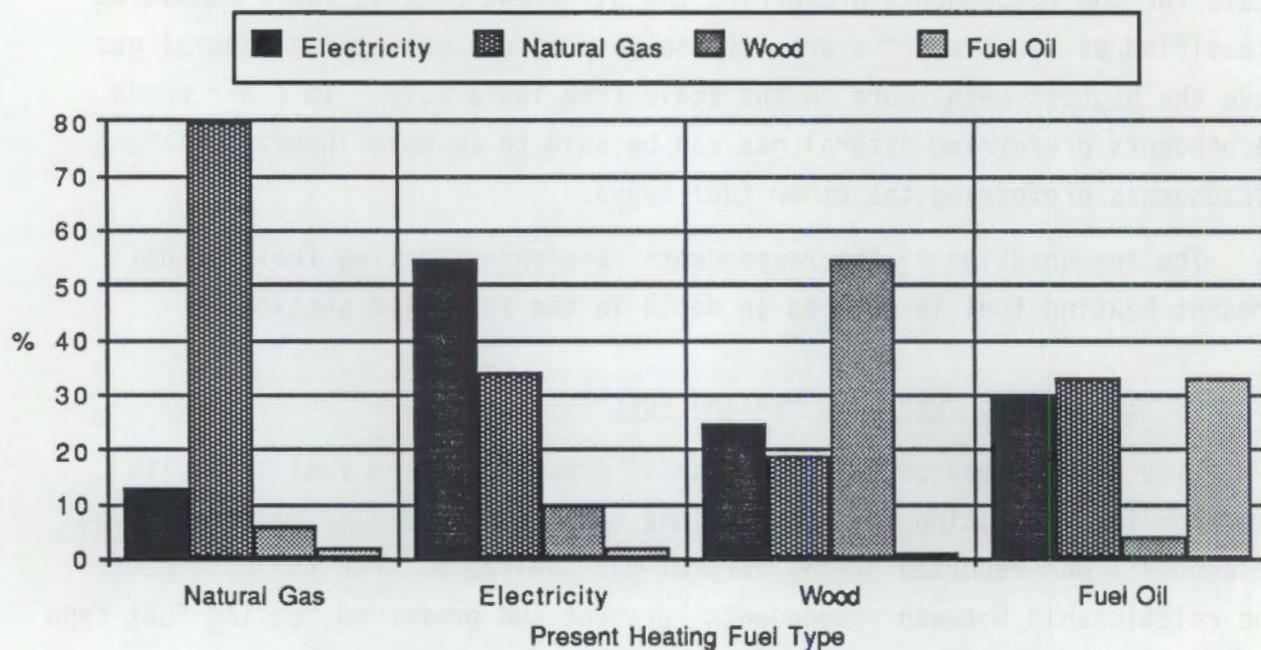
FIGURE 5.2. Respondents' Present Heating Fuel Type Compared With Their Preferred Fuel Type

consideration other factors that may prohibit fuel switching. When asked how likely it was for the household to switch heating fuels in the next two years, only 5% of the homeowners reported they would consider switching. Another 5% were unsure. Of those homeowners that have been in their residence longer than two years, approximately 6% had switched their heating fuels in the past two years. Half of these respondents switched their heating fuels because they changed their residence.

Examining those homeowners who have switched their heating fuel in the past two years, three had switched from electricity to gas, two from electricity to fuel oil, and three from electricity to wood. Five respondents switched from natural gas: three to electricity, one to fuel oil, and one to wood. Eight respondents switched from fuel oil to other fuels, mostly to natural gas, and four respondents switched from wood, mostly to electricity.

These results indicate that while there may be considerable potential for fuel switching due to fuel preferences, very little actually occurs. The long replacement life of heating furnaces creates a situation where only three to four percent of households replace their furnace in any given year.

5.4

Many homeowners continue to use the same fuel. In this sample, only three percent switched primary heating fuels for reasons other than a change of residence.

Influencing the fuel type of new residences will have the most effect on a fuel's market share in the long run. Since little fuel switching occurs, encouraging the use of electricity in new residences will ensure electricity's long term market share. Figure 5.3 compares the heating fuel type of homes with the year they were constructed. The figure indicates a trend towards the increased installation of natural gas as a primary heating fuel. Whereas wood heat experienced a growth in new residence installation during the seventies and the early eighties, it is presently being installed in fewer new homes.

Those respondents who had switched heating fuels in the past and those who reported they were likely to switch fuels in the next two years were segmented according to region, primary heating fuel, smart shopper attitudes,
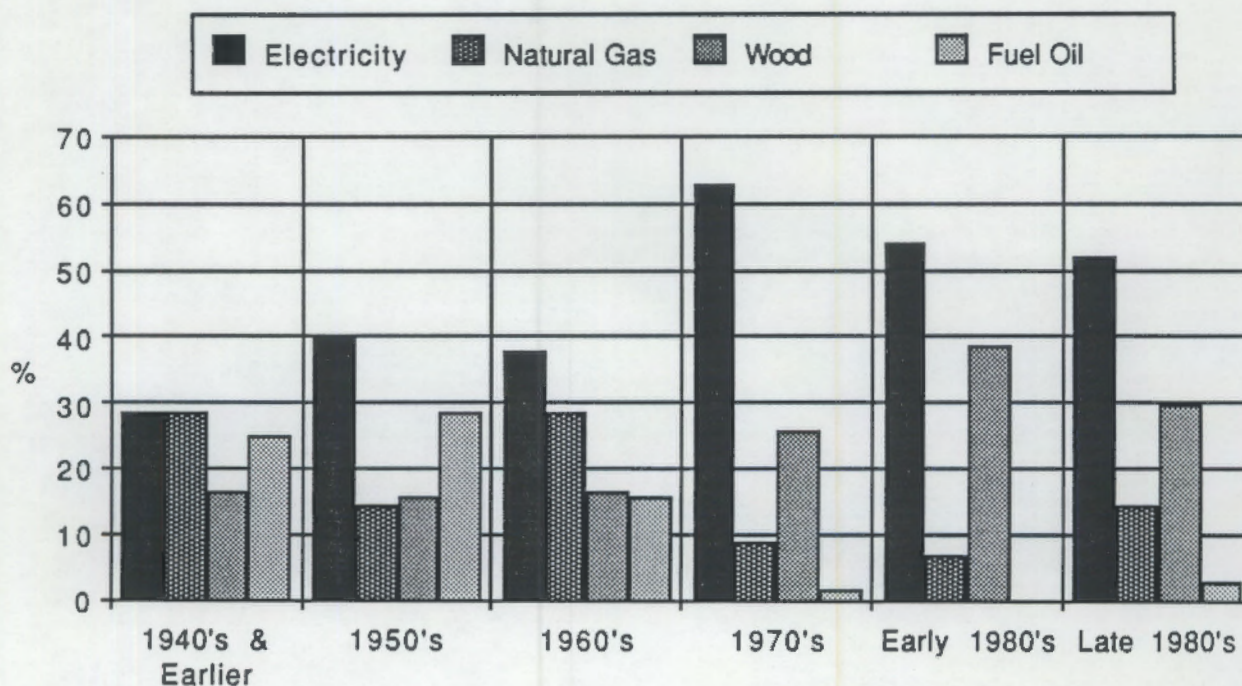
FIGURE 5.3. Respondents' Present Heating Fuel Type Compared With the Vintage of Their Home

5.5

innovator attitudes, and life-cycles. The only statistical differences found between the "switchers" and the rest of the respondents was on the innovator scale scores for those respondents who had switched heating fuels. The mean innovator scale score for fuel switchers is 10.0, compared with a mean of 8.9 for nonswitchers. Although the mean scores are not high enough to classify the switchers as innovators according to this report's definition, switchers are more innovative than nonswitchers.
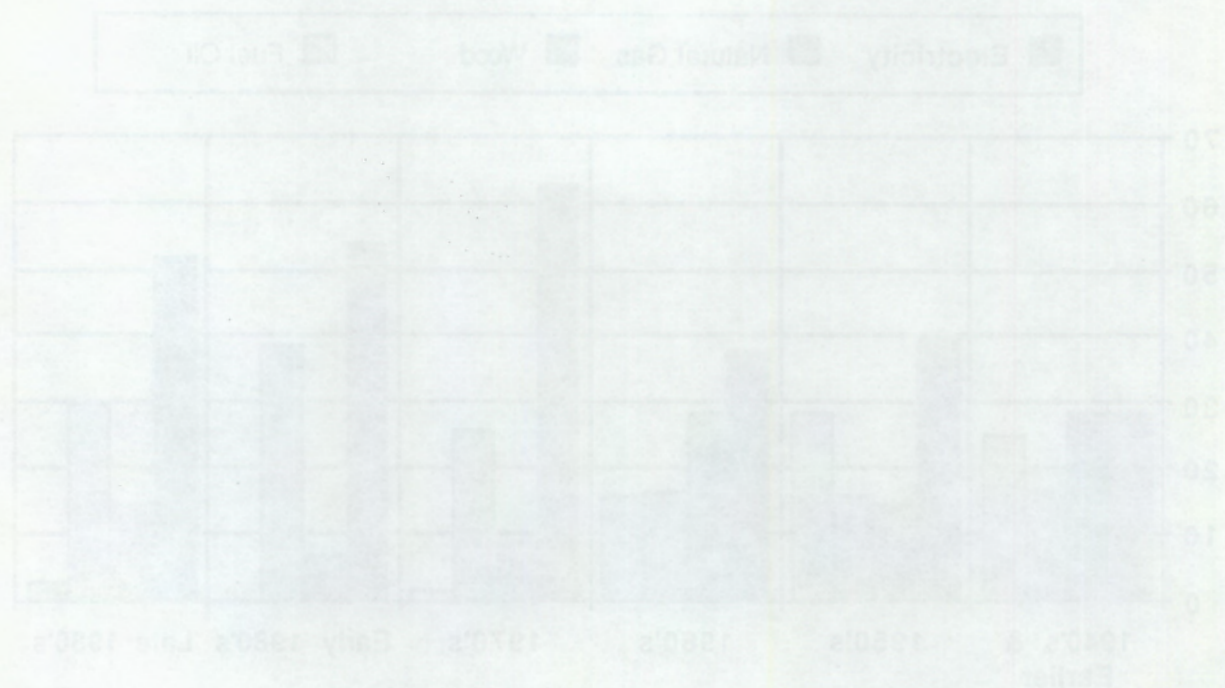
6.0 WOOD USERS

According to a 1985 survey of Pacific Northwest households, approximately 29% of the households were using wood as a primary heating fuel (Ivey et al. 1987). More recently, the Phase III tracking report indicated that wood is the primary heating fuel in 22% of Pacific Northwest households, but of those households that switched their primary heating fuels, 45% switched to wood (Schultz 1988). Although wood use appears to be on the decline, it still represents a large segment of the primary heating fuel market and if households switch their primary heating fuel, they are more likely to switch to wood.

This section provides more information about the primary wood users. It investigates wood users' perception of wood, why they use wood, and how much wood they use. The section begins with a description of the households which primarily use wood heat.

6.1 DESCRIPTION OF WOOD USER HOUSEHOLDS

Forty-nine percent of wood user households are adult couples or adult roommates with no children. The second and third largest wood user life-cycle segments are households in the middle-family stage with one or two children present (24%) and large nuclear families with at least three children (11%). Table 6.1 shows the distribution of wood user households across the life-cycle segments.

According to their scores on the innovator scale, only eight percent are classified as innovators. In this respect, the wood users do not differ from the rest of the respondents. Statistically, their innovator scale scores are not significantly different from the rest of the respondent households. The same holds true for their scores on the smart shopper scale. Approximately 64% of the wood users are classified as smart shoppers.

In Section 3.0, Figure 3.1 shows the proportion of households using a specific primary heating fuel by region. In three of the four regions, the proportion of wood users is around 17% (Western Washington; Western Oregon; Eastern Washington/Northern Idaho/Western Montana). Seven percent of the

6.1

TABLE 6.1. Wood Users by Life-cycle Segments

Life-Cycle Segment	Percent of Wood Users
Early Career Single Adults	3
Middle Age Single Adults	3
Elderly Single Adults	6
Adults - No Kids	49
Single Parents	2
Middle Family Stage	24
Late Family Stage	2
Large Nuclear Families	11

households in Eastern Oregon/Southern Idaho heat their homes primarily with wood. The largest proportion of wood users (68%) are located in Western Washington; 20% are in Western Oregon; 10% are in Eastern Washington/Northern Idaho/Western Montana; and 2% are in Eastern Oregon/Southern Idaho.

For the most part, wood users are satisfied with wood as their primary heating fuel. Fifty percent of the wood users stated their preferred fuel was wood. Electricity was the second most preferred heating fuel among wood users, with 23% preferring it. Approximately 18% of the wood users would choose natural gas as their primary heating fuel if they had their preference.

6.2 WOOD USERS' PERCEPTIONS OF HEATING FUELS

Section 4.2.2 reports on how the users of the various heating fuels perceive the different heating fuels. As noted, wood users perceived wood differently than did other respondents who did not use wood as a primary heat source. Recapping these results, wood users perceive wood to be less expensive, more dependable, safer, more comfortable, more efficient, more convenient, and more pleasing to the sense of smell than do the rest of the respondents.

A further comparison of wood users' and nonusers perceptions, reveals that wood users perceive natural gas, electricity, and fuel oil to be more expensive than non-wood users do. Interestingly, wood users perceive wood to be more polluting than do non-wood users. Also, wood users perceive electricity to be less dependable and to provide a less comfortable heat.

6.2

Table 6.2 presents only the statistically significant differences between the mean ratings of the fuel attributes of wood users and non-wood users.

6.3 REASONS FOR WOOD USE AS A PRIMARY HEATING FUEL

The reasons stated for using wood as a primary heating fuel are covered in Section 4.2.3, but are repeated in this section with some additional comments.

Wood users most often mentioned that the reason they use wood is because it is less expensive than other fuels (59%). The availability of wood and the wood users' familiarity with it was mentioned 16% of the time as reasons for using wood. Ten percent of the responses from wood users suggested that the reliability, safety, and efficiency of wood heat were reasons for its use. Only 8% of the responses mentioned that wood being already installed in the house as a reason for its use. Surprisingly, only 3% of the responses included the aesthetics of wood heat as a reason for its use.

TABLE 6.2. Mean Ratings of Fuel Attributes for Wood Users and Nonusers

Fuel Type	Attribute	Wood Users	Non-Wood Users
WOOD	Low Cost	3.48	2.50
	Dependable	3.33	2.70
	Safe	2.78	2.16
	Non-Polluting	2.65	2.98
	Comfortable Heat	3.58	2.90
	Efficient	3.08	2.56
	Convenient	2.14	1.61
	No Offensive Odor	3.13	2.85
	Positive Image	24.06	19.67
NATURAL GAS	Low Cost	2.83	3.10
ELECTRICITY	Low Cost	1.90	2.17
	Dependable	2.86	3.16
	Comfortable Heat	3.16	3.37
	Positive Image	24.20	25.02
FUEL OIL	Low Cost	1.76	2.06
	No Offensive Odor	2.23	2.54
	Positive Image	18.25	19.88

The wood users were asked under what circumstances they would use less wood and rely more on their secondary heating systems. Twenty-seven percent of the responses to this question stated that a lack of wood or an increase in wood prices would cause them to use their secondary heating system more. Nineteen percent of the responses stated that a reduction in the cost of their backup fuels would prompt them to use less wood. These responses and the most mentioned reason for using wood indicate that wood users, as a whole, are more concerned with the cost of their heating fuels than with any other attributes.

Fourteen percent of the wood users are hard core wood users and stated they could think of no circumstances that would prompt them to use less wood. Other circumstances mentioned were a change in the weather (11%), becoming to lazy to use wood (10%), becoming physically unable to use wood (10%), and making energy improvements to home and backup system (5%). Approximately 2% mentioned the air pollution factor as a reason to use less wood.

6.4 AMOUNT OF WOOD USED FOR HEATING

Accurate estimations of how much wood users use are difficult to obtain. Self report estimations rely on the respondents recollection and definition of an amount of wood. The survey was fielded in March of 1988. The survey asked the wood users how many cords of wood they expected to burn during the present heating season. A cord was defined as a stack of wood that measures 4 ft. x 4 ft. x 8 ft., 128 cubic feet, or roughly a standard-size pickup load stacked 3 ft. high. The wood users were also asked if they had burned more, less, or the same amount of wood for the 1986-87 and 1987-88 heating season.

For the 1987-88 heating season, the average amount of wood burned by a wood user household was 3.8 cords. Thirty-three percent of wood users reported using 3 cords of wood for the 1987-88 heating season. Eighty-three percent of the wood users reported using between 2 and 5 cords. Thirteen percent of the wood users used more than 5 cords during the 1987-88 heating season. The large majority of the wood users (64%) gathered 100% of the wood they used for the 1987-88 heating season and 26% purchased and had their wood delivered. The average price per cord for the wood users who paid for either

gathering it themselves or having it delivered was $46. Fifty-six percent of the wood users paid nothing for their wood.

No support was found for the hypothesis; the amount of wood burned by wood users has declined since the 1985/86 heating season. Eighty-one percent of the wood users responded that the amount of wood they burned this year was about the same as last year (1986-87 heating season). Approximately 12% burned less wood this season and 9% burned more wood. From these responses it is difficult to draw the conclusion that the amount of wood burned by wood users has decreased.

Of those wood users who burned more wood this year, half did so because of colder temperatures. The other half did so because they installed a different heating system between the two years or because they increased the amount of space that needed heating. Of those wood users who burned less wood this year, 71% did so due to milder temperatures, 14% did so due to spending less time at home, and 7% did so due to less wood being available. Seven percent of the wood users gave no reason for burning more or less wood.

7.0 APPLIANCE FUEL CHOICE

The previous sections have reported on the respondents use, preferences, and perceptions of heating fuels. Although a large portion of energy is consumed in home heating, energy is also consumed by household appliances. Three appliances, the stove/range, water heater, and clothes dryer, are discussed in this section. Each of these appliances can use fuels other than electricity. Section 7.0 covers the respondents present appliance fuels, their preferred appliance fuels, and appliance fuel switching.

7.1 PRESENT AND PREFERRED APPLIANCE FUELS

Most of the surveyed households use electricity for their appliances. For their cooking fuel, 93% of the respondents use electricity. Five percent of the respondents use natural gas for cooking. Two other cooking fuels that were mentioned are wood and propane. Households with electric water heaters make up 86% of the surveyed households. Twelve percent of the households have gas water heaters. Another 2% of the households use either fuel oil or propane for their water heating fuels. Thirteen percent of the households surveyed did not have a clothes dryer. Of those homes which have clothes dryers, 97% have an electric clothes dryer. The rest of the households have clothes dryer fueled by natural gas.

Most of the respondents who own their homes also prefer electricity for their appliances. Seventy-five percent of homeowners prefer electricity as a cooking fuel, 20% prefer natural gas, and 5% prefer other fuels such as wood or propane. For water heating fuels, 66% of homeowners prefer electricity, 27% prefer natural gas, and 5% have no preference. Solar, propane, and oil are preferred water heating fuels for 2% of the homeowners. Electricity, as a fuel for a clothes dryer, is preferred by 82% of the homeowners. Eleven percent of the homeowners prefer natural gas as a fuel for their clothes dryer. Seven percent of the homeowners prefer drying their clothes in the sun.

The most often recited reason for preferring a specific cooking fuel was that the fuel was already installed in the home and their used to it.

7.1

Thirty-two percent of those homeowners preferring electricity for cooking did so for just this reason. Only 4% of those homeowners preferring natural gas for cooking did so for this reason. Table 7.1 lists the reasons for preferring a specific cooking fuel. Homeowners who cook with natural gas seem to perceive their fuel to be more economical, easier to cook with, more convenient, and more efficient/dependable than do those homeowners who cook with electricity.

When homeowners' present and preferred appliance fuels are compared across the five segmentation schemes, the only statistically significant pattern is the homeowners' present appliance fuels compared to their primary heating fuels. This topic is discussed in the next section.

7.2 APPLIANCE FUEL SWITCHING

The potential for switching appliance fuels is discussed in terms of the potential for mixed fuel homes, in terms of the homeowners' present and preferred appliance fuels, and in terms of past appliance fuel switching among the homeowners.

In Table 7.2 homeowners' primary heating fuel is compared with their present appliance fuels. The table gives an indication of the potential for

TABLE 7.1. Homeowners' Reasons for Preferring a Cooking Fuel, by Preferred Cooking Fuel

| | Cooking Fuel | |
Reasons	Electricity	Natural Gas
Already installed/Used to it	32%	4%
Easier to cook on	1%	12%
Economical	3%	16%
Available	8%	1%
Cleaner/Pollution factor	11%	5%
Convenient/No hassle	15%	25%
Efficient/Dependable	20%	32%
Other	10%	5%

7.2

TABLE 7.2. Homeowners' Primary Heating Fuel by Appliance Fuels

Primary Heating Fuel	Cooking Fuel			Water Heating Fuel		Clothes Dryer Fuel	
	Electricity	Gas	Other	Electricity	Gas	Electricity	Gas
Electricity	98%	2%		98%	2%	100%	
Natural Gas	80%	20%		43%	57%	89%	11%
Wood	95%	2%	3%	95%	5%	97%	3%
Fuel Oil	98%	2%		100%		99%	1%

appliance fuel switching in homes where the other fuel already exists, there-fore making the switch easier to complete. A small percentage of households have a mixture of appliance and primary heating fuel types. For mixed fuel homes, electricity dominates natural gas in the percentage of homes that use electricity for their cooking and clothes drying fuels. Natural gas domi-nates electricity for water heating in mixed fuel homes. There appears to be a strong potential for switching away from electric water heaters in mixed fuel homes.

Comparing preferred appliance fuels with present appliance fuels pro-vides more insight into the potential for appliance fuel switching than reporting percentages of preference. In Tables 7.3, 7.4, and 7.5 homeowners' preferred appliance fuel is compared with their present appliance fuel for

TABLE 7.3. Present Cooking Fuel Compared with Preferred Cooking Fuel

Present Cooking Fuel	Preferred Cooking Fuel		No Preference
	Electricity	Natural Gas	
Electricity	78%	19%	3%
Natural Gas	25%	75%	0%

TABLE 7.4. Present Water Heating Fuel Compared With Preferred Water Heating Fuel

Present Water Heating Fuel	Preferred Water Heating Fuel		No Preference
	Electricity	Natural Gas	
Electricity	77%	17%	6%
Natural Gas	10%	88%	2%

TABLE 7.5. Present Clothes Dryer Fuel Compared With Preferred Clothes Dryer Fuel

Present Clothes Dryer Fuel	Preferred Clothes Dryer Fuel		
	Electricity	Natural Gas	No Preference
Electricity	86%	9%	6%
Natural Gas	18%	82%	0%

stoves, water heaters, and clothes dryers. The tables demonstrate that homeowners are generally satisfied with their present appliance fuels. All three tables present results that are statistically significant.

Although most of the homeowners are satisfied with their present appliance fuels, there appears to be some potential for switching appliance fuels. Everything else being equal, it appears that, given the opportunity, homeowners would switch to their preferred appliance fuels. In the real world, homeowner preference is just one of the influences on the fuel choice decision and the actual potential for switching appliance fuels is probably smaller than that is indicated in Tables 7.3, 7.4, and 7.5. For this reason, the past appliance fuel switching behavior of the homeowners is examined. Of the 610 homeowners surveyed, 151 (25%) had switched their water heating fuel and 231 (38%) had switched their cooking fuel. Table 7.6 presents the past fuel switching of homeowners for their cooking and water heating fuels. The percentages reported in the table are of those homeowners who reported switching their cooking or water heating fuel. The percentages do not include all homeowners.

TABLE 7.6. Homeowner Switching of Cooking and Water Heating Fuels

Present Fuel	Cooking Fuel Switched From			Water Heating Fuel Switched From		
	Electricity	Natural Gas	Other Fuels	Electricity	Natural Gas	Other Fuels
Electricity	0%	78%	13%	0%	61%	7%
Natural Gas	6%	0%	1%	29%	0%	1%
Other	1%	1%	1%	0%	0%	0%

The homeowners were asked if they had ever switched their cooking fuel or water heater fuel. Thirty-eight percent of the homeowners surveyed had switched their cooking fuels. Of this 38%, 78% switched from natural gas to electricity while 6% switched from electricity to natural gas. Those switching from natural gas to electricity mentioned building a new home as the primary reason for switching (62% of the responses). Fifteen percent of the responses mentioned that the fuel was already in the home when they moved in as a reason why they switched cooking fuels. Other reasons mentioned less frequently were that electricity was cleaner (4%), easy to operate (3%), and safer (3%). Those that switched from electricity to natural gas mentioned building a new home as the primary reason for their change of cooking fuels (22% of the responses). Another 22% mentioned that the fuel was already in the home as a reason for changing their cooking fuels. Other reasons mentioned were that natural gas is easier to operate (6%) and cheaper (11%).

Twenty-five percent of the homeowners surveyed had switched water heating fuels. Of the 25%, 61% switched from natural gas to electricity and 29% from electricity to natural gas. Those that switched from natural gas to electricity most often mentioned building a new home (64% of the responses) and the fuel already being in the home when they moved in (16%) as the reasons for their switch. Other reasons mentioned were recovery time, costs, and availability. Those that switched from electricity to natural gas most often mentioned building a new home as the reason for switching water heating fuels (33% of the responses). Twenty-four percent of the responses mentioned that the fuel was already in the home, 20% mentioned that gas cost less than electricity, and 14% of the responses mentioned that gas water heaters had a faster recovery time as a reason for switching to natural gas.

Assuming that those homeowners who said they had their residence built actually chose their cooking and water heating fuels, the potential for home-owners actively deciding to switch to their preferred fuels is dependent on a change of residences. The bottom line is that homeowners are willing to switch to their preferred fuels, but mostly for new residences. Few will retrofit old homes to get their preferred fuels.

7.5

The likelihood of homeowners switching all their appliances and their
heating system if they switched to their preferred cooking fuel was investi-
gated. A logical assumption, following from the previous discussion is that
few homeowners would change their heating and appliance fuels completely
without moving to a new residence. However, to examine this possible situa-
tion, the homeowners were asked the question in a hypothetical sense. Home-
owners who did not have their preferred cooking fuel but had their preferred
cooking fuel available were asked what the likelihood was that they would
switch their present appliances and their heating system to their preferred
cooking fuel type, assuming that they were going to switch their cooking
fuel.

The situation described above included very few homeowners out of the
entire sample. Only 35 homeowners did not have their preferred cooking fuel
and reported their preferred cooking fuel being available. Only 29 home-
owners (5% of the homeowners) in the sample had electricity with which to
cook yet preferred natural gas. Assuming these homeowners switched to natu-
ral gas for cooking, eleven reported being very likely to switch the rest of
their appliances to natural gas, eight somewhat likely, four not very likely,
five not at all likely, and one being unsure. All of the six homeowners
having natural gas and preferring electricity for cooking were unsure or
refused to answer how likely they were to switch their other appliances.
Only one homeowner reported being very likely to change heating fuels assum-
ing changing cooking fuels. The rest of the 35 were unsure or refused to
answer.

The small sample size of this specialized situation makes it difficult
to draw any conclusions. If this area needs to be investigated more thor-
oughly, a study designed strictly to investigate the topic should bring more
conclusive results.

To help describe those homeowners that have switched either their cook-
ing fuel or their water heating fuel, the data were examined for differences
between switchers and nonswitchers across the five segmentation schemes. The
only significant difference that exists is between the mean innovator scale

7.6

score for switchers and nonswitchers. Although neither group can be classified as innovators by the scale, the appliance switchers are more innovative than nonswitchers, hence their switching of fuels. To prevent or encourage the switching of appliance fuels, efforts can be targeted towards innovative homeowners.

8.0 OWNERSHIP, FAMILIARITY, PERCEPTIONS, AND PURCHASE INTENT OF HEAT PUMPS

Diverging from the fuel issue, the remaining two sections of the report are concerned with the heat pump and water heater markets. This section develops a picture of the heat pump market in terms of heat pump ownership, familiarity with heat pumps, perceptions of heat pumps, and the respondents' reported likelihood of purchasing a heat pump. It is difficult to draw any strong conclusions about the heat pump owners because there were only 27 in the sample. To provide better information concerning heat pump owners, another study designed to address just heat pump owners would be appropriate.

8.1 HEAT PUMP OWNERS

The purpose of this section is to describe heat pump owners in terms of the five segmentation schemes. Statistically, heat pump owners were found to be no different than non-owners across the five segmentation schemes. Respondents were asked what type of heating equipment they currently used in their homes; a total of 27 respondents (2% of the sample) said they had either an electric or gas heat pump.

Table 8.1 shows the characteristics of the heat pump owners. Fifty-nine percent of the heat pump owners live in Western Washington, 30% live in

TABLE 8.1. Heat Pump Owners by Segmentation Schemes (N=27)

Attitude		Life-cycle	
Smart Shoppers	56%	Middle Aged Single Adults	4%
Innovators	7%	Elderly Single Adults	11%
		Single Parents	11%
Region		Adults - No Children	56%
		Middle Family Stage	19%
Western Washington	59%	Large Nuclear Families	5%
Western Oregon	30%		
Eastern Washington/	0%	Primary Heating Fuel	
Northern Idaho/			
Western Montana		Electricity	85%
Western Oregon/	11%	Natural Gas	15%
Southern Idaho			

Western Oregon, and the rest live in Eastern Washington/Northern Idaho/ Western Montana. The largest heat pump markets are in Western Washington and Western Oregon where the climate is better suited for a heat pump and where there are more people. The largest group of homeowners purchasing heat pumps are those couples without any children, but households in various family stages make up 24% of heat pump owners. Electrical heat pumps dominate the market due to the availability and widespread use of electricity.

8.2 HOMEOWNER'S LEVEL OF FAMILIARITY WITH HEAT PUMPS

Only 4% of the homeowners in the sample own a heat pump. The homeowners who did not own one were asked whether they would classify themselves as being very, somewhat, not very, or not at all familiar with heat pump systems. Nine percent of the homeowners reported being very familiar with heat pumps and 30% reported being somewhat familiar with heat pumps.

To verify the respondents' self-reported familiarity with heat pump systems, the respondents were also asked if a heat pump also cools. As would be expected, the relationship was significant: 100% of those who were very familiar, 93% of those who were somewhat familiar, 82% of those who were not very familiar, and only 46% of those who were not at all familiar with heat pumps said they were aware of the heat pump's cooling capability. The results suggest that the self-reporting in this instance is fairly accurate. They also suggest that a heat pump's ability to cool a home should be stressed in any educational or promotional program for heat pumps.

The homeowners' level of familiarity with heat pumps varies significantly across two segmentation schemes. Table 8.2 shows these differences. Innovative homeowners and homeowners who primarily heat with electricity are more familiar with heat pumps than are noninnovators and other primary heating fuel users. One would expect innovative homeowners to know more about technologies such as the heat pump. Although heat pumps can use electricity or natural gas, electric heat pumps are the better known and most used. Users of other primary heating fuels know little about heat pumps probably

TABLE B.2. Familiarity with Heat Pumps, by Segmentation Schemes

Present	Familiarity with Heat Pump Systems			
Heating Fuel	Very	Somewhat	Not Very	Not At All
Electricity	17.3%	30.8%	23.7%	28.2%
Natural Gas	10.3%	28.4%	25.0%	36.2%
Fuel Oil	3.3%	32.2%	20.0%	44.4%
Wood	10.8%	23.8%	26.9%	38.5%
Attitude				
Innovators	23.2%	37.7%	15.9%	23.2%

because heat pumps cannot be used with their fuel type. Targeting educational and promotional heat pump programs towards fuel oil users and wood users may pay off when these homeowners are retrofitting or changing residences.

8.3 HOMEOWNERS PERCEPTIONS OF HEAT PUMPS

Only those respondents who own a heat pump or stated they were very familiar or somewhat familiar with heat pump systems were asked what they liked and disliked about heat pumps. These homeowners were also asked if the opportunity arose, would they purchase a heat pump again and the reasons why or why not. Tables 8.3 and 8.4 contain results for the questions regarding likes and dislikes about heat pumps.

TABLE 8.3. What Homeowners Like About Heat Pumps

Response	Percent
Efficient/Reliable/Even Heat/Not Dry Heat	36
Less Expensive/More Economical	21
Heats & Cools - Versatile	20
Clean quite environmentally sound	6
Convenient	5
Other	0
Don't Know/Nothing	12

TABLE 8.4. What Homeowners' Dislike About Heat Pumps

Response	Percent
Expensive/Not Economical	32
Inefficient/Unreliable/ Doesn't Work Well in Cold	15
Noisy/Ugly	9
Prone to failures/Short Lifespan	7
Complicated/Hassle to Install	1
Other	3
Don't Know/Nothing	33

Of the homeowners who own or are familiar with a heat pump, 43% percent of those who responded said they would purchase a heat pump if they were to purchase another heating system for their next home. Twenty-seven percent said "no" and 30% were "unsure". For those who said they would purchase a heat pump the four reasons most often mentioned for their decision were

Efficient/Heats Faster/Even Heat	39.6%
Economical/Saves Money	28.6%
Air Conditioning/Heating	16.5%
Clean/Safe	5.5%

For those who said they would not purchase a heat pump the four reasons most often mentioned for their decision were

Too Expensive/High Maint. Costs	32.5%
Lack Information	13.1%
Inefficient/Not Comfortable	11.5%
Inconvenient/Too much hassle	8.2%

For those who indicated they were not sure whether or not they would purchase a heat pump the four reasons most often mentioned for their response were

Lack Information	61.4%
Don't know why	19.3%
Too Expensive/High Maint. Costs	10.5%
Other	8.8%

As would be expected, the reasons given for or against the decision to pur-
chase a heat pump in the hypothetical instance tended to support the men-
tioned likes and dislikes of heat pumps. The reasons given by the group who
were unsure about purchasing a heat pump for their next home were based on a
lack of knowledge of heat pump systems. This result suggests that an educa-
tion problem may still exist even with those who claim to be very or somewhat
familiar with heat pump systems.

8.4 HOMEOWNERS' INTENT TO PURCHASE A HEAT PUMP SYSTEM

Homeowners were asked how likely they would be to seriously consider
purchasing a heat pump for their current residence within the next two years.
Four percent said they were very likely to purchase within the next two
years, 8% said they were somewhat likely, 21% said not very likely, and 65%
said they were not at all likely to purchase a heat pump within the next two
years. No significant differences were found across the five segmentation
schemes for the homeowners' reported likelihood to purchase a heat pump. No
one particular region, life-cycle, attitude set, or fuel user group reported
being more likely to purchase a heat pump than the others.

Figures 8.1 and 8.2 present the reported purchase intent of the
homeowners by region and primary heating fuel segment.
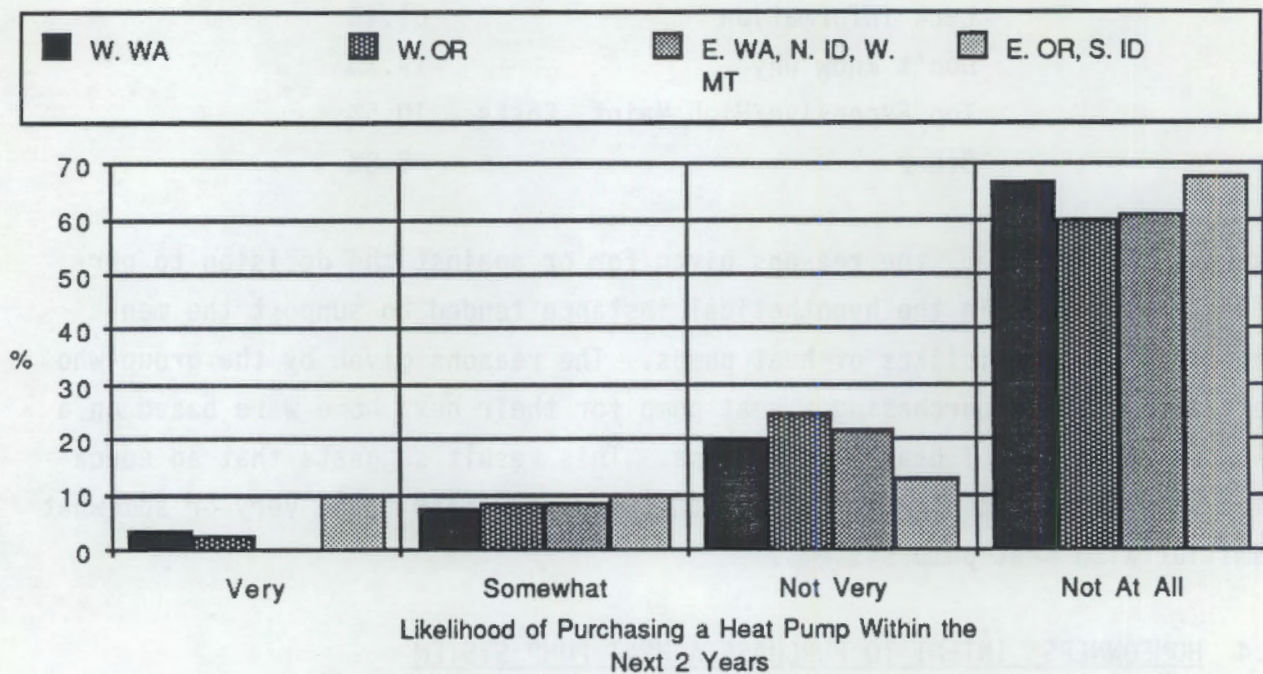
FIGURE 8.1. Intention to Purchase a Heat Pump by Region
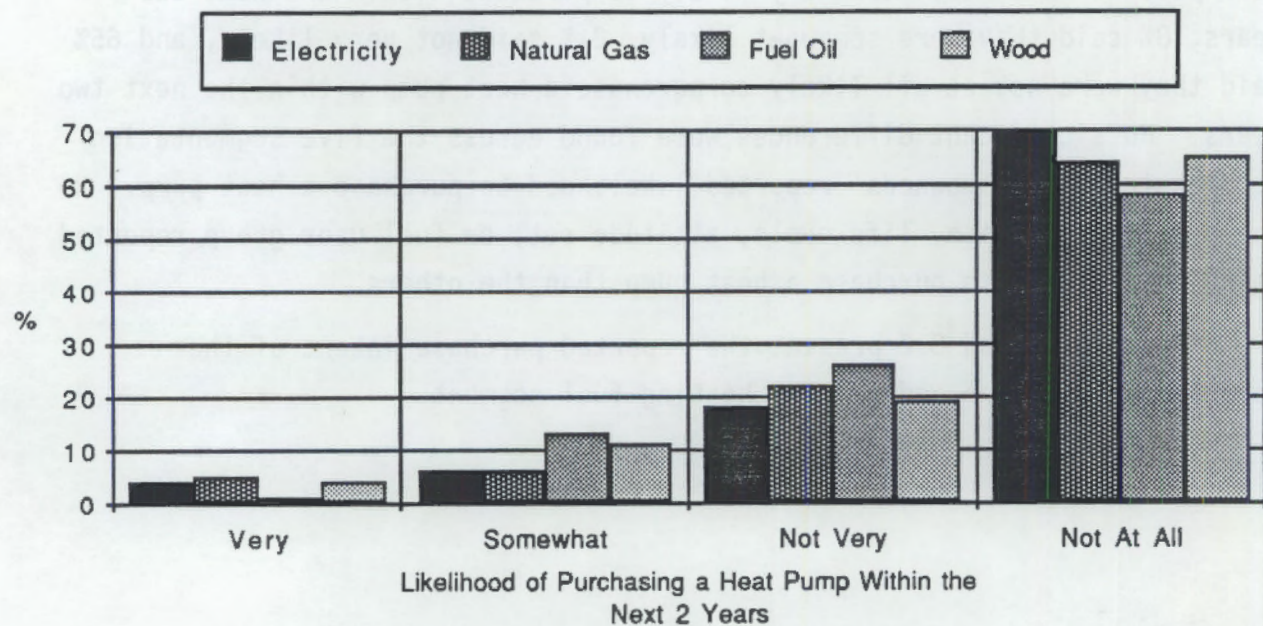
FIGURE 8.2. Intention to Purchase a Heat Pump by Fuel Type

9.0 WATER HEATER MARKETING PROGRAMS

This section is also concerned with a specific piece of residential energy use equipment--water heaters. The focus of this section is not on respondents' perceptions of the equipment, but rather on the present market for water heaters and respondents' awareness of water heater marketing programs.

9.1 THE REPLACEMENT MARKET FOR RESIDENTIAL WATER HEATERS

The objective of this section is to describe the water heater market. Since renters are not usually part of the water heater market, only home-owners were asked the age of their water heaters, whether they are presently in the market for a water heater, and if they own or rent their water heater.

Most people who are in the market for a water heater are replacing a broken water heater or are concerned with the age of their present water heater. For the purpose of segmenting the potential water heater market, twelve years is assumed to be the average replacement age of a water heater. Table 9.1 shows the age distribution of the water heaters owned by homeowners in the sample by region, present water heating fuel, and preferred water heating fuel. The information in the table indicates what percentage of homeowners might be replacing their water heaters in the near future.

TABLE 9.1. Age of Water Heater by Region, Present Water Heating Fuel, and Preferred Water Heating Fuel

| Age of Water Heater | Total Sample | Region | | | | Present Fuel | | Preferred Fuel | |
		Western Washington	Western Oregon	Western Montana/ Northern Idaho/Eastern Washington	Southern Idaho/ Eastern Oregon	Natural Gas	Electricity	Natural Gas	Electricity
0 - 4	37%	39%	28%	46%	34%	59%	34%	46%	34%
5 - 8	20%	21%	20%	15%	22%	13%	21%	22%	19%
9 - 12	17%	15%	20%	22%	19%	7%	19%	12%	18%
13 - 16	8%	8%	6%	11%	9%	2%	8%	4%	9%
17 - 20	4%	4%	7%	6%	3%	2%	5%	2%	5%
21 +	14%	14%	20%	8%	13%	16%	14%	15%	13%

Twenty-six percent of the homeowners surveyed reported their water heaters being over 12 years old. These water heaters should soon wear out and the homeowner will enter the water heater market.

A second indication of the size of the water heater replacement market is a self report measure by the respondents. Only 4% of the homeowners surveyed reported presently being in the market for a new water heater. This percentage is low compared with the 26% of homeowners that have a water heater over 12 years old. Only 3% of the surveyed homeowners leased their water heater.

9.2 WATER HEATER MARKETING PROGRAMS AND INCENTIVES

The respondents were asked which water heater marketing programs they were aware of and what types of incentives they would prefer for purchasing a specific water heater. Eighty-two percent of the homeowners stated that they were not aware of any programs promoting water heaters.

Those homeowners who reported being aware of at least one marketing program, made only general references to the programs. For example, 35% of the responses did not mention specific programs or sponsors, but said they thought the local electric or gas utility was sponsoring some type of market-ing program. The other responses mentioned specific utilities or retailers as sponsors of programs. The specific utilities or retailers mentioned were Seattle City Light, Cascade Gas Company, Puget Power, Sears, Inner Mountain, and WNG. Also, of those homeowners who had purchased a new water heater within the past year, 86% stated they had not received an incentive or dis-count through a program to purchase their water heater.

Since only 18% of the homeowners stated that they were aware of a water heater marketing program and of these, 35% did not mention a specific sponsor or program, it is concluded that the awareness of water heating marketing programs is very low.

Homeowners' most preferred incentive for purchasing a water heater was a discount on the price of the water heater. Forty percent of the homeowners stated that price discounts would most influence their decision to purchase a

9.2

specific water heater. Cash rebates would most influence the water heater
purchase decision of 21% of the homeowners and low interest loans would most
influence 12% of the homeowners' decision.

To get an idea of how receptive consumers are to electric utilities pro-
viding more than just electricity, all of the respondents were asked their
level of agreement with the attitude statements shown in Table 9.2. Con-
sumers appear to think that electric utilities should do more than just pro-
vide electricity. The respondents generally agreed that utilities should
offer low-interest loans or rebates for energy conservation investments. The
respondents expressed some reservation about utilities getting involved with
retailing energy use equipment, but there was not an overwhelming number who
were against this idea.

TABLE 9.2. Respondents' Level of Agreement With Statements Concerning the
Role of Utilities

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I would like to be able to purchase energy equipment and appliances through my electric utility.	4%	27%	22%	34%	8%
Utilities should just concern themselves with providing electricity and nothing else.	4%	26%	13%	42%	12%
My utility should offer low-interest loans or rebates for energy con- servation investments.	18%	57%	12%	8%	2%

9.3

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APPENDIX A

ANALYTICAL TECHNIQUES

ANALYTICAL TECHNIQUES

A.1 LIFE-CYCLE SEGMENTATION

The objective of the life-cycle segmentation is to group households that are most similar on age of household members, sex of household members, and size of household. A clustering technique that assigns cases to clusters based on squared Euclidean distances from cluster centers was used for the analysis. The technique produced nine life-cycle segments.

Life-cycle Segments	Percent of Sample
Early Career Single Adults	8.9%
Middle Aged Single Adults	4.8%
Elderly Single Adults	9.1%
Single Parents	4.3%
Adults with No Children	47.3%
Late Family Stage Households	2.3%
Middle Family Stage Households	18.7%
Large Nuclear Families	4.7%

A.2 ATTITUDE SEGMENTATIONS

The respondents are segmented according to their scores on two scales. A scale measures a single construct by summing the responses of number of items that measure the same construct. For example, a person's Intelligence Quotient (IQ) is estimated according to his/her responses to a set of questions that are supposed to measure the construct of intelligence. The reliability of a scale can be tested for its consistency of measuring the same construct among its scale items.

The internal reliability of a scale is the degree to which the scale items are intercorrelated. Little or no correlation among the scale items indicates that the items may not be measuring the same construct. There are

a number of tests of internal reliability. Cronbach's alpha is used to test the internal reliability of the scales constructed in this analysis. It can be interpreted as the average correlation between scale items.

Well-developed and accepted measures of personality, interest, and values generally have a reliability of 0.80 (Brown 1970 p. 78). A considerably lower reliability can be expected for the initial attempts at constructing new attitude scales.

The smart shopper segmentation scheme is based on the respondents' score on a scale constructed from attitude statements. Possible scores on the scale range from one to ten. Respondents scoring a seven or above are categorized as smart shoppers.

The respondents were asked to rate their level of agreement with the following three attitude statements:

Q.120 I usually go to several stores to find the lowest prices for the important items I buy.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Q.121 I consult Consumer Reports or similar publications before making major purchases.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Q.128 The cost of something I am buying is more important to me than its other qualities.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Responses were summed and the internal reliability among the three statements was tested using Cronbach's alpha. The internal reliability of the three-item scale was an alpha of 0.2421. An examination of the inter-item correlation matrix revealed a low correlation between Q.128 and the other two

statements. The removal of Q.128 from the scale increased the internal reliability to an alpha of 0.4177. Q.128 is measuring the cost facet of a product purchase in relation to other product qualities. Having cost be the sole determinate of a purchase decision is probably not being a "smart shopper." The respondents were segmented according to their score on the two item scale.

The innovator segmentation scheme is based on a scale constructed from attitude statements and product purchase behavior. The possible scores on the scale range from one to twenty. Respondents scoring a thirteen or above are categorized as innovators.

The innovator scale was constructed from the following questions:

Q.122 1 like to try out new products before other people do.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Q.132 Other people often ask my opinion on new products.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Q.134 About how many years ago did you purchase a VCR?

Q.135 Would you say you are likely to purchase a VCR ...

    1 Within a year?
    2 Within one to two years?
    3 Not likely to purchase a VCR at all?

Q.137 About how many years ago did you purchase a CD player?

Q.138 Would you say you are likely to purchase a CD player

    1 Within a year?
    2 Within one to two years?
    3 Not likely to purchase a CD at all?

To convert these questions into a single innovator scale, the product purchase behavior responses were recoded into a five-point scale based on the frequency distributions for the specific questions. Those respondents purchasing a VCR over five years ago were rated a five; those purchasing a VCR between three and five years ago were rated a four; those purchasing a VCR one to two years ago were rated a three; those reporting they were likely to purchase a VCR were rated a two; and those saying they would not purchase a VCR were rated a one.

Those respondents purchasing a CD player over a year ago were rated a five; those purchasing a CD player within the past year were rated a four; those reporting they were likely to purchase a CD player within the next year were rated a three; those reporting they were likely to purchase a CD player within one to two years were rated a two; and those saying they would not purchase a CD player were rated a one.

The respondents' recoded responses were summed with their responses to the two attitude statements. The internal reliability of the four-item scale was an alpha of 0.4091. No improvement in the internal reliability was obtained by deleting scale items.

A.3 ANALYSIS OF VARIANCE TECHNIQUES

Friedman's two-way analysis of variance by ranks is an appropriate test for the analysis of variance between matched samples when the data are in at least an ordinal scale. It is a nonparametric test that approximates a chi square distribution (Siegel 1956 p. 168). Friedman's analysis of variance is used to test the hypothesis that consumers have different perceptions of the various heating fuels.

The respondents rated eight heating fuel attributes for each of four separate heating fuels. The respondents were asked to rate how well the attribute described the fuel in question on a four-point scale ranging from a poor description (1) to a very good description (4). The respondents' ratings of each attribute for each fuel and the summation of ratings across all attributes for each fuel were tested for statistically significant differences.

The Kruskal-Wallis one-way analysis of variance by ranks is used to test whether k independent samples are from different populations. The Kruskal-Wallis analysis of variance technique requires at least ordinal level data and approximates a chi square distribution. "Sample values almost invariably differ somewhat, and the question is whether the differences among the samples signify genuine population differences or whether they represent merely chance variations such as are to be expected among several random samples from the same population" (Siegel 1956 p.184).

The Kruskal-Wallis one-way analysis of variance by ranks is used to test for differences between perceptions of the importance of the fuel attributes across the segmentation schemes. It is also used to test for differences in a number of variables across the segmentation schemes. In testing for differences across segmentation schemes, the Kruskal-Wallis test is used whenever ordinal data are involved (e.g., fuel switcher by "innovator"). For segmentation schemes that involve only categorical data (e.g., fuel switcher by region), a different test is used.

A.4 MEASURES OF STATISTICAL SIGNIFICANCE FOR CATEGORICAL DATA

The chi square distribution is used to test for the significance of the associations between the variables. Associations that are not significant at least at the 0.05 level are not reported.

APPENDIX B

SELECTED DEMOGRAPHICS

SELECTED DEMOGRAPHICS

Q1   HOME OWNERSHIP

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
OWN	1	610	59.6	59.6	59.6
RENT	2	413	40.4	40.4	100.0
	TOTAL	1023	100.0	100.0	

VALID CASES   1023   MISSING CASES   0

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Q3   PRESENT HEATING FUEL

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
ELECTRIC	1	543	53.1	53.1	53.1
NATURAL GAS	2	174	17.0	17.0	70.1
FUEL OIL	3	124	12.1	12.1	82.2
WOOD	4	160	15.6	15.6	97.8
LP GAS	5	7	.7	.7	98.5
KEROSENE	6	2	.2	.2	98.7
STEAM	7	7	.7	.7	99.4
OTHER	8	6	.6	.6	100.0
	TOTAL	1023	100.0	100.0	

VALID CASES   1023   MISSING CASES   0

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Q4   ELEC. HEATING SYS.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
FORCED AIR	1	171	16.7	31.5	31.5
BASEBOARD	2	249	24.3	45.9	77.3
HEAT PUMP	3	23	2.2	4.2	81.6
SPACE HEATER	4	10	1.0	1.8	83.4
WALL HEATER	5	49	4.8	9.0	92.4
OTHER	6	9	.9	1.7	94.1
CEILING HEAT	7	32	3.1	5.9	100.0
	.	480	46.9	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   543   MISSING CASES   480

Q5   NATURAL GAS HEATING SYS.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
FORCED AIR	1	149	14.6	85.6	85.6
HEAT PUMP	2	4	.4	2.3	87.9
WALL HEATER	3	12	1.2	6.9	94.8
OTHER	4	6	.6	3.4	98.3
HOT WATER RADIATORS	5	3	.3	1.7	100.0
	.	849	83.0	MISSING	
		-------	-------	-------	
	TOTAL	1023	100.0	100.0	

VALID CASES   174   MISSING CASES   849

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Q6   WOOD HEATING SYS.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
STOVE	1	127	12.4	79.4	79.4
INSERT	2	20	2.0	12.5	91.9
FIREPLACE	3	5	.5	3.1	95.0
FURNACE	4	7	.7	4.4	99.4
OTHER	5	1	.1	.6	100.0
	.	863	84.4	MISSING	
		-------	-------	-------	
	TOTAL	1023	100.0	100.0	

VALID CASES   160   MISSING CASES   863

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Q7   OIL HEATING SYS.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
FORCED AIR	1	111	10.9	89.5	89.5
WALL HEATER	2	1	.1	.8	90.3
OTHER	3	12	1.2	9.7	100.0
	.	899	87.9	MISSING	
		-------	-------	-------	
	TOTAL	1023	100.0	100.0	

VALID CASES   124   MISSING CASES   899

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Q10   PRESENCE OF BACKUP SYS.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
YES	1	396	38.7	38.7	38.7
NO	2	627	61.3	61.3	100.0
		-------	-------	-------	
	TOTAL	1023	100.0	100.0	

VALID CASES   1023   MISSING CASES   0

Q11   BACKUP HEATING FUEL

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
ELECTRIC	1	142	13.9	35.9	35.9
NATURAL GAS	2	18	1.8	4.5	40.4
FUEL OIL	3	15	1.5	3.8	44.2
WOOD	4	198	19.4	50.0	94.2
LP GAS	5	3	.3	.8	94.9
KEROSENE	6	3	.3	.8	95.7
HEAT PUMP	7	5	.5	1.3	97.0
OTHER	8	5	.5	1.3	98.2
FIREPLACE	9	7	.7	1.8	100.0
	.	627	61.3	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   396   MISSING CASES   627

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Q12   BKUP ELEC. SYS.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
FORCED AIR	1	44	4.3	31.0	31.0
BASEBOARD	2	51	5.0	35.9	66.9
SPACE HEATER	4	20	2.0	14.1	81.0
WALL HEATER	5	17	1.7	12.0	93.0
OTHER	6	6	.6	4.2	97.2
CEILING HEAT	7	4	.4	2.8	100.0
	.	881	86.1	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   142   MISSING CASES   881

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Q13   BKUP GAS SYS.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
FORCED AIR	1	15	1.5	83.3	83.3
WALL HEATER	3	1	.1	5.6	88.9
FIREPLACE	5	2	.2	11.1	100.0
	.	1005	98.2	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   18   MISSING CASES   1005

Q14   BKUP WOOD SYS.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
STOVE	1	82	8.0	41.4	41.4
INSERT	2	43	4.2	21.7	63.1
FIREPLACE	3	71	6.9	35.9	99.0
FURNACE	4	1	.1	.5	99.5
OTHER	5	1	.1	.5	100.0
	.	825	80.6	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   198   MISSING CASES   825

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Q15   BKUP OIL SYS.

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
FORCED AIR	1	13	1.3	86.7	86.7
WALL HEATER	2	1	.1	6.7	93.3
OTHER	3	1	.1	6.7	100.0
	.	1008	98.5	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   15   MISSING CASES   1008

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Q16   PREFERRED HEATING FUEL

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
ELECTRICITY	1	362	35.4	35.4	35.4
NATURAL GAS	2	364	35.6	35.6	71.0
WOOD	3	143	14.0	14.0	84.9
FUEL OIL	4	50	4.9	4.9	89.8
LP GAS	5	19	1.9	1.9	91.7
KEROSENE	6	50	4.9	4.9	96.6
HEAT PUMP	7	17	1.7	1.7	98.2
SOLAR	8	15	1.5	1.5	99.7
OTHER	9	3	.3	.3	100.0
	TOTAL	1023	100.0	100.0	

VALID CASES   1023   MISSING CASES   0

Q146   RESIDENCE TYPE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
SNGL FAM DWELL	1	684	66.9	66.9	66.9
DU TRI QUADPLEX	2	94	9.2	9.2	76.1
MULTI UNITS COMPLX	3	173	16.9	16.9	93.1
MOBILE HOME	4	66	6.5	6.5	99.5
BOAT	6	3	.3	.3	99.8
DON'T KNOW	7	2	.2	.2	100.0
	.	1	.1	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   1022   MISSING CASES   1

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Q149   MALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	6	.6	.7	.7
PRIMARY SCHOOL	2	6	.6	.7	1.5
SECONDARY SCHOOL	3	9	.9	1.1	2.6
COLLEGE AGE	4	20	2.0	2.5	5.0
EARLY CAREER	5	294	28.7	36.2	41.3
MIDDLE AGE	6	364	35.6	44.8	86.1
ELDERLY	7	113	11.0	13.9	100.0
	.	1	.1	MISSING	
	0	210	20.5	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   812   MISSING CASES   211

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Q150   2ND   MALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	38	3.7	16.1	16.1
PRIMARY SCHOOL	2	46	4.5	19.5	35.6
SECONDARY SCHOOL	3	52	5.1	22.0	57.6
COLLEGE AGE	4	22	2.2	9.3	66.9
EARLY CAREER	5	61	6.0	25.8	92.8
MIDDLE AGE	6	16	1.6	6.8	99.6
ELDERLY	7	1	.1	.4	100.0
	.	1	.1	MISSING	
	0	786	76.8	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   236   MISSING CASES   787

Q151   3RD   MALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	23	2.2	30.3	30.3
PRIMARY SCHOOL	2	24	2.3	31.6	61.8
SECONDARY SCHOOL	3	12	1.2	15.8	77.6
COLLEGE AGE	4	7	.7	9.2	86.8
EARLY CAREER	5	9	.9	11.8	98.7
MIDDLE AGE	6	1	.1	1.3	100.0
	.	1	.1	MISSING	
	0	946	92.5	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   76   MISSING CASES   947

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Q152   4TH   MALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	6	.6	31.6	31.6
PRIMARY SCHOOL	2	7	.7	36.8	68.4
SECONDARY SCHOOL	3	3	.3	15.8	84.2
COLLEGE AGE	4	1	.1	5.3	89.5
EARLY CAREER	5	2	.2	10.5	100.0
	.	1	.1	MISSING	
	0	1003	98.0	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   19   MISSING CASES   1004

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Q153   5TH   MALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	2	.2	25.0	25.0
PRIMARY SCHOOL	2	1	.1	12.5	37.5
SECONDARY SCHOOL	3	2	.2	25.0	62.5
EARLY CAREER	5	1	.1	12.5	75.0
MIDDLE AGE	6	2	.2	25.0	100.0
	.	1	.1	MISSING	
	0	1014	99.1	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   8   MISSING CASES   1015

Q154   FEMALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	2	.2	.2	.2
PRIMARY SCHOOL	2	3	.3	.3	.6
SECONDARY SCHOOL	3	2	.2	.2	.8
COLLEGE AGE	4	36	3.5	4.1	4.9
EARLY CAREER	5	288	28.2	32.8	37.7
MIDDLE AGE	6	390	38.1	44.5	82.2
ELDERLY	7	156	15.2	17.8	100.0
	.	1	.1	MISSING	
	0	145	14.2	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   877   MISSING CASES   146

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Q155   2ND   FEMALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	40	3.9	17.5	17.5
PRIMARY SCHOOL	2	51	5.0	22.4	39.9
SECONDARY SCHOOL	3	43	4.2	18.9	58.8
COLLEGE AGE	4	34	3.3	14.9	73.7
EARLY CAREER	5	42	4.1	18.4	92.1
MIDDLE AGE	6	16	1.6	7.0	99.1
ELDERLY	7	2	.2	.9	100.0
	.	1	.1	MISSING	
	0	794	77.6	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   228   MISSING CASES   795

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Q156   3RD   FEMALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	25	2.4	38.5	38.5
PRIMARY SCHOOL	2	25	2.4	38.5	76.9
SECONDARY SCHOOL	3	10	1.0	15.4	92.3
EARLY CAREER	5	5	.5	7.7	100.0
	.	1	.1	MISSING	
	0	957	93.5	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   65   MISSING CASES   958

Q157   4TH   FEMALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	8	.8	61.5	61.5
PRIMARY SCHOOL	2	4	.4	30.8	92.3
SECONDARY SCHOOL	3	1	.1	7.7	100.0
	.	1	.1	MISSING	
	0	1009	98.6	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   13   MISSING CASES   1010

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Q158   5TH   FEMALE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRE-SCHOOL	1	2	.2	50.0	50.0
PRIMARY SCHOOL	2	2	.2	50.0	100.0
	.	1	.1	MISSING	
	0	1018	99.5	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   4   MISSING CASES   1019

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Q159   RESPONDENTS OCCUPATION

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRF/MGR	1	266	26.0	26.3	26.3
CLERC/SALE/SERV	3	189	18.5	18.7	44.9
CRFT/OPERT/FRM	5	98	9.6	9.7	54.6
HOMEMAKER	9	129	12.6	12.7	67.3
RETIRED	10	204	19.9	20.1	87.5
UNEMPL.	11	26	2.5	2.6	90.0
MILITARY	12	6	.6	.6	90.6
SELF EMP	13	29	2.8	2.9	93.5
STUDENT	14	49	4.8	4.8	98.3
	15	1	.1	.1	98.4
	99	16	1.6	1.6	100.0
	.	10	1.0	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   1013   MISSING CASES   10

Q161   2ND ADULT OCCUPATION

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRF/MGR	1	210	20.5	28.5	28.5
CLERC/SALE/SERV	3	140	13.7	19.0	47.6
CRFT/OPERT/FRM	5	100	9.8	13.6	61.1
HOMEMAKER	9	65	6.4	8.8	70.0
RETIRED	10	122	11.9	16.6	86.5
UNEMPL.	11	21	2.1	2.9	89.4
MILITARY	12	8	.8	1.1	90.5
SELF EMP	13	23	2.2	3.1	93.6
STUDENT	14	27	2.6	3.7	97.3
	15	7	.7	1.0	98.2
	99	13	1.3	1.8	100.0
	.	287	28.1	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   736   MISSING CASES   287

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Q163   3RD ADULT OCCUPATION

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
PRF/MGR	1	9	.9	8.4	8.4
CLERC/SALE/SERV	3	22	2.2	20.6	29.0
CRFT/OPERT/FRM	5	14	1.4	13.1	42.1
HOMEMAKER	9	9	.9	8.4	50.5
RETIRED	10	12	1.2	11.2	61.7
UNEMPL.	11	8	.8	7.5	69.2
MILITARY	12	1	.1	.9	70.1
SELF EMP	13	2	.2	1.9	72.0
STUDENT	14	22	2.2	20.6	92.5
	15	5	.5	4.7	97.2
	99	3	.3	2.8	100.0
	.	916	89.5	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   107   MISSING CASES   916

B.9

Q167   RESPONDENTS EDUCATION

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
NO SCHL	0	4	.4	.4	.4
SOME ELEM	1	1	.1	.1	.5
COMPL. ELEM.	2	7	.7	.7	1.2
SOME H.S.	3	99	9.7	9.7	10.9
COMPL. H.S.	4	287	28.1	28.1	38.9
SOME COLLEGE	6	353	34.5	34.5	73.5
COMPL. COLL.	7	149	14.6	14.6	88.1
SOME GRAD	8	54	5.3	5.3	93.3
COMPL. GRAD	9	48	4.7	4.7	98.0
	77	20	2.0	2.0	100.0
	.	1	.1	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   1022   MISSING CASES   1

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Q168   2ND ADULT EDUCATION

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
NO SCHL	0	2	.2	.3	.3
SOME ELEM	1	2	.2	.3	.5
COMPL. ELEM.	2	8	.8	1.1	1.6
SOME H.S.	3	50	4.9	6.8	8.4
COMPL. H.S.	4	236	23.1	32.0	40.4
SOME COLLEGE	6	223	21.8	30.3	70.7
COMPL. COLL.	7	114	11.1	15.5	86.2
SOME GRAD	8	30	2.9	4.1	90.2
COMPL. GRAD	9	37	3.6	5.0	95.3
	77	19	1.9	2.6	97.8
	99	16	1.6	2.2	100.0
	.	286	28.0	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   737   MISSING CASES   286

Q169   3RD ADULT EDUCATION

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
SOME ELEM	1	2	.2	1.9	1.9
SOME H.S.	3	7	.7	6.5	8.4
COMPL. H.S.	4	48	4.7	44.9	53.3
SOME COLLEGE	6	22	2.2	20.6	73.8
COMPL. COLL.	7	7	.7	6.5	80.4
SOME GRAD	8	3	.3	2.8	83.2
COMPL. GRAD	9	2	.2	1.9	85.0
	77	10	1.0	9.3	94.4
	99	6	.6	5.6	100.0
	.	916	89.5	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   107   MISSING CASES   916

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Q171   1NCOME

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
<15K	1	229	22.4	22.4	22.4
15-29K	2	293	28.6	28.7	51.1
30-44K	3	197	19.3	19.3	70.4
45-59K	4	103	10.1	10.1	80.4
60-74K	5	44	4.3	4.3	84.7
75K+	6	22	2.2	2.2	86.9
	9	134	13.1	13.1	100.0
	.	1	.1	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   1022   MISSING CASES   1

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REGION

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1.00	706	69.0	69.4	69.4
	2.00	187	18.3	18.4	87.7
	3.00	84	8.2	8.3	96.0
	4.00	41	4.0	4.0	100.0
	.	5	.5	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   1018   MISSING CASES   5

B.11

INNOVATE

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	1.00	1	.1	.1	.1
	2.00	6	.6	.6	.7
	3.00	5	.5	.5	1.2
	4.00	19	1.9	1.9	3.0
	5.00	47	4.6	4.6	7.6
	6.00	127	12.4	12.4	20.1
	7.00	101	9.9	9.9	29.9
	8.00	178	17.4	17.4	47.4
	9.00	134	13.1	13.1	60.5
	10.00	135	13.2	13.2	73.7
	11.00	88	8.6	8.6	82.3
	12.00	68	6.6	6.7	88.9
	13.00	49	4.8	4.8	93.7
	14.00	32	3.1	3.1	96.9
	15.00	13	1.3	1.3	98.1
	16.00	14	1.4	1.4	99.5
	17.00	4	.4	.4	99.9
	18.00	1	.1	.1	100.0
	.	1	.1	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   1022   MISSING CASES   1

- -

SHOPPER

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
	2.00	13	1.3	1.3	1.3
	3.00	14	1.4	1.4	2.6
	4.00	103	10.1	10.1	12.7
	5.00	66	6.5	6.5	19.2
	6.00	237	23.2	23.2	42.5
	7.00	104	10.2	10.2	52.6
	8.00	304	29.7	29.8	82.5
	9.00	110	10.8	10.8	93.2
	10.00	69	6.7	6.8	100.0
	.	3	.3	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   1020   MISSING CASES   3

CLUSMEM

VALUE LABEL	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
EARLY CAREER SINGLE ADULTS	1.00	90	8.8	8.9	8.9
MIDDLE AGED SINGLE ADULTS	2.00	48	4.7	4.8	13.7
ELDERLY SINGLE ADULTS	3.00	92	9.0	9.1	22.8
SINGLE PARENTS	4.00	43	4.2	4.3	27.0
2-3 ADULTS NO CHILDREN	5.00	478	46.7	47.3	74.4
LATE FAMILY STAGE	7.00	23	2.2	2.3	76.6
MIDDLE FAMILY STAGE	8.00	189	18.5	18.7	95.3
LARGE NUCLEAR FAMILIES	9.00	47	4.6	4.7	100.0
	.	13	1.3	MISSING	
	TOTAL	1023	100.0	100.0	

VALID CASES   1010   MISSING CASES   13

APPENDIX C

PHASE III QUESTIONNAIRE

PHASE III QUESTIONNAIRE

Hello, this is _____ with Market Trends, a firm that conducts public opinion surveys. We're doing a survey here in the Pacific Northwest and I'd like to ask you a few questions. May I please speak with the head of the household mostly responsible or equally responsible for decisions regarding your home's heating system?

(DO NOT VOLUNTEER, BUT IF ASKED SAY ... 'This questionnaire is sponsored by Battelle Pacific Northwest Laboratories. You are not required to respond, but your cooperation would really be appreciated.')

S.1 What is the name of your electric utility?

_____

Q.1 Do you own or rent your residence?

[ ] Own
[ ] Rent/Lease to Own

Q.2 About how many years have you lived in your current residence?

_____ YEARS

Q.3 What fuel do you use most for heating your home? (ONE MENTION)

[ ] Electric
[ ] Natural Gas
[ ] Oil
[ ] Wood   (IF NOT ELECTRIC, GAS, OIL, OR
[ ] Propane/Bottled Gas   WOOD SKIP TO Q.8)
[ ] Kerosene
[ ] Other (SPECIFY):

Q.4 (IF ELECTRIC) Would that be a .....(READ)

[ ] Central forced air furnace,
[ ] Baseboard,
[ ] A heat pump,
[ ] Portable space heater,
[ ] A wall heater, or
[ ] Something else? (SPECIFY):   (SKIP TO Q.8)

Q.5 (IF NATURAL GAS) Would that be a.....(READ)

[ ] Central forced air furnace,
[ ] A gas heat pump,
[ ] A wall heater, or
[ ] Something else (SPECIFY):   (SKIP TO Q.8)

Q.6 (IF WOOD) Would that be a.....(READ)

[ ] Wood burning stove,
[ ] A fireplace insert,
[ ] A fireplace alone,
[ ] Wood furnace, or
[ ] Something else? (SPECIFY)   (SKIP TO Q.8)

Q.7 (IF FUEL OIL) Would that be a.....(READ)

[ ] Central forced air furnace,
[ ] A wall heater, or
[ ] Something else? (SPECIFY):

Q.8 For what reasons do you heat primarily with _____, rather than
     with another heating fuel? (PROBE/CLARIFY)

(IF RESPONSE IN Q.8 WAS 'IT WAS PRESENT IN THE HOUSE WHEN WE BOUGHT IT', DO
NOT ASK Q.9, ENTER A 2, AND CONTINUE)

Q.9 Did you or someone in your household decide on the primary heating system
    currently used in your home, or was it already installed when you moved
    into your home?

[ ] Resident was the decision maker
[ ] System was already installed or someone else made the decision

Q.10 Do you have a secondary, or backup heating system?

[ ] Yes
[ ] No   (IF NO, SKIP TO Q.16)

Q.11 What fuel does this system use?

[ ] Electric
[ ] Natural Gas
[ ] Oil
[ ] Wood
[ ] Propane/Bottled Gas
[ ] Kerosene
[ ] Other (SPECIFY):

C.2

Q.12   (IF ELECTRIC) Would that be a.....(READ)

[ ] Central forced air furnace,
[ ] Baseboard,
[ ] A heat pump,
[ ] Portable space heater,
[ ] A wall heater, or
[ ] Something else? (SPECIFY):   (SKIP TO Q.16)

Q.13   (IF NATURAL GAS) Would that be a.....(READ)

[ ] Central forced air furnace,
[ ] A gas heat pump,
[ ] A wall heater, or
[ ] Something else (SPECIFY):   (SKIP TO Q.16)

Q.14   (IF WOOD) Would that be a......(READ)

[ ] Wood burning stove,
[ ] A fireplace insert,
[ ] A fireplace alone,
[ ] Wood furnace, or
[ ] Something else? (SPECIFY)   (SKIP TO Q.16)

Q.15   (IF FUEL OIL) Would that be a......(READ)

[ ] Central forced air furnace,
[ ] A wall heater, or
[ ] Something else? (SPECIFY):

Q.16   Assuming you were about to move into a new home and could choose any
       fuel for heating, what would you choose? (READ LIST)

[ ] Electricity,
[ ] Natural Gas,
[ ] Wood,
[ ] Fuel Oil, or
[ ] Other (SPECIFY):
[ ] (DON'T READ) No Preference

Q.17   For what reasons would you prefer this?
                            (IF IN HOME LESS THAN 2 YRS, GO TO Q.21)
       _____   (IF RENT, GO TO Q.24)

Q.18   You mentioned your primary heating fuel is _____. Was this the
       case two years ago, or not?

[ ] Yes (IF YES, GO TO Q.21)
[ ] No

C.3

Q.19 What fuel did you rely on then?

[ ] Electric
[ ] Natural Gas
[ ] Oil
[ ] Wood
[ ] Propane/Bottled Gas
[ ] Kerosene
[ ] Other (SPECIFY):

Q.20 For what reasons did you change from _____ to _____?

_____

Q.21 Will you be considering changing your primary heating fuel in the coming two years, or not?

[ ] Yes
[ ] Maybe/Unsure
[ ] No   (IF NO, GO TO Q.24)

Q.22 To what fuel would you likely switch?

[ ] Electric
[ ] Natural Gas
[ ] Oil
[ ] Wood
[ ] Propane/Bottled Gas
[ ] Kerosene
[ ] Other (SPECIFY):

Q.23 For what reasons would you be switching from _____ to _____?

_____

Q.24 To your knowledge, is natural gas available in your neighborhood as a heating fuel? (We are referring to gas that would be piped in from a gas main, not bottled gas.)

[ ] Yes
[ ] No
[ ] Unsure

Q.25 To the best of your knowledge, what is the MOST expensive home heating fuel? (READ)

[ ] Electricity
[ ] Natural Gas
[ ] Wood
[ ] Oil
[ ] (DON'T READ) Unsure

Q.26 And what is the LEAST expensive home heating fuel? (READ)

[ ] Electricity
[ ] Natural Gas
[ ] Wood
[ ] Oil
[ ] (DON'T READ) Unsure

Q.27 Thinking five years from now, which do you think will be the most expensive for home heating ... (READ)

[ ] Electricity
[ ] Natural Gas
[ ] Wood
[ ] Oil
[ ] (DON'T READ) Unsure

Q.28 When you think of the cost of electricity, are you more likely to think of it in terms of....(READ)

[ ] Your electric bill
[ ] Rate per kilowatt hour
[ ] (DON'T READ) Don't Know/Unsure   (IF BILL OR UNSURE, GO TO Q.30)

Q.29 To your knowledge, what is the price per kilowatt hour you pay for electricity in your home? (ENTER 777 FOR DON'T KNOW)

PRICE PER KILOWATT HOUR

_____

Q.30 Is your electric bill...(READ)

[ ] Monthly
[ ] Bi-monthly
[ ] (DON'T READ) Don't Know/Unsure

Q.31-38 I'm going to read to you a list of characteristics of heating fuels. Imagine that you are in the market for a new heating system for your home, how important to you would it be that your preferred heating fuel have the characteristics mentioned. Would you say it is not at all important, not very important, somewhat important, or very important that a heating fuel.....(READ)

Q.31 be Economical?

[ ] Not at all important
[ ] Not very important
[ ] Somewhat important
[ ] Very important
[ ] DON'T KNOW

Q.32 be Efficient?

[ ] Not at all important
[ ] Not very important
[ ] Somewhat important
[ ] Very important
[ ] DON'T KNOW

Q.33 be Dependable?

[ ] Not at all important
[ ] Not very important
[ ] Somewhat important
[ ] Very important
[ ] DON'T KNOW

Q.34 be Convenient to Use?

[ ] Not at all important
[ ] Not very important
[ ] Somewhat important
[ ] Very important
[ ] DON'T KNOW

Q.35 be Safe?

[ ] Not at all important
[ ] Not very important
[ ] Somewhat important
[ ] Very important
[ ] DON'T KNOW

Q.36 be Non-polluting?

[ ] Not at all important
[ ] Not very important
[ ] Somewhat important
[ ] Very important
[ ] DON'T KNOW

Q.37 Provide comfortable heating (warm the house evenly, easy
      temperature control)?

[ ] Not at all important
[ ] Not very important
[ ] Somewhat important
[ ] Very important
[ ] DON'T KNOW

Q.38 Not have an offensive odor?

[ ] Not at all important
[ ] Not very important
[ ] Somewhat important
[ ] Very important
[ ] DON'T KNOW

Q.39-Q.70 I'm going to read a list of words and phrases which could be used
to describe different heating fuels. I would like you to tell me
how well each word or phrase describes gas, electricity, oil and
wood. On a scale from 1 to 4, 1 meaning it does not describe the
fuel at all and 4 meaning it is a very good descriptor of the
fuel, please tell me how well the word or phrase describes the
fuel.

Q.39-Q.46 How well does the word (phrase) _____ describe NATURAL GAS?

Q.39 Low-cost

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.40 Unreliable

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.41 Safe

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.42 Polluting

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.43 Comfortable

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.44 Inefficient

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.45 Hassle-free operation

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.46 Has an unpleasant odor

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.47-Q.54 How well does the word (phrase)_____describe ELECTRICITY?

Q.47 Low-cost

[ ] Poor Oescription   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.48 Unreliable

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.49 Safe

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.50 Polluting

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.51 Comfortable

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.52 Inefficient

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.53 Hassle-free operation

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.54 Has an unpleasant odor

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.55-Q.62 How well does the word (phrase) _____ describe WOOD?

Q.55 Low-cost

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.56 Unreliable

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.57 Safe

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.58 Polluting

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.59 Comfortable

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.60 Inefficient

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.61 Hassle-free operation

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description   4
[ ] DON'T KNOW/NO EXPERIENCE

Q.62 Has an unpleasant odor

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description   4
[ ] DON'T KNOW/NO EXPERIENCE

Q.63-Q.70 How well does the word (phrase)_____describe OIL?

Q.63 Low-cost

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description   4
[ ] DON'T KNOW/NO EXPERIENCE

Q.64 Unreliable

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description   4
[ ] DON'T KNOW/NO EXPERIENCE

Q.65 Safe

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description   4
[ ] DON'T KNOW/NO EXPERIENCE

Q.66 Polluting

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description   4
[ ] DON'T KNOW/NO EXPERIENCE

Q.67 Comfortable

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.68 Inefficient

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.69 Hassle-free operation

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4
[ ] DON'T KNOW/NO EXPERIENCE

Q.70 Has an unpleasant odor

[ ] Poor Description   1
[ ] 2
[ ] 3
[ ] Very Good Description 4   (IF DO NOT HEAT WITH WOOD, GO TO Q.80)
[ ] DON'T KNOW/NO EXPERIENCE   (IF RENT, GO TO Q.95)

Q.71 About how many years ago was your wood heating equipment installed?
      (ENTER 77 FOR DON'T KNOW)

      YEARS

      _____

Q.72 Under what circumstances would you use less wood for home heating and
      rely more on _____?

      _____

Q.73 About how many cords of wood do you expect to burn for your home this
      heating season? (ENTER 77 FOR DON'T KNOW/UNSURE AND 99 FOR REFUSED)

      DESCRIPTION OF A CORD OF WOOD: A cord is stacked wood in dimensions of
                                      4x4x8 feet or 128 cubic feet. Or roughly
                                      a standard size pickup load stacked 3 feet
                                      high.

      CORDS
      _____

Q.74 Would you say that is more, less or about the same amount as you burned
      in last year's heating season ('86-'87)?

      [ ] More
      [ ] Less   (IF LESS, GO TO Q.76)
      [ ] Same   (IF SAME, GO TO Q.77)

Q.75 For what reasons did you burn more wood last season?
      _____   (GO TO Q.77)

Q.76 For what reasons did you burn less wood last season?

      _____

Q.77 Of the amount this heating season, about what percent did you gather
      yourself? (ENTER 777 FOR DON'T KNOW)

      PERCENT
      _____

Q.78 About what percent did you purchase and have delivered to your home?
      (ENTER 777 FOR DON'T KNOW)

      PERCENT
      _____

Q.79 What was the price per cord that you paid for your wood?
      (ENTER 777 FOR DON'T KNOW)

      PRICE PER CORD
      _____   (GO TO Q.84)

Q.80 Do you have a wood stove, fireplace insert, or wood furnace in your
      residence?

      [ ] Yes
      [ ] No   (IF NO, GO TO Q.82)

Q.81 For what reasons do you not use your wood stove or insert for heating?
      (PROBE/CLARIFY)

      _____

Q.82 Have you ever considered purchasing a wood stove or fireplace insert
      for use in your current residence, or not?

      [ ] Yes
      [ ] No   (IF NO, GO TO Q.84)

Q.83 For what reasons did you decide not to obtain a wood stove or insert
      for heating? (PROBE/CLARIFY)

      _____

Q.84 Did you receive a rebate, discount, or other incentive to install
      heating equipment in your home?

      [ ] Yes
      [ ] No   (IF NO, GO TO Q.87)

Q.85 For what equipment was/were the incentive(s)?

      _____

Q.86 What was the amount of the incentive, rebate, or discount?

      _____

Q.87 Would you say you are....(READ)

      [ ] Very familiar,
      [ ] Somewhat familiar,
      [ ] Not very familiar, or   (IF NOT FAMILIAR, GO TO Q.93)
      [ ] Not at all familiar with heat pump systems?

Q.88 Have you heard of a water or ground coupled heat pump?

      [ ] Yes
      [ ] No
      [ ] Unsure

Q.89 What do you like about a heat pump system?

      _____

Q.90 What don't you like about a heat pump system?

      _____

Q.91 If you were to purchase another heating system for your next home, would you purchase a heat pump?

[ ] Yes
[ ] No
[ ] Unsure

Q.92 Why is that? (PROBE FOR CUSTOMER SATISFACTION)

_____

Q.93 Were you aware a heat pump provides air conditioning as well as home heating?

[ ] Yes
[ ] No
[ ] Unsure

Q.94 In the coming two years, how likely will you be to seriously consider purchasing a heat pump for your current residence? Would you say.....(READ)

[ ] Very likely,
[ ] Somewhat likely,
[ ] Not very likely, or
[ ] Not at all likely?
[ ] (DON'T READ) Don't Know

Q.95-97 I am going to read a list of appliances. Please tell me if you have the appliance and what type of fuel it uses.

Q.95 (READ IF NECESSARY: Please tell me if you have the appliance and what type of fuel it uses.)

..........Stove/range

[ ] Gas
[ ] Electric
[ ] Other (SPECIFY):
[ ] Don't Have

Q.96 (READ IF NECESSARY: Please tell me if you have the appliance and what type of fuel it uses.)

........Clothes dryer

[ ] Gas
[ ] Electric
[ ] Other (SPECIFY):
[ ] Don't Have

Q.97 (READ IF NECESSARY: Please tell me if you have the appliance and what type of fuel it uses.)

..........Water heater

[ ] Gas
[ ] Electric
[ ] Other (SPECIFY):
[ ] Don't Have   (IF RENT, GO TO Q.120)

Q.98 How old is your water heater? (IF MORE THAN ONE, MOST RECENTLY PURCHASED) (ENTER 77 FOR DON'T KNOW/UNSURE)

YEARS

_____

Q.99-104 I am going to read the same list of appliances. Assuming you were in the market for new appliances, please tell me what type of fuel you would like for each of the following and the reason for your preference.

Q.99 (READ IF NECESSARY: Assuming you were in the market for new appliances, please tell me what type of fuel you would like for....)

..........Stove/range (cooking)

[ ] Gas
[ ] Electric
[ ] Other (SPECIFY):
[ ] No Preference   (IF NO PREFERENCE, GO TO Q.101)

Q.100 What is the reason for your preference?

_____

Q.101 (READ IF NECESSARY: Assuming you were in the market for new appliances, please tell me what type of fuel you would like for...)

.........Clothes dryer

[ ] Gas
[ ] Electric
[ ] Other (SPECIFY):
[ ] No Preference   (IF NO PREFERENCE, GO TO Q.103)

Q.102 What is the reason for your preference?

_____

C.16

Q.103 (READ IF NECESSARY: Assuming you were in the market for new appliances, please tell me what type of fuel you for....)

........Water heater

[ ] Gas
[ ] Electric
[ ] Other (SPECIFY):
[ ] No Preference   (IF NO PREFERENCE, GO TO Q.105)

Q.104 What is the reason for your preference?

_____

Q.105 Do you own or rent your water heater?

[ ] Own
[ ] Rent

Q.106 You mentioned that you own a _____ water heater. Have you ever owned a water heater other than a _____ water heater?

[ ] Yes
[ ] No   (IF NO, GO TO Q.109)

Q.107 What type?

[ ] Gas
[ ] Electric
[ ] Other (SPECIFY):
[ ] No Preference

Q.108 For what reasons did you switch from _____ to _____?

_____

Q.109 You mentioned that you own a _____ stove or range. Have you ever owned a stove or range other than a _____ stove or range?

[ ] Yes
[ ] No   (IF NO, GO TO Q.112)

Q.110 What type?

[ ] Gas
[ ] Electric
[ ] Other (SPECIFY):
[ ] No Preference

Q.111   For what reasons did you switch from _____ to _____?

_____

Q.112   You've indicated your current stove is electric and that you'd be
        inclined to purchase a gas stove. Assuming you did so, how likely
        would you be to purchase other gas appliances? Please use a scale of
        1 - 4, where 4 means very likely and 1 means not at all likely to
        purchase other gas appliances.

        [ ] Not at all likely
        [ ] Not very likely
        [ ] Somewhat likely
        [ ] Very likely
        [ ] DON'T KNOW/NOT SURE

Q.113   Assuming you were to purchase a gas stove, how likely would you be to
        switch from an electric heating system to a gas heating system? Again,
        please use a scale of 1-4.

        [ ] Not at all likely
        [ ] Not very likely
        [ ] Somewhat likely
        [ ] Very likely
        [ ] DON'T KNOW/NOT SURE

Q.114   You've indicated your current stove is gas and that you would be
        inclined to purchase an electric stove. Assuming you did so, how
        likely would you be to purchase other electric appliances? Please use
        a scale of 1 to 4, where 4 means very likely and 1 means not at all
        likely to purchase other electric appliances.

        [ ] Not at all likely
        [ ] Not very likely
        [ ] Somewhat likely
        [ ] Very likely
        [ ] DON'T KNOW/NOT SURE

Q.115   Assuming you were to purchase an electric stove, how likely would you
        be to switch from a gas heating system to an electric heating system?
        Please use a scale of 1 to 4.

        [ ] Not at all likely
        [ ] Not very likely
        [ ] Somewhat likely
        [ ] Very likely
        [ ] DON'T KNOW/NOT SURE

Q.116 Are you presently in the market for a new water heater, or not?

[ ] Yes
[ ] No

Q.117 What marketing programs, if any, are you aware of that promote a specific type of water heater? (PROBE/CLARIFY)

_____

Q.118 Which of the following types of incentives or programs would MOST influence your choice of fuel (electricity, gas, solar) for water heating? (READ)

[ ] Cash rebates
[ ] Price discounts
[ ] Low interest loans
[ ] Being able to rent or lease
[ ] (DON'T READ) Other (SPECIFY):
[ ] (DON'T READ) Unsure

Q.119 You indicated you recently purchased a water heater. What incentives or discounts, if any, were you offered to purchase brands or types of water heater? (PROBE/CLARIFY) (Manufacturer or utility sponsored?)

_____

Q.120-132 I am going to read a list of statements about how some people feel about various issues. With response choices of Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree, please tell me how you feel about each of the following statements. (READ)

Q.120 I usually go to several stores to find the lowest prices for the important items I buy.

[ ] Strongly Disagree 1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.121 I consult Consumer Reports or similar publications before making major purchases.

[ ] Strongly Disagree 1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.122 I like to try out new products before other people do.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.123 Electricity prices are fair when you think about the cost of other things today.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.124 Natural gas is the energy of the future.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.125 My electric utility works hard to satisfy customers.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.126 The safety of natural gas is a concern to me.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.127   I would like to be able to purchase energy equipment and
        appliances through my electric utility.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.128   The cost of something I am buying is more important to me than its
        other qualities.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.129   Utilities should just concern themselves with providing
        electricity and nothing else.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.130   My utility should offer low interest loans or rebates for energy
        conservation investments.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.131   The heat pump system is the most efficient heating and cooling
        system of the future.

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.132 Other people often ask my opinion on new products

[ ] Strongly Disagree   1
[ ] Disagree   2
[ ] Neutral   3
[ ] Agree   4
[ ] Strongly Agree   5
[ ] NO OPINION   6

Q.133 Have you ever purchased a video cassette recorder, or VCR?

[ ] Yes
[ ] No   (IF NO, GO TO Q.135)

Q.134 About how many years ago did you do so?   (ENTER 77 FOR DON'T KNOW)

YEARS
_____   (GO TO Q.136)

Q.135 Would you say you are likely to purchase a VCR... (READ)

[ ] Within one year,
[ ] Within one to two years, or
[ ] Not likely to purchase a VCR at all?
[ ] (DON'T READ) Don't Know/Unsure

Q.136 Have you ever purchased a compact disc player?

[ ] Yes
[ ] No   (IF NO, GO TO Q.138)

Q.137 About how many years did you do so?   (ENTER 77 FOR DON'T KNOW)

YEARS
_____   (GO TO Q.139) (IF RENT, GO TO Q.146)

Q.138 Would you say you are likely to purchase a compact disk player (READ)

[ ] Within one year
[ ] Within one to two years, or
[ ] Not likely to purchase a compact disc player at all?
[ ] (DON'T READ) DON'T KNOW/UNSURE   (IF RENT, GO TO Q.146)

Q.139 In about what year was your residence built? (ENTER 777 FOR DON'T
       KNOW) (ENTER LAST TWO DIGITS OF THE YEAR)

                (IF BEFORE 1910, ENTER 555)

YEAR
_____

Q.140   (In about what year was your residence built?)

PROBE WITH CATEGORIES

(ENTER TWO DIGIT CODE BELOW)

(01) Before 1910,
(02) Between 1910 and 1929,
(03) Between 1930 and 1939,
(04) Between 1940 and 1949,
(05) 1950 and 1959,
(06) 1960 and 1969,
(07) 1970 and 1973,
(08) 1974 and 1978,
(09) 1978 and 1982,
(10) 1982 and 1984, or
(11) After 1984?
(99) (DON'T READ) STILL UNSURE

TWO DIGIT CODE:

_____

Q.141   You mentioned that you have lived in your residence about _____
        years. Does that correspond to when you purchased your home?

        [ ] Yes
        [ ] No (EXPLAIN ON NEXT SCREEN)

EXPLANATION

_____

Q.142   I now have a few final questions. What was the approximate purchase
        price of your home? (ENTER 77 FOR DON'T KNOW AND 99 FOR REFUSED)

        PURCHASE PRICE
_____

Q.143   About how many square feet was your residence when you purchased it
        (FINISHED AREAS)?

        [ ] 600 sq. ft. or less
        [ ] 601 - 1,000 sq. ft.
        [ ] 1,001 - 1,500 sq. ft.
        [ ] 1,501 - 2,300 sq. ft.
        [ ] 2,301 - 3,100 sq. ft.
        [ ] 3,101 sq. ft. or more
        [ ] UNSURE/DON'T KNOW

Q.144 How many bathrooms are in your residence?

[ ] One
[ ] One and one-half
[ ] One and three-quarters
[ ] Two
[ ] Over two
[ ] Refused

Q.145 In what type of home do you currently live? (READ LIST)

[ ] Single family detached home
[ ] 2-4 family home-duplex-town house
[ ] Building with more than 4 units, or
[ ] Mobile home-trailer?
[ ] (DON'T READ) Other (SPECIFY):
[ ] (DON'T READ) DON'T KNOW/NOT SURE
[ ] (DON'T READ) REFUSED/MISSING

Q.146 Including yourself, how many adult people live in your home?
       (21 years of age or older)

[ ] One
[ ] Two
[ ] Three
[ ] Four
[ ] Five
[ ] Six
[ ] Seven
[ ] Eight or more

Q.147 RECORD RESPONDENT'S SEX

[ ] Male
[ ] Female

Q.148 May I have the age and sex of all people (both adults and children)
       who live in your home? (START WITH THE OLDEST ADULT MALE, NEXT OLDEST
       ADULT MALE, ETC. THEN OLDEST < 18 MALE, NEXT OLDEST < 18 MALE, ETC.
       THEN DO FEMALES IN THE SAME PATTERN.) IF ONLY ONE MALE, ENTER 99 FOR
       ALL OTHERS TO CONTINUE AGE (MALE #1)

       _____

       AGE (MALE #2)

       _____

       AGE (MALE #3)

       _____

       AGE (MALE #4)

       _____

       AGE (MALE #5)

       _____

Q.149 (START WITH THE OLDEST ADULT FEMALE, NEXT OLDEST FEMALE, ETC. THEN
       OLDEST <18 FEMALE, NEXT OLDEST < 18 FEMALE, ETC.)

       IF ONLY ONE FEMALE, ENTER 99 FOR ALL OTHERS TO CONTINUE

       AGE (FEMALE #1)

       _____

       AGE (FEMALE #2)

       _____

       AGE (FEMALE #3)

       _____

       AGE (FEMALE #4)

       _____

       AGE (FEMALE #5)

       _____

Q.150   What is your occupation?
            (ENTER TWO DIGIT CODE BELOW)
(01) Professional
(02) Management
(03) Clerical
(04) Sales
(05) Craft
(06) Operative
(07) Farm
(08) Service
(09) Homemaker
(10) Retired
(11) Unemployed
(12) Military
(13) Self Employed
(14) Student
(15) Other (SPECIFY ON NEXT SCREEN)
(99) Refused

      TWO DIGIT CODE:
      _____

OTHER OCCUPATION (SPECIFY):
      _____

Q.151   What are the occupations of the other adults in the household?
         (OTHER #1) (ENTER TWO DIGIT CODE BELOW)
(01) Professional
(02) Management
(03) Clerical
(04) Sales
(05) Craft
(06) Operative
(07) Farm
(08) Service
(09) Homemaker
(10) Retired
(11) Unemployed
(12) Military
(13) Self Employed
(14) Student
(15) Other (SPECIFY ON NEXT SCREEN)
(99) Refused

      TWO DIGIT CODE:
      _____

OTHER OCCUPATION (SPECIFY):
      _____

Q.152   What are the occupations of the other adults in the household?
        (OTHER #2) (ENTER TWO DIGIT CODE BELOW)

(01) Professional
(02) Management
(03) Clerical
(04) Sales
(05) Craft
(06) Operative
(07) Farm
(08) Service
(09) Homemaker
(10) Retired
(11) Unemployed
(12) Military
(13) Self Employed
(14) Student
(15) Other (SPECIFY ON NEXT SCREEN)
(99) Refused

     TWO DIGIT CODE:
     _____

OTHER OCCUPATION (SPECIFY):
     _____

Q.153   What are the occupations of the other adults in the household?
        (OTHER #4) (ENTER TWO DIGIT CODE BELOW)

(01) Professional
(02) Management
(03) Clerical
(04) Sales
(05) Craft
(06) Operative
(07) Farm
(08) Service
(09) Homemaker
(10) Retired
(11) Unemployed
(12) Military
(13) Self Employed
(14) Student
(15) Other (SPECIFY ON NEXT SCREEN)
(99) Refused
     TWO DIGIT CODE:
     _____

OTHER OCCUPATION (SPECIFY)
     _____

C.27

Q.154 How many years of formal education did you complete?

(ENTER TWO DIGIT CODE BELOW)

(00) Never Attended School (0)
(01) Some Elementary School (1-5)
(02) Completed Elementary School (6)
(03) Some High School (7-11)
(04) Completed High School (12)
(05) Some Trade, Vocational School
(06) Some College (13-15)
(07) Completed College (16)
(08) Some graduate
(09) Completed graduate
(77) DON'T KNOW/NOT SURE

   TWO DIGIT CODE:

   _____

Q.155 How many years of formal education did the other adults in the
       household complete? (OTHER #1)

(ENTER TWO DIGIT CODE BELOW)

(00) Never Attended School (0)
(01) Some Elementary School (1-5)
(02) Completed Elementary School (6)
(03) Some High School (7-11)
(04) Completed High School (12)
(05) Some Trade, Vocational School
(06) Some College (13-15)
(07) Completed College (16)
(08) Some Graduate
(09) Completed Graduate
(77) Don't Know/Not Sure
(99) Refused/Missing

   TWO DIGIT CODE:

   _____

Q.156 How many years of formal education did the other adults in the
       household complete? (OTHER #2)

(ENTER TWO DIGIT CODE BELOW)

(00) Never Attended School (0)
(01) Some Elementary School (1-5)
(02) Completed Elementary School (6)
(03) Some High School (7-11)
(04) Completed High School (12)
(05) Some Trade, Vocational School
(06) Some College (13-15)
(07) Completed College (16)
(08) Some Graduate
(09) Completed Graduate
(77) Don't Know/Not Sure
(99) Refused/Missing

       TWO DIGIT CODE:
       _____

Q.157 How many years of formal education did the other adults in the
       household complete? (OTHER #3)

(ENTER TWO DIGIT CODE BELOW)

(00) Never Attended School (0)
(01) Some Elementary School (1-5)
(02) Completed Elementary School (6)
(03) Some High School (7-11)
(04) Completed High School (12)
(05) Some Trade, Vocational School
(06) Some College (13-15)
(07) Completed College (16)
(08) Some Graduate
(09) Completed Graduate
(77) Don't Know/Not Sure
(99) Refused/Missing

       TWO DIGIT CODE
       _____

Q.158 Is your total combined household income...(READ)

       [ ] Less than $15,000,
       [ ] $15,000 to $29,000,
       [ ] $30,000 to $44,999,
       [ ] $45,000 to $59,999,
       [ ] $60,000 to $74,999, or
       [ ] More than $75,000?
       [ ] (DON'T READ) REFUSED

C.29

Q.159 Finally, for bookkeeping reasons, what is your zip code?

ZIP CODE

———

So I may tell my supervisor I spoke with you, may I please have your first name only?

Name

———————————————

And just to verify, did I dial....(READ NUMBER). Thank you for your time and information. Have a nice day/evening.

AREA CODE

———————

PHONE NUMBER

———————

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