

**Assessing Marketplace Methodologies
for Understanding Consumer Values
Influencing Product Selection in Building
and Other EERE Technologies**

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ASSESSING MARKETPLACE METHODOLOGIES FOR UNDERSTANDING CONSUMER VALUES INFLUENCING PRODUCT SELECTION IN BUILDING AND OTHER EERE TECHNOLOGIES

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EXECUTIVE SUMMARY

DOE's Office of Energy Efficiency and Renewable Energy (EERE) is interested in increasing the marketplace acceptance of energy-efficient technologies, both by taking steps to transform markets to be more accepting of these technologies and by incorporating information on consumer preferences into the design and development of technologies. The focus of this study is on alternatives for understanding the relationship between consumer values and the attributes of EERE energy-efficient residential products, including construction options in building and weatherization, appliances, lighting, and on-site power generation. Our results are based largely on an assessment of publicly available market research literature covering market segmentation for product selection; survey methodologies, including types of instruments, approaches to surveying, and cost/benefit analysis; and specific case studies that feature data analysis.

Market research is the principal methodology for understanding consumer values in the selection of energy-efficient technologies. By designing market research carefully and applying its results appropriately, EERE can increase market adoption of these technologies. Key conclusions from this study include:

- EERE should undertake or sponsor more market research that can be published in the open literature or made available to the public, as well as help update much of the peer-reviewed literature on market segmentation for energy-efficient products. Most market research studies are proprietary and unavailable to the public. Public information on energy-using technologies is available though peer-reviewed open literature and reports either produced or offered through consumer advocacy groups or other professional organizations. Many of these reports are not free to the public but cost thousands of dollars to obtain. Market segmentation analysis for energy-efficient products is quite dated. It precedes most modern events affecting consumer behavior, such as the advent of the internet, the widespread availability of consumer credit, and the globalization of the world economy. Though some of the information in these studies is still relevant, it would be valuable to assess possible changes in consumer values.
- Market research supported by EERE should be carefully targeted at market transformation and technology development areas where gaps remain between what consumers value and actual product availability. Currently available research is customized to the needs of specific organizational clients and does not always address the actual needs of consumers. Effective targeting includes stating specific value

targets, segmenting populations to match targets, developing and testing survey instruments to pretest validity, choosing a method of data collection that balances costs with information validity, and choosing a method of data analysis that exploits the information content of the data base produced by the survey.

- The literature offers many different types of values for targeting. A common value is consumer willingness-to-pay. Others include levels of information, attitudes, sensitivity to uncertainty, and ethical/moral precepts. No one survey instrument can measure all values equally well. Some research techniques seek to identify emerging trends. Some seek to draw inferences about larger populations, and still others target specific subpopulations. These factors all need to be considered in effective survey design.
- Market segmentation of consumers is very important. Timing to enter a market is particularly relevant for residential technologies and can be influenced by the technology life cycle or the consumer life cycle. Technology life-cycle analysis centers on the point of the market penetration process at which specific groups are likely to “buy-in.” For example, some groups are early adopters, while others wait until products are well established. Consumer life cycles deal with demographic events, such as marriage, starting a family, the empty nest, and retirement. Other cycles include home remodeling and purchase of a used home.
- Because EERE will always be resource constrained, it must take care to trade-off the various attributes of survey research that drive up costs with the implications of the choice for survey result validity. No single survey instrument dominates in all categories. A cost-effective market research campaign will balance quantitative and qualitative research with collection methods—in person, by phone, by mail, and using other means. Electronic approaches to conducting consumer value surveying are an interesting emerging technology, though their use is not reflected widely in the current literature. Online survey approaches will gain validity as more consumers gain private access to the internet.
- A distinction should be drawn between single-period “slice of time analyses” and dynamic “across time” studies. Dynamic studies, for example, are of particular interest when tracking market changes due to market transformation activities or other events. EERE should consider the establishment of dedicated consumer panels to track changes that occur over time.

EERE’s pursuit of these recommendations will greatly further market transformation in consumer selection and use of energy-efficient technologies, leading to greater energy savings across the national economy.

INTRODUCTION

DOE's Office of Energy Efficiency and Renewable Energy (EERE) is responsible for developing energy-efficient and renewable energy technologies for the future, promoting the purchase and efficient use of these technologies, and transforming markets to be more accepting of energy-efficient technologies, leading to energy savings. Based on well-documented studies, EERE recognizes that energy-efficient performance is only one of many attributes, and often not the primary one, for consumers in the selection of technology products. Accordingly, in carrying out its responsibilities to increase market penetration of energy-efficient technologies, EERE requires an understanding about the relationship between consumers' values in the selection of technologies and linkages that inform consumers about advantages offered by new technologies and inform suppliers about potential product changes. The first step in increasing market acceptance of energy-efficient technologies is to understand the consumer values, as well as product attributes, that drive the selection of these products. Although many survey methods are available to EERE in understanding the relationship between consumer values and preferred choice of product attributes, a logical first step is to examine the alternatives and assess their strengths and weaknesses.

This study presents an overview of the current literature and market research practices on consumer values and product attributes influencing the selection of EERE technologies and on the survey methodologies used to understand these. Such an overview will establish baseline data about the marketplace environment. Those EERE technologies pertinent to residential, rather than commercial or industrial, use were reviewed. The most likely areas providing information about direct consumer interaction with EERE-developed products include residential building and weatherization, high-energy-consuming home appliances, lighting, and electric power generation (fuel sources and advanced technologies). Although transportation vehicles constitute another important area, they were not included in this study.

This study was limited to reviewing survey approaches for consumer values in the following specific products:

- Building and weatherization
 - Insulation
 - Weather sealant/caulk
 - Windows
- High-energy-consuming appliances
 - Heat pump
 - Air conditioner
 - Water heater
 - Dishwasher
 - Washer and dryer
 - Refrigerator and freezer
 - Oven

- Lighting
 - Solar panels
 - Indoor and outdoor residential lighting
- Electric power generation
 - Green power selection

This study is the first of three market transformation analyses as follows:

- understanding consumer values and the survey methods used to assess them,
- describing the translation of these values into available products and services through the supply chain; and
- determining the role of government in positively influencing market transformation for these products.

These analyses can help EERE to better define its relationship with the private sector in developing products and services to support greater energy efficiency, as well as more effectively track results in influencing the marketplace. This study is primarily a survey of current methods used to understand consumer values for selecting the technologies listed above and reflects a multidisciplinary approach to surveying the literature. In addition to clarifying a definition of consumer values, other topics include market segmentation for product selection; survey methodologies, including types of instruments, approaches to surveying, and cost/benefit analysis; and specific case studies that feature data analysis.

UNDERSTANDING CONSUMER VALUES IN THE MARKETPLACE

Defining Consumer Values

What consumers consider important in the selection of energy-consumptive products is referred to as “consumer value”. Other terms like “attitudes,” “satisfaction,” and “preferences” are used to describe this concept in the psychology and economic literature. The focus on understanding consumer values is integral to market transformation in increasing the selection and use of energy-efficient technologies. Identifying what is important to consumers can be translated back through the supply chain into the design and production of products that meet the desires and needs of the purchasing public. For this study, we define the supply chain as the entire set of activities responsible for products reaching the marketplace, starting with research and design, through production, to wholesale and retail trade distribution.

The literature identifies two frameworks for understanding consumer values.

- **Dominant Satisfaction Themes**—This construct by DeYounge and Kaplan (1986) includes dominant and secondary satisfaction themes in energy interactions in daily life. These are described as follows:

“Dominant Satisfaction Themes”

1. Conservation ethic
2. Money
3. Comfort and convenience

“Secondary Satisfaction Themes”

1. Modern lifestyle
 - Independence
 - Sensual quality of experiences
 - Image
2. Social concern
 - Helping others
 - Social change
 - Community involvement and social contact
3. Challenge

- **Eight Dimensions of Energy Innovation Adoption**—This framework by Darley and Beniger (1981) attempts to identify reasons individuals do or do not adopt technologies:

1. **Capital Cost of the Innovation**—This cost is associated with purchase and installation of new technology, such as ripping out the walls to insulate vs setting back the thermostat. It also includes the inconvenience of a major retrofit.
2. **Perceived Savings**—This refers to the perceived payback period and whether the consumer will gain enough savings through buying the innovation.
3. **Certainty of Savings**—Some items like programmable thermostats, refrigerators, and domestic water heaters provide highly predictable savings. Others (e.g., wall insulation done by home contractors) are only as good as the quality of work done. Home contractors do not have a reputation for being trustworthy.
4. **Value, Attitude, and Style Compatibility**—The use of the innovation must be compatible with the values of the purchaser. Some people who have ecological values may want to install solar equipment because it does not deplete nonrenewable resources or it signals commitment to a particular way of life. Those who lead lives of voluntary simplicity may adopt innovations early on. Others who value the comfort or “health” of being cool in the summer may accept more wall insulation that will keep their house cool in the midday, but they will not accept the discomfort of not attempting maximal cooling during the midafternoon heat.

5. Innovation and Life-Pattern Interactions—Some innovation adoptions require no behavioral changes to maximize their effectiveness. Others require daily changes in actions, like drawing thermal curtains.
6. Trialability of the Innovation—For example, a setback thermostat may offer a 10-day free trial and money back if you are not satisfied, but installing wall insulation has no trial period and no guarantee.
7. Dissatisfaction with the Existing Situation—People are more ready to change if they are dissatisfied. For example, parents are anxious about the threat of home fire. Smoke alarms are quickly adopted.
8. Effort and Skill Involved in Installing the Innovation—The presence of someone in the house who can make repairs was one of the best predictors of the adoption of a set of energy-conserving modifications in the home.

In an effort to blend these two multidisciplinary approaches to help define consumer behavior, as well as add other relevant factors, we offer the following list of consumer values:

- Conservation and ecological ethic
- Social concern and social responsibility ethic
- Affordability (including capital cost and perceived savings)
- Financial security and risk (including certainty of savings and trialability)
- Comfort
- Convenience (including ease of operation, self-tending, and availability of service and maintenance)
- Reliability
- Independence and self-reliance
- Sensual quality of experiences (e.g., quiet)
- Status, image, and aesthetics
- Timing of entry into the market

With the identification of these 11 consumer values, we need to emphasize that no one single survey method or process can capture each concept equally. Therefore, EERE must give careful consideration to determine which values will be assessed when designing and implementing market surveys. The last consumer value, “timing of entry into the market,” addresses when an individual actually chooses to select a technology. Timing can be based on demographic events, such as marriage, starting a family, the empty nest, and retirement. Other cycles can include home remodeling and purchase of a new home; for example, new homeowners are likely to weatherize, and more mature homeowners are likely to insulate. Timing is also affected by the life cycle of the technology. Some individuals are prone to be early adopters, while others wait until the second generation of products to purchase, when technology is more reliable and less costly. Survey development and design requires incorporating an understanding of timing of entry based on life-cycle issues.

The Impact of Market Segmentation

Market segmentation related to selection of energy-efficient technologies

Market segmentation can help understand consumer values and develop the most effective approaches to market transformation with various groups and products. In energy-efficient technology selection, identification of receptive populations based on their timing to enter the market or willingness to adopt new technologies is a key focus for market segmentation. The following provides a brief overview of findings in this area:

Studies based on consumer life-cycle issues include:

- **Segmentation by homeowner/renter**

- “Adoption of energy-conserving devices is best predicted by four positional factors: home ownership, socioeconomic status, ownership of home technologies, and the presence of a household member able to perform household repairs” (Costanzo, Archer, Aronson, and Pettigrew, 1986).

This suggests that advertising energy-efficient technology to people who own their own homes and have the income and interest to invest in technology would be effective.

- Renters tend to be poorer and more transient than homeowners and cannot or will not invest in energy-efficient technologies. Even high-income, long-term renters are unlikely to be motivated to undertake improvements on a dwelling owned by someone else (Costanzo, Archer, Aronson, and Pettigrew, 1986). Subsequently, approaches could include the following: (1) For renters, use a “take it with you” energy-efficiency technology campaign that recommends adoption of conservation technologies (e.g., low-flow showerheads and draft stoppers for doors) that the tenant can take with them when they move. (2) Target landlords rather than tenants to purchase energy conservation technologies. (3) Subsidize programs for installation of energy conservation technology for renters that bear high energy costs of living in nonweatherized and noninsulated housing stock.

- **Weatherization**

- An ethnographic study (Wilk and Wilhite, 1987) on weatherization shows that new homeowners weatherize, while others do not. “If weather stripping is not done during the initial two years after the home is occupied, it is unlikely that it will be done at a later date.” It appears that there is about a two-year time frame in which new homeowners make improvements on their houses. People who purchase “fixer-upper homes” are especially likely to weatherize. “If it [weatherization] is done later it is almost always done in conjunction with a major remodeling project, rather than by itself.” Weatherization is usually done by younger couples rather

than older couples. Based on this information, the target audience for weatherization messages is younger new homeowners, especially those who purchased a “fixer-upper” home, not the general public.

- **Insulation**

- “Insulation is rarely installed immediately after a house is occupied, but rather comes after the household has settled in, often when the total income is higher, but the disposable income is lower.” (Wilk and Wilhite, 1987). As a result it would be more effective to market insulation to more mature households.

Studies based on technology life-cycle issues include:

- **Segmentation by economic status (income level)**

- Results of a large survey show that the wealthy buy energy conservation technology and the poor make lifestyle cutbacks (Dillman, Rosa, and Dillman, 1983). As a result it would be effective to (1) segment the market by income level when advertising energy-efficiency technology. Perhaps, advertise expensive conservation technologies (e.g., solar) only to upper-income households. (2) Subsidized weatherization programs may be necessary to improve the energy efficiency of current housing stock, especially homes owned by lower-income people.

- **Segmentation by ethnicity**

- “[T]he belief in the relationship between thermal comfort at home and family health was found to be stronger among Blacks and Hispanics compared to Whites.” (Samuelson and Biek, 1991, p. 564). This indicates that the message of thermal comfort and family health should be included in marketing and educational campaigns for Blacks and Hispanics.

- **Segmentation by presence of “handyman”**

- The presence of someone in the house who can make repairs was one of the best predictors of the adoption of a set of energy-conserving modifications in the home (Darley and Beniger, 1981). This indicates that advertising of self-installation of energy-efficiency devices should be targeted at do-it-yourselfers and let them be early adopters to spread the word through their social groups.

Most publicly available studies on market segmentation pertaining to energy conservation are more than 10 years old. EERE needs to consider updating these studies to gain a more current understanding of consumer values associated with consumer and technology life cycles.

Commitment to selection and use of technologies

Although this study is focused on the identification of what consumers value in selecting energy-efficient technologies, selection alone will not determine how people actually use and adopt technologies. Gaining knowledge of how consumer values change with use of products is also a subject of ongoing research using various survey methodologies. From discussions with market researchers who are engaged in market adoption of energy-efficient technologies, surveys are conducted over time to determine changes in values.

Though not related to the technologies of focus in this study, one anecdotal story describing factors in the use and adoption of electronic devices is highlighted by Ellen Goodman, who indicated in her newspaper column that household technology was so complicated these days that middle-aged and elderly family members have to consult 12-year-old children to operate new devices. She described how her mother worried about buying a new TV and whether she would be able to use the two or three remote control devices that go with the TV and the VCR or DVD players. Goodman makes an excellent point that, to increase market adoption, new technologies should not be complicated to operate.

Assessment of Marketplace Methodologies for Acquiring Consumer Value Information

Identification of current methodologies

In identifying survey methodologies used to acquire consumer value information, both quantitative and qualitative approaches are used in clarifying consumer behavior and are considered complementary in obtaining relevant information (Wade, 2002). Quantitative methods result in gathering direct, numerical data; whereas qualitative methods filter data through an observer. Although quantitative methods still dominate in the mix of approaches, because consistent baseline data are desirable, the use of qualitative methods is increasing. Greater use of qualitative methods derives from an increased desire to understand anomalies in consumer behavior and underlining motivations (James, 2000).

Market research is used to study consumer behavior and determine attributes that influence buying decisions. It results in the gathering of primary data that can be targeted to EERE's interest in producing goods, services, and policies that match the public's needs. Market research is cost-effective because talking to a relatively small number of people can provide relevant information about a larger population. To be successful, the right questions need to be asked of a representative subgroup of the total population of interest. From the results, additional research can be conducted to enhance attributes of a product, make the product more cost-effective, or more effectively highlight important product attributes in an organization's advertising campaign.

Market research is a recognized tool for understanding consumer behavior, and it is an important source of understanding the marketplace for EERE. The total expenditure for industry, commerce, and government market research worldwide in the year 2000 was \$15.26 billion, which represents an increase of 4% over the previous year. In the year 2000, market research in the United States accounted for 39% of the total world market for these studies, while the European Union accounted for 36% of the world market (Samuels, 2001).

Several quantitative and qualitative methodologies are used to evaluate consumer behavior through market research. Table 1 provides a recent summary of research methods, both ad hoc (one-time) and continuous (conducted over time), reflecting the mix between approaches.

Table 1. Summary of research methodologies: expenditure by research method

Worldwide split	60% Ad hoc	40% Continuous
Worldwide split within ad hoc	80% Quantitative	20% Qualitative
Worldwide split within quantitative	Telephone:	Face-to-face:
	North America	Most of Europe
	Scandinavia	Central and South America
	Australasia	Asia
Worldwide split within qualitative	75% Groups	25% One-on-one

Source: Samuels, J. 2001. "ESOMAR Annual Study of the Market Research Industry 2000."

Quantitative methodologies and approaches

Quantitative survey approaches provide numerical data. The essence is that every respondent is asked the same series of questions. Questions can take the several forms of direct ratings or trade-off analysis (Lehman and Winer, 1997, p. 113) as briefly described below:

- Direct ratings on a scale—rates by degree such as strongly agree, agree, or strongly disagree
- Constant sum ratings—rates preferences for items by dividing an allotted number of points among choices
- Graded pair comparisons—rates preferences by comparing pairs of items, usually by price
- Conjoint analysis—rates items by attributes
- Hybrid analysis—combines rating approaches

The use of quantitative approaches varies based on the type of product being assessed as well as the data gathering method. For example, conjoint analysis would be appropriate with residential air conditioners and fluorescent tube lights because there are relatively few differentiating features; however, heating, ventilating, and air conditioning (HVAC) or lighting systems would

have too many variables to use conjoint analysis effectively (Torok and Davalli, 2000, p. 8.398). Within these direct rating approaches, researchers advocate a complete range of applications, varying with project scope and goals (Gibson, 2001; Green and Krieger, 2002).

Once a survey instrument is developed incorporating various rating methods, implementation requires a trade-off in balancing cost and consumer bias (which includes self-selection, computer literacy, lack of control, and lack of confidentiality). Various data gathering methods include:

- **Mail and self-administered questionnaires** are the least costly to administer, though it can take a relatively long time to gather data by mail. Self-completion questionnaires (such as those handed out at exhibitions) must be kept simple, and the researcher has little control over who or how many people return the form.
- **Telephone surveys** are less expensive per interview than conducting face-to-face interviews and can provide data more quickly; they are suited more for smaller scale, fast turnaround projects.
- **Face-to-face interviews** are a traditional approach: rapport established can help to ensure that detailed and thorough information is obtained.
- **Omnibus surveying** is an approach that adds a few questions to a larger survey. It is useful for those with small budgets and relatively few questions to ask, thus obtaining data at a lower cost than for a stand-alone project.
- **Online surveying** is an approach that uses electronic interaction in interviewing. Costs vary for this approach.

In practice, organizations conducting consumer values research for energy applications indicated preference for short turnaround, high-control approaches to gathering quantitative data. Use of telephone surveying is prevalent. In addition, use of conjoint analysis for phone surveys is somewhat limited and is not a preferred approach for this type of surveying method because it is difficult to compare attributes over the phone.

Qualitative methodologies and approaches

The qualitative approach to surveying provides understanding of how or why things are as they are as filtered through an observer, rather than numerical data. It can be used on its own or to help in the development of a questionnaire for a quantitative study. There is no fixed set of questions and therefore no assumptions about what is, or is not, important. Instead a list of topics, problems, or possibilities is explored. Several approaches are used in gathering qualitative information (Woodruff and Gardial, 1996):

- **Observation** involves watching how consumers behave and also giving feedback as a participant (e.g., Proctor and Gamble used video cameras in homes to see how consumers used dishwashing liquid).

- **Focus group** involves a small group of customers, usually 5 to 12, gathered to discuss their product experiences with a trained facilitator.
- **In-depth unstructured interview** is a one-on-one interview conducted over 1 to 2 h with a trained interviewer.
- **Online qualitative research** is an electronic interactive approach to conducting focus groups or in-depth interviews.

In practice, organizations conducting consumer values research for energy applications indicated preference for using focus groups to test ideas before conducting quantitative surveys, to help understand the issues and pertinent vocabulary for consumers. In addition, focus groups are often used after a quantitative survey to clear up confusing issues about data gathered.

Impact of electronic approaches to assessing consumer values

With increased access to the internet and web-based communication with consumers, more online surveying is taking place. Advantages of online marketing research include:

- large numbers of respondents that can be surveyed at one time
- international boundaries are no longer an obstacle
- an inexpensive way to conduct large surveys
- most large agencies have panels that provide an easily accessible, reliable, respondent base that can respond promptly to online questionnaires
- very rapid turnaround
- capturing emerging trends for new product ideas

Disadvantages of online research include:

- loss of control over population
- lack of confidentiality

Approaches to electronic surveying, from least to most expensive to conduct, include

- **Email** (online paper and pencil survey)
- **Bulletin boards** (moderately easy, fast, and inexpensive)
- **Web HTML** (most common form of online surveying—80% of all survey data collected online)
- **Web fixed-form interactive** (limit the range of options in which the survey can be displayed)
- **Web customized interactive** (most powerful and flexible of all online surveying—preparation time and cost can be double that of fixed form)

- **Downloadable surveys** (more costly and time-intensive than other forms of online research—can also require a greater level of respondent sophistication to install software and correctly handle the data upload process)
- **Web-moderated interviewing: chat interviewing and other discussion formats** (session moderation fees higher than traditional focus groups due to the increased technical skill requirement. Usually offset by the cost savings of conducting online)

The use of online bulletin boards as an alternative to traditional focus groups is increasing. This approach results in a greater amount of data and in-depth feedback than can be extracted from a focus group. It works especially well where the topic is sensitive, complicated, or controversial (James, 2002). It is more expensive (\$12K for an online focus session vs \$5 to \$6K for a traditional focus group session) and requires a different time frame (30 to 60 min per session over 5 days for online vs one 90-min session for traditional groups).

In practice, organizations conducting consumer values research for energy applications are not indicating use of online approaches, because much of the consumer base being studied does not have private and/or home access to the internet.

Cost and time to conduct surveys

The cost of quantitative and qualitative surveys varies from hundreds of dollars to the millions of dollars allocated for the U.S. Census. The goals and budget for the survey will determine many of the survey variables. When contacting a firm to plan a survey, a standard price list for methodologies is not provided. The firm will customize a price list of recommended methodologies based on the survey goals (i.e., quick turnaround needed or detailed information needed from specialized audience). When developing the survey budget, it is important to incorporate direct (computer programmer fees) and indirect costs (mailing supplies) of conducting the survey (Fink, 1995).

The time to conduct a survey varies significantly based on factors such as audience size, prescreening required, methodology used, number and type of survey questions, and how much data analysis is required. A leading international market research firm provided “ballpark” estimates of 1 to 2 weeks to conduct a telephone survey, 2 weeks for a face-to-face interview, and 3 to 4 weeks for a mail survey. Focus groups usually take about 90 min per group session, with a minimum of three and maximum of about eight groups required to explore a topic. In-depth structured interviews usually take 1 to 2 h per interview. Time required for observations varies greatly.

The time to conduct an online survey from final questionnaire to quantitative topline data will vary, but according to the Council of American Survey Research Organizations (CASRO), the average times follow.

- Email surveys: 1 to 10 days
- HTML form surveys: 3 to 15 days

- On-site intercepts: 10 to 30 days (includes several days of custom programming and server installation)
- Downloadable interactive surveys: 7 to 20 days (includes 3 days of custom programming/quality assurance)

The actual time to complete and submit the online survey may be much shorter; however, time for the design and analysis requirements may be just as long or longer than traditional methods.

Summary of cost/benefit analysis to conduct surveys

As a result of assessing information from available literature and interviewing several organizations that have either subcontracted or conducted market research, we have developed a matrix to compare quantitative and qualitative methodological approaches to gathering consumer values information (Table 2). Though the matrix reflects a summary of survey cost ranges in 2002, we found it difficult to assess overall survey prices outside of specific applications.

Organizational approaches to market research

Many market research firms that conduct ongoing surveys over time to assess potential changes in consumer values toward product attributes have consumer “panels” in-hand that have agreed over a course of time (i.e., two years) to complete surveys administered by the market research firms. Some firms offer an incentive (i.e., sweepstakes for \$500) to encourage participation in the panel. In establishing a specialized panel, for instance, of professional remodelers, information on items that influence buying behavior can be obtained. In conducting effective market transformation strategies, EERE could benefit from this approach by establishing panels that address ongoing issues of interest.

The Home Improvement Research Institute (HIRI) utilizes a variety of market research firms (and methodologies) to collect data on the home improvement industry for its 50+ member companies, including Lowe’s and Home Depot. A popular publication is the *2000 Product Purchase Tracking Study*, updated biennially. A market research firm prescreened 6,000 of its homeowner panelists for HIRI’s 12-page questionnaire regarding their home improvement product purchases and project activity for 1999. HIRI received 2,602 completed questionnaires. These were the survey objectives:

- Measure and track purchase incidence of 157 products in 1999
- Profile product purchasers demographically and identify brand influencers and product installers and users
- Provide purchase outlet information for each specific product
- Measure and track participation in home improvement projects
- Measure level of agreement with a series of 54 attitudinal statements about the home and home improvement activities and purchases

Table 2. Methodologies matrix

Methodology	Quantitative/ Qualitative	Survey Format	Cost	Benefit	Limitation	Price Range^a (\$)	Best When Project Has
Mail and self-administered questionnaire	Quantitative	Print	Moderately inexpensive	Removes interviewer bias	Long time frame needed to collect data	10K+	Longer time frame
Telephone survey	Quantitative	Print and computer-assisted telephone interviews (CATI)	Moderately inexpensive	Speed	Interviewer bias	15K+	Short time frame
Face-to-face interview	Quantitative	Print and computer-assisted personal interviews (CAPI)	Moderately expensive	Personal	Interviewer bias	35–40 per interview	General audience
Omnibus surveying	Quantitative	Print and computer-assisted telephone interviews (CATI)	Moderately inexpensive	Speed	Small amount of data received	750 per question for phone	Small budget
Observation	Qualitative	Print and electronic (handhelds)	Moderately expensive	Hands-on data	Interviewer bias	35–40 per observation	Longer time frame
Focus group interviews	Qualitative	Print and electronic	Moderately expensive	Personal	Interviewer bias	15K+	Strong need for personal feedback
In-depth unstructured interview	Qualitative	Print and electronic	Moderately expensive	Personal	Interviewer bias	35–40 per interview	Strong need for personal feedback

Table 2. (continued)

Methodology	Quantitative/ Qualitative	Survey Format	Cost	Benefit	Limitation	Price Range^a (\$)	Best When Project Has
Email survey	Quantitative	Electronic	Moderately inexpensive	Speed	Penetration— 54% of U.S. using internet	15K+	General audience
Bulletin boards	Quantitative	Electronic	Moderately inexpensive	Speed	Penetration	15K+	Shorter time frame
Web survey	Quantitative	Electronic	Moderately inexpensive	Speed	Penetration	15K+	Shorter time frame
Downloadable surveys	Quantitative	Electronic	Moderately inexpensive	Depth	Penetration	20K+	General audience
Web-moderated interview	Qualitative	Electronic	Moderately inexpensive	Depth	Penetration	20K+	General audience

^aPrice is variable and is dependent on factors such as audience desired for research (may need prescreening), audience size, type of information needed, time frame for results, complexity of the survey, and format of results. Based on factors such as these, a market research firm will recommend a particular methodology or combination of methodologies and provide a cost estimate. The price ranges above are ballpark averages from discussions with three leading international market research firms gathered in July 2002.

- Profile reasons for making home repairs/improvements and collect detail on home improvement shopping habits, sources of information on home improvement products and projects, and media popularity for purchasers (e.g., books, magazines, and TV).

This is the most expensive type of market research HIRI conducts. The cost to the market research firm was more than \$100,000. However, HIRI sells the 200-page final publication for \$3,295 to nonmembers. The report is also sold by its sections: “Market Size and Growth,” the “Remodeler Market,” and the “Consumer Market;” and by its product categories: hardware; electrical and lighting; power tools and accessories; hand tools and accessories; lumber and building materials; paint and sundries; wall, window, ceiling, and floor coverings; doors, windows, and millwork; plumbing; kitchen and bath; HVAC; and lawn and garden. HIRI utilizes other market research firms and methodologies, including omnibus surveying, online surveying, and in-depth telephone interviewing (described in “Methodologies” section). Market research firms craft specific survey instruments to meet customized client needs and use a variety of analysis tools to evaluate the data, based on the types of questions asked.

Specific case studies of survey research

All types of organizations are active in market research, market assessment, and/or analysis, including

- administrators of mandated efficiency programs (utilities and nonutilities),
- efficiency advocates,
- regional organizations [e.g., the Consortium for Energy Efficiency (CEE), the American Council for an Energy-Efficient Economy (ACEEE), the Northeast Energy Efficiency Program (NEEP), and the Alliance for Energy Savings (AES)],
- national laboratories, and
- private industry (Home Depot).

Although specific results-oriented case study information is available through these organizations and through published literature, most of this information is proprietary and unavailable or requires purchase for access (usually several thousand dollars). As mentioned previously, one report from HIRI alone was almost \$4K. Reports available through the Electric Power Research Institute (EPRI) are another example of valuable studies that are only available free to members and average several thousand dollars for public access. Though the cost of these reports is reasonable compared with the cost to execute the surveys, the scope and analysis will generally not match what a buyer is looking for. The limited scope and availability of no cost, publicly available survey reports provide an opportunity for EERE to make more of this information accessible.

To highlight methods and results from recent market surveys, four reports are summarized.

Residential Energy-Efficient Lighting Consumer Research

This marketing research study, published in March 2000, was conducted by Regional Economic Research, Inc., (RER) for the Northwest Energy Efficiency Alliance. The goal was to identify consumer's perceptions of compact fluorescent lighting (CFL) lamps and fixtures to determine why sales are still low despite technological advances. Table 3 compares the attributes of a standard fluorescent bulb with those of a technologically advanced, energy-efficient, ENERGY STAR lamp. The table shows several advantages of the efficient lamp, though the price is considerably higher. RER studied related reports, conducted telephone interviews, used four focus groups, and administered an online questionnaire that was tabulated using conjoint analysis. All of the research efforts resulted in similar significant positive attributes and barriers facing CFL lamps and fixtures. Selected highlights follow:

- Past experiences and perceptions (i.e., high prices, dim light, flickering ballasts, and large size) dominate thinking about CFL. Consumers were skeptical of performance claims but would be reassured by long-term warranties and verification (i.e., by Underwriter's Laboratory). One recommendation from the report was to implement an unconditional satisfaction guarantee.
- Consumers were very attracted by long bulb life. Interesting bulb shapes, smaller sizes, low heat, and quality of light were also positive attributes.
- Consumer awareness was found to be the largest barrier to CFL, with the initial high cost being the second. Once the products were demonstrated and energy savings explained, consumers were interested in learning more about CFL. Focus group participants were very impressed with two CFL lamps that cost \$5.95 and \$3.95. Another report recommendation emphasized the importance of interactive retail displays.

Table 3. Attributes of standard fluorescent bulbs (halogen) vs energy-efficient lamps (ENERGY STAR)

Feature	Halogen	ENERGY STAR®
Bulb Temperature (°F)	750 to 860	100 to 150
Bulb Life	5 to 17 months	3 to 8 years
Bulb Cost	\$4 to \$6	\$20 to \$30
Power Consumption (Watts)	265 to 335	55 to 80
Torchiere Light Output (Lumens)	3,200 to 5,500	3,000 to 4,100
Torchiere Efficiency (Lumens Per Watt)	10 to 12	60 to 65
Operating Cost Per Year	\$35 to \$75	\$7 to \$15

Source: Regional Economic Research, Inc. 2000. "Residential Energy-Efficient Lighting Consumer Research," March, p. 2-30.

- The link with energy-efficient kitchen remodel designs was apparent. Many focus group participants referred to past or current plans to remodel their kitchens which including new lighting.

The online bulb survey, completed by more than 500 respondents in the Northwest, indicated that a small CFL lamp with medium or long life at a low bulb cost would have the greatest utility value; however, at the time of the survey, no such product on the market met each of those features. This report reflects a gap in product availability based on actual consumer values for certain attributes.

Residential Lighting and Appliance Saturation Study in California

The goal of this report, published by RLW Analytics, Inc., in June 2000, was to collect baseline data on the saturation of lighting and major appliances in the residential sector for San Diego Gas and Electric, the Sacramento Municipal Utility District, and the California Public Utilities Commission. A total of 1,258 on-site surveys were completed in various service territories in California. A subset of respondents was also given a lighting questionnaire on the purchase of energy-efficient lighting systems. The subset (36 survey respondents) was determined by asking if the customer had conducted a home remodeling project in the past three years that incorporated the replacement or addition of new hard-wired lighting fixtures. Table 4 lists the reasons that were given when asked why an energy-efficient lamp was not installed.

Attributes other than price, reliability, and efficiency were the most significant reasons for not buying an energy-efficient lamp. The responses complement the recommendation from the previous “Consumer Research” study to increase consumer awareness by such methods as interactive retail displays.

Table 4. Reason for not buying energy-efficient lamp

Aesthetics	29.2%
Color Quality	35.1%
Lack of Awareness	14.4%
High Cost of Energy Efficient Lamp	2.7%
Energy Efficiency Technology Unreliability	2.7%
Energy Efficiency Not Priority	1.5%
Not Part of Decision Making Process	2.7%
Don't Know	11.6%

Source: RLW Analytics, Inc. 2000. “California Statewide Residential Lighting and Appliance Saturation Study,” June, p. 130.

Market Assessment for ENERGY STAR Appliances

RLW Analytics, Inc., has conducted several market assessment studies for NEEP. NEEP is a nonprofit regional organization of electric and gas utilities tasked with promoting energy efficiency in the northeast (see <http://www.neep.org>). In collecting data, RLW Analytics communicated with appliance organizations, manufacturers, distributors, dealers, and customers using various methodologies such as telephone interviews, mail-in cards, and “mystery shopping” observation. The results of *Market Assessment for ENERGY STAR® Appliances: MA, CT, and NH*, Final Report, September 1999, indicated that ENERGY STAR is making significant progress in becoming more brand recognizable. However, some barriers still exist. The incremental price difference was the number one barrier with the recommended strategy being rebates and education on savings and payback. Table 5 summarizes dealer responses to ENERGY STAR washers.

The involvement and product knowledge of the dealers are key elements of market transformation. The ENERGY STAR program has been a clear success in the appliance market with the help of companies such as Sears, Roebuck, and Company. Sears sold 750,000 ENERGY STAR-compliant products in 1999 and 1.1 million in 2000, becoming the “2000 ENERGY STAR Retail Partner of the Year.” The Sears ENERGY STAR program is implemented in more than 850 full-line stores and 750 independently owned dealer stores in all 50 states. Sears supports the ENERGY STAR program by displaying and selling ENERGY STAR-labeled appliances, electronics, and office equipment in all Sears stores and online (Sears, 2002).

ENERGY STAR’s voluntary labeling program currently spans office equipment, residential heating and cooling equipment, appliances, new homes, commercial buildings, home electronics, windows, residential and commercial lighting, and other commercial-sector products. The Department of Energy and the Environmental Protection Agency are planning to

Table 5. Responses to ENERGY STAR tumble clothes washers

Percent of Customers Willing to Pay the Extra Cost, As Reported by Dealers	\$200 More for ENERGY STAR (Percentage of Dealers)	\$100 More for ENERGY STAR (Percentage of Dealers)
0-20%	41.6%	14.2%
21-40%	21.2%	21.3%
41-60%	15.0%	23.6%
61-80%	7.1%	16.6%
81-100%	5.5%	16.5%
Don't Know	9.4%	7.9%

Source: RLW Analytics, Inc. 1999. “Clothes Washer Market Assessment, TumbleWash Program Evaluation,” October, p. 17.

expand the product scope for ENERGY STAR and to increase deployment of efficient “systems” and “services” (i.e., air duct sealing) in addition to individual products (Brown, 2000).

Market Assessment for Green Power Choice

Electric power restructuring has resulted in numerous surveys of consumers’ values concerning choice of renewable sources of energy over other sources. Much of this information is driven by private utilities’ interests in assessing the market for green power and is considered proprietary and not accessible through the public domain. Some reports are available to members or for purchase through EPRI. Though specific case study information is not readily available for finding out about results and methodologies, a recent report by Barbara Farhar, *Willingness to Pay for Electricity from Renewable Resources: A Review of Utility Market Research*, summarizes her review of approaches and results from 14 proprietary quantitative surveys administered by 12 utility service territories in 5 Western/Southwestern states from 1995–1997. She also includes results from a 1997 EPRI study on this subject (Farhar, 1999). She indicates that most of the quantitative data collection strategy was built on qualitative focus group results, which is consistent with approaches that other organizations have used in conducting surveys for other energy-efficient technology market analysis.

Three areas of focus for her analysis were

- attitudes of consumers toward knowledge and use of renewable sources of energy,
- consumer willingness to pay more for renewable sources, and
- attitudes of consumers toward utility companies as suppliers of power from renewable sources.

Knowledge and use of renewables. Data from these surveys support consumer preference for renewable energy sources in production of energy compared with other sources. Consumers were asked about preference of source among energy resources using the direct rating scale approach of favor, oppose, and don’t know, with the following results in Table 6.

Although few surveys included questions about knowledge and awareness, the results indicate a low level of awareness for most renewable sources, except for solar and wind. These survey results are also consistent with market survey feedback for the TVA Green Power Switch® Program, conducted in 1998 and 1999 by SRBI for TVA (SRBI, Inc., 2002).

In another recent survey conducted by Opinion Dynamics Corp. of Cambridge for the Massachusetts Technology Collaborative, 90% of those polled support the concept of increasing the use of renewable energy, although there was a general lack of awareness and understanding about renewable energy (*Boston Globe* and *Global Power Report*, 2002).

Table 6. Attitudes about energy resources

Energy Resource	Somewhat or strongly favor %	Somewhat or strongly oppose %	Don't know %	Totals
Solar	93	5	2	100
Wind	91	9	–	100
Natural gas	83	11	6	100
Geothermal	71	13	16	100
Landfill gas	64	18	18	100
Forest waste	59	29	12	100
Nuclear	31	63	6	100
Coal	24	69	7	100

Source: Farhar, B. C. 1999. *Willingness to Pay for Electricity from Renewable Resources: A Review of Utility Market Research*. National Renewable Energy Laboratory, NREL/TP.550.26148, July, p. 8.

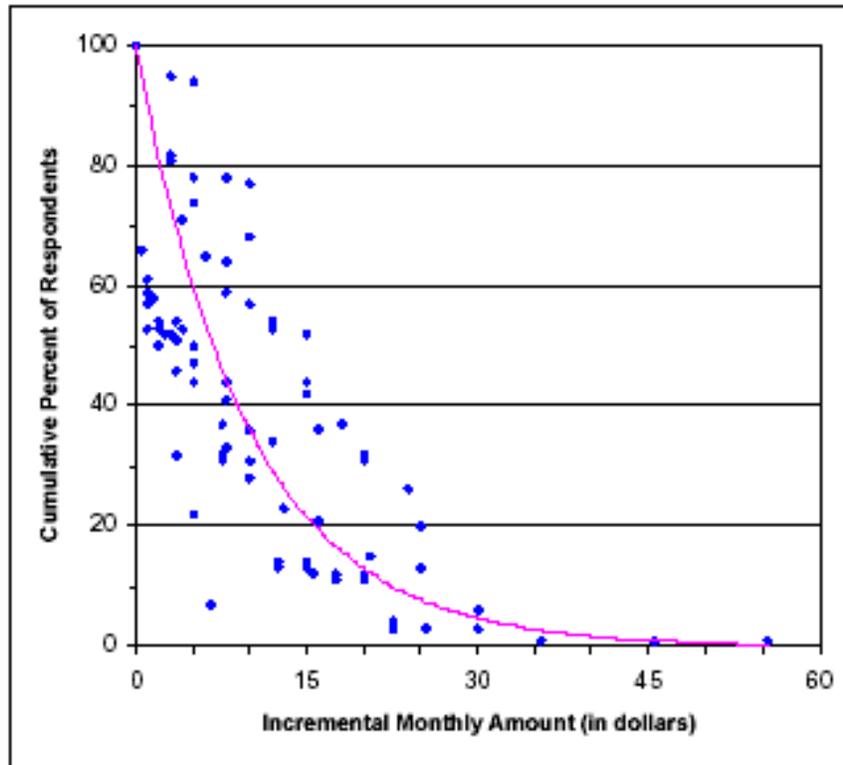
Willingness to pay. Consumers were queried on a direct rating scale of very likely, somewhat likely, unlikely, and unsure about willingness to pay more for renewable sources of energy. In all surveys a majority are willing to pay more and indicate at least \$5 more per month on their monthly utility bill for this power. The aggregated results from surveys are shown in Fig. 1.

When consumers were asked preference for rate basing vs voluntary purchase, results strongly indicated support for spreading the cost of renewable sources of energy across the entire customer base.

In the recent Massachusetts survey, 51% said they would be willing to pay extra for renewable energy and 57% of those said they would pay \$10 per month or more on their monthly utility bill if the electricity came from renewable sources. (*Boston Globe* and *Global Power Report*, 2002)

Consumer trust: Attitudes toward utilities. On a direct rating scale of very important, somewhat important, not important, or unsure, 90% of respondents would choose electricity providers who have taken steps to provide more renewable energy resources. There is also a high correlation between willingness to voluntarily pay more for renewables and a high level of trust in the utility company. Factors that influence selection of power providers include price, environmental benefits, and credentials of the provider (e.g., reputation and experience providing clean, renewable energy) as shown in Table 7.

Factors revealed as important in green power adoption in the TVA Green Power Switch Program included confidence in ability to make a difference and trust in the utilities. Individuals who are most likely to think they can make a difference are strong early adopter candidates for green power.



The equation for the curve is:

$$Y = 100e^{-0.104 * M}$$

Where Y = cumulative percentage of respondents, and M = \$ more per month.

$$R^2 = 0.76$$

Figure 1. Aggregated willingness-to-pay curve (residential customers). *Source:* Farhar, B. C. 1999. *Willingness to Pay for Electricity from Renewable Resources: A Review of Utility Market Research*. National Renewable Energy Laboratory, NREL/TP.550.26148, July, p. 10.

Table 7. Importance of green-power provider attributes

Attributes	%
Is trustworthy/reliable	74
Has experience with clean/renewable energy	64
Experienced/been around a long time	62
Is located in your state	48
Is a company you are familiar with	48
Is a leader in the industry	47
Is your current provider	42

Source: Farhar, B. C. 1999. *Willingness to Pay for Electricity from Renewable Resources: A Review of Utility Market Research*. National Renewable Energy Laboratory, NREL/TP.550.26148, July, p. 20.

In addition, this group is highly literate (including computer literate) and requires information updates on progress in the program. Some of this information is delivered to this group via an electronic newsletter.

The importance of utility credibility is reflected in an article (Boschee, 1999) that describes a report, *Green Buyers Beware*, issued in 1998 by Ralph Nader’s Public Citizen organization. This report pointed out that the cost of renewable energy in California, which comes from facilities that are either owned by or under long-term contract to utilities, was already being fully charged to current ratepayers. The article goes on to refute this report by discussing how utilities are producing new sources of renewable energy. However, this is an example of how utilities can lose credibility without providing effective information and education to consumers.

European research has also indicated that consumers do not trust their utilities’ green credentials (Bloemers, 2001). Furthermore, the study indicates that building alliances with organizations that have credible “green” brands with proven appeal can capture those willing to pay a premium. One example cited is the U.S.-based Greenmountain.com, that built a customer base by selling “cleaner” energy through the internet.

Despite the recognized interest in and willingness to pay for “green power,” there is still an indication that “customer surveys of attitudes toward, and even intended purchase of, green products often substantially overestimate product demand” (Wiser, 1998). Some of these approaches are recommended to appeal to consumers’ values and increase adoption:

- Appeal to community values and social norms
- Assure individual consumers that their actions can make a difference
- Urge consumers to make longer term commitments to programs
- Offer private value to consumers—appealing to health, providing discounts on environmentally preferable products and services, giving free tree seedlings and bird feeders.

Marketplace capabilities for assessing consumer preferences

Market assessment activities are conducted by many organizations. Private industry typically uses market research firms. The HIRI (which includes 50 member companies such as Lowe’s and Home Depot) uses a variety of market research firms, such as

- Ipsos-NPD
- Market Facts, Inc.
- Decision Analyst, Inc.
- TNS Intersearch
- RoperASW

Organizations implementing market assessment activities for utility companies typically conduct the assessment themselves or hire another organization to conduct the assessment, such as a consultancy company or a national laboratory. For some examples, the California Demand Side Management (DSM) Measurement Advisory Committee (<http://www.calmac.org>) was established to provide a forum for DSM program measurement studies, to coordinate the development and implementation of studies common to all or most California utilities, and to facilitate the development of effective, state-of-the-art protocols for measuring and evaluating the impacts of DSM programs. The organizations referenced on the CALMAC web site that conduct one or more studies on subjects such as impact evaluation and market evaluation are listed in Attachment A.

UNDERSTANDING CONSUMER VALUES AND MARKET TRANSFORMATION

It is clearly understood that providing energy-efficient products in the marketplace with attributes that match consumers values is a key factor in increasing consumer selection of these technologies. Issues that influence consumer values are numerous and complicated. One overview (Anderson and Claxton, 1982) outlines the gaps for consumers in selecting energy-efficient technologies, which are still salient today:

- Limited cognitive capacity—Consumers have a limited ability to retain complex technical or performance information about products.
- Salience of energy information—Energy information needs to be relevant to what consumers actually value.

- Dominance of retail sales staff—Store sales people continue to be an important source of information for some types of energy products.
- Product selection and promotion—Energy-efficient products need to be available and advertised in terms of consumer values.

Effective market segmentation approaches to reaching the values of different populations are also a critical factor in connecting consumer values with product selection. In selection of green power options, it is evident from the experience of utilities attempting to market renewable sources of power that more educated consumers are the early adopters of such approaches. These consumers value ongoing information about progress and changes in the program.

Just as consumer values are complex, surveying methodologies to provide an understanding of key values in selecting products require multiple approaches to gain a level of understanding needed. Both quantitative and qualitative approaches are used concurrently in these assessments to complement the level of understanding. For organizations that offered more information about approaches to surveying, they suggested

- using qualitative focus groups to help design the quantitative survey and understand issues and vocabulary for communicating new technologies;
- wanting quick-turnaround results, thereby preferring the use of phone surveying for gathering quantitative data; and
- following up on areas of misunderstanding through qualitative focus groups.

Although most of these organizations use market research firms with specialization in energy research, many also continue to do some level of research work within their organizations. There is strong indication from much of the literature we reviewed and organizations we interviewed that effective communications approaches are critical to building market adoption.

CONCLUSION AND FOLLOW-ON STUDIES

EERE is interested in understanding consumer values in the selection of energy-efficient products as one step in the complicated process of market transformation for adoption of energy-efficient technologies. A summary of key points from this report include:

- Market research by many types of organizations continues to be the core approach to understanding consumer values in the selection of energy-efficient technologies as reflected in the volume of ongoing work in this area.
- In defining populations for assessing consumer values for energy-efficient technologies, time to enter market is a key factor. This includes timing based on consumer life cycle as well as technology life cycle. Much of the literature defining this segmentation is more than 10 years old, reflecting a need to update it.

- Both quantitative and qualitative methods are used in assessing this information and are considered complementary. Qualitative approaches are often used to develop scope and wording of quantitative surveys. Quantitative surveys are often followed by qualitative approaches to clarify misunderstandings in the data findings. Although quantitative surveying still dominates methodological approaches, use of qualitative surveying is increasing because of perceived rapid changes in consumer preferences.
- Many organizations conducting surveys on energy-efficient technologies prefer using a fast turnaround, telephone approach. Quantitative questions dominate. Qualitative focus groups are often used to help define the scope and vocabulary of the questions used with consumers. Focus groups are also used after the survey is conducted to clarify results.
- Use of online surveying is increasing and is beneficial for certain types of applications. Most organizations surveying for energy-efficient technologies are not yet using this approach because many of their residential consumers do not have private online access.
- Cost/benefit analysis for using different methodologies reflects a trade-off between balancing timeliness and consumer bias. Actual survey applications dictate cost-effectiveness, and total price for a complete survey approach is not available.
- Though specific case study information is available through the literature and from advocacy organizations (e.g., CEEE, Institute for Home Improvement, ACEEE, and AES), much of this information is still proprietary and unavailable. Much of the information available to the public is very costly to obtain, usually several thousand dollars per report. Although these costs are inexpensive compared with the cost of carrying out the studies, buying them is generally prohibitive. In addition, the scope and analysis of many of studies will generally not match what a buyer is looking for.
- Ongoing research is needed to help understand changes in consumer values as issues change and as the use of products influence values. Many organizations employ panels to gather information over time.

EERE can increase effectiveness in market transformation programs through greater awareness of and involvement in market research studies on energy-efficient technologies by

- conducting or sponsoring market research in areas where gaps remain between consumer values and product availability,
- reviewing regularly the survey results from market research on consumer values and preferred product attributes,
- offering ways to provide greater public access to important trends in consumer value research,
- supporting update of studies in population segmentation and analysis, and
- employing ongoing consumer panels to assess trends in overcoming these gaps.

Other levels of understanding are needed to translate consumer values into products that reflect attributes valued by consumers. These include

- how the supply chain uses this information to develop and distribute products,
- how the government needs to be involved to support market transformation for the public good, and
- how the R&D process can best be influenced by consumer values in the innovation and design of new technologies.

Studies of these areas are suggested as the next phase of this project.

BIBLIOGRAPHY

- Anderson, C. D., and J. D. Claxton. 1982. "Barriers to Consumer Choice of Energy-Efficient Products." *Journal of Consumer Research*. **9**, 163.
- Aronson, E., and M. O'Leary. 1983. "The Relative Effectiveness of Models and Prompts on Energy Conservation: A Field Experiment in a Shower Room." *Journal of Environmental System*. **12(3)**, 219–224.
- Becker, L., 1978. "Joint Effect of Feedback and Goal Setting on Performance: A Field Study of Residential Energy Conservation." *Journal of Applied Psychology*. **63(4)**, 428–433.
- Berry, L. G., and M. A. Brown. 1994. *Patterns of Impact in the Weatherization Assistance Program: A Closer Look*. ORNL/CON-331, Oak Ridge National Laboratory, Oak Ridge, Tenn.
- Bloemers, R., F. Magnani, and M. Peters. 2001. "Paying a green premium." *The McKinsey Quarterly*, New York. **3**, 15–17.
- Boschee, P., 1999. "Green power or green sham." *Independent Energy*, Tulsa. **10**, December 22–24.
- Brown, M. A., L. G. Berry, D. L. White, and D. Trumble. 1988. "How Influential is the Auditor? Determinants of Sales Effectiveness in Energy Conservation Programs." *Energy Systems and Policy*. **12**, 135–149.
- Brown, M. A., L. G. Berry, L. F. Kinney, J. O. Kolb, T. Wilson, and D. L. White. 1993. *Keys to Success: Ten Case Studies of Effective Weatherization Programs*. ORNL/CON-328, Oak Ridge National Laboratory, Oak Ridge, Tenn.
- Brown, 2000. "Status and Future Directions of the ENERGY STAR Program," ACEEE Proceedings.
- CASRO—Council of American Survey Research Organizations. 2000. "Frequently Asked Questions about Conducting Online Research." <http://www.casro.org>, accessed May 15, 2002.
- Claxton, J. D., J. R. B. Ritchie, and G. H. G. McDougall. 1983. "Evaluating Acceptability and Effectiveness of Consumer Energy Conservation Programs." *Journal of Economic Psychology*. **4**, 71–83.
- Consortium for Energy Efficiency Appliance Committee. 2000. *National Residential Home Appliance Market Transformation Strategic Plan*. Consortium for Energy Efficiency.

- Cook, S. W., and J. L Berrenberg. 1981. "Approaches to Encouraging Conservation Behavior: A Review and Conceptual Framework." *Journal of Social Issue*. **37(2)**, 73–107.
- Costanzo, M., D. Archer, E. Aronson, and T. Pettigrew. 1986. "Energy Conservation Behavior: The Difficult Path from Information to Action." *American Psychologist*. **41(5)**, 521–528.
- Craig, C. S., and J. M. McCann. 1978. "Assessing Communication Effects on Energy Conservation." *Journal of Consumer Research*. **5**, 82–88.
- Darley, J. M., and J. R. Beniger. 1981. "Diffusion of Energy-Conserving Innovations." *Journal of Social Issues*. **37(2)**, 150–171.
- Dennis, M. L., and E. J. Soderstrom. 1988. "Application of Social Psychological and Evaluation Research: Lessons from Energy Information Programs." *Evaluation and Program Planning*. **11**, 77–84.
- DeYoung, R., and S. Kaplan. 1986. "Conservation Behavior and the Structure of Satisfactions." *Journal of Environmental Systems*. **15(3)**, 233–242.
- Dillman, D. A., E. A Rosa, and J. J. Dillman. 1983. "Lifestyle and Home Energy Conservation in the United States: The Poor Accept Lifestyle Cutbacks While the Wealthy Invest in Conservation." *Journal of Economic Psychology*. **3(3-4)**.
- Diamond, R., and M. Moezzi. 2000. "Revealing Myths about People, Energy, and Buildings." *Consumer Behavior and Non-Energy Effects Proceedings of 2000 ACEEE Summer Study on Energy Efficiency in Buildings*, Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.65–8.76.
- Du Pont, P., and D. Lord. 1996. "Reality Check: Comparing Policymaker Perceptions with Consumer Energy Behavior." *Human Dimensions of Energy Consumption Proceedings ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.27–8.37.
- Eagan, C., W. Kempton, A. Eide, E. Lord, and C. Payne. 1996. "How Customers Interpret and Use Comparative Graphics of Their Energy Use." *Human Dimensions of Energy Consumption Proceedings ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.39–8.45.
- Farhar, B. C., 1999. *Willingness to Pay for Electricity from Renewable Resources: A Review of Utility Market Research*. National Renewable Energy Laboratory, NREL/TP.550.26148, July.

- Feldman, S. 1987. "Why is it So Hard to Sell "Savings" as a Reason for Energy Conservation?" *Energy Efficiency: Perspectives on Individual Behavior*, Washington, D.C.: American Council for an Energy-Efficient Economy, ed. W. Kempton and M. Neiman, p. 27–40.
- Fink, A. 1995. *The Survey Handbook*. SAGE Publications, United Kingdom.
- Gibson, L. D. 2001. "What's Wrong with Conjoint Analysis?" *Marketing Research*, p. 16.
- Glowa, T., S. Lawson, and J. Lambert. May 2002. "Competitive Strategy." *Quirk's Marketing Research Review*. **16(5)**, 44–49.
- Green, J., and L. A. Skumatz. 2000. "Evaluating the Impacts of Education/Outreach Programs: Lessons on Impacts, Methods, and Optimal Education." *Consumer Behavior and Non-Energy Effects Proceedings of 2000 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.123–8.136.
- Green, P. E., and A. M. Krieger. 2002. "What's Wrong with Conjoint Analysis?" *Marketing Research*, p. 24.
- Grover, S., and B. Babiuch. 2000. "Pay Now, Save Later: Using Conjoint Analysis to Estimate Consumers' Willingness to Pay for Energy Efficiency." *Consumer Behavior and Non-Energy Effects Proceedings of 2000 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.137–8.148.
- Heschang, L., R. Wright, and S. Okura. 2000. "Daylighting and Productivity: Elementary School Studies." *Consumer Behavior and Non-Energy Effects Proceedings of 2000 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.149–8.160.
- James, D. 2002. "This Bulletin Just In." *Marketing News*. **36(5)**, 45.
- James, D. 2000. "Qualitative." *Marketing News*. **34(2)**, 14.
- Kempton, W., J. M. Darley, and P. C. Stern. 1992. "Psychology Research for the New Energy Problems: Strategies and Opportunities." *American Psychologist*. **47(10)**, 1213–1223.
- Kindig, L. June 2002. "Compare and Contrast." *Quirk's Marketing Research Review*. **16(6)**, 48–50.
- Lawson, S., and T. Glowa. 2000. "Discrete Choice Experiments and Traditional Conjoint Analysis." *Quirk's Marketing Research Review*. Article No. 0592, <http://www.quirks.com/article>, accessed on June 5, 2002.

- Lehmann, D. R., and R. S. Winer. 1997. *Analysis for Marketing Planning*. Irwin/McGraw-Hill, Boston, Massachusetts.
- MacElroy, B. 1999. "Comparing Seven Forms of On-Line Surveying." *Quirk's Marketing Research Review*. Article No. 0510, <http://www.quirks.com/article>, accessed on May 15, 2002.
- "Massachusetts Electricity Customers Say They Want to Pay for 'Green' Power." 2002. *Global Power Report*, New York, March 21, p. 17.
- McCullough, D. 1998. "Trade-Off Analysis: A Survey of Commercially Available Techniques." *Quirk's Marketing Research Review*. Article No. 0307, <http://www.quirks.com/article>, accessed on May 15, 2002.
- Medlin, B., and D. Whitten. 2001. "A Comparison of Internet and Mail Survey Methodologies." *Quirk's Marketing Research Review*. Article No. 0702, <http://www.quirks.com/article>, accessed on June 3, 2002.
- Moezzi, M. 1996. "Social Meaning of Electric Light: A Different History of the United States." *Human Dimensions of Energy Consumption Proceedings ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.123–8.132.
- Northeast Energy Efficiency Partnerships, Inc. 1999. *ENERGY STAR® Appliances: Regional Market Transformation Plan*. Final Report September 30, 1999. Northeast Energy Efficiency Partnerships, Inc.
- Peters, J. S., M. McRae, L. Morander, and D. O'Brien. 2000. "Detecting Behavioral Change from a Visit to a Children's Museum Energy Conservation Exhibit." *Consumer Behavior and Non-Energy Effects Proceedings of 2000 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.281–8.292.
- "Poll: 51% of Mass. residents would pay extra for 'green power.'" 2002. *The Boston Globe*. March 14. Referenced from Massachusetts Technology Collaborative news clips on the web site: www.mtpc.org.
- Regional Economic Research, Inc. 2000. *Northwest Energy Efficiency Alliance Residential Energy-Efficient Lighting Consumer Research*. Report No. 00-051. Regional Economic Research, Inc., Portland, Oregon.
- RLW Analytics, Inc. 2000. *California Statewide Residential Lighting and Appliance Saturation Study*—Final Report, June 2, 2000. RLW Analytics, Inc., Sonoma, California.

- RLW Analytics, Inc. 1999. *Tumble Wash and ENERGY STAR Appliance: Market Progress Report*—Final Report, July 1999. RLW Analytics, Inc., Middletown, Connecticut.
- RLW Analytics, Inc. 1999. *Market Assessment for ENERGY STAR Appliances: MA, CT, and NH*—Final Report, September, 1999. RLW Analytics, Inc., Middletown, Connecticut.
- RLW Analytics, Inc. 1999. *Clothes Washer Market Assessment: Tumble Wash Program Evaluation*—Final Report, October, 1999. RLW Analytics, Inc., Middletown, Connecticut.
- Samuels, J. 2001. “ESOMAR Annual Study of the Market Research Industry 2000.” *ESOMAR: The World Association of Research Professionals*. p. 1–23.
- Samuelson, C D., and M. Biek. 1991. “Attitudes Toward Energy Conservation: A Confirmatory Factor Analysis.” *Journal of Applied Social Psychology*. **21(7)**, 549–568.
- Sangren, S. 1999. “A Survey of Multivariate Methods Useful for Market Research.” *Quirk’s Marketing Research Review*. Article No. 0494, <http://www.quirks.com/article>, accessed on May 15, 2002.
- Sears, Roebuck, and Company—News Release February 2002. “New Home Buyers Want Energy-Efficient Appliances.” Personal communication to M. V. Lapsa, Oak Ridge National Laboratory, Oak Ridge, Tenn., February 8, 2002.
- Scherzer, P. 1996. “Completing the Conservation Cycle: Customer Education and Customer Satisfaction.” *Human Dimensions of Energy Consumption Proceedings ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.171–8.177.
- SRBI, Inc. 2002. TVA GREEN POWER SWITCH Program Survey Interview. August.
- Stern, P. C. 1992. “What Psychology Knows About Energy Conservation.” *American Psychologist*. **47(10)**, 1224–1232.
- Sweet, C., and J. Walkowski. 2000. “Online Qualitative Research Task Force: Report of Findings.” *Quirk’s Marketing Research Review*. Article No. 0643, <http://www.quirks.com/article>, accessed on May 15, 2002.
- Torok, C., and J. Davalli. 2000. “Analyzing Consumer Behavior for Setting Energy Efficiency Program Priorities.” *Consumer Behavior and Non-Energy Effects Proceedings of 2000 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy, p. 8.395–8.408.

- Trochim, W. M. K. 2002. "Plus & Minus of Survey Methods." <http://trochim.human.cornell.edu>, accessed on June 4, 2002.
- Vriens, M., and F. Ter Hofstede. 2000. "Linking Attributes, Benefits, and Consumer Values." *Marketing Research*. Article No. 161, <http://www.marketingpower.com/live>, accessed May 24, 2002.
- Vriens, M., and F. Ter Hofstede. 2000. "Linking Attributes, Benefits, and Consumer Value." *Marketing Research: A Magazine of Management and Applications*. p. 5–10.
- Wade, R. K. 2002. "Focus Group's Research Role is Shifting." *Marketing News*. **36(5)**, 47.
- Wansink, B., and S. Sudman. May 2002. "Selecting a Consumer Panel Service." *Quirk's Marketing Research Review*. **16(5)**, 30–36.
- Wilk, R. R., and H. Wilhite. 1987. "Why Don't People Weatherize Their Homes?: An Ethnographic Solution." *Energy Efficiency: Perspectives on Individual Behavior*. W. Kempton and M. Neiman (eds.), Washington, D.C.: American Council for an Energy-Efficient Economy, p. 51–65.
- Wiser, R. H. 1998. "Green Power Marketing: Increasing Customer Demand for Renewable Energy." *Utilities Policy*. **7**, 107–119.
- Woodruff, R. B., and S. F. Gardial. 1996. *Know Your Customer: New Approaches to Understanding Customer Value and Satisfaction*. Blackwell Publishers, Inc., Malden, Massachusetts.

ATTACHMENT A
ORGANIZATIONS ON THE CALMAC WEB SITE THAT
CONDUCT MARKET ASSESSMENT

- AAG & Associates
- ADM
- Alternative Energy Systems Consulting, Inc. (AESC)
- Analysis Group, Inc.
- ANCO Engineers, Inc.
- Applied Econometrics, Inc.
- Architectural Energy Corp.
- Arthur D. Little
- Aspen Systems Corp.
- ASW Engineering
- Balakrishnan, Celentano
- Barakat & Chamberlin, Inc.
- Baxter, Lester
- BCI, Inc.
- Bordner, Robert D.
- Brown & Whiting
- Business Economic Analysis and Research
- California AgQuest Consulting
- Cambridge Systematics, Inc.
- Chaudhury, Iftekharul (Sharim)
- Christensen
- CIC
- Cognitive Research
- Consumer Research Associates
- D&R International
- Davis Energy Group
- Decision Sciences Research
- DGA
- Eley Associates
- Energy Investment, Inc.
- Energy Market Innovations
- Energy Solutions
- Equipoise Consulting, Inc.
- Eskinder Berhanu Associates
- Feldman, Shel
- Freeman, Sullivan & Company
- Gavelis, Bill
- GeoPraxis

- Goldfarb Consultants
- Gustafson, C.
- Hagler Bailly, Inc.
- HBRS
- HDR Engineering, Inc.
- HEC Energy Services
- Heshong Mahone Group
- John Peterson, Athens Research
- Knight Research Marketing
- Kreitler Research & Consulting
- KVD Research Consulting
- LBL (Lawrence Berkeley National Laboratory)
- Macro International, Inc.
- Marketing Information Masters
- Marquette University
- Mast, Bruce
- Mathematica Policy Research
- Megdal & Associates
- Natural Resources Defense Council
- ORNL (Oak Ridge National Laboratory)
- Opinion Dynamics
- Opinion Research Corp.
- Pacific Consulting Services
- Pacific Gas and Electric (PG&E)
- Parikh, Dr. Kirtida
- Parris, Kenneth
- Peters, Jane
- Peterson, John
- PHB
- Planmetrics, Inc.
- Primen/The Response Center
- Proctor Engineering Group
- Quantum Consulting, Inc.
- RCG
- Regional Economic Research (RER)
- Research Into Action, Inc.
- Ridge & Associates
- RJ Research
- RLW Analytics
- Robert Mowris & Associates
- San Diego Gas & Electric (SDG&E)
- SBW Consulting, Inc.
- Schiffman/Martin
- Science Applications International

- Shel Feldman Management
- Sickles, Andrew
- Sierra Energy & Risk Assessment, Inc.
- Skumatz Economic Research Associates
- Skumatz, Lisa
- Smith, D.
- Southern California Edison (SCE)
- Southern CA Gas Company (SCG)
- Synergic Resources Corp.
- Taylor Systems Engineering, Inc.
- TekMrkt Works
- Tellus Institute
- Texas A&M University Energy Systems
- Train, Kenneth E.
- VACom Technologies
- VIEWtch
- Wiggins, Don
- Wirtshafter Associates
- Wirtshafter, Bordner, Skumatz & Kreitler
- Wirtshafter, Robert M.
- Xenergy, Inc.
- Xenergy & Business Economic Analysis & Research