

Lawrence Berkeley National Laboratory

Lawrence Berkeley National Laboratory

Title

Residential market transformation: National and regional indicators

Permalink

<https://escholarship.org/uc/item/0709p3mh>

Authors

Van Wie McGrory, Laura L.
McNamara, Maureen
Suozzo, Margaret

Publication Date

2000-06-01

Residential Market Transformation: National and Regional Indicators

*Laura Van Wie McGrory,¹ Lawrence Berkeley National Laboratory
Maureen McNamara, U.S. Environmental Protection Agency
Margaret Suozzo, American Council for an Energy-Efficient Economy*

ABSTRACT

A variety of programs are underway to address market barriers to the adoption of energy-efficient residential technologies and practices. Most are administered by utilities, states, or regions that rely on the ENERGY STAR[®] as a consistent platform for program marketing and messaging. This paper reviews regional and national market transformation activities for three key residential end-uses—air conditioning, clothes washing, and lighting—characterizing current and ongoing programs; reporting on progress; identifying market indicators; and discussing implications.

Introduction

Across the nation there has been a noticeable shift in how energy efficiency programs are delivered to residential customers. In the past two decades, the dominant program approach—referred to as demand-side management (DSM)—focused on achieving short-term energy savings predominantly through direct financial incentives, which were then recovered through rate increases. These programs typically influenced single transactions and often resulted in temporary shifts in market share for high efficiency products. More recently, spurred by electric utility restructuring and the need for more cost-effective programs, a new approach has taken hold. This approach, coined “market transformation,” focuses on identifying and designing strategic interventions to overcome market barriers and create lasting change in market share for high efficiency products and services. Financial incentives, while an important tool for engaging some markets are only one of a suite of strategies employed by market transformation programs and often are phased out after a program gains momentum. Thus, market transformation offers the promise of lower costs relative to traditional DSM—particularly attractive in an environment in which ratepayer funded energy efficiency is perceived to have a finite lifetime.

Market transformation activities are strongest in deregulated or semi-deregulated regions with mandated energy efficiency programs funded through ratepayer charges. The degree to which market transformation can become a reality greatly depends on the state

¹ This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor The Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or The Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or The Regents of the University of California.

regulatory framework, utility incentive structure, the ability to plan and develop multi-year strategies, support for coordinated efforts across utility service territories, and cost-effectiveness and savings criteria.

Scope of Current Study

Market transformation initiatives that address the vast majority of residential energy end uses are currently in operation throughout the country. The national platform for many of these is the ENERGY STAR label. As of May 2000, 77 utilities representing more than 33 percent of U.S. households, use ENERGY STAR as the platform for some or all of their residential energy efficiency initiatives. A number of national and regional nonprofits and state administrators also actively promote information sharing about ENERGY STAR and other market transformation strategies across utility and state boundaries.²

This paper reviews market transformation initiatives for air conditioning equipment, clothes washers, and lighting, focusing on initiatives with the longest history and/or broadest range of promotional activity. To paint the picture of progress toward market transformation, the paper relies both on bottom up evaluations of local and regional efforts, e.g., periodic progress reports on market indicators where available, and top-down data on sales and shipments from manufacturers, trade associations, outside market research firms, or government sources.

Residential Air Conditioning

On average, air conditioning consumes 11 percent of electricity used in U.S. homes, making it the third largest end user of residential electricity. For homes with central air conditioning it comprises a substantially larger share—typically one-third of electricity use (Neme, Proctor & Nadel 1999). Further, in much of the country, residential air conditioning use closely coincides with utility system peaks. As a result, many utilities have sponsored incentive-based equipment programs since the 1990's. While these programs create a temporary increase in market share for higher efficiency equipment, absent other market interventions, market share typically drops off when the programs are no longer operating.

Minimum efficiency standards can lock in some of these changes, but updates to standards are infrequent and do not necessarily influence the market position of the most efficient models. The current federal standard for residential central air conditioners (CACs) and heat pumps, in effect since 1992, mandates a seasonal energy efficiency ratio (SEER) for equipment with a cooling capacity of 65,000 Btu/hour or less: SEER 10 for split systems (which comprise about 85 percent of the market) and SEER 9.7 for single-package systems. For heating mode, heat pumps for split systems must meet a heating season performance factor (HSPF) of 6.8 (6.6 for single-package systems). The Department of Energy (DOE) has

² These include the Consortium for Energy Efficiency (CEE) and the American Council for and Energy Efficient Economy (ACEEE), nationally; the Northeast Energy Efficiency Partnership (NEEP), the Northwest Energy Efficiency Alliance (NEEA), and the newly formed Midwest Energy Efficiency Alliance (MEEA), regionally; and the New York State Energy Research and Development Authority (NYSERDA), the California Energy Commission, and the Wisconsin Department of Administration and Wisconsin Energy Conservation Corporation (WECC), at the state level.

been working to update this standard since 1998 and anticipates publishing the new standard by the end of 2000 to take effect in 2006. About 75 percent of units just meet the standard (McCabe 2000).

Review of Existing Initiatives

Two national initiatives, CEE's Residential CAC and Heat Pump Initiative and the ENERGY STAR labeling program, have established energy efficiency criteria for promoting high-efficiency air conditioning equipment. CEE specifications consist of a graduated set of efficiency tiers. Designed in 1994, CEE's program aimed to increase manufacture and market penetration of high efficiency units and contained an optional set of installation guidelines. CEE's base tier (tier 1) and the ENERGY STAR labeling program (launched in Spring 1995) promote an efficiency of SEER 12. In implementing the ENERGY STAR Program, EPA recognized that product labeling alone was insufficient for overcoming the higher first cost associated with qualifying equipment. In late 1996/early 1997, the program launched a contractor sales training program and introduced the first ENERGY STAR financing product. ENERGY STAR financing is offered by private lenders and provides preferred terms and interest rates for qualifying products and is a potentially sustainable tool for the marketplace, since it is a profitable venture for the financing company and does not require subsidization. While many utility programs have adopted ENERGY STAR specifications, only a few have adopted the ENERGY STAR contractor sales training and financing platform. This is in large part due to the program's emphasis on marketing the initiative through manufacturer distribution channels.

As part of a recent emphasis on whole building systems, emerging initiative are attempting to capture the substantial savings (i.e., 24 to 35 percent) associated with better installation and maintenance (Neme, Proctor & Nadel 1999). CEE recently revisited its installation guidelines and is developing a quality installation specification that utilities can promote within their programs (CEE 1998; CEE 2000).

In 1997, building on early successes from PSE&G, NEEP launched an initiative to promote high efficiency air conditioning equipment sales and improved installation practices throughout New Jersey. Participating utilities offer contractors consistent rebates for SEER 13 and higher equipment (ranging from \$370 to \$710 provided that contractors document proper installation); conduct joint consumer education activities; offer contractor training on best practices; and promote contractor certification. Long Island Power Company also adopted the program design and will begin implementation in 2000.

The NW Alliance has been funding a project to establish duct retrofits as a profitable business venture for contractors. The program involves training and certifying contractors to diagnose and seal leaky ducts and provides marketing and advertising support. The four investor-owned utilities in California have also developed a residential retrofit program that includes customer education and incentives for certain measures including diagnostics and tune-ups for CACs and heat pumps.

National and Regional Indicators

While market attribution is difficult and beyond the scope of this paper, there are a number of indicators that the market for high efficiency residential heating and cooling products is undergoing change. These indicators include:

- **Market share.** Sales of high efficiency air conditioners and heat pumps have slowly progressed throughout the 1990s. Data from the Air Conditioning and Refrigeration Institute (ARI) indicate that equipment rated SEER 12 and higher accounted for 20.3 percent of national shipments in 1998 compared with 13 percent of shipments in 1993. The efficiency breakdown for 1998 is shown in Table 1.

Table 1. Number of CAC and heat pump units shipped (<65,000 BTU) in 1998

Units	Shipments
SEER 12-12.9	988,000 (16.6%)
SEER 13-13.9	154,000 (2.6%)
SEER 14-14.9	54,000 (0.9%)
SEER 15 & above	11,000 (0.2%)
Total units shipped	5,960,000

Source: Nadel 2000.

Regionally market share of CEE and ENERGY STAR qualifying equipment has reached much higher levels in areas of aggressive utility promotions, such as Austin Energy (Austin, Texas), Potomac Electric Power Company (PEPCO, Washington, DC), and Public Service Electric & Gas (PSE&G, New Jersey) service territories. For example, PEPCO market share for SEER 12 and greater equipment reached 50 percent or more (Neme, Peters & Rouleau 1998).

- **Average efficiency.** From 1992 (when the SEER 10 standard went into effect) to 1996, the national average efficiency of CACs increased by about 1.8% and the efficiency of heat pumps increased by about 3.4%. The average efficiency of units sold nationally continues to climb slowly; between 1997 and 1998, the sales-weighted average for CACs increased from 10.66 to 10.92 SEER, and the average for heat pumps increased from 10.97 to 11.29 (Nadel 2000). Where aggressive local programs are in place, much higher averages have been seen. For example, 1999 data indicate that the average SEER level of equipment installed through an HVAC program in Austin, Texas is 13.7 (Gustafson 1999). However, such dramatic success might not be possible in other climate regions. Additionally, more than half of the rebates issued in the New Jersey statewide program last year (approximately 20 percent of the replacement market) were for SEER 14 or higher units.
- **Product availability.** Change in market share and efficiency is paralleled by an increase in the availability of higher SEER models (Neme, Peters & Rouleau 1998; Nadel 1999). Except for a temporary dip in 1997, product availability has been increasing steadily. From 1994 to 1998, SEER 12 unit availability increased from 10 to 41 percent; SEER 13 availability increased from 1 to 5 percent, and SEER 14 availability increased from 0 to 5

percent (CEE 1999d). The percentage of units listed in the ARI directory that were SEER 13 or higher jumped from 2 percent of total models in 1994 to about 15 percent in 1996 (Neme, Peters & Rouleau 1998).

- **Product costs.** Analysis based on the producer price index (PPI) indicates that prices of CAC equipment in general have decreased by 2 to 3 percent per year over the past decade (Rosenquist 2000). For several years, prices of higher-efficiency units led this decline. In 1998, prices of CACs and heat pumps with a minimum SEER of 13 were 40 to 50 percent lower than they had been several years before (Neme, Peters & Rouleau 1998), but these prices have since stabilized. During the past two years, while prices for SEER 12 products have tended to decrease slightly, particularly in high-volume states such as Florida and Texas, very little change has been seen in manufacturer pricing of the highest-efficiency units (Abremski 2000).
- **Manufacturer and consumer feedback.** In July 1999, interviews were conducted with 6 of the top 10 HVAC manufacturers—which account for 85 percent of the market share—to determine the efficacy of the ENERGY STAR program strategy. Manufacturers reported active use of the ENERGY STAR label in media and publicity materials, with three of five manufacturers using materials—including dealer training ideas and methods, software, financing charts, and press releases—supplied by the federal program. Four out of five respondents believed that financing can help reduce customer resistance to paying higher first cost associated with high efficiency products. Sales training was generally deemed valuable in convincing contractors to sell up to high efficiency, although getting contractors to attend sales training was still considered a barrier. In addition, five of six respondents described their firm's research and development with respect to high efficiency products as aggressive in the past few years (Rosenberg 2000). Other, anecdotal evidence suggests that consumers and retailers are somewhat receptive to CAC and heat pump market transformation efforts. For example, when consumers are presented with objective information on energy cost savings, they appear often to select high efficiency products despite their higher first cost. Additionally, one large national retailer has reported that its sales of high-efficiency HVAC equipment are increasing by 30 to 40 percent each year due to the ENERGY STAR program (Offutt 1999).

Clothes Washers

An estimated 81 million American households own washing machines, and about 7 million of these buy a new washer each year (CEE 1999b; Hewitt 1999). The most recent federal energy efficiency standard took effect in May 1994. For standard sized washers (1.6 ft³ or larger), the federal standard mandates an EF of 1.18; compact units must have an EF of 0.09. An unheated rinse water option also is mandated for new and advanced machines. In May 2000, DOE announced a new agreement on clothes washer standards. The proposed standard will raise the minimum efficiency level for clothes washers by more than 22 percent in 2004 and 35 percent in 2007.

Most of the energy used for clothes washing goes to heat the wash water. Horizontal axis clothes washers and new vertical axis designs substantially reduce the water needed for clothes washing and, as a result, markedly reduce clothes washer energy use. More efficient

clothes washers also often spin at higher speeds, which reduces the amount of moisture remaining in the clothes at the end of the cycle and, in turn, reduces dryer energy use. Efficient washers currently on the market save about half of the water and a third of the energy of conventional models (DOE 1999). Limited product availability, high prices, and limited consumer and retailer awareness about high efficiency washers have been cited as key barriers to higher sales of these models.

Review of Existing Initiatives

Numerous market transformation initiatives to promote high efficiency clothes washers have been implemented at the national, regional, state, and local levels, as well as by individual utilities and manufacturers. In 1993, building on earlier research and development activities, CEE launched a High-Efficiency Residential Clothes Washer Initiative, comprised of two tiers of common specifications for washers. CEE's base tier has a minimum EF of 2.5 ft³/kWh/cycle, a water factor of 11.0 gals/ft³, and low remaining moisture content [RMC] (CEE 1998). Participating utilities promote CEE-qualifying washers through rebates ranging from \$25 to \$175 per unit, marketing campaigns, consumer education, equipment demonstrations, and retailer outreach. Eight utilities now also offer financing (Banks 1999). Program participants include more than 240 utility companies (more than 190 electric, 5 gas, and about 50 water utilities), the majority of which are in the Northwest (CEE 1999c; Banks 1999).

In 1997, the ENERGY STAR program expanded to include appliances, including residential clothes washers. As part of its effort, the program developed criteria for qualifying clothes washers that coincided with CEE's base efficiency level. The ENERGY STAR program is now supported by almost every manufacturer of high efficiency clothes washers. Participants in the ENERGY STAR marketing effort include a large and growing number of utilities, retailers, and other groups; in 1998, activities of 29 utilities promoting ENERGY STAR-qualified clothes washers and other appliances were estimated to reach more than 27 million households (NW Alliance 1999a). Two major regional market transformation initiatives, the ENERGY STAR Resource Efficient Clothes Washer Program in the Northwest, and the ENERGY STAR Appliances Program in the Northeast phased out their program brands in favor of the ENERGY STAR platform.

There are also a number of statewide ENERGY STAR appliance initiatives including California (coordinated by four utilities), New York (managed by NYSERDA), and Wisconsin (managed by WECC). Finally, manufacturers of high efficiency clothes washers carry out a number of activities ranging from rebate programs to advertising campaigns to promote their high-efficiency products.

National and Regional Indicators

Efforts to promote efficient washers have contributed to the following market impacts:

- **Market share.** National market penetration of high efficiency clothes washers has increased significantly and remains on an upward trend. Sales data from national retailers indicate that market share of ENERGY STAR qualifying clothes washers nationwide

increased from 5.7 percent in 1998 to 8.5 percent in 1999. Market share is higher in areas of heavy promotion with a 1998 to 1999 increase from 6.6 to 15.66 percent in New England, 12.1 to 14.3 percent in the Northwest, 7.9 to 11 percent in California, and 6.1 to 10.3 percent in Wisconsin. (DOE 2000; 1999 figures are preliminary.) Market share appears to be holding steady in regions that have scaled back or eliminated incentives. (NW Alliance 1998a; Wall 2000).

- **Average efficiency.** One approach of some regional market transformation organizations has been to support stronger federal standards to permanently secure changes resulting from education, marketing, and incentives. The proposed new federal standards discussed above provide indications that this objective is being realized.
- **Product availability.** In 1991, only one U.S. manufacturer produced clothes washers meeting the CEE specification, and imports of complying models were very limited. By 1999, all major U.S. manufacturers had introduced high efficiency models; the qualifying list now totals 35 models (CEE 1999c; NW Alliance 1999a; Lucas 2000).
- **Retailer product knowledge and stocking practices.** Leading national appliance retailers—Sears, Circuit City and Wards—have joined the ENERGY STAR program as retail partners. In a limited study conducted in the Northeast (with similar results in the Northwest), all major chains and most independent retailers surveyed stocked high efficiency washers (NEEP 1998).
- **Product costs.** List prices of high efficiency clothes washers from domestic manufacturers have remained stable, ranging from \$600 to \$1900 with an average of about \$850. Two manufacturers, Maytag and Frigidaire, continue to dominate the market accounting for 90 percent of total sales. On average, domestic high efficiency models cost about \$370 more than conventional models with similar features. However, some products are now available at \$100 to \$250 more than conventional washers—the two newest Frigidaire models list at \$699—which shows promise for increasing market penetration of these models. Prices of imported models remain higher, but are decreasing to become more competitive in the U.S. market (NW Alliance 1999a; Pratt 1999).
- **Manufacturer and consumer feedback.** In regions with market transformation efforts, consumers are more aware of and satisfied with high efficiency clothes washers. In the Northwest, 19 percent of customers surveyed are very familiar and 51 percent somewhat familiar with high-efficiency washers (NW Alliance 1998a). The vast majority of purchasers are highly satisfied—greater than 90 percent in a PG&E study; 85 percent in a NW Alliance study. In the Northeast, virtually all purchasers (96 percent) would recommend the product to others (Casentini 1999; NEEP 1998; NW Alliance 1998a).

Home Lighting

In most homes, lighting accounts for 5 to 10 percent of energy consumption costing \$50 to \$150 per year to operate. Homes are lit primarily with common incandescent “A-line” bulbs, which offer excellent light quality but produce considerable waste heat. Compact

fluorescent lamps (CFLs) and efficient fixtures, which generally include a built-in ballast and matching fluorescent lamp, are highly efficient alternatives that save 75 to 80 percent of the energy used by standard lamps and fixtures and last up to 10 times longer (Wilson, Thorne, & Morrill 1999; Banwell 1999). Nonetheless, high prices (e.g., CFLs cost 10 to 20 times as much as incandescent lamps), compromised performance of earlier models, limited product availability, and limited consumer awareness continue to be significant barriers to increased market adoption of energy-efficient residential lighting products.

In several small fixture markets, including those for reflector lamps and linear fluorescents, the Energy Policy Act of 1992 (EPAct) defined efficacy and/or color rendering index requirements; these requirements have influenced the product offerings in these markets toward more efficient alternatives. A Federal Trade Commission (FTC) labeling program requiring manufacturers to include information on lamp labels about energy use, lumen output, lifetime, and proper usage, is also in place for several lamp types, including medium-base compact fluorescent lamps.

Review of Existing Initiatives

Many individual utility initiatives and efforts by regional entities and states (e.g., the NW Alliance, NEEP, California, New York, and Wisconsin) rely on the specifications ENERGY STAR Residential Fixtures, which include torchieres (launched June 1997) and ENERGY STAR CFLs (launched in June 1999) as platforms for incentives and promotions. In these programs, rebates of up to \$8 per CFL and \$20 per fixture, or manufacturer buy-down payments of approximately \$2 to 3 per lamp, typically are coupled with extensive marketing, retailer training, and catalog sales.

The NW Alliance runs two regional residential lighting programs: LightWise (for screw-in CFLs) and ENERGY STAR Residential Fixtures. Both programs provide a manufacturer buy-down and consumer and retailer education. In NEEP's ENERGY STAR residential lighting program, sponsoring utilities promote the ENERGY STAR fixtures and CFL specifications through direct installation and instant customer rebates. The program also provides consumer education and retail sales training, and distributes a lighting catalog. As product availability increases and prices become more competitive, NEEP plans to slowly reduce lamp and fixture rebates.

California utilities coordinate promotions of the ENERGY STAR fixtures, and have employed either retailer instant rebates or manufacturer buy-down incentives. Currently most utilities are offering manufacturer buy-down incentives of \$3 for fixtures and \$2 for lamps, although in 2000 they will phase out rebates in favor of cooperative advertising, training, and retail and manufacturer co-promotions (Horowitz 1999; Banwell 2000). New York State's Energy Smart program does not include either manufacturer or customer incentives, but relies on cooperative marketing and assistance for upstream and mid-stream actors, as well as links to consumer financing (Hunter 1999).

In addition to the various promotions mentioned above, another popular activity employed in multiple regions has been torchiere turn in events, where consumers exchange standard halogen torchieres for ENERGY STAR qualifying models. These initiatives take advantage of the fire safety concerns associated with halogen torchieres.

There are several ongoing efforts to bring new products to market that will likely feed into the ENERGY STAR pipeline. DOE currently is working on a procurement for energy-

efficient recessed cans—the most popular residential fixture (Ledbetter 2000)—and CEE is currently working on a lighting design competition.

National and Regional Indicators

Several changes are evident in the lighting market:

- **Market share.** Data on market share are somewhat limited, but based on retail sales data and utility incentives, EPA estimates that market share of ENERGY STAR qualifying fixtures increased from 1.3 percent in 1997 to 3.3 percent by 1999. A goal of 3 million ENERGY STAR fixtures, established for 1999, was exceeded by 20 percent. Of these, torchiere sales accounted for more than 650,000 units—up from a baseline of 0 in 1996—with an estimated 50 percent of sales attributed to utility promotions (Banwell 2000). No national data are available on the CFL share of the residential lamp market, although the Northwest estimates the market in their region is 2.5 percent (NW Alliance 1999b).
- **Product availability.** Availability of both CFLs and efficient fixtures appears to be increasing. CFLs are gaining shelf space in national stores, such as Kmart, Target, and Walmart, and regionally, three grocery chains in the Northeast are now stocking qualifying CFLs (Rivera 2000; Wall 2000). Furthermore, increased product availability resulting largely from relaxed power quality requirements is apparent in the Northwest. More manufacturers now offer products (an increase from 3 to 6), and the number of qualifying products has increased from 17 in 1998 to 66 in 1999 (NW Alliance 1998b; NW Alliance 1999b). Additionally, four large fixture manufacturers launched new product lines in 1999.
- **Product costs.** Data on changes in fixture cost is limited, in part because of the wide range of products in this market. However, CFL prices appear to be declining nationwide. One notable indicator is that prior to the ENERGY STAR CFL program launch, no products were available at a cost of less than \$10 retail. Now several of the major lighting manufacturers offer products in major distribution channels (e.g., Lowe's, Home Depot) for less than \$10 (Rivera 2000). In the Northwest and the Northeast, CFL shelf prices have dropped. The NW Alliance reports a shift in the total costs (before manufacturer buy-down) for CFLs from \$14 to \$27 in November 1997 to \$13 to \$16 in November 1999 (NW Alliance 1999b).
- **Manufacturer and consumer participation/feedback.** Manufacturer participation in the ENERGY STAR Residential Fixtures program grew from 15 to 54 since the program's inception in June 1997. This increase was attributed largely to regional and statewide programs actively promoting ENERGY STAR (Banwell 1999). Consumers also are becoming more aware of CFLs, although purchases are still limited. In the Northeast, for example, a baseline study for NEEP's program indicated that 84 percent of consumers are aware of CFLs, but only 30 percent have purchased them.

Discussion

While attribution and permanence are beyond the scope of this paper, a number of indicators show that market transformation is occurring to varying degrees for each of the products reviewed. The degree seems to be tied to several characteristics including product cost and complexity, presence of additional non-energy benefits, consumer relationship to the product, manufacturer promotion efforts, and the number of market players. Although the energy savings potential for all of these end uses is large, in some cases, the greatest savings may be derived from codes and standards.

Of the programs discussed, those promoting clothes washers appear most successful. National market penetration of high efficiency clothes washers has increased markedly, particularly in regions with intensive promotion; product availability has increased dramatically; retailer stocking has increased; and product costs are beginning to come down. Several characteristics of both the product and the market may have encouraged this success. Since consumers use their machines several times a week, they may be more receptive to the added benefits (e.g., more features, gentler cycles) of newer models as well as energy and water savings. Also manufacturers have actively promoted high efficiency models. As a result, the market has grown steadily and has either continued to grow or stabilized after initial program incentives were removed. Some observers consider these market changes as contributing to the successful negotiation of new efficiency standards for clothes washers.

Market penetration of high efficiency air conditioners and heat pumps has increased at a slower rate, but continues to climb. Market share is higher in areas of aggressive utility promotion and regions with strong climate drivers. Product availability has generally been increasing since 1994, however, there has been little change in manufacturer price for the highest-efficiency units. Several factors may be at play. While some products offer reduced noise levels, few other non-energy benefits are apparent. In addition, consumers have an indirect relationship with this equipment. As a result, sizable incentives and substantial promotions are likely to remain an active part of utility initiatives; although, in the case of at least one utility (PEPCO), rebates were cut in half over a two-year period without adverse effects on program participation. Early utility initiatives with above average success rates typically had multiple components: incentives (often substantial rebates or low-cost financing), contractor training or certification, and aggressive marketing (Neme, Peters, & Rouleau 1998). Manufacturers report active use of the ENERGY STAR label in media and publicity materials and efforts focusing on contractor training and financing hold promise for overcoming market inertia. While not an objective of the federal ENERGY STAR program, new minimum efficiency standards will make current ENERGY STAR levels the minimum. ENERGY STAR will revise specifications accordingly to retain market differentiation.

Early data on home lighting shows promise for significant increases in market share and product availability, lower product costs, and improved consumer/manufacturer awareness. In the case of lamps, the relatively new ENERGY STAR program offers significant potential for addressing remaining price and availability barriers. Variable customer familiarity with efficient residential lighting products continues to hinder transformation efforts. However, programs that combine direct incentives with consumer education show strong potential for increasing customer awareness. A number of program implementers have also been successful in raising awareness and spurring demand by promoting products in key

market channels, such as lighting showrooms, big box stores (e.g., Home Depot), and grocery chains.

References

- Abremski, R. (ICF Consulting). 2000. Personal communication. March.
- Banks, D. (Consortium for Energy Efficiency). 1999. Personal communication. April.
- Banwell, P. (U.S. Environmental Protection Agency). 2000. Personal communication.
- Casentini, L. (Pacific Gas & Electric Co.) 1999. Personal communication.
- [CEE] Consortium for Energy Efficiency. 1998. *Board of Directors Meeting, Program Committee Meeting*, December 2-3 1998, La Jolla California. Boston, Mass.: Consortium for Energy Efficiency.
- CEE. 1999a. *Update: Residential Air Conditioning: News for Stakeholders in CEE's Residential Central Air Conditioning and Heat Pump Initiative*. January. Boston, Mass.: Consortium for Energy Efficiency.
- CEE. 1999b. *Fact Sheet on High-Efficiency Residential Clothes Washer Initiative*. Boston, Mass.: Consortium for Energy Efficiency.
- CEE. 1999c. *Update: Residential Clothes Washers: News for Stakeholders in CEE's National Clothes Washer Initiative*. May. Boston, Mass.: Consortium for Energy Efficiency.
- CEE. 2000. Consortium for Energy Efficiency Website: <http://www.ceeformt.org>. Boston, Mass.: Consortium for Energy Efficiency.
- DOE. 2000. *1999 Retail Sales Data: Draft Customized Report*. Washington, D.C.: U.S. Department of Energy.
- DOE. 1999. ENERGY STAR Website: <http://www.energystar.gov>. Washington, D.C.: U.S. Department of Energy.
- Gustafson, J. (Austin Energy Services). 1999. Personal communication. June.
- Hewitt, D. (Pacific Energy Associates). 1999. Personal communication. April.
- Horowitz, N. (Natural Resources Defense Council). 1999. Personal communication.
- Hunter, J. (New York State Energy Research and Development Authority). 1999. Personal communication.

- Ledbetter, M. 2000. "PNNL Program Element." *Presentation at Department of Energy Emerging Technologies Program Review*. March 1, 2000. Portland, Ore.: Pacific Northwest National Laboratory.
- Lucas, M. (Consortium for Energy Efficiency). 2000. Personal communication. March.
- McCabe, M. (U.S. Department of Energy). 2000. Personal communication. March.
- Nadel, S. (American Council for an Energy-Efficient Economy). 1999 and 2000. Personal communication.
- [NEEP] Northeast Energy Efficiency Partnerships. 1998. *Market Assessment of Tumble Clothes Washer and Other ENERGY STAR Appliances: Phase I: The Baseline Assessment*. Prepared by RLW Analytics. Lexington, Mass.: Northeast Energy Efficiency Partnerships.
- Neme, C., J. Peters, and D. Rouleau. 1998. Promoting High Efficiency Residential HVAC Equipment: Lessons Learned from Leading Utility Programs. *In Proceedings of the ACEEE 1998 Summer Study on Energy Efficiency in Buildings*. Volume 2. Washington, D.C.: American Council for an Energy-Efficient Economy.
- Neme, C., J. Proctor, and S. Nadel. 1999. *National Energy Savings Potential from Addressing Residential HVAC Installation Problems*. Washington, D.C.: American Council for an Energy-Efficient Economy.
- NW Alliance. 1998a. *Market Progress Evaluation Report: WashWise, No. 2*. Prepared by Pacific Energy Associates. Report #E98-012. Portland, Ore.: Northwest Energy Efficiency Alliance.
- NW Alliance. 1998b. *Market Progress Evaluation Report: Lightwise, No. 1*. Prepared by The Gilmore Research Group. Report #E98-019. Portland, Ore.: Northwest Energy Efficiency Alliance.
- NW Alliance. 1999a. *Market Progress Evaluation Report: WashWise/ENERGY STAR Resource-Efficient Clothes Washer Program: Report No. 3: Final Report*. Prepared by Pacific Energy Associates. Portland, Ore.: Northwest Energy Efficiency Alliance.
- NW Alliance. 1999b. *Market Progress Evaluation Report. Lightwise, No. 2*. Prepared by Linda Dethman. Report #99-038. September. NW Alliance: Portland, Ore.: Northwest Energy Efficiency Alliance.
- Offutt, S. (U.S. Environmental Protection Agency). 1999. Personal communication. June.
- Pratt, J. (Pacific Energy Associates, Inc.). 1999. Personal communication.
- Rivera, J. (D&R, International). 2000. Personal communication.

Rosenberg, M. (Xenergy, Inc.). 2000. *ENERGY STAR Residential Heating and Cooling Program: Findings from Interviews with Manufacturers. Draft memorandum submitted to EPA March 29, 2000.* Burlington, Mass.: Xenergy, Inc.

Rosenquist, G. (Lawrence Berkeley National Laboratory). 2000. Personal communication.

Siegal, M., C. Neme, and C. Nickerson .1999. "Quality Installation for HVAC Systems." *In Proceedings from the Third Annual Market Transformation Workshop.* p.42-1. Washington, D.C.: American Council for an Energy-Efficient Economy.

Wall, B. (Northeast Energy Efficiency Partnerships). 2000. Personal communication. March.

Wilson, A., J. Thorne, and J. Morrill. 1999. *Consumer Guide to Home Energy Savings.* 7th ed. Washington, D.C.: American Council for an Energy-Efficient Economy.

