Bonneville Power Administration

A History of Home Energy Improvements in the Pacific Northwest

Over more than a decade, Bonneville Power Administration (BPA) weatherization programs completed approximately 900,000 home energy improvements in the Pacific Northwest, reaching more than half of eligible customers. Bonneville launched its program in an era of rising electricity prices and mounting federal interest in energy efficiency. BPA funded the programs; local utilities in its service area administered them. Program participation rates varied, and the most successful utilities upgraded more than half of eligible properties. Participating homeowners received free energy assessments and paid between as little as 15% of the total upgrade cost (the energy assessment and balance of the cost were funded by BPA). The best-performing utilities curried participant trust by helping homeowners choose a contractor and performing rigorous inspections to ensure that that the measures were properly installed.

Background

In the 1980s and 1990s, Bonneville Power Administration (BPA), a federally-managed electricity wholesaler in the Pacific Northwest, ran a series of residential weatherization programs. BPA's Weatherization Pilot Program ran from 1980-1982 and engaged 11 utilities; the Interim Residential Weatherization Program ran from 1981-1983; and the Long-Term Weatherization Program ran from 1983 through the mid-1990s. By the time the long-term program started, 96 utilities were involved. These programs were driven by federal interest in energy efficiency in the late 1970s and by the Pacific Northwest Electric Power Planning and Conservation Act, passed by Congress in1980.

The act required BPA to acquire power in a manner consistent with a regional plan to be developed by the Northwest Power Planning Council (NPPC), and instructed NPPC to favor cost-effective efficiency and renewables in developing this plan (Hirst et al 1982). The Northwest Power Planning Act also gave BPA $1.2 billion in borrowing authority from the federal treasury to pay for the upfront cost of efficiency programs, which would be paid off over time by wholesale power sales. The director of BPA was interested in finding out whether or not energy efficiency was a reliable resource, so planners put emphasis on evaluating the impacts of the weatherization projects (E. Hirst, personal communication, April 2, 2010).

Another driver of BPA weatherization programs was the increased cost of retail electricity in the late 1970s and early 1980s. In the early 1970s, BPA entered into financing agreements to purchase electricity from three nuclear power plants. Two of these plants never became operational due to cost overruns and lower-than-estimated electricity demand, but BPA was still responsible for paying off debt for all three plants. From 1979-1983, BPA's wholesale power rates increased by about a factor of three (GAO 2004). Utilities wanted to appear responsive to their customers and became interested in promoting weatherization programs. The Pacific Northwest was considered well-suited to weatherization as there were many poorly insulated homes as a result of historically low electricity costs (Hirst et al 1982).

Program Basics

BPA's weatherization programs targeted electrically heated residences, and the vast majority of participants were single-family homeowners. Eligible measures included: ceiling insulation, floor insulation, unfinished exterior wall insulation, cold- and hot-water pipe insulation, dehumidifiers, programmable thermostats, and heating duct insulation. Houses that met the program's indoor air-quality criteria were also eligible for storm windows, storm doors, caulking, weather stripping, and outlet gaskets (Hirst 1987b).

In order to participate in the program, a homeowner requested an energy assessment from the local utility. Once the free assessment was performed, the homeowner got bids from pre-approved contractors for the measures recommended by the assessment and sent these bids to the local utility. The utility then told the homeowner the rebate amount, and the homeowner authorized the work to be done. After the job was inspected by a third party assessor, the rebate was paid either to the homeowner or the contractor (Brown and White 1992). Quality assurance was an important part of BPA's program. In addition to certifying assessors and inspectors, BPA trained contractors using rigorous specifications for how measures were to be installed. Only approved contractors could perform energy upgrades.

Financing was another key component of BPA's programs. The original pilot program included both a zero-interest loan option and a direct rebate option, but the loan option was found to be less attractive so it was dropped in the interim program (Hirst 1987b). Assessments were free to homeowners, and the rebates covered a large fraction of the weatherization cost. In the Long-Term Weatherization program, rebates were capped at 85% of the cost of the measures (Hirst 1987b). Evaluators considered the strong financial incentive of the rebate a major factor in driving demand (E. Hirst, personal communication, April 2, 2010). Tom Eckman, Manager of Conservation Resources for the Northwest Power & Conservation Council, says at least 50% of the cost to consumers should be covered in order for a program to generate significant uptake (T. Eckman, personal communication, April 2, 2010).

The impact of BPA's program varied across the region, in part because utilities used different tactics to sell the program. Some utilities were more interested in the program than others. According to BPA evaluator Ken Keating, some utilities were still opposed to energy efficiency because it meant "telling people to use less of what you're selling them," even though they were encouraged to implement BPA programs (K. Keating, personal communication, April 8, 2010). In the Interim Weatherization Program, the fraction of eligible households that accepted a free assessment varied from 2% to 23% (average: 9%) across utility territories and the fraction of homes weatherized after an assessment varied from 58% to 91% (average: 60%) (Stern et al 1985).

Driving Demand

Because BPA was a power wholesaler and did not interact directly with customers, the agency had to rely on utilities to promote and market its weatherization programs. Eugene Water & Electric Board (EWEB) was one utility that performed well. From 1982-1995, EWEB weatherized 31,000 homes with an average reimbursement per residence of $1,250. This is more than half of the electrically-heated households in EWEB's service territory during that time period.

EWEB started running residential weatherization programs before BPA launched its incentive program. Eugene promoted its programs through tabling at malls, speaking with neighborhood groups, and cold-calling customers. Persuading customers to accept even free assessments was "pulling teeth," according to EWEB's Energy Management Programs Supervisor Kathy Grey. However, once BPA's incentives became available, EWEB had a huge surge in demand for weatherization –a backlog of 8,000 customers who wanted improvements.

The biggest lesson that EWEB staff say they drew was the importance of building trust with customers and contractors. EWEB made an effort to guide customers through the process. The utility provided a list of contractors who agreed to install measures according to BPA's specifications and abided by certain labor standards. For customers who did not feel comfortable picking a contractor, EWEB offered a bid-request service. Utility staff randomly chose three contractors off the list and had them give bids to the customer. EWEB also helped customers interpret the bids if customers brought them to EWEB's office. Utility staff say these services helped build the program's credibility. Once this credibility was established, word-of-mouth referrals worked well to generating demand. According to Kathy Grey, "one woman loved [her ductless heater] so much that everyone in her bridge group contacted us" (Grey, K. personal communication, 2010).

EWEB staff also spent a lot of time in the beginning of the program explaining BPA's specifications to contractors and inspecting contractors' work. EWEB created a failure-notification process that recorded the reason for installation failure and notified contractors when work was not installed to specifications; the notifications improved the quality of completed work and doubled as a training tool. EWEB had a complaint process that customers could go through if they had problems with contractors, and contractors were removed from the approved list if they received large numbers of complaints (Grey, K., personal communication, April 16, 2010).

Results

The pilot program improved 4,100 homes and the interim program improved 104,000 homes (Hirst 1986b; Hirst 1987b). The Interim program cost Bonneville $157 million over its two years of operation (Hirst 1987b), about $1,300 per home in 1983 dollars. The Interim program convinced BPA that residential weatherization was a cost-effective and reliable resource and led to the creation of the Long-Term Residential Weatherization Program, which was designed to reach 3-5% of the eligible homes in the region each year (White and Brown 1990). However,

funding for weatherization declined from $143 million in 1983 to $40 million in 1984 and $36 million in 1986. By 1986, a forecasted power surplus led BPA to scale back weatherization efforts even further (Brown and White 1992).

Households that participated in the Interim Weatherization Program saved an average of 3,300 kWh/year versus the baseline (non-participants reduced electricity consumption about 5%, presumably because real residential electricity prices increased 45% during the course of the program) (Hirst 1987b). However, at the individual household level, savings were highly variable. Actual electricity savings were within 50% of the assessment estimate for less than half of homes (Hirst 1987b)[1]. Savings per household (relative to non-participants) declined over the course of the Long-Term Weatherization Program, from 3,060 kWh/home in 1986 to 2,180 kWh/home in 1988 and 1,330 kWh/home in 1989 (Brown and White 1992; White and Brown 1990). In addition, the pre-upgrade energy consumption of participants declined from 1981 to 1989, perhaps implying that initial program participants were the "lowest-hanging fruit" – households with the highest energy consumption and biggest potential for savings (Brown and White 1992). Nevertheless, BPA evaluator Ken Keating estimates that by 1996, BPA's weatherization programs had completed a total of about 900,000 weatherization jobs (which includes some repeat customers), surpassing BPA's original goal of 300,000 homes (K. Keating, personal communication, April 8, 2010).

Despite the large volume of homes weatherized during the course of BPA's weatherization programs, there is still significant demand for residential energy upgrades in the Pacific Northwest. Gas-heated homes were not eligible for the BPA's weatherization programs. There is also energy efficiency potential in electrically-heated homes, even in ones that were reached in the 1980s; in such homes, the greatest potential today is in replacing storm windows with high-performance windows (T. Eckman, personal communication, April 2, 2010).

Lessons Learned

BPA took advantage of a unique situation in which steep price increases made consumers suddenly more aware of their electricity use. BPA offered consumers rebates that covered most of the weatherization costs. The average rebate in the interim program was $1,330 per home; total job cost was $1,560 per home (Brown and White 1992). In the Long-Term program, total job cost was $3,130 in 1986 and $2,310 in 1988. Yet Ken Keating points out that utilities need "to do more than just stand there with money," outreach, marketing, and other aspects of program design are critical to success (K. Keating, personal communication, April 8, 2010). The example of Eugene Water and Electric Board indicates that building trust with the community by holding contractors to rigorous specifications and assisting consumers through the process of getting and interpreting bids is an important factor in achieving high program participation.

[1] Part of the reason for the wide variance between estimates and actual performance is that initially energy savings estimates were not calibrated to pre-retrofit baseline usage. There have been significant improvements in the estimation capabilities since the HRCP experience.