Using Social Marketing to Spur Residential Adoption of ENERGY STAR[®]-Certified LED Lighting

P. Wesley Schultz¹, Julie Colehour², Jill Vohr³, Lara Bonn⁴, Ashlee Bullock⁵, and Amy Sadler⁵

Abstract

Recent technological advancements in lighting have produced light bulbs that are dramatically more efficient than the traditional incandescent bulb. Yet despite these benefits, the marketplace has been slow to adopt these newer and more efficient bulbs. To help facilitate this change, the Environmental Protection Agency's ENERGY STAR program conducted a series of pilot behavior change campaigns to encourage residents to purchase and install ENERGY STAR-certified light-emitting diode (LED) lights. Campaigns were conducted with Duke Energy and Efficiency Vermont aimed at encouraging residents to purchase and install certified LED lighting in their homes. The campaigns used community-based social marketing (CBSM) as the platform for developing the overarching strategy and were developed to highlight the benefits of certified LED lights and to decrease the barriers. In Vermont, a school-based fund-raiser was used to promote certified LED bulbs, and in North Carolina, special in-store lighting events were held at Home Depot and Costco retail locations. Both programs were implemented using a control group, and quantitative outcomes were tracked. Reported results highlight the increase in sales of certified LEDs associated with the campaigns. Survey data are also reported from participants in the two campaigns, along with tests for spillover of the newly adopted behavior into other lighting purchases and behaviors. The lessons learned from these two CBSM pilots are synthesized into turnkey materials that can be adopted by other organizations looking to promote the adoption of LED lights.

Keywords

sustainability, best practices, research, best practices, environment, other practice areas

¹ California State University, San Marcos, CA, USA
² C C, Seattle, WA, USA
³ Environmental Protection Agency, Washington, DC, USA
⁴ Efficiency Vermont, Burlington, VT, USA
⁵ Duke Energy, Raleigh, NC, USA

Corresponding Author:

P. Wesley Schultz, California State University, 333 Twin Oaks Rd,
San Marcos, CA 92078, USA. Email: wschultz@csusm.edu

Energy is fundamental to any industrial economy. Energy facilitates the production of goods, promotes commercial transactions, and increases the standard of living for residents. Producing and distributing this energy is critical to the stability and affluence of any industrial country, but it also comes with a number of challenges. Producing energy requires natural resources, many of which are nonrenewable and must be mined, extracted, or harvested from nature. Energy production is also associated with by-products and pollution, which can directly impact human health and, in the case of carbon emissions, can alter the earth's climate. Given these challenges, it is critical that individuals use energy efficiently.

Energy efficiency means using the least amount of energy possible to achieve a desired outcome. Efficiency is often associated with new technologies or products. For example, a more efficient light bulb can achieve equivalent lighting output (lumens) to its predecessors for less energy input (kilowatt-hour [kWh]). Similarly, a newer refrigerator can produce sustained internal temperatures with less electrical input. While there are considerable opportunities for improved efficiency through new technologies and products, behavior remains a fundamental roadblock. In short, the efficiency achieved through new technologies can only happen if people replace older, less efficient technologies. This requires action on the part of individuals, organizations, and communities.

ENERGY STAR is a federally funded program to help businesses and individuals be more energy efficient. ENERGY STAR was established in 1992 under the Clean Air Act and was charged to "... develop, evaluate, and demonstrate non-regulatory strategies and technologies for reducing air pollution." The mission was expanded in 2005 to "... identify and promote energy-efficient products and buildings in order to reduce energy consumption." Among its many activities, ENERGY STAR is most well known for its third-party certification programs for products, along with certifications for new homes, commercial buildings, and industrial plants (Sanchez, Brown, Webber, & Homan, 2008). The ENERGY STAR label is the most widely recognized conservation brand in the marketplace today with more than 80% of U.S. households across the country recognizing the label (Environmental Protection Agency [EPA], 2014). A 2013 study found that 64% of households associated the brand with "efficiency or energy savings" and 41% of all households reported purchasing an ENERGY STAR-labeled product in the past year (EPA, 2014). In addition, research has shown that consumers are willing to pay more for products that carry the ENERGY STAR certification (Ward, Clark, Jensen, Yen, & Russell, 2011).

How Energy Is Used and Where Efficiency Can Be Achieved

In the United States, like many industrial nations around the world, electricity is one of the main sources of energy. In 2011, the United States consumed 97.5 quadrillion British thermal units of energy, and roughly 40% of this was in the form of electricity (U.S. Energy Information Administration, 2012). This electricity use was divided across three sectors, with residential being the largest (39%), followed by

commercial (35%) and industrial (26%). Across these sectors, lighting accounts for approximately 17% of total U.S. electricity use, and more than two thirds of all lamps are installed in the residential sector.

One of the primary uses of electricity worldwide is lighting. A typical household dedicates between 15% and 22% of its total electricity consumption to lighting (U.S. Energy Information Administration, 2012). At the time of this writing (2014), the average home in the United States is estimated to have 51 light bulbs installed, with most being in the bathroom, bedroom, living room, and kitchen. Despite advances in technology, incandescent bulbs remain the dominant type in households (62% of all bulbs), followed by compact fluorescent light bulbs (CFLs; 23%), fluorescent bulbs (10%), halogens (4%), and others including light-emitting diode bulbs (LEDs; 1%), (Department of Energy [DOE], 2012).

Recent technological advancements in lighting have led to bulbs that can produce equivalent light using substantially less electricity (DOE, 2011). Compared to a traditional 60-Watt incandescent bulb, a comparable LED bulb uses from 9.5 to 12 Watts, which corresponds to 80% less electricity, produces less heat, and lasts 25 times longer. Even compared with CFLs, LED bulbs are more efficient, longer lasting, more easily dimmable, and comprised largely of inert materials allowing for easier disposal. As part of the ENERGY STAR certification process, LED lamps are certified to meet stringent criteria of efficiency, quality, and durability.

Social Marketing to Promote the Adoption of LED Lighting

This article reports two campaigns developed using a Community-Based Social Marketing (CBSM) framework to promote the purchase and installation of ENERGY STAR-certified LED light bulbs. In recent years, CBSM has emerged as a promising approach for promoting behavior change (McKenzie- Mohr & Schultz, 2014). CBSM is a process that involves five steps, namely, behavior selection, identifying barriers and benefits, innovative tools of change, pilot testing, and evaluation (McKenzie-Mohr, 2011). The initial step in the CBSM framework is to select an end state, nondivisible target behavior. Specifically, the behavior needs to be final, or not able to be divided into smaller behaviors, and it needs to produce the intended effect. For instance, reducing household electricity consumption is divisible, because multiple behaviors are associated with electricity consumption and some are more impactful than others.

The second step involves identifying benefits and barriers to the selected behavior (Schultz, 2014). These can be identified through literature reviews, observations, focus groups, and surveys. For instance, if campaign strategists want to identify the benefits and barriers to turning off air conditioning at night, they might administer a phone survey and or conduct focus groups that are specific to the target behavior. Before implementing a program, a strategy needs to be developed in order to directly address and mitigate barriers while emphasizing benefits in the third step.

Once a plan has been developed, the fourth step is to pilot test the program elements on a small scale. Whatever group is selected, a comparison group with similar characteristics should be selected (or created through random assignment) to

allow for an assessment of program materials and impact. Once the pilot is concluded, the research team can compare the results of the campaign group to the comparison group to see if the program was effective. The team may have to return to Step 3 and redesign a strategy and re-pilot it several times before finding an effective solution. Once an effective program strategy is developed, it can be implemented on a larger scale to a wider audience.

To facilitate the adoption of ENERGY STAR-certified LED lighting, EPA conducted two pilot programs using CBSM. The campaigns were intended to focus on different regions of the country and to develop and test different strategies for local campaigns. Two regional partners were selected, and for each, the CBSM process was used to select the target behavior, identify barriers and benefits, develop social marketing campaign materials, and pilot these materials with rigorous evaluation. The details of the two campaigns are summarized subsequently. For both campaigns, behavior change tools were selected based on the relative level of barriers and benefits. The targeted behaviors were rated as relatively low on benefits and relatively high on barriers. As a result, both programs used financial incentives to reduce the cost barriers associated with purchasing LED bulbs, along with personalized communications (McKenzie-Mohr & Schultz, 2014; Schultz, 2014).

Duke Energy CBSM Pilot Results: Retail Strategy

The first CBSM pilot was conducted in North Carolina in partnership with Duke Energy Progress. Duke Energy is a large investor-owned utility providing electricity service to approximately 2.4 million residential and commercial customers in North Carolina and surrounding areas. The campaign focused on residential customers living in the Raleigh-Durham area.

CBSM Step 1

The initial step in the CBSM framework is to select an end-state, nondivisible target behavior. The behavioral domain of “lighting” is very broad, and the team worked to identify an end-state and nondivisible behavior. Potential target behaviors that were considered and excluded were as follows:

- Increasing website traffic related to energy-efficient lighting (does not achieve the goal of reducing kWh consumption, and is therefore not end-state),
- Purchase and install ENERGY STAR-certified lighting (ENERGY STAR certifies many different types of bulbs, so the behavior is divisible),
- Promoting the purchase of an LED bulb (unless the bulb is installed, this does not achieve kWh reductions. In addition, the topic of LED is too vague and therefore divisible.),
- Signing a commitment card to purchase and install one LED bulb (does not directly achieve kWh reductions and is therefore not end state. In addition, LED is too vague and therefore divisible.).

The final selected behavior was, that is, to purchase and install one ENERGY STAR-certified LED reflector bulb for a recessed can light fixture.

The team recognized that this is really two linked behaviors (purchase and install), and so the campaign needed to directly address each. The behavior is nondivisible because it focuses on one type of energy-efficient light (ENERGY STAR-certified LED bulb) and one specific type of LED bulb (reflector for a recessed can fixture). The behavior is end state because of the focus on installation. Recessed can lights provide a good target behavior because they typically have not already been switched out to CFL bulbs in most homes meaning there is potential for more substantial energy savings (an incandescent to LED switch saves a lot more energy than a CFL to LED switch). In addition, they are hard to reach and therefore are more likely to benefit from a longer lasting bulb (see subsequently about barriers and benefits; Gordon & McCullough, 2009).

CBSM Step 2

Barriers and benefits to the target behavior were identified through a literature review. As noted previously, lighting has been a long-standing area of research for nearly 50 years, and a sizable amount of information is available on both the technical and marketing aspects of residential lighting options (Hong, 2009; McCullough et al., 2008; Rizzo, Gribbon, & O'Rourke, 2008; Sandahl, Gilbride, Led-better, Steward, & Calwell, 2006). Our target behavior was the purchase and installation of one ENERGY STAR-certified LED reflector bulb. The team recognized that this was really two behaviors, and so separate barriers were identified for "purchase" and "installation."

On the purchase side, the primary barriers identified were price, ambiguity about lighting options, and product availability. At the time of the campaign, LED lights were relatively new and expensive. While prices varied by manufacturer and retail location, they averaged US\$30 each for an ENERGY STAR-certified reflector bulb. In addition, because LED bulbs were new, there was considerable ambiguity among shoppers about the benefits associated with different options. While most shoppers were familiar with incandescent bulbs and CFLs, there was low awareness of LED bulbs. In addition, prior surveys had shown a relatively low level of satisfaction with CFL bulbs, and therefore some uncertainty about the high cost of LED bulbs. Finally, most stores had only a limited quantity of LED bulbs in stock relative to other types of bulbs.

On the installation side, the primary barriers were motivational. While stores did offer some retrofit lighting kits that involved replacing the trim around the recessed cans, the current ENERGY STAR campaign targeted bulbs that used the existing screw socket and could easily swap with the existing bulbs. The largest concern with regard to installation was the tendency to wait for bulbs to burn out before replacing them or forgetting to install the new bulb.

CBSM Step 3

A retail-based campaign was developed to directly address the barriers and benefits and to promote the target behavior. The primary barrier to purchasing a bulb was price, which was addressed through a “buy down” in which the utility worked with the retailer and manufacturer to provide a direct rebate on selected LED bulbs. At the time of the campaign, Duke Energy was already providing a US\$10 per-bulb buy down on the targeted reflector bulbs, but even with the buy down the bulbs sold for approximately US\$20 each. As part of the campaign, Duke Energy provided an additional buy down which reduced the price for selected bulbs to ~US\$5 (for the Parabolic Aluminum Reflector; PAR 30 bulb) and ~US\$10 (for the Bulged Reflector [BR] 30 bulb), with minor price differences across manufacturers. Importantly, the buy down was applied directly at the purchase, eliminating the need for the consumer to submit a rebate form or provide a coupon.

The second barrier to purchasing LED bulbs was ambiguity, which was addressed using in-store booths on the day of the event. The booths were staffed by Duke Energy representatives and contained demonstration materials highlighting the longevity of the bulbs, the lighting quality, and the energy savings. The campaign also leveraged the ENERGY STAR brand as a widely recognized credible source for information on lighting. Finally, to address the barrier of availability, each store had large quantities of bulbs on hand for the event. See Figure 1 for a picture of the in-store booth and signage. On the installation side, the booth contained fun-and-engaging activities to attract shopper interest. Staff at the booth provided one-on-one communications to shoppers and highlighted the benefits of ENERGY STAR-certified LED reflector bulbs. In addition, shoppers who purchased a bulb were asked to sign a pledge card to “change one light in my home today to an ENERGY STAR long-lasting LED reflector.” The focus was on “today” to reduce the chances of forgetting, and staff at the booth noted the benefits of replacing now rather than waiting for the older inefficient bulbs to burn out. This was noted through the potential “loss” associated with waiting.

CBSM Step 4

The campaign was piloted in three retail locations in the Raleigh area. The locations were The Home Depot in Cary, The Home Depot in Raleigh, and Costco in Raleigh. For each store event, we selected a control store in North Carolina with similar demographics and sales volume. The control stores were The Home Depot in

Wilmington, a second The Home Depot in Wilmington, and Costco in Wilmington. The control stores were sufficiently far from the event stores to reduce the possibility of exposure to the marketing materials.

The event included in-store signage during the week preceding the one-day promotion, and expanded signage on the day of the event. Flyers about the event were distributed in customer bags at checkout for the preceding week and promoted at a large regional home show. For the two The Home Depot locations, direct mail postcards were sent to customers within a 10-mile radius of each store; e-mail notifications were sent to Duke Energy customers on record in the 10-mile radius; and “sticky notes” publicizing the event were put on newspapers delivered in the region. Due to corporate guidelines at Costco, the direct mail, e-mail, and newspaper promotional materials were not used in that location, so the primary success was foot traffic on the event day. See Figure 2 for examples of the promotional material.

Figure 1. Duke Energy lighting event at Costco. *Note.* Image shows the light-emitting diode (LED) bulbs on hand, the demonstration rack to show customers ENERGY STAR-certified LED lighting quality, printed materials on the benefits of ENERGY STAR-certified LED bulbs, and the pledge card.

The three events were held on Saturdays in October 2013. The success of the events was evaluated using sales data, pledge cards, follow-up surveys, and subsequent household electricity consumption. Consistent with the CBSM approach, the success of the campaigns was evaluated using a comparison group of similar

stores that did not hold the events.

Data Sources

Historic lighting sales data were obtained from each of the six stores for the past 12 months. The lighting sales showed total number of bulbs sold on a weekly basis for 2 weeks before and after the events occurred and were separated to show those bulbs targeted by the campaign and other ENERGY STAR-certified bulbs that were not targeted by the campaign. As part of the campaign, Duke Energy offered an additional incentive to all ENERGY STAR bulbs, but only LED reflector bulbs were targeted with the promotional materials and at the in-store booth.

At each event, customers who purchased a promotional bulb were asked to sign a pledge card. The cards obtained contact information for a follow-up survey, along with the pledge.

Survey data were obtained 6–10 weeks following the event from customers who provided a pledge card. Survey items asked about the disposition of the bulb (was it installed, and where), satisfaction with the bulb, whether they had purchased or were interested in purchasing other bulbs, and self-reported energy conservation behaviors. Surveys were conducted by telephone. In addition to the customers who made the pledge, surveys were conducted with a comparison group of residents living in close proximity to the pledge households. Comparison households were selected using a nearest neighbor approach, in which 10 nearby households were identified and contacted by phone for an interview.

Finally, monthly electricity consumption data (kWh) were obtained for each of the pledge households and for the comparison households. The data were obtained in a disidentified data file, linked to the survey data and pledge data with a randomly keyed identifier.

Figure 2. Sample promotional materials from the campaign regions in North Carolina.

Results

Sales of Incentivized LED Bulbs

Sales of ENERGY STAR-certified LED bulbs were obtained from each of the six stores on a weekly basis and were tracked separately for the promoted incentivized bulb and for other nonpromoted LED bulbs. Figure 3 shows the weekly sales of the promoted incentivized bulbs during the promotional period for each of the six stores, along with the average weekly sales of these same bulbs during the prior 2 weeks. As shown in the figure, a total of 8,593 incentivized bulbs were sold in treatment stores during the promotional week compared to 959 bulbs for an average week—an increase of 7,634 bulbs (896%). Comparison stores sold a total of 241 bulbs during the promotional week compared to 156 bulbs for an average week, a 54% increase. In total, treatment stores sold 8,352 more incentivized bulbs during the promotional week than comparison stores; this difference is statistically significant, $F(1, 4) = 12.92$, $p = .02$.

Figure 3. Sales of incentivized ENERGY STAR-certified light-emitting diode (LED) bulbs at campaign and control stores.

Sales of Nonpromoted LED Bulbs

Both The Home Depot treatment stores showed increases in sales during the promotional period for ENERGY STAR-certified LED bulbs that were not part of the promotional materials. As shown in Figure 4, one store sold 13,265 of these bulbs during the promotional week, compared to average sales of 24 bulbs in previous weeks. The three comparison stores and the Costco treatment store did not see this increase in nonpromoted bulb sales. Sales of these nonpromoted LED bulbs actually decreased in the Costco treatment store from an average of 7,410 bulbs prior to the treatment to 6,258 bulbs during the promotional period. Despite the decrease in sales at the Costco treatment store, sales of these bulbs in the three treatment stores combined were 249% higher than historical same-store sales, and the change was significantly greater than those in the three control stores, $F(1, 4) = 11.02, p = .03$.

Survey Data

At each of the three stores in which the promotional event was held, participants who purchased a promotional bulb were asked to sign a commitment card. These cards allowed participants to be later contacted by phone for a survey and were signed by 79 participants in Costco, 108 in The Home Depot, and 60 in the second The Home Depot location. From these, our team successfully completed surveys with 50 respondents (22.7% overall response rate). An additional 30 participants were contacted who did not attend the event in order to compare answers to the survey questions and serve as a comparison group.

Respondents were asked demographic information about themselves and their residence. The two groups were similar in residency, age, employment status, and the number of people living in the home. Respondents who attended the event on

average, however, had larger homes (64% greater than 2,000 sq ft) compared to those in the comparison group (33.4% greater than 2,000 sq ft).

Next, respondents answered questions about their knowledge of energy-efficient lighting and past behaviors. On average, those who attended the event reported that fewer incandescent bulbs (26.7%) and more LED bulbs (36.6%) were installed in their homes compared to the comparison group (53.4% and 9.0%, respectively). The majority of event participants reported last purchasing an LED light bulb (96%) and planned to purchase an ENERGY STAR-certified LED bulb in the future (84%). Those in the comparison group most often reported last purchasing a CFL bulb (53.3%), and only 20% planned

Figure 4. Sales of nonincentivized ENERGY STAR-certified light-emitting diode (LED) bulbs in campaign and control stores.

to purchase an ENERGY STAR-certified LED bulb in the future. When asked why they would choose to purchase an LED bulb, event participants stated that they were long lasting, efficient, and would save money on their electricity bill.

Those who attended the event were asked specific questions related to attending and hearing about the event. These participants reported purchasing an average of 14 LED bulbs at the event. By signing the pledge card, participants committed to purchasing and installing one ENERGY STAR-certified LED bulb. When asked if they had installed an LED bulb, 91% of participants reported carrying out the behavior asked of them on the pledge card.

Survey respondents were asked to rate the qualities of ENERGY STAR-certified LED light bulbs. Those who attended the events and respondents who did not, reported similarly. Both groups reported that they believed this type of bulb protects the environment, are high quality, and they save money on the electricity bill. Respondents also reported that they are hard to find, hard to install, and are expensive. Finally, participants were asked about other behaviors in order to assess spillover effects from purchasing and installing an LED light bulb; however, no differences in reported behaviors were found between those who attended the event and those who did not.

Household Electricity Consumption

Monthly energy use data were collected for all households that signed the commitment card at one of the event stores, and nonparticipants from the match group. Data were obtained for 1 year, including 6 months prior to the campaign, and then 6 months including and subsequent to the campaign. Figure 5 shows the average daily electricity consumption for all participants and non-participants, with previous average daily energy consumption as a covariate. As shown in the figure, the electricity consumption for participants was slightly lower than for nonparticipants, but the difference was not statistically significant.

Summary

The results from the ENERGY STAR pilot with Duke Energy showed a number of positive outcomes. First, sales of ENERGY STAR-certified bulbs increased dramatically during the campaign period (896% more than the comparison stores). In addition, sales of nonpromoted ENERGY STAR-certified bulbs increased during the campaign period for two of the three stores. Participants in the campaign

Figure 5. Household electricity consumption for retail campaign participants and nonparticipants from matched comparison. *Note.* Daily electricity consumption prior to, during, and following the campaign period. Error bars represent 95% confidence intervals around the means, calculated using the pooled standard error. The campaign occurred in October 2013. September 2013 is one month prior to the campaign, and November 2013 through March 2014 represent follow-up months after the conclusion of the campaign. Marginal means shown were calculated using the mean of the past six months of electricity consumption, prior to September 2013, as a covariate.

reported purchasing and installing LED bulbs at higher rates than nonparticipants, and participants reported a higher likelihood of purchasing

ENERGY STAR-certified bulbs in the future. Interestingly, there were no differences between participants and nonparticipants in their ratings of ENERGY STAR-certified LED bulbs, and both groups reported that LED bulbs protect the environment, are high quality, and that they save money on the electricity bill; both groups also reported that they are hard to find, hard to install, and expensive. Finally, there was no evidence for behavioral spillover associated with purchasing and installing an LED bulb as part of the campaign.

Efficiency Vermont CBSM Pilot Results: A School-Based Fund-Raiser

The second CBSM pilot was conducted in Vermont in partnership with Efficiency Vermont. Efficiency Vermont is the statewide energy efficiency utility operated wholly by a nonprofit organization. Efficiency Vermont provides technical assistance, rebates, and other financial incentives to help households and businesses in Vermont achieve energy efficiency. The overarching goal of the Vermont campaign was to increase the number of ENERGY STAR-certified LED reflector bulbs installed in homes in a particular target area.

CBSM Step 1

The selected target behavior was to replace all the incandescent bulbs in recessed cans in one room with ENERGY STAR-certified LED reflector bulbs.

The target market was households within the Essex Junction region in the northern part of Vermont which was facing electrical transmission constraints. The campaign focused on homeowners in a geo-targeted region with approximately 10,000 single-family households. Demographics of the region showed that they were generally above-average income, above average in education, politically conservative, and interested in technology (due in part to a large IBM facility in the region).

CBSM Step 2

The barriers and benefits were identified through a literature review and by drawing on survey and interview data previously collected by Efficiency Vermont and in the broader region (Efficiency Vermont, 2011; NMR Group, 2013; New York State Energy Research and Development Authority, 2012). The top three barriers were cost, time, and product availability. On the cost side, LED reflector bulbs were perceived to be expensive, with costs ranging from US\$8.99 to US\$74.99 after existing rebates. With regard to time, residents in the target region were largely working professionals and many had school-aged children, and they were reluctant to commit to activities that required a large amount of time (such as attending a home lighting party or having a home energy audit). Finally, with regard to availability, only a few stores in the area carried ENERGY STAR-certified LED

bulbs for recessed cans and those that did typically carried a very limited quantity. Other barriers previously identified through focus groups included perceptions that LEDs were not dimmable, confusion around LED versus other technologies such as CFL, and a tendency to see replacing a working bulb as wasteful.

Primary benefits associated with LED bulbs included the availability of existing rebates, potential for cost savings on utility bills, and an early adopter mentality. Other identified benefits included longer lasting bulbs, lighting quality (with LED light preferred over CFL), and civic pride (coming together to solve a local energy supply issue).

CBSM Step 3

EPA's ENERGY STAR program staff worked with the staff at Efficiency Vermont to develop a campaign that directly addressed the barriers and benefits and that leveraged a personalized channel of communication. The selected strategy was to conduct a school-based fund-raiser in which grade-school children promoted ENERGY STAR-certified bulbs. The bulbs promoted through the fund-raiser included an additional rebate, which reduced the cost substantially. The order form offered 11 options for recessed cans, ranging in price from US\$2 to US\$21. The order form also showed the regular retail price (ranging from US\$20 to US\$59), the rated life hours of each bulb, and an image to differentiate a retrofit kit, BR, or reflector.

The campaign was conducted over a 3-month period and included three local, public elementary and middle schools. The fund-raiser launch at each school began with an assembly to educate the students about lighting and to orient them to the fund-raiser. In all, approximately 450 students participated. Figure 6 shows one of the promotional posters developed for the fund-raiser. As part of the campaign, kids solicited purchased orders from their family friends, and returned the order forms through their teachers. The bulbs were distributed through the schools and delivered by the children and parents.

CBSM Step 4

Data for the evaluation came from total sales, survey data, and household kWh consumption.

Sales data. The total number and type of bulbs sold through the fund-raiser were obtained from each of the schools.

Survey data. Follow-up survey data were obtained from the households that purchased at least one LED bulb through the fund-raiser. The survey items were similar to the survey used in the Duke Energy pilot

Figure 6. Fund-raising poster for efficiency Vermont campaign.

(reported previously) and asked about the disposition of the bulb (was it installed, and where), satisfaction with the bulb, whether they had purchased or were interested in purchasing other bulbs, and self-reported energy conservation behaviors. Surveys were conducted by telephone. In addition to the residents who purchased a bulb through the fund-raiser, surveys were conducted with a comparison group of residents living in the same community but who didn't make a purchase through the fund-raiser. Finally, monthly electricity consumption data were obtained for each of the households that purchased a bulb through the fund-raiser and for all households in the target region that did not participate in the fund-raiser. A second comparison group was also obtained by sampling households in a nearby community. The data were obtained in a disidentified data file and could be linked to the survey data

and fund-raiser order data with a randomly keyed identifier.

Results

Sales of ENERGY STAR-Certified LED Bulbs

Total sales of ENERGY STAR-certified LED bulbs were collected at the conclusion of the fund-raiser. Orders were provided from 87 homeowners who purchased a total of 1,022 LED bulbs, averaging 11.75 bulbs per person.

Survey Data

Of the 87 individuals who purchased ENERGY STAR-certified LED bulbs, 21 were successfully contacted by phone to answer a survey (24.14% response rate). In addition, 300 homes in Essex and 300 in South Burlington were contacted to answer the survey. Of these, 47 individuals were contacted (7.83% response rate) who did not purchase bulbs through the event in order to compare answers to the survey questions and serve as a comparison group.

Respondents were asked demographic information about themselves and their residence. The two groups were similar in residency and size of home. Those participants who were part of the event on average, however, had lived in their home for a shorter time (12.71 years) compared to those in the comparison group (23.27 years).

Bulb knowledge and behaviors. Next, respondents answered questions about their knowledge of energy- efficient lighting and past behaviors. On average, participants who were part of the event reported fewer CFL bulbs (46.83%) and more LED bulbs (29.33%) were installed in their homes compared to the comparison group (63.94% and 12.87%, respectively). The majority of fund-raiser participants reported last purchasing an LED light bulb (58%) and planned to purchase an ENERGY STAR- certified LED bulb in the future (77.8%). Those in the comparison group most often reported last purchasing an ENERGY STAR CFL bulb (33.0%); 25% reported last purchasing an LED light bulb. Only 36.2% planned on purchasing an ENERGY STAR-certified LED bulb in the future.

Qualities of ENERGY STAR LED bulbs and spillover behaviors. All respondents were asked to rate the qualities of ENERGY STAR-certified LED light bulbs. Those who were part of the fund-raiser and those in the comparison reported similarly. Both groups reported that they believed this type of bulb protects the environment, are high quality, and the bulbs help to save money on their electricity bill. Those who were part of the fund-raiser reported that they produced good quality light (8.5 out of 10) and were dimmable (8.13 out of 10) more than those in the comparison group (6.67 and 5.36 out of 10, respectively). This may reflect a higher familiarity with the bulbs than those in the comparison group. Finally, participants were asked about other behaviors in order to assess spillover effects from purchasing and installing an LED light bulb; however, no differences in reported behaviors were found between those who participated in the fund-raiser and those who did not.

Household Electricity Consumption

Energy consumption data were obtained from a total of 12,639 households in the treatment area of Essex, Vermont and the comparison, nontreatment area of South Burlington. Data for all households were obtained for 7 months prior to the

campaign (February 2013 to August 2013), 3 months during the campaign (September 2013 to November 2013), and the following 7 months after the campaign (December 2013 to June 2014). In the treatment area, data from 6,176 nonparticipating households and 54 participating households were acquired. Data were collected from an additional 6,409 homes in the second comparison area. Average daily kWh consumed was calculated by dividing each household's monthly energy use by the number of days in the billing cycle. Figure 7 shows the average monthly consumption for all 17 months for the fund-raiser participants, nonparticipants, and comparison households.

The figure shows that from the second to the 3rd month of the campaign, both the treatment nonparticipant group and comparison group increased in energy consumption (+ 4.5% and + 4.8%, respectively), while the participant group decreased (- 5.5%). For the 6-month follow-up period from December 2013 to May 2014, the average daily energy consumption of the participant group was 17.84, compared with 18.86 for the comparison households, and 18.95 for the treatment area non- participants. This is a 5.65% savings.

Figure 7. Household electricity consumption for fund-raiser participants, nonparticipants, and comparison. *Note.* September 2013–November 2013 was the campaign period; December 2013 through May 2014 is the follow-up period after the conclusion of the campaign. Error bars represent 95% confidence intervals around the means, calculated using the pooled standard error. Marginal means shown were calculated using the mean of the prior 7 months of electricity consumption as a covariate.

Summary

The results from the ENERGY STAR CBSM pilot with Efficiency Vermont showed that a school- based fund-raiser could provide an effective platform for a social

marketing campaign. The campaign sold 1,022 ENERGY STAR-certified LED bulbs. As with the Duke Energy pilot, the survey data showed that a large percentage of households that purchased an LED bulb through the campaign reported installing it, and they reported a higher likelihood of purchasing ENERGY STAR-certified LEDs in the future than did nonparticipants or households in the comparison group. Participating households did not differ from nonparticipants or comparison households in their quality ratings of LED bulbs, and there was no evidence from the survey data for behavioral spillover.

The most striking finding from the Efficiency Vermont pilot was the reduction in household electricity consumption for participating households, relative to nonparticipants or comparison households. In the 6 months following the campaign, participating households consumed 5.65% less electricity than comparison and nonparticipating households. Importantly, this difference statistically controls for baseline historical usage, so the savings cannot be attributed to the physical properties of the household or preexisting motivation.

General Discussion

The results mentioned previously summarize the findings from two social marketing campaigns conducted as part of the U.S. EPA's ENERGY STAR program. Both campaigns focused on recessed can lights in residential single-family homes. The results from the Duke Energy retail-based campaign showed a spike in the sales of targeted ENERGY STAR-certified LED lights. In addition, residents who purchased the bulbs reported high rates of installation, and a higher likelihood of purchasing

ENERGY STAR-certified LED bulbs in the future, compared with households in the comparison groups. Similar results were found for the Efficiency Vermont campaign, with an added finding for a reduction in household kWh consumption.

The results from the Duke Energy campaign illustrate the potential for conducting social marketing campaigns through existing retail channels. The large spike in sales of targeted bulbs is directly attributable to the campaign elements, which aimed to reduce cost, increase availability, and reduce ambiguity associated with different lighting options. The in-store events were well attended, and the sales volume for both target bulbs and energy-efficient bulbs that were not targeted through the campaign increased substantially during the campaign (896% and 249%, respectively). However, because of the nature of the evaluation, we cannot pinpoint which elements of the program were more strongly linked to its success.

A second key finding from the Duke Energy retail campaign was the high rate of reported installations and a high intent to purchase ENERGY STAR-certified bulbs in the future. Surveys from households that purchased an LED bulb as part of the campaign showed that 84% reported an intention to purchase certified LED bulbs in the future, compared with only 20% for comparison households. We attribute these results, in part, to the commitment card that accompanied the in-store sales booth. Whereas the event booth was intended to address barriers of ambiguity (and cost via

the added rebate), the commitment card was intended to spur immediate installation, rather than residents purchasing and stockpiling the bulbs.

The results for Efficiency Vermont showed similarly positive findings. While the total of certified LED bulbs distributed through the program were smaller (1,022 compared to 7,634 for the Duke Energy retail application), it is important to note the smaller region targeted through the Vermont program (only 10,000 households, compared with approximately 100,000 in the targeted regions in North Carolina). In addition, the fund-raiser strategy adopted for the Efficiency Vermont campaign further narrowed the households that can be reached to those with (or indirectly connected with) school-aged children.

Despite the tighter focus of the school-based fund-raiser, the results were encouraging. In addition to the sales, and the positive survey findings, there was evidence to suggest that those households that purchased bulbs through the fund-raiser subsequently used less electricity than did households in the comparison groups ($\approx$ 10% in the last month of the campaign and 5.65% over the 6 months following the campaign). This effect is not likely the direct results of the LED bulbs. While LED bulbs typically consume about 80% less than a comparable incandescent bulb, lighting is only 15–22% of a typical household's electricity consumption (DOE, 2011; U.S. Energy Information Administration, 2012). Instead, the effect is possibly the result of an increased awareness of electricity use and a greater commitment to energy efficiency.

Finally, it's useful to compare the costs associated with the two social marketing strategies. The retail campaign with Duke Energy cost an estimated US\$101,470. This included US\$60,000 in marketing materials and advertisements, US\$3,300 in staffing costs for the three events, and US\$38,170 in additional "buy down" costs for the bulbs. The campaign yielded 7,634 LEDs, resulting in a per unit cost of US\$13.29. For Efficiency Vermont, the fund-raiser cost an estimated US\$26,578. This included approximately US\$3,500 in marketing materials, US\$4,800 in staff time associated with running and overseeing the campaign, and US\$18,278 in additional "buy down" costs. The campaign yielded 1,012 LEDs, resulting in a per unit cost of US\$26.26. Note that the costs associated with staff time were only directly related to the campaign implementation, and it does not include the staff time associated with developing and planning the campaign.

The return-on-investment (ROI) analysis shown previously suggests that the retail approach produced a larger return, and a greater ROI, than did the fund-raiser. However, it's important to point out that the fund-raiser reported in this article was a pilot and that the model can be applied on a larger scale for greater efficiency. In a follow-up to this article, Efficiency Vermont conducted a similar fund-raiser with more schools and more classrooms. In the scaled-up version, they were able to reduce the bulb-price to US\$0 for the schools, which meant that 100% of the sales went back to the classrooms. In the larger application, they sold 23,981 LED bulbs. The scaled-up version of the campaign cost US\$254,804 in buy-down costs, US\$1,300 in marketing costs, and US\$4,900 in staff time. This resulted in a per unit cost of US\$10.88.

The success of these two campaigns attests to the strength of the CBSM approach.

Both campaigns used the five-step CBSM process, and the campaign elements were created to directly address noted barriers and to highlight the benefits. This stands in contrast to many social marketing campaigns that load up with as many elements as possible, often with little forethought to their relevance to the target behavior or audience—what Tabanico, Schultz, and Schmitt (2015) refer to as a “social marketing cornucopia.” While such broad campaigns can be useful for raising awareness, their success promoting behavior change is questionable.

The two campaigns reported in this article highlight the importance of a behavioral focus in social marketing campaigns. Over the past 20 years, the ENERGY STAR program has had tremendous success in labeling products and gaining recognition in the marketplace as a credible source for information about energy efficiency (Banerjee & Solomon, 2003; Brown, Webber, & Koomey, 2000). But awareness and education are only one part of an effective campaign. As illustrated in this article, the success of ENERGY STAR has been its ability to couple a national-level awareness and education focus, with local-level behavioral strategies and implementation. The CBSM pilots reported in this article provide useful tools and strategies for local social marketing campaigns, and they illustrate the value of leveraging a national campaign to spur local change.

Authors' Note

This work was completed under contract with ENERGY STAR. We want to thank the ENERGY STAR team for their involvement in the project, especially Ann Bailey and Taylor Jantz-Sell. In addition, we want to acknowledge Sarah Duffy, Crystal Myers, and Cara Clusen from The Cadmus Group, and Jan Kleszynski from C C for helping to coordinate the many pieces of this project. At Duke Energy, Jocelyn Quick and Bhagyesh Deshpande provided assistance with data and analyses, and at Efficiency Vermont, Laura Drexel and Paul Markowitz were involved in the design and implementation of the fund-raising campaign. Finally, at CSUSM, Rebecca Sokoloski helped with the analyses and interpretation of the results.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

- Banerjee, A., & Solomon, B. (2003). Eco-labeling for energy efficiency and sustainability: A meta-evaluation of U.S. programs. *Energy Policy*, 31, 109–123.
- Brown, R., Webber, C., & Koomey, J. (2000). Status and future directions of the

- ENERGY STAR program.
Energy, 27, 505–520.
- Efficiency Vermont. (2011). *Energy independence and security act: Qualitative research*. Burlington, VT: Kelliher Samets Volk.
- Gordon, K., & McCullough, J. (2009). Recessed lighting in the limelight. *Home Energy*, 21, 12–13.
- Hong, H. J. (2009). *Acceptability of energy-efficient lighting and environmental behaviors by homeowners*. East Lansing: Michigan State University.
- McCullough, J., Gilbride, T., Gordon, K., Ledbetter, M., Sandahl, L., & Ton, M. (2008). *LED lighting: Applying lessons learned from the CFL experience*. Richland, WA: Pacific Northwest National Laboratory.
- McKenzie-Mohr, D. (2011). *Fostering sustainable behavior: An introduction to community-based social marketing* (3rd ed). Gabriola Island, BC: New Society.
- McKenzie-Mohr, D., & Schultz, P. W. (2014). Choosing effective behavior change tools. *Social Marketing Quarterly*, 20, 35–46.
- New York State Energy Research and Development Authority. (2012). Residential lighting market characterization study. Available online at:
<http://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2012ContractorReports/2012Residential-Lighting-MCA-Report.pdf>
- NMR Group. (2013) *Vermont single-family existing homes onsite report*. Somerville, MA: Author.
- Rizzo, P., Gribbin, C., & O'Rourke, C. (2008). *Specifier reports: CFL residential downlights* (Vol. 12). Troy, NY: National Lighting Product Information Program.
- Sandahl, L., Gilbride, T., Ledbetter, M., Steward, H., & Calwell, C. (2006). *Compact fluorescent lighting in America: Lessons learned on the way to market*. Richland, WA: Pacific Northwest National Laboratory.
- Sanchez, M., Brown, R., Webber, C., & Homan, G. (2008). Savings estimates for the United States Environmental Protection Agency's ENERGY STAR voluntary product labeling program. *Energy Policy*, 36, 2098–2108.
- Schultz, P. W. (2014). Strategies for promoting proenvironmental behavior: Lots of tools but few instructions.
- European Psychologist [Special Issue on Sustainability]*, 19, 107–117.
doi:10.1027/1016-9040/a000163
- Tabanico, J. J., Schultz, P. W., & Schmitt, J. (2015). Driving change: Applying theoretical models in social marketing. In D. Stuart (Ed.), *Handbook of persuasion and social marketing* (Vol. 2, pp. 119–153). Santa Barbara, CA: Praeger.
- U.S. Department of Energy. (2011). *Energy savings estimates of light emitting diodes in niche lighting applications*. Retrieved from
http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/nichefinalreport_january2011.pdf
- U.S. Department of Energy. (2012). *2010 U.S. lighting market characterization*.

Retrieved from <http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2010-lmc-final-jan-2012.pdf>

U.S. Energy Information Administration, Office of Energy Statistics, U.S. Department of Energy. (2012). *Annual energy review 2011 (Report No. DOE/EIA-0384)*. Retrieved from <http://www.eia.gov/totalenergy/data/annual/pdf/aer.pdf>

U.S. Environmental Protection Agency. (2014). *National awareness of ENERGY STAR for 2013: Analysis of 2013 CEE household survey. EPA office of air and radiation, climate protection partnerships division*. Retrieved from http://www.energystar.gov/sites/default/uploads/about/old/files/2013%20CEE%20Report_508%20compliant.pdf

Ward, D., Clark, C., Jensen, K., Yen, S., & Russell, C. (2011). Factors influencing willingness-to-pay for the ENERGY STAR label. *Energy Policy*, 39, 1450–1458.

Author Biographies

P. Wesley Schultz is professor of psychology at California State University, San Marcos and scientific advisor to the EPA's ENERGY STAR program. He maintains an active program of research on the behavioral aspects of energy and resource conservation, and has worked to develop and promote Community-Based Social Marketing as a framework for behavior change. Contact information: Department of Psychology, California State University, San Marcos, CA, 92078, USA. wschultz@csusm.edu. www.csusm.edu/schultz.

Julie Colehour is a partner at Colehour+Cohen, a 36-person social marketing and public relations firm with offices in Seattle and Portland. She has spent her career working to motivate people to alter their behaviors for social good. C+C works on behavior change campaigns for causes including healthcare, water conservation, recycling, education and energy efficiency. Contact: jcolehour@cplusc.com; <https://www.linkedin.com/in/JulieColehour>; www.cplusc.com.

Jill Vohr is consumer marketing manager for ENERGY STAR Products at the U.S. Environmental Protection Agency (EPA). She has an MBA in Marketing from New York University's Stern Graduate School of Business, and more than 20 years of experience working in Environmental Marketing, spanning everything from recycling education for the New York Department of Sanitation to providing consulting services to a wide variety of federal and state environmental programs focused on issues such as sustainability, hazardous waste/source reduction, green development, green buildings, environmentally preferable products, transportation, green power and, of course, energy efficiency. Since joining EPA in 2000, Ms. Vohr heads up a team dedicated to engaging consumers in energy-efficiency behavior change to reduce climate change and encourages you to take the ENERGY STAR Pledge at energystar.gov/changetheworld.

Lara Bonn is retail efficient products program manager for Efficiency Vermont.

Ashlee Bullock is marketing communications manager at Duke Energy, where she works on various programs across the Duke Energy footprint, including the Energy Efficient Lighting Program. She has spent her career in a variety of marketing and advertising type roles, with most of her work focusing on energy-efficiency programs, products, and services.

Amy Sadler is product and services manager at Duke Energy and operates the Energy Efficient Lighting Program, a mark down/buy down approach to encourage market transformation in the retail lighting market. She has had a 14-year career in land and energy conservation in various organizations, governmental entities and companies, the last seven of which have been with Duke Energy. Amy holds a Bachelor's Degree in Environmental Studies from the University of North Carolina at Chapel Hill and a MBA from North Carolina State University.