Maintaining the Value of Voluntary Performance Specifications for Consumer Electronics: Successful Elements for Addressing a Nimble and Prolific Market

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ABSTRACT

There is room for many tools in the energy efficiency toolbox. In a number of product categories—including appliances and heating and cooling products—standards and voluntary programs have existed together and even complimented one another. Until recently, voluntary programs have largely stood alone as tools for driving efficiency in the consumer electronics and office equipment markets. However, interest in standards for these products, which represent an ever-growing piece of the home energy budget, is growing. In 2009, California passed a minimum energy performance standard for televisions, and other states are following California's lead. The federal governments of the United States, Canada and the members of the European Union are also poised to act on standards for electronics products.

With this expansion of interest in standards into the traditional voluntary program space, it is a good time to evaluate what the unique role for voluntary programs is with electronics, what these programs have achieved to date, and what they promise to deliver going forward. Since the 1990s voluntary performance specifications like those developed by ENERGY STAR® and the Consortium for Energy Efficiency have been used as an effective tool for capturing energy savings in a wide range of product areas including electronics. Mandating minimum performance levels like California's television standard will establish a floor for energy use of TVs sold in that state. With the entry of standards efforts into the electronics space, voluntary programs have the opportunity to redouble efforts to establish the ceiling and incent partners to reach for it.

This paper will critically examine the value of voluntary specifications in the consumer electronics market, a market that includes a large number of different products and is marked by rapid technological advancement. The topics that will be addressed include the role and value of a market-based approach using voluntary specifications as compared to standards, how these voluntary specifications should be developed and deployed to overcome the challenges posed by this market and achieve greatest effect, and results from the use of voluntary specifications, including information from ENERGY STAR and energy efficiency programs that are using them.

Introduction

Consumer electronics products represent an increasingly large amount of household electricity use. A 2007 study commissioned by the Consumer Electronics Association calculated that 12 percent of residential electricity consumption is by consumer electronics (Roth and McKenney 2007, 16), and the Environmental Protection Agency (EPA) estimates that percentage will increase to 18 percent by 2015. At the same time, consumer electronics offer a large savings potential. A report by the Electric Power Research Institute finds that the electronics category offers the greatest savings potential in the residential sector, with cumulative potential electricity savings of roughly 21 million TWh by 2020 and 45 million TWh by 2030 (EPRI 2009, 4-6).

As recognition of this savings opportunity grows, so do efforts to capture it. Until recently, these efforts have primarily been in the voluntary realm. EPA first adopted voluntary ENERGY STAR specifications for electronics products in 1992, for personal computers and monitors. In fact, these were the first products to receive the ENERGY STAR label. This initial specification applied performance criteria only to standby power. Since then, EPA has added 13 ENERGY STAR specifications for electronics products, with new products being added annually, and expanded the performance criteria to include active operational modes. More details about EPA's work and success in this area are set forth below.

In the mid-2000s, voluntary energy efficiency program administrators increased their focus on this savings opportunity. In 2007, the Consortium for Energy Efficiency (CEE) adopted the CEE Consumer Electronics Initiative to facilitate efficiency programs in their efforts to increase the sale and market share of energy-efficient consumer electronics. The work under the Initiative includes working with ENERGY STAR on specifications and program support, developing program guidelines, conducting consumer education, and building relationships with the consumer electronics industry. In 2008, CEE adopted its first super efficient performance specification for an electronics product—televisions. With the resources supplied by their work together at CEE under the Initiative, at least 14 CEE members are conducting programs in 2010 to accelerate market adoption of energy efficient electronics products; two of these programs are further described below. In addition, 52 other member organizations have joined CEE's Consumer Electronics Committee to work together on developing these programs, about 40 percent of whom have begun actively planning programs themselves.

As seen in other product areas (e.g., appliances and heating and cooling equipment) that have received attention for their energy use and savings potential, the gains made through voluntary efforts are often followed by regulatory attention in the form of codes and standards. Consumer electronics products are no exception. In 2009, California adopted the first minimum efficiency standard for active power in televisions, building on its 2004 work to regulate standby power. The standard will be effective on January 1, 2011, and the California Energy Commission estimates that the regulation will save a total of 6,515 GWh after the existing stock of televisions is replaced (CEC 2009). In 2010 several other states, including Massachusetts, New York, Washington and Wisconsin, noted the action in California and are considering regulating televisions in a similar fashion. The latest entrant into this arena is the United States Department of Energy (DOE), which is developing a national efficiency standard for televisions. There is regulatory interest in other electronics products as well, including game consoles and set-top boxes.

Although the process of adopting them can be contentious, minimum efficiency standards may be the ultimate end in many minds. In particular, when the federal government becomes involved, there is an opportunity to capture a huge amount of energy savings in one fell swoop. Standards could be seen as particularly attractive in a product category like consumer electronics, which until recently has not been the focus of regulators. Electronics are proliferating at a rapid pace and continue to include new functionalities and capabilities that generally tend to increase power consumption. As such, they collectively represent a large slice of the home energy pie. Electronics standards can free voluntary programs to seek expanded savings for a product or to direct efforts to new products where savings opportunities are compelling, and to sunset voluntary specifications where the standard will realize all possible savings.

With this recent regulatory activity as a backdrop, this paper will focus on the value of voluntary performance specifications for electronics products, how they should be developed and deployed to achieve and maintain greatest effect, and results from their use in voluntary energy efficiency programs.

The Role and Value of Voluntary Specifications

In the pairing of minimum efficiency standards and voluntary approaches, the former supplies the "push" while the latter provides the "pull" (NAEWG 2002). The voluntary specifications developed by EPA form the basis of the labeling program known as ENERGY STAR, which was established in 1992 to identify and promote energy-efficient products to reduce greenhouse gas emissions. The super efficient specifications developed by CEE are intended to help CEE's members—voluntary energy efficiency program administrators from the United States and Canada—differentiate higher efficiency products for their incentive programs while providing consistency in the market. Both provide the pull necessary to achieve the full energy savings potential for electronics.

As a consumer-facing brand, the ENERGY STAR label has tremendous brand recognition and influence on consumer purchasing decisions. According to a 2008 survey conducted by CEE, more than seventy-five percent of households recognized the ENERGY STAR label. More than 35 percent of US households knowingly purchased an ENERGY STAR-labeled product in the past year. Of these purchasers, more than 75 percent report the label as influential in their purchasing decision and more than 90 percent report they are likely to recommend ENERGY STAR qualified products to friends (EPA 2009, ES-1-ES-2). CEE's specifications are not intended to directly influence consumers (e.g., there is no consumer-facing CEE product brand as there is for ENERGY STAR), but rather serve as a tool for energy efficiency program administrators. Many program administrators choose to link incentives to CEE specifications, often providing higher incentives as rewards for products that meet the higher specification levels.

Both EPA's and CEE's use of voluntary specifications in this fashion provide market pull on the basis of energy efficiency. With consumer demand for ENERGY STAR labeled products paired with efficiency program incentives oriented to consumers, retailers, and manufacturers, the market moves toward greater product efficiency. At the same time, these specifications stimulate technical innovations. When manufacturers and other stakeholders are rewarded for bringing new innovations related to efficiency to the market, they work to distinguish themselves in a fashion that allows them to reap the benefits of increased product sales and other recognition like the ENERGY STAR awards program.

Voluntary programs can define how products are assessed, including how features and functions are treated to ensure energy consumption is measured in a consistent and fair way. Governments and standards bodies often adopt these definitions and testing tools.

Voluntary specifications can also be quite nimble. EPA had originally planned to begin a revision of its Version 3.0 specification in September 2009. Yet when it saw the rapid market uptake of the 3.0 levels, it accelerated its review process to February of that year, completing development of the new Version 4.1 specification a mere seven months later. That specification was effective May 1, 2010. CEE's process is similarly nimble. When its original two-tier

television specification failed to provide sufficient differentiation to avoid free ridership problems, CEE added two more tiers to the specification, which was effective only eight months after the original specification.

Crafting Voluntary Electronics Specifications to Have Greatest Effect

Challenges

Hitting the right mark with a voluntary performance specification is a challenging task under the best of circumstances. With electronics, it is especially hard in part due to the large number of products. When TIAX studied the energy use of residential consumer electronics in 2007, it examined 16 different products in detail. EPA maintains ENERGY STAR specifications for 10 different electronics product categories, often addressing multiple product types, as shown in Table 1.

Table 1. ENERGY STAR Electronics Specifications

Specification	Examples of products
Audio/video equipment	CD players/changers CD recorders/burners DVD & Blu-ray Disc products Equalizers Laserdisc players
Battery charging systems	Power tool chargers Camcorder chargers
Computers	Desktop computers Notebook computers Game consoles Small scale servers
Computer servers	Storage under development
Cordless phones	
Displays	Computer monitors Digital picture frames Professional displays
External power supplies	
Imaging equipment	Copiers Fax machines Multi-function devices Printers Scanners
Set-top boxes	Cable boxes Satellite boxes Internet protocol boxes
Televisions	

Source: Environmental Protection Agency 2010

Dealing with so many product types is especially challenging because EPA has finite resources. Developing, maintaining, and updating this number of specifications periodically—not to mention developing new ones—is therefore difficult.

Performance data is also difficult to obtain for electronics products. The electronics industry is extremely competitive, and energy performance information tends to be closely held. One benefit of minimum energy performance standards is that manufacturers' performance data is collected and maintained in a public form by the regulating body. The same is true when there is an EnergyGuide label for a device. As there are no standards currently in effect to regulate the active operational mode of electronics products and the Federal Trade Commission only in March 2010 proposed requiring an EnergyGuide label for an electronics product—televisions—such information is not available at this time. In setting specifications, EPA and CEE rely on voluntary submissions from manufacturers, and those data tend to only apply to products currently available for sale, not those in development.

The fast rate at which the electronics industry brings new innovations to the market also presents a challenge for voluntary specifications. Both ENERGY STAR and CEE seek to set specifications that reward top performers in terms of energy efficiency. Yet recent experience with their television specifications has shown a rapid response to those specifications and high market penetration over very short time frames. One reason is that many leading electronics manufacturers and retailers have made business decisions to only manufacture and stock ENERGY STAR products. The fast rate of innovation includes new features and functionalities that have an effect on a product's energy consumption. The introduction of LED screen lighting for televisions, for example, has notably decreased the energy use of televisions. The increasing prevalence of high definition and DVR functionalities in set-top boxes, on the other hand, has had the effect of elevating energy consumption of those products.

The last challenge to be noted here is the relatively small savings available on a per-unit basis for many electronics products. In a study TIAX prepared for DOE, the annual unit energy consumption difference between a baseline and best in class component audio product was a mere 19 kWh, for a savings of 15 percent (Roth et al. 2008, 4-5). EPA evaluates national savings potential—if large numbers of a product are sold, even small savings on individual products can make a difference. The challenge comes in marketing these savings to retailers and consumers. Energy efficiency program administrators, however, find it particularly difficult to use a specification that does not deliver significant energy savings because they must justify the use of incentives cost effectively to their regulators.

Successful Elements

Given these challenges—and others not noted here—the development of voluntary specifications that are relevant, affect the market, and realize the energy savings potential of this area requires a strategy involving both art and science. EPA and CEE have learned that the elements described below are important to the success of their voluntary specifications.

Leverage the brand recognition of ENERGY STAR. The strong brand recognition of ENERGY STAR is noted above. This brand recognition is a major driver in bringing industry stakeholders to the table to develop voluntary specifications. At the same time, regulatory activity is prompting these stakeholders to distinguish themselves—in part to stand out in the market and in part to avoid even more burdensome actions by regulators. The success of the

ENERGY STAR brand provides them with a trusted resource. Leveraging the ENERGY STAR brand is also critical to the success of the voluntary program efforts of CEE's members. CEE's super-efficient specifications are intended to complement ENERGY STAR specifications, and in most cases apply to products that are also ENERGY STAR qualified. By leveraging the ENERGY STAR brand, their efforts to engage consumers, retailers and manufacturers in their programs are significantly enhanced. Consumer education is a major focus of this work. Both EPA and CEE's members devote substantial resources to educating consumers about the value of ENERGY STAR and energy efficiency in general. While awareness of the ENERGY STAR label is an important accomplishment, it is ultimately brand loyalty that is the goal.

Conduct frequent market assessments and revisions. To overcome the challenge of a fast moving market in which little performance information is available, it is critical that the market be frequently assessed and specifications revised as necessary to differentiate top energy efficiency performers. In the past three years, for example, EPA has redoubled efforts to keep ENERGY STAR specifications current and stringent. During this time, EPA has revised the computer specification twice, with another planned for this year, the monitor and imaging requirements twice, and developed three TV specifications. In recent months, EPA and DOE have shared their enhancement plans for the ENERGY STAR program to include doubling the number of new product specifications introduced each year and increasing the rate at which existing product specifications are revised.

Set a course for the future. In an industry as competitive and fast moving as electronics, the value of using voluntary specifications to set a course for the future cannot be understated. With recent revisions to the set-top box, television, and audio/video specifications, EPA has set a course by simultaneously establishing criteria for the short term, and for the future—typically two years later. Through this practice, EPA seeks to provide advance notice, ensuring that ENERGY STAR specifications are revised in a timely manner and that the ENERGY STAR is a mark of superior performance despite the rapid evolution of this product category.

EPA is also looking to the future by including sufficiency concepts in two recent specifications, notably including televisions. The concept of sufficiency holds a product to progressively tighter efficiency requirements if the manufacturer wants it to be labeled as energy efficient. As the sizes of televisions and energy use continues to grow, EPA has determined for its Version 5.1 specification that there is a limit to what TV sizes the federal government can credibly designate as preferable from an energy and environmental perspective.

CEE takes a different approach to setting the course for the future, though its objectives are generally the same. CEE's original television specification included two tiers that were simultaneously effective and was revised to add two more tiers resulting in a specification in which four tiers were simultaneously effective. This scheme recognizes that different CEE members have different savings goals and program objectives and allows them to design their programs around the one or more tiers that meet their needs. CEE's most rigorous efficiency tiers are intended to reward exceptional performers. The higher tiers also provide a pathway for products meeting the lower tiers to travel. CEE does not set future performance specifications for several reasons. If the mark is set too high for the market to meet, the number of products available for promotion by voluntary programs (and the energy savings those programs generate)

could decrease substantially, putting the programs' success in jeopardy. On the other hand, if the mark is set too low, the incentive for industry to incorporate technical innovations in their products could be reduced, also leading to reduced energy savings.

Involve stakeholders, while conducting independent research. A robust stakeholder involvement process is essential to a successful voluntary specification. Both ENERGY STAR and CEE pride themselves on open, transparent, and inclusive stakeholder involvement processes. These enable the organizations to learn about market and technical issues from the industry staff working on those issues day in and day out and craft specifications that are responsive to those major trends.

At the same time, the competitive nature of the electronics industry means that stakeholders cannot always be fully forthcoming and the industry's nimble nature means that the future is hard for them to predict. This is where independent research is essential. The national laboratories, regulatory bodies across the world, and independent technical experts should be consulted to add in important details to the specification development process. Other partners have important perspectives and contributions as well, including energy efficiency program administrators, retailers, and advocacy organizations.

Provide robust verification. Verifying, testing, and enforcing program requirements are essential to maintaining credibility, especially with a consumer-facing labeling program such as ENERGY STAR. EPA and DOE are working to enhance product verification, testing and enforcement for the ENERGY STAR program. As part of the Enhanced Program Plan for ENERGY STAR Products, the agencies will be working to implement qualification in an accredited lab prior to labeling and comprehensive verification testing, which leverages both market approaches and enhanced government testing well, with a prompt response to instances of non-compliance. EPA will continue its discussion of proposed changes with stakeholders in the coming months with the intention of finalizing them this calendar year.

Expand offerings as new products, technologies and savings opportunities emerge. As new products emerge and existing products incorporate new functions or our understanding of their energy savings potential evolves, the specifications developed by ENERGY STAR and CEE must expand. This is another area where voluntary programs have an opportunity to lead the charge when compared to standards. Voluntary programs are in a strong position to recognize market leaders and innovations in new product areas. EPA is currently planning to develop new electronics specifications for uninterruptable power supplies, data center storage, and small network equipment with several others under consideration. CEE continues to monitor the market to assess where other super-efficient electronics specifications might provide value to its members.

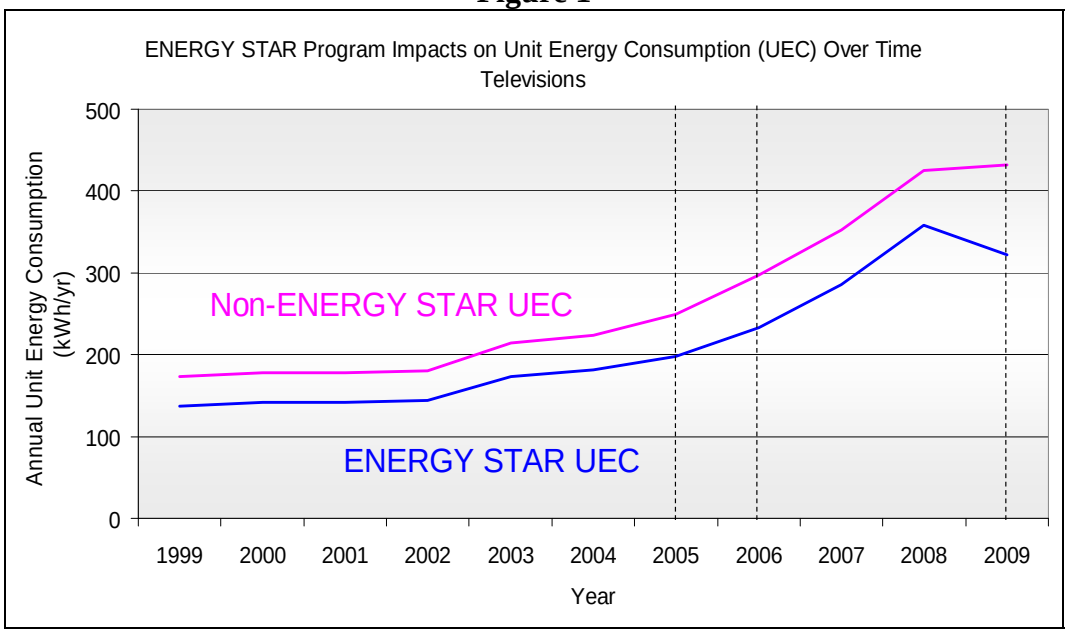
Program Results

In order to continue to be a viable tool, voluntary specifications must deliver energy savings. The ENERGY STAR and CEE voluntary performance specifications are doing just that.

ENERGY STAR

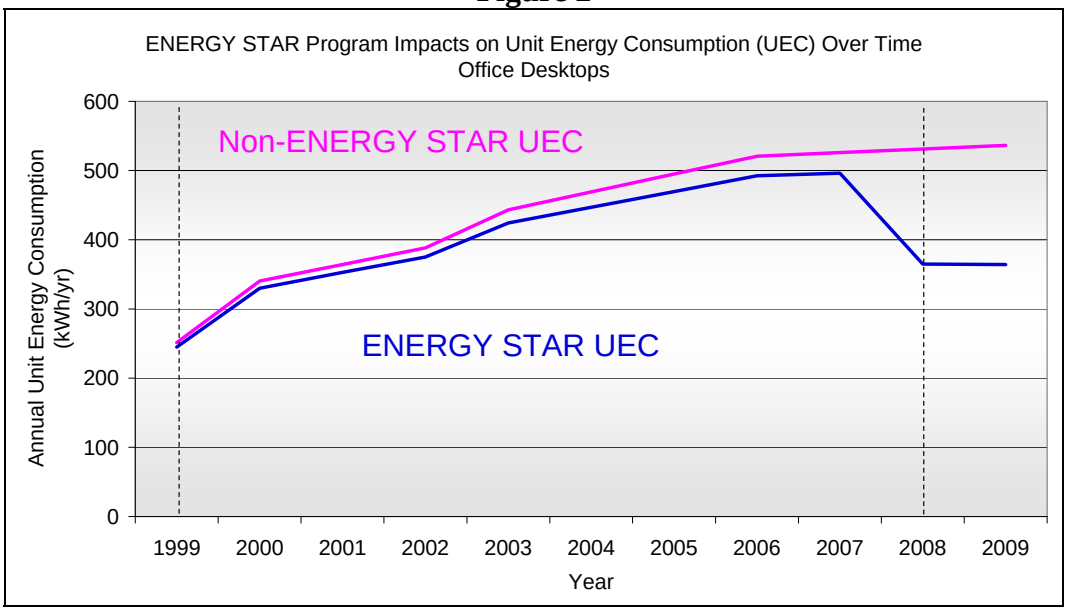
ENERGY STAR's impact on the energy consumption of electronics products is substantial. Figures 1-3 show the effect of ENERGY STAR specifications over time on the energy consumption of televisions, computers, and monitors:

Figure 1



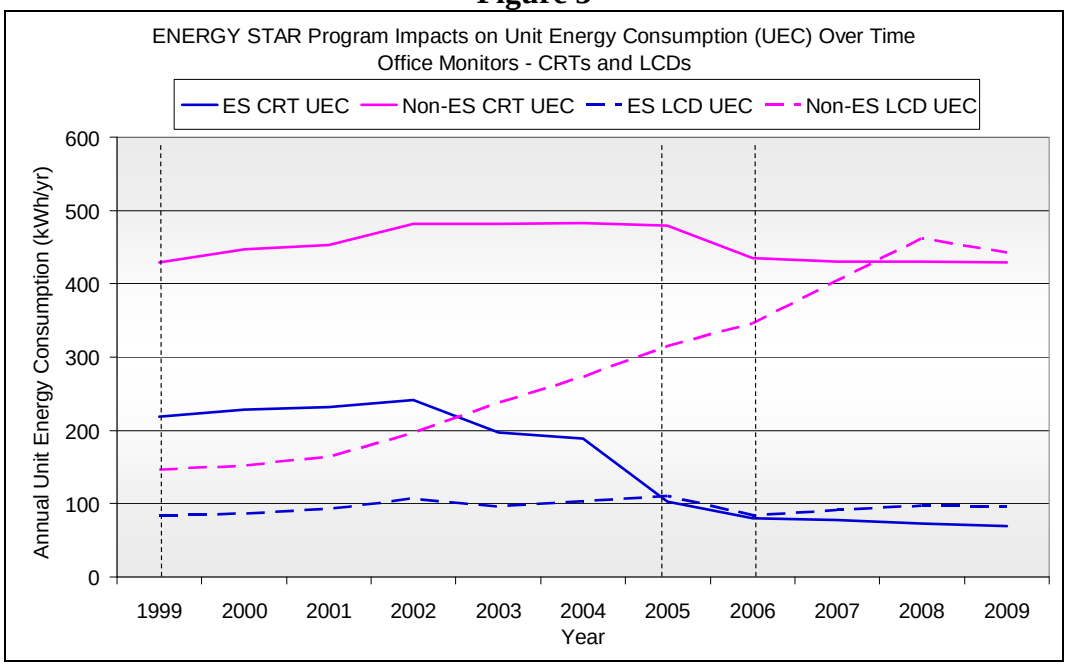
Source: Environmental Protection Agency 2010

Figure 2



Source: Environmental Protection Agency 2010

Figure 3



Source: Environmental Protection Agency 2010

Since 2000 American consumers have purchased more than 3 billion ENERGY STAR qualified products, with more than 300 million sold in 2009. With the help of ENERGY STAR, Americans prevented 45 million metric tons of greenhouse gas emissions in 2009 alone—equivalent to the annual emissions from 30 million vehicles—and saved more than $17 billion on their utility bills.

CEE Members

Voluntary, ratepayer-funded energy efficiency programs for consumer electronics products are still fairly new, with the first entering the market in earnest in 2008. Quantifiable program results are consequently difficult to provide, although anecdotal reports are promising. The following descriptions of two leading consumer electronics energy efficiency programs illustrate the elements of successful voluntary specifications in practice and how they are used to overcome the challenges posed by the consumer electronics category.

The Business and Consumer Electronics (BCE) program began at Pacific Gas and Electric Company (PG&E) and Sacramento Municipal Utility District (SMUD) in late 2008, with the Northwest Energy Efficiency Alliance (NEEA) joining the effort in early 2009. The BCE program quickly concluded that a voluntary specification was the best foundation for a program. They reasoned that any program, regardless of its design, would be hard-pressed to promote efficient models without a specification to indicate the level that qualified as “efficient.” They set a goal of capturing 25 percent of models and found that this efficiency threshold was, unfortunately, higher than ENERGY STAR for some product categories. As a result, the program designated an efficiency threshold at ENERGY STAR *plus* a certain percentage for televisions (as with the CEE television specification) and monitors. The program thus raised the bar while leveraging the ENERGY STAR brand and marketing efforts designed to educated consumers and create demand pull.

In developing a design for the program, the program administrators found that any incentive for an individual consumer would be too small to be compelling, since each electronic device only offered a small amount of energy savings on its own. For an organization that could aggregate those savings, though, such as a retailer, the incentive could be compelling indeed. This midstream approach would also help the utilities clearly address their two goals. First, they sought large energy savings, which they could achieve by encouraging retailers to stock, promote, and sell efficient models. Second, they wanted to provide stepping stones for the industry, leading them gradually towards the ballpark of efficiency levels that mandatory codes and standards were likely to eventually require.

The BCE program administrators soon learned that the consumer electronics market moves much more quickly than they anticipated. For example, they initially offered marketing incentives on televisions that met ENERGY STAR 3.0 + 15 percent (CEE Tier 2), but they have had to increase the threshold several times to prevent the majority of television sales from qualifying. In an effort to lead such a rapidly changing market instead of following it, the 2010 program has flexibility mechanisms built in, including two tiers of efficiency: a higher tier that receives a greater incentive per sale, and a lower tier at for which incentive dollars are capped at 60 percent of total available incentive funds, a percentage which retailers understand could decrease after a mid-year program evaluation.

PG&E, SMUD, and NEEA have been very pleased with their program's effects. Between the first conversations with retailers in early 2008 and the end of 2009, market penetration for televisions rose approximately 40 percent for ENERGY STAR 3.0 + 15 percent (CEE Tier 2) and approximately 25 percent for ENERGY STAR 3.0 + 30 percent (CEE Tier 3). In 2009 alone, northern and central California residents in PG&E's service territory saved more than three MW and 40 GWh—equivalent to powering over 5,500 homes for one year—by purchasing more efficient electronics. Some of this market shift would have occurred naturally, but anecdotal evidence strongly suggests the program's effectiveness. For example, all participating retailers made large changes in the electronics that they stock and promote, and, in several cases, even chose to purchase from one manufacturer instead of another.

BC Hydro provides an example of a different approach to voluntary specifications in consumer electronics. Their two-year-long consumer electronics program began April 1, 2009, offering retailers a financial incentive for televisions that met CEE Tier 2; six months later, the program switched to CEE Tiers 3 and 4 because the average television had become significantly more efficient.

To design their program, BC Hydro needed to understand the televisions already being sold in their service territory, and provide incentive dollars only for the most efficient models. They found that the baseline was at the current ENERGY STAR level (Version 3.0), so they would need to use a higher voluntary specification, regardless of a decade of promoting ENERGY STAR and its strong level of awareness in British Columbia. BC Hydro had learned from experience that it would be best to avoid managing their own efficiency brand and specification, but they found that CEE's advanced specification for televisions met their needs. It set efficiency tiers higher than ENERGY STAR and provided for administrative responsibilities, such as qualified product lists. However, this would be the first BC Hydro program to use a CEE specification. They had taken note of CEE's work in other areas, particularly appliances, and this consumer electronics program would provide a testing platform.

BC Hydro has been extremely happy with the program's results, which they achieved through their five industry partnerships, including the two largest TV retailers in Canada. Once

retailers saw the financial opportunity that the utility offered them, their buying decisions changed rapidly, and often affected the entire nation. Consequently, BC Hydro hit its targets earlier than expected, achieving 10-15 percent market penetration in 12 months instead of the projected 18 and capturing more than 5,000,000 kWh (unevaluated) in energy savings. However, since the television market evolves so quickly, the utility is concerned that they will not be able to stay ahead of its efficiency improvements. At the moment, though, BC Hydro's efficiency program was the first in Canada to target televisions, and they believe that they have set the baseline for what can be achieved. They are expanding their retailer partnerships, looking to introduce other consumer electronics products into the program, and several other Canadian utilities, including Ontario Power Authority and Hydro Québec, are now following their lead.

Conclusion

As standards for consumer electronics products become increasingly prevalent, the opportunity for programs using voluntary specifications is stronger than ever. When used in a nimble fashion to set a course for the future, voluntary specifications have the freedom to recognize and reward new heights in product innovation in this especially challenging market.

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