Breaking the Habit… Life beyond the CFL for Efficiency Programs

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ABSTRACT

Programs promoting screw-based compact fluorescent lamps (CFLs) account for a large percentage (above 60%) of electricity efficiency savings claimed annually by some of the most established program providers. Comparatively, lighting accounts for only approximately 10-12% of the average residential household's electricity consumption.

Over the last 20 plus years, through the partnership of manufacturers, retailers and program sponsors, the lighting sector has experienced significant cost reductions, improved quality and increased availability of CFL products. This success has only strengthened the cost-effectiveness and attractiveness of CFL promotions for programs. The Energy Independence and Security Act of 2007 set the stage for taking this plum away from programs, as most residential light bulbs will now be required to be nearly 30% more efficient. The EISA requirements have fueled discussions around market transformation across the country and have raised questions about the continued support of the standard CFL through efficiency programs.

As programs wrestle with this potentially major impact to program savings while still achieving aggressive state goals for load and green house gas emissions reductions, the identification of new technologies and increase in market penetration of others takes on a new level of urgency.

Both New Jersey and Vermont have engaged in long term strategy mapping for their respective state efficiency programs and have identified significant opportunities in high growth areas, like consumer electronics. Programs can not address this industry with a simple customer rebate or educational tools, but rather requires a high-level of cooperation between programs, manufacturers and retailers, necessary to transform a market. Learning from the success of our upstream engagement with the CFL market, programs are retooling to approach these new hurdles with a combination of old and new tactics.

This paper will take a close look at these obstacles and opportunities and review one of the strategies identified for the long-term success of efficiency programs in New Jersey and Vermont.

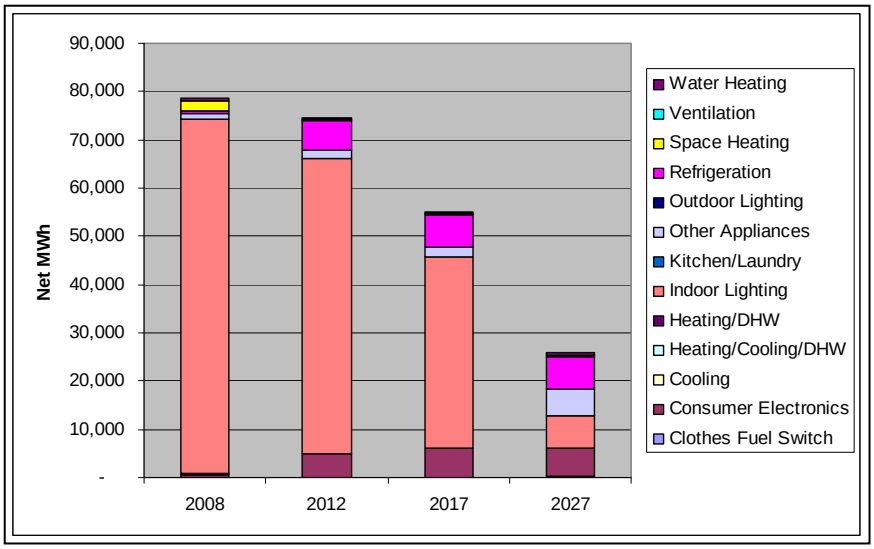
Introduction

In 2010 many efficiency programs find themselves at a crossroads in defining the state of the CFL market and the technology's central role as the primary engine for residential energy savings. After years of close collaboration between state and efficiency programs, manufacturers, retailers and government regulatory bodies, the industry has witnessed significant improvement in the quality of compact fluorescent lighting, dramatic price reductions and widespread availability in the retail market. On a parallel path to this positive trend within the efficient lighting market, the 2007 Energy Independence and Security Act and subsequent legislation mandate a nearly 30% improvement in most residential lighting applications starting in 2012.

Following a national trend, state efficiency programs in Vermont and New Jersey have initiated long term strategic plans for assessing energy savings potential, recognizing that programs will need to broaden the portfolio of measures and expect to pay a premium to maintain the same level of annual savings afforded through current CFL initiatives.

In 2009 Efficiency Vermont (EVT) completed a budget-constrained energy efficiency potential study to forecast the cost-effective residential and non-residential electricity savings that could be achieved over a 20 year period in the state of Vermont. The residential results of the study shown in **FIGURE 1 and 2** (EVT, 2009) highlight the dramatic decrease in both the incremental and cumulative savings potential after the full adoption of federal lighting standards in 2014 and 2020[1]. Even with the adoption of new appliance technologies (e.g. Heat pump water heaters and dryers), solid state lighting and other measures, the program can not sustain the same level of savings through its current incentive type programs without funding increases.

Figure 1: Efficiency Vermont 20 Yr. Residential Incremental MWh Saved, by End Use

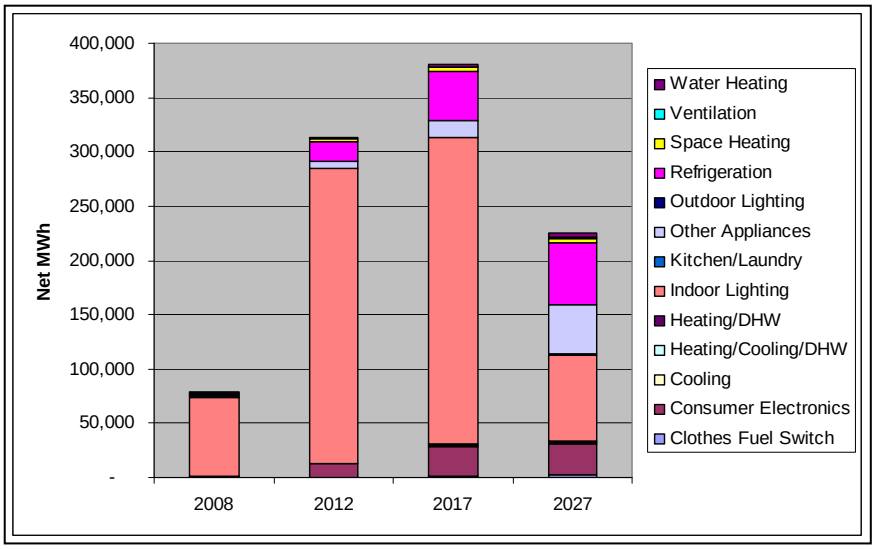


Source: Efficiency Vermont et al. 2009

The forecasted savings primarily reflect programs that support downstream consumer or homeowner incentives, midstream retailer or contractor incentives, and upstream manufacturer incentives. In all of the residential programs, calculations are made based on the per unit savings between an efficient and non-efficient product or installation practice. However, it does not account for the potential significant impact that both individual and collaborative efforts by states and utility program sponsors can have in the rapid acceleration of market transformation in specific sectors. Historically, market transformation effects have been captured at a per unit level through spillover rates in an efficiency program, but as programs focus their efforts to rapidly advance building energy codes or the market share and efficiency of specific products, new evaluation methods need to be adopted.

[1] Some of the decreased savings in the Forecast 20 report are attributed to reduced average hours of operation associated with the higher penetration rates of CFLs in homes and also lower program net-to-gross ratios.

Figure 2: Efficiency Vermont 20 Yr. Residential Cumulative MWh Saved, by End Use

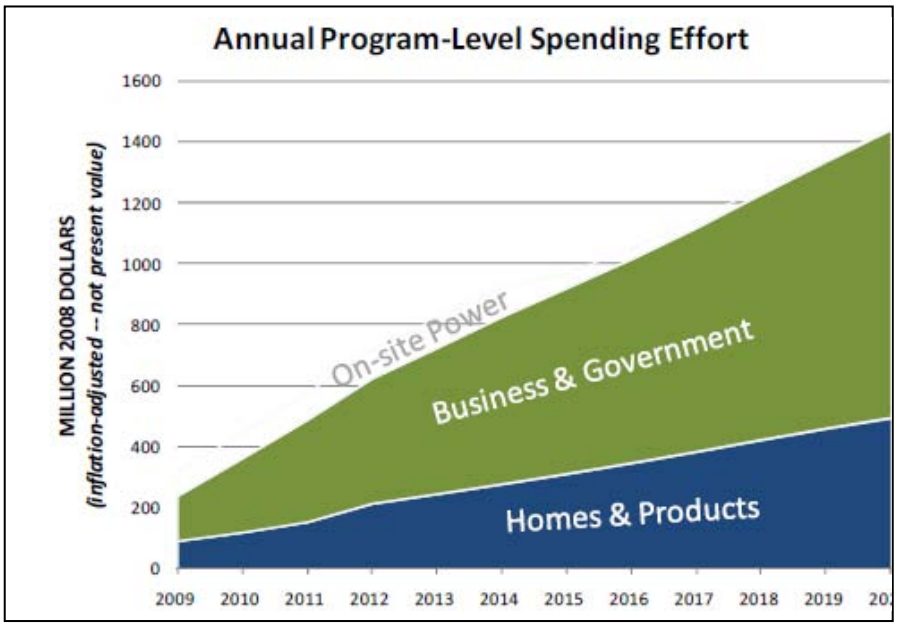


Source: Efficiency Vermont et al. 2009

Significant opportunity exists for programs to get the biggest bang for their buck from seeding market transformation, but it is also one of the largest areas of contention when it comes to evaluation and the associated savings attribution for a program. A recent baseline study for the Business and Consumer Electronics statewide initiative in California highlights the use of a "case study causality approach" (ODC 2009) to evaluate the direct and indirect savings impacts of an efficiency program's intervention by capturing changes in a market actor's decision making process on a case by case basis. In order to avoid confusion in the market and create a unified position, strong collaboration among efficiency programs though a national affiliation like the Consortium for Energy Efficiency or at a regional level in the Northeast Energy Efficiency Partnerships, allows for a magnified presence and impact on both the industry and on federal efficiency standards. However, with limited budgets and rapidly expanding product and initiative mixes, programs are becoming more selective about both the application of funds and the limited internal resources that efficiency programs can bring to bear on specific measures. It becomes paramount for national and regional partnerships to clearly document their efforts and the changes in the industry, to be able to attribute savings from these types of funded collaborative efforts for their program sponsors.

The New Jersey Energy Master Plan (EMP) released in 2008 mandates approximately 30% in cumulative heating and electrical residential savings in both the current building stock and new construction to be achieved in the state by 2020. A follow-up analysis led by the Northeast Energy Efficiency Partnerships (NEEP) laid out an actionable strategy for achieving the goals set forth in the EMP, emphasizing the need for significant increases in the residential efficiency budget to $3.8 billion over the 12 year period between 2012 and 2020 (NEEP 2009) highlighted in **FIGURE 3**.

Figure 3: Recommended Funding Levels to Meet NJ EMP Goals



Source: NEEP et al. 2009

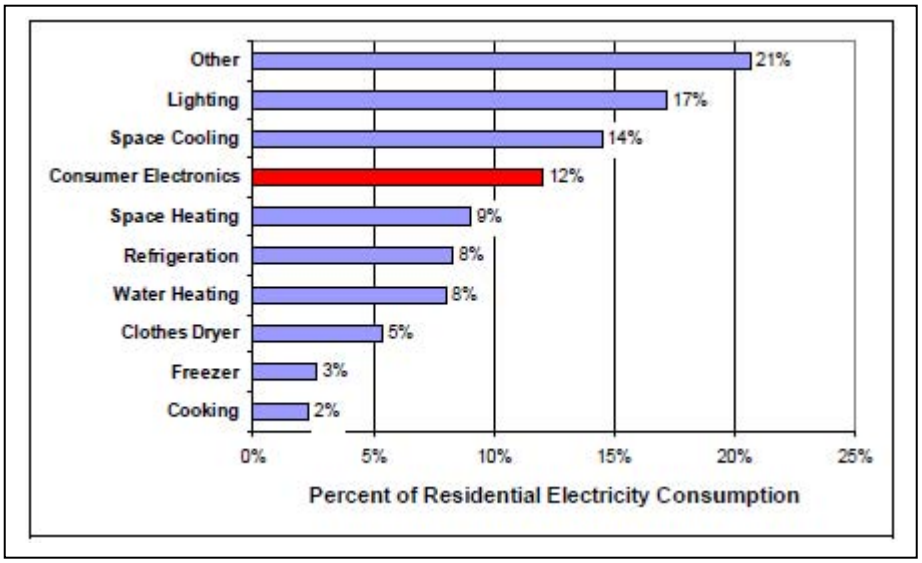
Starting in 2009, New Jersey's Clean Energy Program (NJCEP) began actively targeting new cost-effective opportunities to achieve the high level savings for residential homeowners outlined in the EMP and the NEEP report. As part of this effort, NJCEP embarked on an ambitious initiative in consumer electronics, having the end goal of market transformation within the state, but requiring a significantly different approach to the industry and the promotion of the efficient technologies.

Consumer Electronics and Set Top Boxes

With approximately 25 devices in the average US household (CEA 2009), consumer electronics is the fastest growing sector of residential energy usage. A recent report estimated that 12% (**FIGURE** 4) of residential household energy consumption is attributed to consumer electronics (TIAX 2007).

Since 2001, the EPA has been engaging the cable industry to limit the rising levels of energy consumption without restricting the access to rapid performance improvements for consumers. ENERGY STAR released a specification for efficient set top boxes in 2008, but program sponsors have been slow to pursue this opportunity due to concerns around savings attribution and limited manufacturer and service provider participation. With an average of 2.2 set top boxes per household and a dramatic shift towards higher energy consuming digital video recorder (DVR) and high definition units, the need for programs to address this sector is becoming more pressing.

Figure 4: Average Household Electricity Consumption by End Use



Source: Tiax LLC. 2007

Laying Out the Framework for a Program

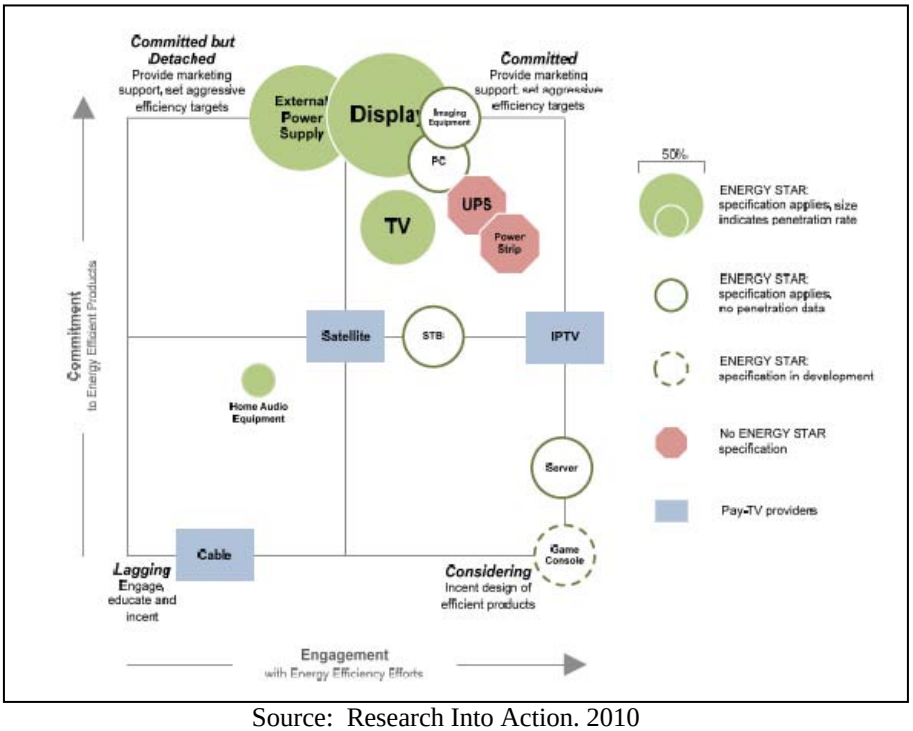
Although a comprehensive potential study was completed for BC Hydro and the Canadian Set Top Box Working Group in early 2009 (Marbek/Ecos 2009), finding both willing partners and a suitable strategy for rolling out a consumer electronics efficiency program has proved elusive. However, if there is any lesson from the rapid acceleration of television efficiency improvements over the last two years, it is that the simple act of engaging and challenging the consumer electronics industry, coupled with the roll out of a voluntary program can have a "near immediate impact" (Research Into Action 2010) on mid-stream and upstream market actors.

The graphic below in **FIGURE 5** from the BCE Baseline Study for California highlights the different levels of engagement of market actors for the consumer electronics industry. Of specific note is the relatively high level of engagement and commitment from set top box manufacturers, compared to the relatively lagging position of the telecom service providers. The further differentiation of the cable, satellite and internet protocol television (IPTV) service providers emphasizes the need to approach the industry on a case by case basis, allowing flexibility in any efficiency program to address individual strengths and weaknesses.

In 2008, New Jersey made the initial efforts to engage the state cable industry by bringing together two divisions of the New Jersey Board of Public Utilities (NJ BPU), the Office of Clean Energy (OCE) and the Office of Cable Television (OCT) to discuss the issue of energy efficiency and their role in helping meet New Jersey's EMP goals. The strategy of NJCEP was to take a carrot and stick approach to engaging the cable industry, using the funding and incremental savings of the efficiency program coupled with the regulatory purview of the OCT. After identifying the savings opportunities and desire to approach the cable industry from a voluntary, rather then regulatory perspective, New Jersey's Clean Energy Program released an request for proposal late in September of 2009 for the promotion of ENERGY STAR qualified set top boxes as part of a broader efficient consumer electronics initiative. The RFP targeted

retailers, service providers and other efficiency service providers and included ENERGY STAR qualified televisions, set top boxes, desktop computers and monitors.

Figure 5: Consumer Electronics Quadrant Analysis by Product Type



Source: Research Into Action. 2010

Following the release of the RFP, in November of 2009, the NJ BPU OCE and OCT divisions invited regulated cable service providers to a meeting to discuss the opportunities for partnership with the state efficiency program and open a dialogue for further engagement. A key development early in the process was the recognition that although the EPA engages all cable service providers[2] at the corporate level through technical and policy staff, there is an altogether separate level of operational personnel at the regional or state level. In the state of New Jersey, the 2.6 million cable subscribers are served by seven cable providers and another approximately 500,000 satellite subscribers by two direct broadcast satellite (DBS) providers. Despite this concentrated set of market actors, within the 566 municipalities in New Jersey, there are 563 municipal franchise areas. This highlights the multi-faceted face of the cable industry as it has different roles and motivations at the national, state and community level, but all tied to a single actionable technology for an efficiency program.

Identifying Strong Partners & Learning the Industry

As part of their successful proposal for the 2009 RFP, Ecos Consulting proposed acting as a third party administrator to assist cable service providers in designing targeted programs to accommodate both the needs of the cable industry and that of NJCEP to achieve both energy savings and market transformation within the state. Ecos brought a wide array of experience having worked with the National Resources Defense Council (NRDC) in 2007 identifying

[2] Cable, satellite and IPTV service providers

energy savings opportunities within the United States for set top boxes and provided technical support to Marbek Consulting on a set top box potential study (Marbek/Ecos 2009) on behalf of BC Hydro and a broader Canadian coalition. Due to the constrained timeline and budget, Ecos identified Comcast, the largest cable service provider in both New Jersey and nationally (**FIGURE 6**), as a single partner for the 2009 pilot.

Figure 6: Top Ten Cable Multiple System Operators in US

Rank	MSO	BasicVideoSubscribers
1	Comcast Corporation	23,759,000
2	DirecTV	18,441,000
3	Dish Network Corporation	13,851,000
4	Time Warner Cable, Inc.	12,964,000
5	Cox Communications, Inc.[1]	5,247,000
6	Charter Communications, Inc.	4,879,000
7	Cablevision Systems Corporation	3,066,000
8	Verizon Communications, Inc.	2,708,000
9	Bright House Networks LLC	2,283,000
10	AT&T, Inc.	1,817,000

Source: NCTA 2009

For an efficiency program, the cable industry is unique in that customers are limited in both their choice of service providers and the available set top boxes that offer the functionality that they seek. In this case, the opportunity to impact an efficient buying decision lies largely at the service provider and manufacturer level, rather then at the consumer level. Additionally, the service provider is programming the set top box to operate on their networks, which can significantly change the energy performance of the unit. For this reason, ENERGY STAR created a two-pronged specification that addressed both the manufacturer and service provider's role in the labeling process.

Through partnering with Comcast and during preliminary discussions with other service providers, it became apparent that service providers needed to warm to the concept of promoting energy efficient set top boxes if not all of their units were ENERGY STAR qualified. Typically a service provider will push a technology out to its customers and will not be particularly receptive to the concept of creating customer demand for a type of product that they might not be able to satisfy. Additionally, the service provider's existing systems and processes did not immediately allow for tracking distinct set top box models or assessing the availability of newly purchased ENERGY STAR units.

Looking Under the Hood and Understanding the Potential

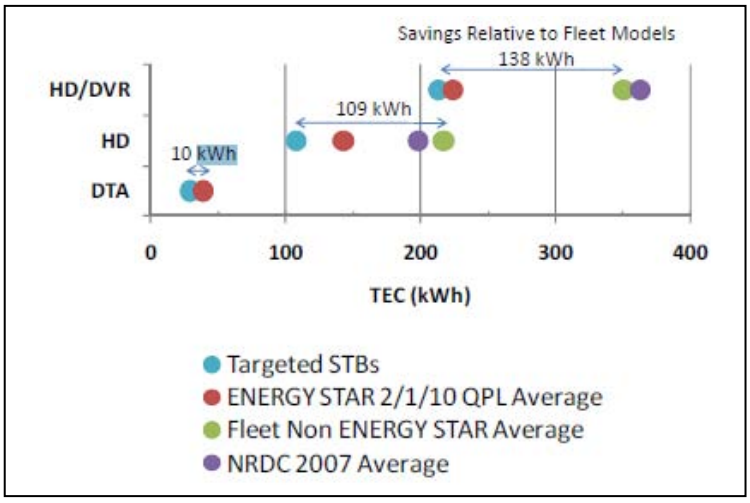
It is important to work closely with the service provider to collect the data for both definition of the baseline deployed fleet of set top boxes in a region as well as defining an appropriate programmatic approach. The market is seeing a rapid increase in penetration of high definition and DVR set top boxes, as in just over 3 years after the introduction of DVRs, over

30% of households contain at least one DVR set top boxes and 30% of those households have two or more units (Nielsen 2009). In this same survey data from Nielsen, it was noted that satellite, at 40%, has a disproportionate share of the DVR market when compared to their national cable subscription levels. Defining this baseline allows for understanding the energy savings potential, identifying the opportunities for program engagement and gauging the impact of the volunteer program in the specific region that both the service provider and EEPS operate.

The initial scoping of the cable set top box fleet in New Jersey (**Figure 7**) tracks very closely to the national averages from 2005 (NRDC 2007). Based on average baseline and ENERGY STAR Tier 1 values from the Canadian potential study (Marbek/Ecos 2009), the incremental per unit annual savings were estimated at 94kWh. In order to maximize savings during the pilot phase of the program, a mixture of HD and DVR set top boxes were incented during time of replacement. Recognizing that there was little opportunity to initially impact the current stock of new ENERGY STAR units in the service provider's regional warehouse, a higher emphasis was placed on creating the proper tracking and identification of the targeted set top boxes in the deployed fleet.

Early retrofit initiatives are another option for programs, but the high per unit cost to compensate the service provider for a loss of revenue limits the cost-effectiveness. However, if this becomes a potential opportunity to up sell a current subscriber to a higher performance unit and avoid a second truck roll, service providers might see a mutual benefit.

Figure 7: Estimated Savings for STBs Deployed in New Jersey



Source: Ecos 2010

Goodwill for Cross-Promotion of EE Programs

One of the clear advantages of partnering with a regulated industry is that the regional service providers are predisposed towards building goodwill with the state. Given the opportunity to avoid regulation and control the energy efficiency messaging regarding efficient set top boxes, Comcast has offered access to their multi-media platforms to promote NJCEP and create customized content for viewers.

NJCEP is exploring the use of public service announcements, newsmaker interviews with efficiency program representatives and the development of Video On Demand content for Comcast subscribers to learn more about energy efficiency in their home. This capacity to build

off of the strengths of a partner, offers the promise of a longer term role for the service provider as part of the efficiency community. Additionally, the cable operator may have the potential to leverage their work with the efficiency community in working with potential advertisers such as energy utilities and consumer electronics retailers.

With the advent of Tru2Way, a licensed two-way cable software platform being deployed on a variety of consumer electronics products, the coming years are likely to see an exponential growth in both the functionality and diversity of cable services, allowing for an internet type of interactivity from previously uni-directional devices. Although increased performance typically tracks energy usage, the introduction of digital televisions supporting Tru2Way can eliminate the need for a separate set top box to receive content from a service provider. Additionally, with the advent of new home energy management tools and smart meter technology, efficiency programs may be able to engage homeowners in a real time learning process to significantly change energy use behaviors.

Conclusion

As energy efficiency programs tap into new efficient technologies and initiatives to counterbalance the declining savings attributed to the increased market adoption of CFLs, the potential for cost-effective collaborative efforts in consumer electronics offers a unique opportunity. This type of collaboration requires adapting the somewhat rigid nature of the evaluation of efficiency programs to accommodate the need for savings attribution to reflect the high level of engagement with upstream market actors in accelerating efficiency gains in products. Additionally, to allow for the maximum potential for voluntary program intervention, EEPS must design programs with the flexibility to engage partners at varying levels to accelerate the adoption of efficiency in different markets.

New Jersey's foray into the program design and roll out of an efficient set top box initiative, has also led to a broader understanding of the potential for cross-promotion and collaboration, not only within state efficiency programs, but also through the support of state regulatory bodies.

The rapid proliferation of HD and DVR technology in the market over just the last couple of years and the significant energy savings of ENERGY STAR qualified set top boxes emphasizes the urgency of engaging the industry. The relatively high per unit cost of a retrofit or early retirement approach makes the cost of lost opportunities for new purchases that much more significant. Further savings within the industry will likely only be accomplished through even greater collaboration between the cable industry, efficiency programs and regulators as major software and hardware infrastructure changes will be needed.

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