

# **Savings Without Rebates: Moving Toward Claiming Savings from Market Transformation**

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## **ABSTRACT**

Claiming savings for market transformation efforts is becoming an increasingly important issue for energy efficiency program administrators. To the extent that strategies focus on upstream market supply chains, or education and training to change standard practice of market actors, appropriate methods of determining savings rely on observation and measurement of market impacts rather than tracking of customer participation or rebates. While regulators historically have been comfortable with relatively easy-to-measure savings associated with tracking installed measures or participating customers, many are hesitant to rely on harder-to-measure market impacts in evaluating the savings achieved by efficiency program administrators.

Similar issues regarding the accelerated implementation of more stringent building energy codes and equipment efficiency standards also challenge regulators and implementers. As it has been realized that savings from the early adoption of codes and standards can dwarf many other common efficiency program strategies, there is a corresponding challenge to determine the extent to which these savings can be attributed to the efficiency efforts of program administrators.

This paper reviews selected recent experience with some of these issues in the Northeast, Midwest, Northwest, and California. This experience is then used to consider how one state facing these issues might move forward toward greater consideration of savings attributed to market effects.

## **Introduction**

As energy efficiency has increasingly come to be recognized as a full-fledged and significant component of energy resource portfolio in numerous jurisdictions, considerable sophistication has been developed in the quantification of the resource savings associated with efficiency program implementation. Regulators have developed a level of comfort with standard methods of program evaluation and savings attribution that has been adequate, in varying degrees, to support resource planning decisions, determination of efficiency program funding levels, and/or determination of performance incentives for program administrators. They have developed a reasonable level of confidence in systems that rely on standard, well-documented monitoring and verification (M&V) protocols, accurate program activity tracking systems, carefully scrutinized estimates of deemed savings, and impact evaluation techniques ranging from metering studies to pre-post billing analysis. This approach has worked particularly well for program strategies that have been focused on end-use customers, such as marketing, recruitment, participation, and payment of incentives. However, as strategies focus on influencing the entire supply chain for a product or service, program efforts have increasingly shifted from the participant to mid- and upstream market actors: contractors, retailers, distributors, design and construction professionals, and manufacturers. These efforts at influencing markets and

stakeholders have raised questions about whether and how we can fully and accurately measure savings associated with market effects generated by our market transformation efforts.

Efforts to quantify market effects, and regulators' willingness to accept these estimates, vary considerably throughout the country. This paper provides a brief review of how some market effects and other savings attributions not directly tied to program participation are measured and considered in several jurisdictions. Specific examples related to residential products, building operator training, and energy codes and standards illustrate similarities and differences in approaches. This provides a context for then considering the situation and directions that one jurisdiction is faced with in addressing these issues.

## **Some Current Approaches to Measuring Market Effects**

### **Losing Track of the Customer**

Efforts to measure market effects recognize that programs can and should have a broad influence beyond direct customer participation. In fact, many efficiency programs are now implemented with no incentives directed to customers, and accordingly, no effort to track or measure "in-program" participation. Programs following this model include NYSERDA's ENERGY STAR<sup>®</sup> Products program and the successful efforts by the Northwest Energy Efficiency Alliance to increase the market share of ENERGY STAR windows. Numerous challenges exist in using changes in market share as a measure of market effects, and in calculating program savings.

Similarly, successful efforts to stimulate the residential lighting market in the Northeast and Northwest through manufacturer buydowns and retailer markdowns do not provide direct measurement of program participation. While the total product shipped or sold through a given promotion is known, which customers and how many buy the product can only be ascertained by subsequent program evaluations.

### **Spillover and Free-ridership**

Accounting for some aspects of market effects has certainly been part of many past program evaluations. Specifically, program evaluations have often attempted to estimate levels of free-ridership and program spillover (participant and non-participant) as a method for adjusting gross savings claims in order to develop estimates of net savings. Not surprisingly, the treatment of both free-ridership and spillover varies significantly across program administrators and regulatory jurisdictions. A recent report by the Northeast Energy Efficiency Partnerships addresses the need for common evaluation protocols and how free-ridership and spillover are considered in each of the eight Northeast states with active gas and / or electricity efficiency programs. Table 1 summarizes the significant variation across the Northeast with regard to whether these factors are currently used to adjust gross savings estimates to capture market effects better. Even among the six New England states, all part of the same regional independent system operator – ISO New England – there are significant differences in the treatment of both free-ridership and spillover.

**Table 1. Summary of Spillover and Free-Ridership Adjustments in the Northeast**

State	Spillover		Free - Ridership
	Participant	Non- Participant	
<b>Connecticut</b>	Yes	Yes	Yes
<b>Maine</b>	No	No	No
<b>Massachusetts</b>	Yes	Yes	Yes
<b>New Hampshire</b>	Yes	Yes	No
<b>New Jersey</b>	No	No	No
<b>New York</b>	Yes	Yes	Yes
<b>Rhode Island</b>	Yes	No	No
<b>Vermont</b>	No	Yes	Yes

Source: Northeast Energy Efficiency Partnerships, 2006

### **Savings from Counting Widgets vs. Measuring Markets**

Over the past decade, substantial system benefits funds have supported the sale, stocking, and promotion of ENERGY STAR lighting products (compact fluorescent bulbs [CFLs] and fixtures) and appliances (primarily clothes washers, and in some jurisdictions, refrigerators, room air conditioners, and dishwashers). Many program administrators continue to use traditional evaluation methods to claim savings for these program efforts. Typically, gross savings are generated by a “bottom-up” approach. Program tracking systems provide rebate numbers and estimated per-unit impacts. These gross savings are then adjusted for free-ridership, participant spillover, and, less frequently, for non-participant spillover. Estimates of free-ridership and spillover are nearly always based on participant and non-participant customer surveys.

What these approaches fail to capture is a larger view of the affected market – a “top down” perspective. Recent evaluations in New York, Massachusetts, Vermont, Wisconsin, and the Northwest have all attempted to measure changes in market structure without having to rely exclusively on counting rebates and then adjusting gross savings based on possibly unreliable self-reporting of free-ridership and spillover. Rather, these states examine program efforts in the context of a regional or national market for the targeted product or practice.

In Vermont, Massachusetts, and Wisconsin, new models use reported ENERGY STAR product market-share information for the program, and compare these data to other states without efficiency programs. This approach provides a broader, and potentially more accurate, estimate of a program’s effect on the penetration of the targeted product. It does not rely on limited non-participant responses to estimate the total penetration of the technology in the market. Similarly, program attribution is not based primarily on participant responses to the typical series of nested free-ridership survey questions. Some questions have been raised, however, regarding the extent to which states without programs may have been impacted by the collective efforts of states with programs.

This approach has been applied to appliances with some provocative results. Recent appliance evaluations in Vermont and Wisconsin show a considerable difference in estimated program attribution based on analysis of various clothes washer market share and sales data. In Vermont, the calculated net-to-gross ratio for the 2004 ENERGY STAR clothes washer program was estimated to be between 0.09 and 0.17 (KEMA, Inc. 2006). In contrast, Wisconsin estimates a net-to-gross ratio of 0.91 to 1.18 for its 2004 clothes washer program efforts (Talerico &

Winch 2005). While the program offerings differed between the two states, as did the comparison “no program” datasets, the differences in the reported program effects are striking. Indeed, while there has been considerable speculation and suggested explanation, it is hard to reconcile such dramatic differences between the two studies. A similar regression-based approach was employed in Massachusetts. While a net-to-gross ratio was not explicitly calculated (Nexus Market Research et al. 2005a, b), the authors of the Vermont study claim that the findings from the Massachusetts analysis, which also employed a detailed regression analysis, were consistent with theirs. These evaluation efforts have, to some extent, created more questions than answers, and may not yet provide a clear basis for adjusting savings claims.

In comparison, recent evaluations using similar techniques for retail CFL programs found net-to-gross ratios for ENERGY STAR in Wisconsin (Talerico & Winch 2006) and Vermont to be much more similar: 1.00 and 1.22-1.36, respectively.

In the Pacific Northwest, program market effects not only are recognized by the Northwest Power Planning Council, they are responsible for a large portion of total program savings claimed by the region’s utilities.<sup>1</sup> The basis for the calculation and claiming of market effect impacts is significantly different in the Northwest than in the Northeast or Midwest. There is little concern with determination of net-to-gross ratios as power planning forecasts are adjusted by gross, not net, savings. Attribution of savings is not as important a concern – there are no explicit free-ridership or spillover adjustments, though it is considered in how program resources are allocated. Potential programs with high free-ridership may generate large gross savings, but continued funding of these efforts may not be an efficient use of limited ratepayer funds.

Northwest regional savings are calculated from a specified “frozen efficiency,” with savings above this baseline assumed to be the result of program market effects. For some programs, these market effect savings are large. In 2005, approximately 6.3 million CFLs were sold in the four-state region (Washington, Oregon, Idaho, and Montana), compared to assumed baseline sales of 0.8 million CFLs. Of those CFLs sold, 2.1 million were rebated by utility programs, resulting in approximately 3.4 million CFLs claimed as market effects by the Northwest Energy Efficiency Alliance (NEEA). Of the 48 adjusted megawatts of savings claimed for programs coordinated by the Alliance on behalf of its member utilities in 2004, 35 adjusted megawatts were the result of market effects from NEEA programs (Alliance 2005).

Measuring market effects based on changes in state and local markets presents numerous on-going challenges to evaluators. Most critical of these is the ability to collect consistent in-state/region sales data and to have comparable data available for other parts of the country. For some products, e.g., ENERGY STAR appliances, there are state-level market share data available from a subset of retailers. These data have been reported quarterly by ENERGY STAR<sup>2</sup> and are often supplemented by state-level sales collection from either a census or sample of participating retailers. In some jurisdictions, e.g., NYSERDA and the Northwest, retailer participation is predicated on the provision of sales data. For other products such as CFLs there has yet to be a concerted effort to implement a consistent national and state-level sales and market share tracking and reporting system (Itron, Inc. 2005).

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<sup>1</sup> While the Power Planning Council is not a utility regulatory body, it does have regional responsibilities for system planning, including developing efficiency-adjusted forecasts of demand.

<sup>2</sup> Though no 2005 market share data have yet been made available. Historically, there is an approximate six-month lag in the reporting of the quarterly market share data by ENERGY STAR’s contractor, D&R International.

## **Savings from Influencing Building O&M Practices**

While raising issues somewhat different from measuring market effects, there are similar challenges in measuring the impact of training programs. Can program administrator-supported training efforts to influence energy efficiency operating practices in commercial and industrial buildings yield measurable and defensible savings? The answer, at least for some programs, appears to be yes.

The Builder Operator Certification (BOC) program "...is a nationally recognized training and certification program for building operators offering improved job skills and more comfortable, energy-efficient facilities" (BOC 2006). The program is licensed by the Northwest Energy Efficiency Council and has been most active in the Northwest and in the Northeast, with program evaluations conducted by NEEA and the Northeast Energy Efficiency Partnerships (NEEP) in their respective regions. To date, several thousand building operators have been certified through the BOC program.

The NEEA evaluations consist of a series of seven Market Progress Evaluation Reports (MPER) that span 1998 to 2001 (NEEA 2006). NEEP has completed two evaluations of their BOC program offering, the most recent one completed in 2005 (RLW Analytics 2005). Through detailed participant interviews, both NEEA and NEEP developed a series of program cost and savings estimates. The final NEEA evaluation estimated impacts of approximately 0.5 kWh per square foot per year for facilities operated by BOC graduates (Research into Action 2001). The most recent NEEP evaluation calculated savings at 0.35 kWh per square foot per year. NEEP also estimated both fossil fuel and water savings impacts. None of the evaluations attempted to measure any non-participant spillover effects of BOC training and certification.

NEEA and its members claim savings for the BOC program based on the MPER impacts. In the Northeast, several BOC sponsors are now claiming savings for their BOC enrollees based on the most recent program evaluation, and several additional sponsors are expected to do so in future regulatory filings. One of the motivations for NEEP's second BOC evaluation was to support the savings estimates generated in NEEP's first BOC evaluation. Prior to the 2005 evaluation, only two BOC sponsors were claiming savings as there were some concerns regarding the rigor of the first analysis and subsequent regulatory acceptance.

## **Savings from Codes and Standards**

The most extensive experience in assessing the impacts of program administrator support for building energy codes and appliance efficiency standards ("standards") has been in California. In no other state has there been the level of program administrator commitment and resources in supporting the development of new and revised efficiency standards and building energy codes. From 2000 through 2005, California utilities are estimated to have spent approximately \$15 million to support standards and code development and related activities. (Mahone et al. 2005)

California has long been recognized as a leader in the development and promulgation of building energy codes and minimum appliance efficiency efforts through its Title 20 and Title 24 activities. In 1998 the state's utilities began work, using ratepayer funds, on their codes and standards enhancement (CASE) initiative. In 2000 the California energy crisis resulted in the granting to the California Energy Commission (CEC) the authority to undertake an emergency rulemaking to adopt new standards. The utilities were able to respond with 14 proposals for new

or updated standards as a result of their CASE work. In the next standards cycle (adoption in 2003, effective in 2005), CASE provided critical support for the eventual adoption of eleven additional standards changes. Work on a third standards cycle is under way, with expected adoption in late 2006 and with implementation in 2008.

Through 2005, the California utilities' standards work was classified as information-only programs and no savings claims were made for their standards efforts. Expenditures for standards activities were treated as general program administration costs. Starting in 2006, the utilities plan to claim savings associated with their standards efforts. The important role of standards in the state's energy efficiency portfolio has been recognized by the California Public Utilities Commission and by the California Energy Commission as the most cost-effective way to achieve energy efficiency.

Two related studies were completed in 2005 that put forward both the policy argument and a proposed methodology to claim savings from standards efforts and to attribute some portion of these savings to the utilities' standards activities (Mahone 2005). These studies estimate that 15 percent or more of California's aggressive utility 2006-2008 energy goals will be met through standards efforts.

Not surprisingly, these two studies identified several challenges in both determining savings from state standards efforts and assessing what proportion to attribute to the utilities' activities. These included changing baselines, addressing multiple standards cycles, market size, interaction among other efficiency programs and standards, and varying compliance rates. For attribution, a score was developed for assigning weights and scores to five factors:

- Importance of Energy Efficient Products in the Market
- Effort Needed for Test Methods/Research
- Innovativeness of Standards Idea
- Preparation of CASE Analysis
- Worked with Stakeholders and Public Process

This scoring and weighting process was applied to 21 appliance standards and to 14 building code standards. For the examples cited in the report, the total proposed weighted utility attribution scores ranged from 95 percent (residential pool pumps) to 45 percent (refrigerated beverage vending machines). These scores assign significant portions of code savings from standards to the utilities' past and on-going standards efforts.

## **Consideration of Market Effects by Efficiency Vermont**

### **Efficiency Vermont's Savings Claims**

Vermont has had a statewide administrator of ratepayer-funded energy efficiency since it established a performance-based contract mechanism for this function in 1999, under the name "Efficiency Vermont" (Hamilton & Dworkin, 2004). The efficiency utility operates under a contract that includes a negotiated set of performance indicators, with a considerable portion of contractor compensation contingent on the achievement of savings goals. These indicators have included MWh savings, summer and winter peak MW savings, and total resource benefits. In this context, there is considerable importance in both setting performance indicators that reflect

regulator's policy goals and in having sound M&V methods to measure success in achieving these goals.

Quantifying the MWh and MW savings goals as negotiated by Efficiency Vermont and the Public Service Board is accomplished through a combination of prescriptive and custom savings analyses documented in a Technical Reference Manual (TRM). Free-rider and spillover factors are applied to all savings estimates, and vary by the sector or track. These free-ridership and spillover estimates are occasionally reviewed by Efficiency Vermont and DPS and renegotiated as a result of changing market conditions or evaluation findings.

Once the performance indicators are established at the start of the contract period, they are frozen unless a change in Efficiency Vermont's forecasted operating budget necessitates an upward or downward revision to the goals. Performance goals are not revised simply due to the impacts of changing market conditions or latest evaluation findings. However, claimed savings for programs or technologies may be adjusted. The DPS regularly commissions impact and process evaluations that are used to assess if changes to savings algorithms or free-ridership and spillover adjustments are necessary. Such changes may be made at any time in the contract cycle.

### **Market Effect Claims by Efficiency Vermont for Select Program Activities**

**Building operator certification.** Currently, Efficiency Vermont supports NEEP's BOC training program. Twice a year Efficiency Vermont recruits Vermont facility operators to attend the training class. Efficiency Vermont covers the cost for the training facility room and subsidizes the cost of the training for the participants by 40 to 50 percent, depending on whether they are associated with for-profit, non-profit, or municipal facilities.

At present, Efficiency Vermont does not track square footage of facilities managed by graduates or attempt to claim any kWh savings from its support of BOC training. The BOC effort is currently viewed as purely a market transformation effort that will yield documented savings as the facility managers engage with Efficiency Vermont in the future for prescriptive or custom equipment retrofit or end of life equipment replacement. Note that NEEP's most recent BOC evaluation did quantify cost-effective savings from BOC graduates over and above any measures they installed through efficiency program.

**Building codes and efficiency standards.** Efficiency Vermont undertakes extensive code- and standards-related efforts as an acknowledged component of the multi-year contract with the state's utility regulator, the Public Service Board (PSB). These efforts operate on two levels: First, to make current residential and commercial codes common practice; and second, to continue development and consensus-building toward future increased efficiency levels in these codes. The education and outreach efforts to builders and design professionals are fully integrated into the delivery of program services working with the market. Efficiency Vermont provides valuable code training and education to the market, while builders and design professionals who work with Efficiency Vermont have an easy and simple path for establishing code compliance. Considerable resources are dedicated to this code effort, including the development and publication of reference guides and technical manuals that integrate advanced building techniques with code education and compliance. Efficiency Vermont also supports regional efforts to improve building codes and through support of NEEP's initiative in this area. Similarly, Efficiency Vermont supports regional efforts to improve equipment and appliance

efficiency standards through NEEP. In addition, the Legislature calls upon Efficiency Vermont to provide information and technical support regarding legislative options for upgrading energy codes and standards. Despite this considerable investment of resources, and the presumed benefit, there is as yet no accounting for any savings associated with these code and standard efforts. This continues to pose resource allocation issues for both the regulator PSB and the contractor. How can there be a clear understanding about the level of effort which the contractor should put into code and standards work without some means to measure and value the results?

**Determination of program savings through top-down market impact analysis.** As noted above, Vermont’s most recent appliance and CFL evaluations produced some provocative results. Table 2 compares these evaluation-derived net-to-gross ratios to the corresponding program free-ridership, spillover, and combined multiplier estimates. These agreed-upon deemed savings assumptions are those currently documented in Efficiency Vermont’s TRM. The combined multipliers are the product of the TRM free-ridership and spillover estimates and are used to derive net program savings estimates.

**Table 2. Comparison of Efficiency Vermont Net-to-Gross Ratios**

	<b>Bottom-Up Savings (TRM) Free-ridership</b>	<b>Bottom-Up Savings (TRM) Spillover</b>	<b>Bottom-Up Savings (TRM) Combined Multiplier</b>	<b>2005 Evaluation Net-to-Gross Ratio</b>
<b>Clothes Washers</b>	0.95	1.20	1.14	0.09 – 0.17
<b>CFLs</b>	0.95	1.25	1.175	1.22 – 1.36

Source: Efficiency Vermont, 2006; KEMA 2005

These results, particularly for clothes washers, do not, without further exploration, suggest a simple adjustment to prior savings estimates, nor immediately adopting the net-to-gross ratios derived from Efficiency Vermont’s most recent program evaluation.

**Some Options for Increased Consideration of Market Effects in Vermont**

Any changes to current methods for measuring and attributing savings would be subject to deliberation by various parties and determined by the Public Service Board. Among the options that could be considered as next steps would be the following:

**Building operator certification.** The results from the recent BOC evaluations suggest that this is an area where new savings measurement and attribution would be appropriate and useful. While Efficiency Vermont does not currently track data on the square footage of the buildings that past and current BOC graduates manage, this could be done, as it has in other jurisdictions.

**Codes and standards.** The recent work in California to develop a framework for quantifying the savings that could be attributed to efficiency program administrators provides an unanticipated opportunity to consider a similar approach in Vermont. While the history and current activities are different, California’s approach would appear to be adaptable to Vermont. However, the level of resources that California has allocated for these savings and attribution determinations may represent a barrier to fully replicating the California approach. Alternatively, these analyses could be pursued on a regional basis.



**Determination of program savings through top-down market impact analysis.** The recently completed market impact evaluations for appliances and CFLs have raised important questions about understanding market effects. Although Vermont has moved into the forefront of program administrators taking a market-based approach to assess program impacts, it is not yet known how these findings will be used to inform current savings claims through the TRM process.

While Vermont is not alone in its use of a market-based approach to assess the impacts of its residential lighting and appliance efforts, it is possible that the newness of the approach may argue for a more careful examination of the underlying methodologies. Potentially this could be done through a larger regional (NEEP) or national (Consortium for Energy Efficiency) forum to determine if there are some minimum requirements for the type of market-based assessments that have been completed in Vermont, New York, Massachusetts, Wisconsin, the Northwest and in California.

## Summary and Conclusions

Increasingly, utilities, regulators, and other stakeholders are taking a more market-based approach to measuring efficiency program savings. This evolution in evaluation is in response to increased efforts to influence markets through up- and mid-stream interventions with contractors, retailers, manufacturers, and others. Such program designs do not lend themselves as well to more traditional methods of estimating savings based on tracking program participant activities. Further, training programs and program administrator efforts to accelerate the adoption of codes and standards also require different approaches to measuring savings impacts and to determining the extent to which savings can be attributed to program administrator activities.

As with any new or evolving evaluation approach, there appear to be some possibly significant differences in the ways in which market effects and program attribution are measured. While some of these differences may reflect dissimilarities in program approaches, these differences might also be due to different evaluation methodologies and definitions. Efforts such as those by NEEP to develop regional evaluation protocols may help in narrowing these differences, as well as to increase the likelihood that the resulting savings estimates will be accepted by regulators and others; e.g., regional independent system operators.

Efficiency Vermont's recently completed program evaluations and other evaluation efforts point to a potentially expanded view of savings claims for its efficiency efforts. For product programs such as ENERGY STAR lighting and appliances, market-based evaluations may generate more accurate assessments of free-ridership and spillover, and of the resulting net savings. However, these more "top-down" evaluation results have not yet been reconciled with the current TRM net-to-gross ratio estimates.

For other program activities, such as BOC training and codes and standards support, there appear to be opportunities for Efficiency Vermont to claim savings for ongoing and future activities. Given the acceptance of BOC evaluation savings claims by regulators in both the Northwest and the Northeast, it may be appropriate for Efficiency Vermont to propose savings claims for its BOC efforts. The ability to claim savings for Efficiency Vermont's significant codes and standards work, however, may be more of a challenge. While program administrators in California are claiming savings for their codes and standards work, it is not yet clear whether this approach is fully replicable in Vermont. Again, a more regional approach to this opportunity may better allow for the resources necessary to undertake the required savings and attribution analysis.

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