

What Does It Take to Turn Load Growth Negative? A View from the Leading Edge

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ABSTRACT

Utilities and policymakers are increasingly considering massive implementation of energy efficiency as a key strategy in achieving greenhouse gas reduction targets, as well as an effective mechanism for acquiring least-cost resources. While energy efficiency has historically been seen as a tool that could reduce the rate of load growth, we are now entering an era with a new, emerging priority: turning load growth negative. What will it take to do this? What might it look like? Some indications and examples in recent experience can be seen where the most aggressive efficiency efforts have been implemented. In Vermont, the underlying load growth has been approximately 1.45%, slightly less than the current national average. For several years, Vermont has had the highest statewide rate of investment in energy efficiency and a correspondingly high rate of savings. In 2007, increasing efficiency efforts in Vermont resulted in a savings rate of 1.74% of annual sales per year, effectively turning load growth negative. Getting to this point has required strong political and regulatory leadership, development of innovative approaches and strategies, high levels of partnership with key market actors, and unprecedented commitment of human resources. This paper provides the latest results from the leading-edge “laboratory” that Vermont provides in pursuing unprecedented levels of efficiency resource acquisition.

Introduction

Policymakers are calling for energy efficiency resources to deliver unprecedented contributions to meet our future energy needs. Some analyses of what it will take to reach stabilization goals for greenhouse gas emissions are concluding that efficiency is the least-cost option to meet 25% to 50% of those goals (see, for example, McKinsey & Company, 2008). State-level and utility least-cost-planning and procurement analyses are increasingly concluding that resource plans should *start* with energy efficiency, and then anticipate that efficiency resources will meet large portions of future need.¹ Efficiency has historically been seen as a resource that could somewhat reduce load growth; however, it is now being recognized not only as having the potential to offset load growth, but to turn it negative.

Turning load growth negative through efficiency is uncharted territory. But experience from those who are implementing the most aggressive efficiency efforts can offer some indicators and suggestions of what sustained, deep efficiency efforts might look like.

¹ Recent examples include California, Rhode Island, Connecticut, Massachusetts and Maryland in addition to Vermont.

Vermont has some factors that have facilitated progress in securing deep energy savings, including supportive legislative and regulatory policies and an environment of high public awareness and interest in environmental and energy issues. On the other hand, Vermont also faces some high barriers to achieving deep savings. These include many years of prior efficiency efforts, relatively high efficiency baselines, a highly rural distribution of customers, and very low electric space heating and air conditioning saturation (and thus less opportunity for savings in these end uses). While Vermont does not have a relatively large industrial base, Vermont's electric load is somewhat representative of the national breakdown: 1/3 residential, 1/3 commercial and 1/3 industrial. On balance, there is reason to believe that the Vermont experience can be relevant to other jurisdictions. The structural features and operating principles that are the focus of this paper are certainly not limited in their application to other jurisdictions.

Vermont's Performance and Possibilities

Vermont's efficiency resource acquisition has grown to the point that it has offset underlying load growth--in 2007--for the first time. Due to year-to-year fluctuations in statewide energy use, associated with other variables such as weather, turning load growth negative is best evaluated by expressing the savings that were achieved as a percentage of sales:

$$(\text{energy savings}) \div (\text{actual energy requirements} + \text{energy savings})$$

The savings as a percent of statewide requirements can then be compared to estimates of underlying growth rate without efficiency. With energy efficiency savings at 1.74% of Vermont electric sales in 2007, and a forecast underlying growth rate of 1.36%, it is readily concluded that efficiency resources are now more than offsetting the underlying growth rate.

Figure 1. Rate of Vermont Efficiency Resource Acquisition Relative to Load Growth

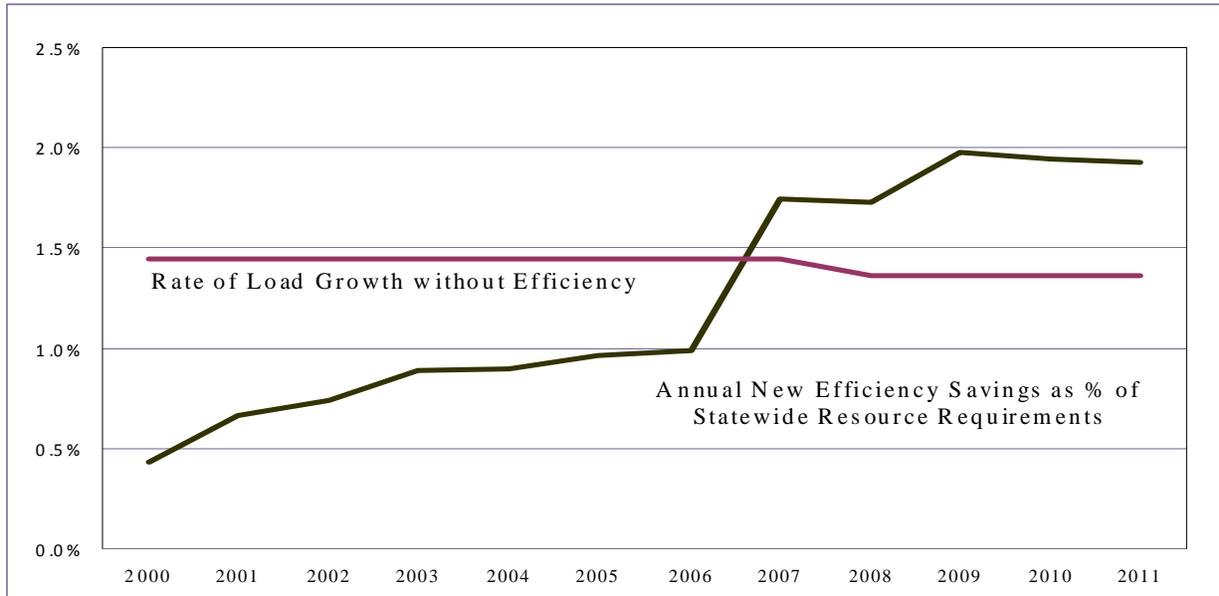
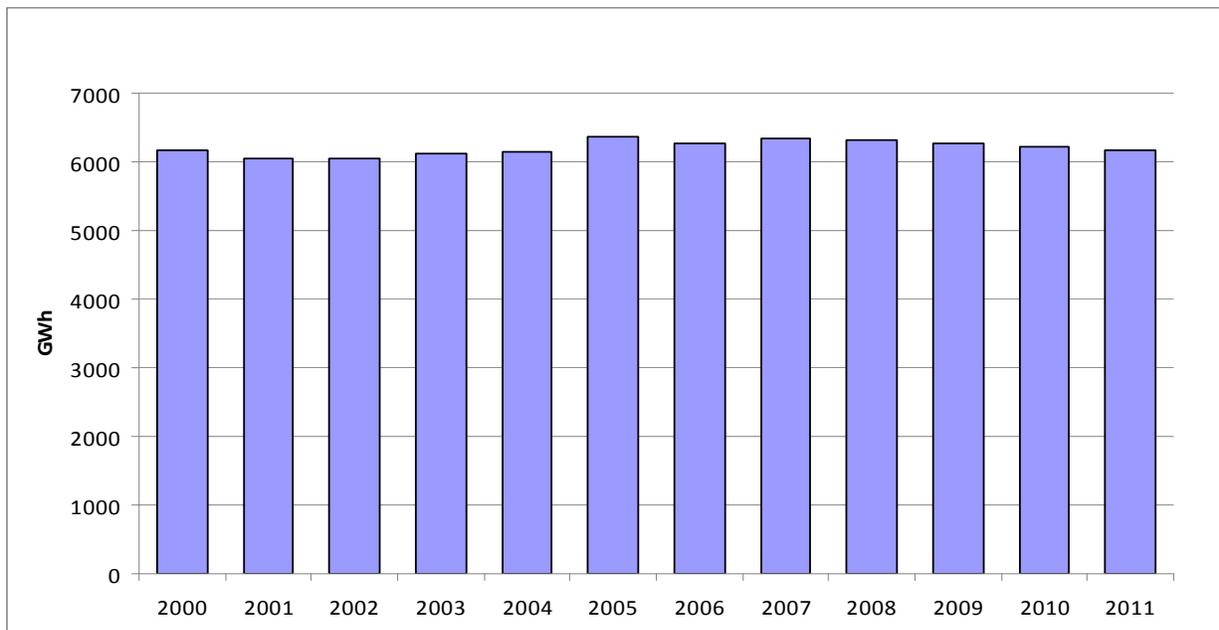


Figure 1 presents both efficiency savings as a percent of sales and the corresponding estimate of underlying growth rate for electric sales in Vermont. The Vermont Department of

Public Service makes estimates of average underlying growth for electric energy as part of long-range electric plans. The 2006 forecast estimates that in the absence of additional electrical energy efficiency investment, base demand for electricity would grow at an average rate of 1.36% compared to the underlying growth rate of 1.45% that Vermont experienced from 1995 to 2005 (Vermont Department of Public Service, 2006),.

Figure 2 presents actual statewide energy sales from 2000 through 2007 and a projection for a further four years. Vermont's 2005 energy forecast was used to project sales without new efficiency for 2008 through 2011. To estimate the effects of new efficiency, funding was assumed constant at 2008 approved levels (\$30.75 million), as was an average savings yield rate (45 MWh per \$10,000 invested) that the Energy Efficiency Utility achieved in 2006-2007. The result is clearly negative load growth, at an average level of approximately -0.7% per year.

Figure 2. Vermont Energy Resource Requirements



Achieving this impact on load growth has required significant investment on behalf of Vermont ratepayers. Figure 3 presents Vermont's per-capita level of investment in efficiency, year by year. Figure 4 presents Vermont's yield rates since 2000. The best year to date has been 2007, with 52 MWh per \$10,000 invested, overall.

What does it take?

Vermont may be the first state in which efficiency resource acquisition has grown to the point where it is offsetting underlying load growth, but other jurisdictions are expected to follow in short order. The structure and strategies that this level of success requires may be substantially different from earlier efficiency efforts. We refer to this level of effort as a **Deep Efficiency Acquisition System**.

Figure 3. Vermont's Efficiency Spending, Per Capita, by Year

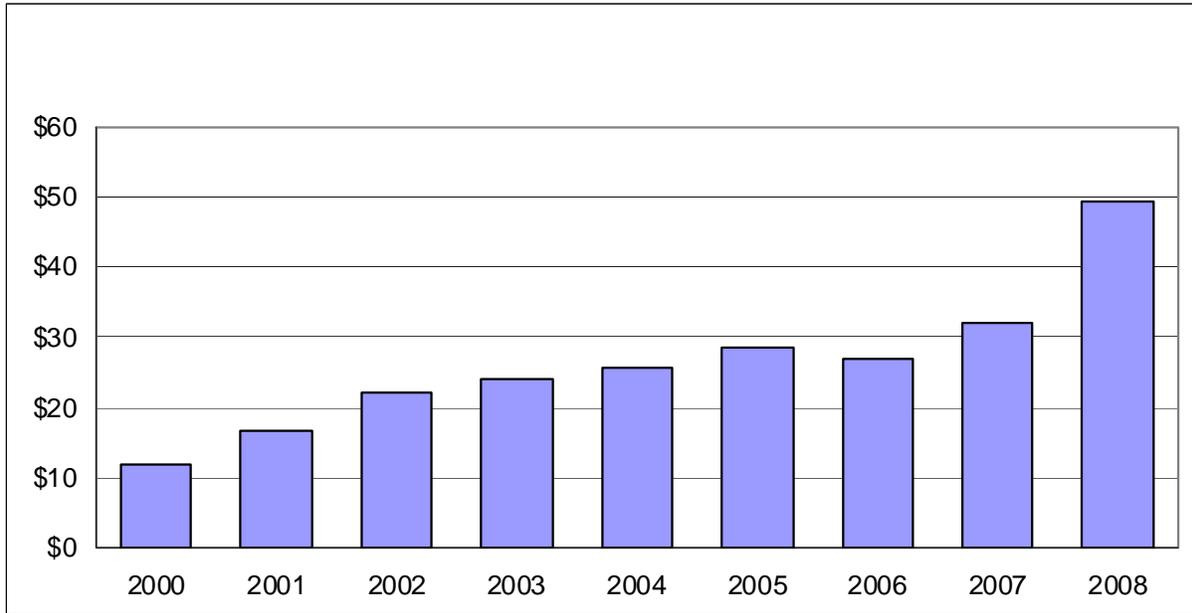
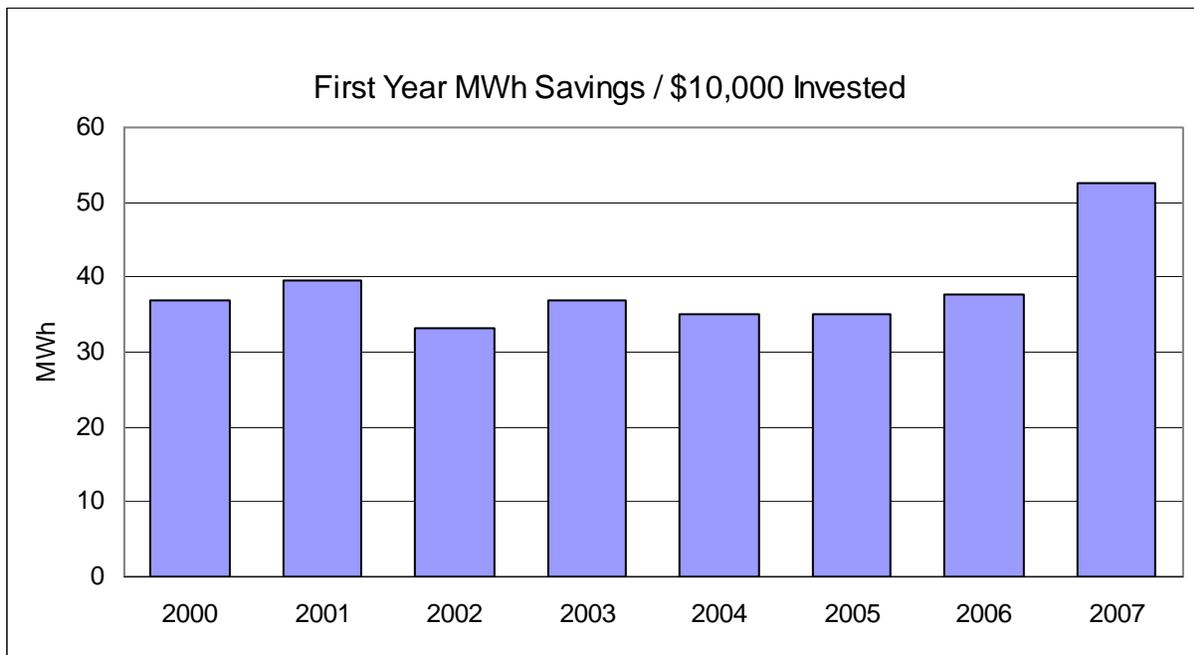


Figure 4. Yield Rates for Vermont Energy Efficiency Utility



Historically, many energy efficiency efforts resulting from political and regulatory “settlements” have not pursued all cost-effective resources in a comprehensive, systematic, and aggressive manner. These settlements have often taken the form of defined, agreed-upon spending levels that were based on past spending, spending levels in other jurisdictions, perceptions of acceptable rate impacts, or other forms of compromise. These approaches have served as artificial constraints to acquiring energy efficiency resources.

In many cases, analyses of energy efficiency potential (“potential” studies) drive expectations about how much resource efficiency can provide. Although these studies have been useful in assessing current potential (a snapshot of the present), they are often quite constrained in assessing the future. That is, such studies typically do not adequately account for the introduction of new, as-yet unknown technologies. The assumptions these studies make are even more significantly limited about the portion of cost-effective potential that is “achievable.” Some estimates of “achievable potential” actually use projected budget amounts as one of the constraining factors. Many studies also constrain achievable potential to what has been achieved historically in different markets. This reliance tends to bias downward the estimates of “achievable” potential. The methods and structures that have delivered relatively low levels of efficiency resources in the past are not necessarily good indicators of what we can achieve in the future.

This is not surprising. The first hurdles faced in the late 1980s and 1990s—and still faced in more jurisdictions than many of us want to admit—were: (1) persuading skeptical utilities, regulators, legislators, and some influential customers that energy efficiency was a real resource that could be relied upon to contribute substantially in meeting electric system requirements; and (2) persuading them that large-scale, systematic efforts to acquire these resources was necessary.

The environment has certainly changed, with efficiency now not only widely recognized as a large and inexpensive resource, but also relied upon by the largest utilities in their future resource planning. Further it is now recognized by regional power system markets as a resource comparable to generation (Jenkins and Hamilton, 2008). In the past, efficiency advocates had to convince the skeptics that there was gold all around them. Now, using Deep Efficiency Acquisition Systems, we have to focus on the best ways to turn that gold into one of the major currencies of a new energy economy.

The remainder of this paper offers a distillation of what Vermont efficiency implementers perceive as some of the most important considerations for an efficiency effort to become a Deep Efficiency Acquisition System. This paper is not an argument for replication of the unique Vermont structure, but it is an argument that some of the structural features and strategies the Vermont Energy Efficiency Utility (EEU) has developed provide critical information for developing further Deep Efficiency Acquisition Systems. As such, the paper is directed as much to policy leaders as to program design and implementation specialists.

Structural Features of a Deep Efficiency Acquisition System: You Can't Launch a Communications Satellite with a Potato Cannon

A stable structure is the foundation for success. This discussion of structural features calls attention to issues that are often treated as incidental--or worse, as areas of “political compromise” when utilities, legislators, regulators, and other policymakers create or modify the systems through which energy efficiency resources are acquired. It is not possible just to “buy” the quantities of off-the-shelf efficiency to turn growth negative. A Deep Efficiency Acquisition System requires sustained, intelligent support and active partnership from those with political will and resources.

This paper assumes, as a baseline, (and therefore does not discuss) many widely recognized and broadly implemented standard practices that are essential to successful resource acquisition, including clear roles and responsibilities, rigorous independent critical evaluation, and systems for establishing and maintaining high quality. This paper's focus is on some not-so-

obvious features that Vermont's experience suggests are particularly important for securing deep, ongoing savings.

1. Clarity on Goals

Appropriately focusing and sustaining efficiency resource acquisition efforts requires that savings acquisition targets be clearly stated and measureable. These goals are best set at the highest policy levels, so they clearly guide regulators and implementers. The goals will be most effective when they express a consistent commitment by political and regulatory institutions to pursue efficiency in a sustained manner. The goals may be expressed as multi-year targets, or a stream of annual targets. They might also incorporate other benefits such as water and fossil fuel savings. Where there are specific components of a more aggregate objective that might create implementation tensions (e.g., targets for residential new construction or low-income-sector savings, which might cost more to achieve than commercial savings), clarity can be accomplished by using weighted performance indicators. In Vermont, a set of quantifiable resource acquisition and market impact indicators are incorporated into a performance-based contract with varying incentives to the contractor for each indicator that reflect regulatory assignment of importance of each goal.

2. Mission Alignment

Implementation of efficiency efforts will only maximize savings if the mission of the implementing entity is fully aligned with the savings objectives. An entity that has energy efficiency as a primary purpose will measure its success by the higher level of savings it achieves². If an implementing entity does not currently have a clear incentive to maximize efficiency (e.g., in many cases, utility shareholder interests now compete with efficiency efforts), it is critical that those barriers be overcome (e.g., with decoupling mechanisms and / or clear performance incentives for excellent efficiency performance). In other words, there must be a commitment at the highest policy levels to create, throughout the delivery system, incentive structures that promote and support the underlying policy objectives.

3. Motivation

A powerful tool for motivating an implementation entity to meet or exceed its goals is a well-constructed, balanced risk-and-incentive mechanism. For this mechanism to be effective, it needs to have considerable weight. It should motivate exemplary effort and risk-taking by providing significant incentives for meeting and going beyond established savings goals. Such performance mechanisms can also usefully be passed through to subcontractors working for the implementing entity. To assign appropriate importance to the achievement of goals, a structural model needs to have a mechanism that communicates the value of achieving those goals—for example, a portion of compensation tied to achievement of savings goals.

In Vermont the EEU operates under a three-year contract, with a holdback of approximately 3.5% of the total contract funds that represent its “profit margin.” That holdback

² Some examples include efficiency portfolio administrators in Oregon, Wisconsin, New York, Maine, and Vermont.

is awarded, based on performance relative to the specific multi-year performance targets. Failure to perform means less revenue. Significant failure may mean loss of the contract itself.

4. Accountability for Results

To the extent that achieving very high levels of savings is the primary objective, the implementing entity should be held fully accountable for achievement of savings results.

One of the significant challenges in moving to the efficiency utility model in Vermont was to shift away from the “preapproval” mindset developed in utility-administered efficiency programs in the 1990s—a mindset that specified exactly what would be done, and then doing exactly what was proposed to assure full program cost recovery. The focus was more on expenditures to implement a program as it had been filed than on achieving results. When Vermont adopted an efficiency utility model that “relieved” utilities of the regulatory responsibility (and risk) of running efficiency programs, the utilities wanted to be part of a “committee” that would direct implementation. However, as soon as the utilities understood that utilities would retain the risk for performance, they abandoned the direct-oversight idea.

But the dangers of over-specification and micro-management are not likely to come just from utilities; legislators and regulators might also want a level of control that unduly restrains the implementing entity. Sustained and deepening acquisition of efficiency resources is about people, markets, intelligence, and innovation. Both the power to implement wisely and the accountability for performing must be placed squarely on the implementing entity.

Leaders at the highest policy levels need to recognize that an Energy Acquisition System is about thoughtfully, intelligently, and persistently partnering with and moving markets. They need to be willing to exchange a *regulatory mindset* for a *performance mindset*. They need to structure incentives and create an intelligent framework in which the commitment to efficiency will be implemented and then stand back and let implementers move with considerable freedom.

5. Flexibility

If the implementing entity is to be held accountable for results, it must have a high degree of flexibility in the details of program design, resource allocation, and implementation. For example, the implementing entity must be able to alter incentive levels in response to market experience and understanding. The flexibility to go after opportunities that present themselves (such as a community that wants to install 40,000 compact fluorescent lamps) should be both encouraged and permitted. It is these opportunities that often suggest innovative approaches to new products or strategies for deeper market penetration. The Vermont EEU has made the choice to invest heavily in people and develop longstanding relationships with vendors, trade allies and large customers. The choice to shift dollars to people and spend less on incentives should be within the purview of the implementing entity as long as performance goals are met.

6. Stability and Sustained Effort

Structural models for Deep Efficiency Acquisition Systems should provide for reasonable stability to support sustained resource acquisition strategies, long-term partnerships, long-term financial agreements, and the sustained building of experience and capability in the implementing entity. The assurance of long-term stability needs to be balanced with structural

mechanisms that can help to assure efficiency of implementation and guard against institutional complacency. A stable and predictable source of funds is critical, together with an approach that values multi-year budgets appropriate to the forecasted needs of the region. The Vermont EEU has been operating with three-year budgets and goals, but regulators are currently considering moving to an alternate structure that would add rolling 20-year budgets and goals that are adjusted triennially (Hamilton, forthcoming).

7. Robust IT Systems

The types of activities that need to be planned, managed, tracked, and reported as part of a Deep Efficiency Acquisition System are extensive and complex. Rock-solid information systems are essential for credibility, reliability, and cross-functional data sharing. Data systems need to contain extensive customer information, both historical and current, including business characteristics and contacts, metered energy and demand, implemented measures, measure savings assumptions and support, contacts and communications, project tracking, and cross-references to project partners. Such rich data systems support improved planning and evaluation, and development of targeted resource acquisition initiatives; and because they provide information in real time, they serve as a tool for increasing management effectiveness and providing feedback that supports continuous improvement of strategies. The level of effort and commitment of resources necessary to develop and maintain these types of systems are typically and profoundly underestimated.³

Operating Principles for a Deep Efficiency Acquisition System

As with the above discussion of structural considerations, this section identifies some critical factors that might not typically be standard practice. The most important are suggested in the following list.

1. Focus on Customers; Don't Run "Programs"

Most energy efficiency implementation has focused on defining and implementing "programs," typically a limited set of actions targeted to a specific market sector and a defined number of opportunities to secure investments in a limited set of end uses. Programs have served as the packages for aggregated strategies for implementation. The "programs" approach may be useful for planning, regulatory review, and ease of administrative organization, but it does not necessarily result in customer-friendly implementation--or in optimal results.

One danger of a program approach is that the program, not the customer, becomes the focus. That is, customers are asked to fit into programs (sometimes many of them), rather than being invited simply to work together with the implementing entity to achieve customer objectives. The Vermont EEU, after only a year of implementing programs defined in its original mandate, realized that customers cared far more about relationships and services than whether they qualified for different programs. Abandoning the program approach in favor of a more customer-focused, market approach provided a strong foundation for achieving deeper and more

³ For Vermont's EEU, annual costs of IT system maintenance and development have averaged approximately 3% of total expenditures.

comprehensive savings (Chiodo, 2004). The ability to introduce this shift to a customer-focused approach was supported by the type of flexibility in program implementation described above.⁴

Focusing on customers begins with careful segmentation and identification of interests and motivations in each segment. The Vermont EEU has formulated customer value propositions for key customer segments and developed corresponding “strategy maps” that have led to goals and action plans. A good action plan delivers customer value while achieving deep savings objectives. Vermont’s EEU is reaching out in a coordinated way to all Vermont grocery stores, for example, and benefiting from that effort by increasing its understanding of just what it will take to get savings beyond lighting replacement.

2. Human Assistance vs. Financial Assistance

In seeking to overcome customers’ market barriers to implementation of energy efficiency, there is always a mix of human (technical and information) assistance and financial assistance (cash or financing). In the pursuit of increasing levels of savings, allocating more resources to human assistance is likely to be far more effective than spending the same amount on financial incentives. As efficiency efforts have grown in Vermont, periodic planning repeatedly has concluded that incremental spending on high-quality staff was generating more and deeper savings than putting the same level of incremental resources into incentives. This has been particularly productive with large business and institutional customers, where the Vermont EEU now has individual customer account managers assigned to maintain ongoing relationships with approximately 200 of the highest-use accounts. Customer feedback cites technical assistance in many cases as having more influence on customer investment than incentives (Cummings, 2005). Moreover, it is dedicated people who build strong partnerships with market allies, build long-term relationships with customers, and know how to pursue custom and niche savings opportunities. These resources are critically important to achieving deeper savings from a broad range of significant but more complex and longer-payback measures.

3. Create a Vibrant Institutional Culture

The implementation of deep efficiency requires very high levels of expertise, excellent communications skills, a willingness to establish long-term relationships, and a culture dedicated to learning and improvement. The structure, stability, responsibility, and flexibility that are essential to institutionalization of a Deep Efficiency Acquisition System do not guarantee such a culture, but these conditions do make it easier for good managers to create an organization with these attributes. The performance incentive at the corporate level can be passed through the organization in part as an added performance benefit to staff and subcontractors in a way that enhances motivation and commitment. VEIC, the entity holding the Vermont EEU contract, has found that in addition to being an organization in which people are expected to be productive and work hard, it is also a place at which people with excellent skills and high levels of motivation want to come work.

⁴ From the customer perspective there are simply “services” that the EEU offers in response to customer needs. From a tracking perspective, savings are attributed and reported by various customer classes and savings end uses.

4. Don't Be Afraid of Complexity

There is an understandable urge to look for simple, broad implementation strategies and mechanisms that will require a minimum of labor and institutional resources. This is often exhibited in an over-reliance on prescriptive rebates and standard offers. Most often, however, customer situations, and the deep savings opportunities they offer, are complex. The deeper we look for savings, the less likely it is that one-size-fits-all strategies will be effective. Indeed, they may even prevent deep savings by skimming the surface savings opportunities. So while there is a role for simple prescriptive measures and rebates, and the Vermont EEU does use them, a Deep Efficiency Acquisition System requires complex, multi-faceted strategies and implementation, involving large numbers of partners and market actors.

5. Leverage Market Partners

There are so many points in the market where efficiency decisions are made every day that no one entity could ever hope to cover them all directly. To do the work of the efficiency entity, it makes sense to enlist partnerships with the market actors who are the key influencers. These market actors range from retail partners to sales representatives, to energy service providers and design professionals. The Vermont EEU discovered the value of these partnerships when it chose a market strategy in commercial new construction, focusing on securing design professionals (architects and engineers) to become the champions of energy efficiency in new projects. Intense outreach, education, and support over several years have resulted in a market in which most of the major firms in the field routinely engage Efficiency Vermont at the outset of their projects and promote high levels of efficiency in the vast majority of all large new construction. This approach has also achieved substantial participation in mid-size new construction projects (Veda and Kleinman, 2006).

6. Expect to Pay Up to Avoided Cost

There may well be a lot of very low-cost energy efficiency available, but it is dangerous to set goals or expectations about costs at a level far below avoided costs. The pursuit of deep, comprehensive savings should be limited only by avoided costs. Otherwise, there is a danger of skimming, or even implementing suboptimal measures that effectively pre-empt alternative measures with deeper and / or more lasting savings. It is easy to under-invest. And it is easy to want to see a high benefit / cost ratio, even if this is not a useful indicator for valuing investment when we are seeking to maximize cost-effective savings.

If it is important to get a high amount of savings fast, or in one location, the higher costs of direct installation may well be warranted. In such instances, there is also no reason to avoid paying the full cost of measures, if it helps to achieve the desired results. Vermont's EEU is currently implementing a targeted initiative that directly installs commercial lighting at no cost to the customer to defer anticipated transmission or distribution upgrades (Massie, Wasserman, & Hamilton, 2008).

7. Look for More Market-Driven Opportunities

Many efficiency portfolios have focused largely on retrofit programs; but numerous lost opportunities slip by, still largely untapped. Market-driven savings opportunities, including new construction, replacement on burn-out, and planned replacement of equipment can be much larger than many assume. Savings in these markets typically have substantially lower costs than retrofits. This approach is successful if it relies on human assistance and ongoing relationship building, as discussed above.

8. Be Prepared to Learn New Things and Change the Rules (and Maybe Laws) Accordingly

Efficiency strategy implementation is a continuous learning process. Implementation reveals both unanticipated market barriers and unanticipated opportunities. A Deep Efficiency Acquisition System must have the flexibility not only to make changes as part of routine program conduct, but also to revisit fundamental assumptions and structures. The implementing entity and the regulatory / legislative structure that support it should be partners in evolving policy and structure to maximize resource acquisition and achieve public policy goals.

Vermont has recently expanded efficiency objectives and efforts to a comprehensive “all fuels” approach that holds the promise of greater savings, broader participation, and increased greenhouse gas reduction. The Vermont EEU’s approach to supporting whole-building efficiency, and through its support of Home Performance with ENERGY STAR® and its partnership with Vermont’s low income weatherization program, helped pave the way for this step. This “all fuels” approach is expected to lead to more comprehensive savings and deeper electric efficiency in the hard-to-reach (non-electric-heated) residential market.

Conclusions

Vermont’s statewide efficiency resource acquisition efforts have demonstrated that statewide load growth can be turned negative. Achieving and sustaining this level of savings requires not just adequate investment, but new structures and approaches. We can define some of the key attributes necessary for the Deep Efficiency Acquisition Systems of the future from the experience of early efforts in achieving high levels of savings.

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