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FILE

BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Ohio Edison Company, The Cleveland Electric Illuminating Company and The Toledo Edison Company for Authority to Establish a Standard Service Offer Pursuant to R.C. § 4928.143 in the Form of an Electric Security Flan	Case No. 08-935-EL-SSO

DIRECT TESTIMONY OF DYLAN SULLIVAN

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ATTACHMENTS:

Part 1: Introduction

Q: Please state your name, address, and position.

A: My name is Dylan Sullivan. My business address is 101 North Wacker Drive, Suite 609, Chicago, Illinois 60606. I am employed by the Natural Resources Defense Council ("NRDC") as an Associate Energy Advocate.

Q: Please describe your educational background and professional experience.

A: I earned a Bachelor of Arts degree, magna cum laude, in Environmental Geology from the University of Missouri-Columbia in 2004. I was awarded a Masters of Science in Civil and Environmental Engineering from Stanford University in June 2008. I joined NRDC as a MAP Fellow in June 2008 and was hired as an Associate Energy Advocate at the conclusion of the fellowship. At NRDC, I have conducted advocacy and analysis to support organizational objectives around utility energy efficiency, coal power, and building codes. I have also represented NRDC on the Stakeholder Advisory Group assisting Illinois utilities in meeting the new energy efficiency portfolio standard. This is my first testimony before the Public Utilities Commission of Ohio ("the Commission").

Q: What is the purpose of your testimony?

A: I will discuss how FirstEnergy – Ohio Edison Company, Cleveland Electric Illuminating Company, and Toledo Edison Company – ("the Company") plans to meet the energy efficiency and demand management obligations required in Amended Substitute Senate Bill No. 221 ("S.B. 221") and specified in the Electric Security Plan ("ESP"). I will explain why these plans are insufficient and suggest another model to deliver the required savings. I will also discuss the AMI pilot that the company is proposing.

Q: What resources did you use in preparing your testimony?

I consulted the ESPs, supporting testimony, and attachments of the Company, American Electric Power Ohio ("AEP") and Duke Energy Ohio ("Duke"). I also consulted various publications concerning energy efficiency program administration, successful energy efficiency programs, and the results of Smart Grid research studies.

Part 2: Energy Efficiency and Demand Side Management

Q: What are the Company's energy efficiency and demand management obligations under S.B. 221?

A: According to Section 4928.66 of S.B. 221, the Company must achieve energy savings of .3% in 2009, .5% in 2010, and .7% in 2011 of the normalized annual kWh sales the Company during the preceding three calendar years. This savings amount continues to rise until the cumulative savings reach 22% by 2025. Peak demand must be reduced by 1% in 2009 and by .75% annually until 2018.

Q: How does the Company propose to meet these energy efficiency and demand management obligations?

A: It is unclear because the obligations are barely acknowledged. The only mention of Section 4928.66 I found is in the testimony of Gregory Hussing, Director, Regulatory Analytics of FirstEnergy Service Company in his discussion of the proposed the Demand Side Management and Energy Efficiency Rider:

> "The Demand Side Management and Energy Efficiency Rider will recover costs incurred by the Companies associated with energy efficiency and demand side management programs, including recovery of lost distribution revenues .... In an effort to encourage customers to implement energy efficiency initiatives, the rider is structured in such a way that customers may avoid a charge by implementing customer-sited programs that help the Companies secure compliance with R.C. 4928.64 and 4928.66."[1]

Though the ESP proposes recovering costs and revenues associated with energy efficiency and demand management, the Company has submitted no information describing the programs that will be used to meet the standard.

[1] Testimony of Gregory Hussing, Page 10, Lines 18-21 and Page 11, Lines 1-4.

Q: Does the Company propose any other mechanisms to support energy efficiency or demand management?

A: Yes. The Company proposes to spend "up to $5 million of investment each year from January 1, 2009 to December 31, 2013 for customer energy efficiency/demand side management improvements made on and after January 1, 2009" .... "up to $25 million over the life of the plan."[2] The "up to $5 million" per year will come out of shareholder funds and the Company will not seek recovery for program costs. The programs from which costs and lost revenue will be recovered are not mentioned. Furthermore, the Company does not specify how much of the proposed $5 million per year will be spent on demand response versus energy efficiency.

Q: How does this compare to the energy efficiency and demand response plans of the other utilities submitting ESPs?

A: Compared to those of AEP and Duke, the Company's plans lack detail and evidence of planning. AEP is conducting a market potential study for energy efficiency in its service territory and is proposing to convene an independently facilitated collaborative group to help select, improve, and create energy efficiency and demand management programs. AEP is proposing to implement 10 programs, reaching residential, commercial, and industrial customers, to help it meet its 2009 S.B. 221 energy efficiency obligations. For each program proposed, AEP provides the following information: program overview, delivery method, rationale, expected program cost, expected participant numbers, expected cost/kWh, and expected cost/kW.

In its ESP application, Duke describes its existing portfolio of 6 residential and 3 non-residential programs that they plan to supplement in later years of the ESP, possibly with the 6 pilot/research programs also described in the ESP. The company provides estimated energy, demand, and avoided cost savings as a result

[2] ESP Application, Page 25.

of portfolio implementation. Duke also proposes its Save-a-Watt program cost recovery and incentive mechanism.

Q: Does the Company's ESP address energy efficiency and demand response adequately?

A: No. Unlike other Ohio utilities, the Company gives no indication that it is designing programs that would allow it to meet the obligations set forth in S.B. 221. The company does not offer to collaborate with stakeholders to design, select, monitor, or improve the programs that will be needed. The proposal to spend shareholder money is impossible to judge without any indication of how the money will be spent or a commitment to a minimum amount of shareholder contribution. In his September 24 deposition with the Ohio Consumers' Counsel, David Blank admitted that the Company has "no specific concept of how" the $25 million "will be deployed."[3] Given its lack of planning, it is doubtful that the Company will be able to meet its energy efficiency and demand management obligations, especially in 2009. The history of energy efficiency program implementation demonstrates that a "willingness to devote the necessary resources to make programs successful"[4] is required. This willingness is not evident in the Company's ESP.

Q: What are the Company's current energy efficiency and demand management programs?

A: The Company offers the Home Performance with Energy Star program in all service territories. The program facilitates improvements in residential energy efficiency by connecting customers with contractors certified by the Building Performance Institute. The Company offers rebates on some efficient products the contractor recommends, up to $1250. The Company offers a residential load control program and interruptible service and load control to large customers.

[3] Deposition of David Blank by Ohio Consumers' Counsel, September 24, 2008.
[4] National Action Plan for Energy Efficiency, July 2006, Chapter 6, Page 2.

Q: How much energy or demand do these programs save?

A: I have been unable to find a public record of this. We requested this information from the Company in Discovery, but it was not provided.

Q: Does the Company have experience in the administration or implementation of energy efficiency and demand management programs in other states?

A: The Company's recent experience is limited. The Company's affiliates offer and administer the Home Performance with Energy Star program in New Jersey and Pennsylvania, but other programs are administered by outside parties. In New Jersey, energy efficiency programs are the responsibility of New Jersey Clean Energy Program, an organization administered by the Board of Public Utilities. The Company's New Jersey affiliate participates as a stakeholder in committee meetings of the Clean Energy Program. In Pennsylvania, until recently there was no statewide energy efficiency mandate and thus few utility administered or implemented energy efficiency and demand management programs. Loan programs in the Company's Pennsylvania affiliates' service territories are administered through separate community foundations.

Q: What do you recommend be done to ensure that the Company meet its energy efficiency and demand management obligations under S.B. 221?

A: When a utility lacks experience with energy efficiency and shows little desire to develop a comprehensive range of programs, third-party administration is the correct path.

Q: Does your organization always support third-party administration?

No. NRDC has no ideological preference for third-party administration and has supported utility administration in Illinois and California. The key factor is a willing utility partner. As seen in Kushler and Martin's "Compendium of Champions," a description of exemplary energy efficiency programs published by the American Council for an Energy Efficient Economy (ACEEE), a variety of organizations can produce effective programs, including utilities, non-profits, and governments.

Q: Is there a model of third party administration that you believe would work best in Ohio?

A: Efficiency Vermont, the nation's first "efficiency utility," has proven to be a successful administrator and implementer of programs since its founding in 2000. Efficiency Vermont administers 4 programs recognized as exemplary and 1 granted an honorable mention in the "Compendium of Champions." In 2007, Efficiency Vermont programs helped turn Vermont's load growth negative.

Q: How is Efficiency Vermont structured?

A: Efficiency Vermont is run by the Vermont Energy Investment Corporation, an independent non-profit under contract with the Public Service Board ("PSB"). The contract is performance-based, and contains numerous indicators that Efficiency Vermont is evaluated against, including policy objectives, market transformation objectives, and resource acquisition requirements. A portion of the contract amount is withheld and distributed upon successful accomplishment of objectives. Funds to support efficiency efforts are collected from electric ratepayers, held by a PSB-contracted Fiscal Agent, and distributed to Efficiency Vermont at the direction of a PSB-contracted Contract Administrator. The Vermont Public Service Department conducts evaluation and verification of Efficiency Vermont programs. To provide more information about the structure of Efficiency Vermont, I am attaching Hamilton et al.'s "The Efficiency Utility: A Model for Replication," presented at the 2005 European Council for an Energy Efficient Economy Summer Study, as Attachment 1.

Q: Explain the roles of Contract Administrator and Fiscal Agent.

A: The Contract Administrator relieves the Public Service Board of day-to-day contract management responsibilities. The Fiscal Agent serves to keep ratepayer funds in the utility system, under the ultimate control of the Public Service Board.

This reduces the chance of a state government "raid" on the funds. System benefit funds have unfortunately been raided with some frequency, though never in Vermont.

Q: What are the key advantages of the efficiency utility model for FirstEnergy?

A: Unlike an electric utility in Ohio's regulatory environment, an efficiency utility has no conflict with reducing kWh sales. As Parker et al. write in "What Does it Take to Turn Load Growth Negative," included as Attachment 2, "An entity that has energy efficiency as a primary purpose will measure its success by the higher level of savings it achieves."[5]

Another advantage of the model is its flexibility. Performance objectives could be changed when the short-term contract with the efficiency utility is up for renewal. As the efficiency utility gains experience and human capital, the Commission could expand its mandate to include the administration of gas efficiency programs or the efficiency portfolios of other electric utilities. Efficiency Vermont's relationship to the PSB recently changed from that of a contractor to a franchise-holder without a change in service delivery. The mission of the utility now also includes efficiency in the uses of all fuels, not just electricity. Ohio could benefit from similar flexibility. For example, the efficiency utility could be charged with procuring the cost effective energy efficiency identified by the Integrated Resource Planning process.

Q: How could the model be implemented for FirstEnergy?

A:

1. The Commission would select a contract administrator through a competitive process and appoint a fiscal agent. The contract administrator should be selected before the program administrator, and would help

[5] Parker, Scudder, et al. "What Does It Take to Turn Load Growth Negative? A View from the Leading Edge." Presented at 2008 ACEEE Summer Study on Energy Efficiency in Buildings.

construct the Request for Proposals ("RFP") and the contract that it will administer.

2. The Commission would direct the Company to issue a RFP for an organization to fulfill its energy and demand reduction responsibilities under S.B. 221, subject to a performance guarantee protecting the Company if the contracted organization fails to supply the necessary savings. In its ESP, AEP expresses its intention to seek similar performance guarantees from the organizations it selects to implement its programs.
3. The Company would issue a contract to an organization approved by the Commission. The contract, which would also be approved by the Commission, would contain numerous program objectives, including the completion of a market potential study, the delivery of the efficiency and demand reductions required by S.B. 221, cost effectiveness criteria, and evaluation, measurement, and verification ("EM&V") requirements.
4. The Commission would select an appropriate funding amount to produce the energy and demand savings required. This amount would be collected from customers by the Company's current Demand Side Management and Energy Efficiency Rider and remitted to the efficiency utility through the fiscal agent upon approval of the contract administrator.

Q: What other issues should the Commission consider and address?

A:

1. The Commission should require independent EM&V for all programs using ratepayer funds. The EM&V contract and contractor should be separate from those of the fiscal agent, contract administrator, and program administrator.
2. The Commission should require that the efficiency utility create a stakeholder group that meets at least quarterly to provide input on portfolio and program design, administration, implementation, and evaluation.

3. The Commission should require that the Company share customer information with the efficiency utility in order to facilitate communication between the efficiency utility and its customers and the effective targeting of programs. The information would be subject to the same confidentiality provisions the Company uses with its other contractors. The Company should be allowed to co-brand programs with the efficiency utility and should be required to use its customer contact channels to promote efficiency programs.

Q: How much time would it take to set up the efficiency utility?

A: That depends on the bid period and the actions of the Commission, Company, and awarded bidder. The request for proposals for Efficiency Vermont was issued in October 1999. Programs began in March 2000. Given that the Company has not planned its energy efficiency programs, it is unlikely that utility administration would produce savings more quickly than third party administration.

Q: What is your estimate of the customer charge that would be required?

A: This depends on the performance incentive, EM&V costs, administrative expenses, and first-year programs the Commission approves in the contract issued to the efficiency utility. As a rough estimate, Efficiency Vermont has been providing between 34 and 52 MWh of first-year savings per $10,000 invested between 2000 and 2007.[6] According to the work papers of Gregory Hussing, the Company's total annual MWh sales based on the test year in Case No. 07-551-EL-AIR is 56,471,209 MWh. .3% of this is 169414 MWh. Using Efficiency Vermont's observed range; energy efficiency program funding would be between $32.5 million and $49.8 million in 2009. This funding would have to increase with the required savings.

Q: Are there any other models of third-party administration?

[6] Parker, Scudder, et al. "What Does It Take to Turn Load Growth Negative? A View from the Leading Edge."

A: Oregon's efficiency utility, the Energy Trust of Oregon, is similar to Vermont's, but it grew out of restructuring legislation rather than a memorandum of understanding between utilities and the Commission. Like in Vermont, system benefit funds are routed to the efficiency utility. The Energy Trust is less involved in program implementation than Efficiency Vermont, which implements many of the programs it administers.

Wisconsin uses a hybrid of governmental and third-party administration. The Public Service Commission oversees statewide energy efficiency programs. The state's energy utilities share a common administrative structure for energy efficiency that creates and funds energy efficiency programs. These programs are administered by third parties after competitive bidding. The program also employs an independent fiscal agent, compliance agent, and evaluation contractor.

Q: Would FirstEnergy still need to recover lost revenues if energy and demand savings are produced using an efficiency utility?

A: There are good public policy reasons for ensuring that utilities are "made whole" for the revenue they forgo as a result of efficiency programs. However, the lost revenue adjustment mechanism the Company proposes does nothing to remove the incentive the Company has to increase kWh sales.

Q: But won't third party administration guarantee energy and demand savings?

A: The proposed efficiency utility will guarantee the savings required by S.B. 221. However, a utility can do more to promote energy efficiency than administer and implement programs. For example, with the throughput incentive removed, the Company could support efforts to strengthen Ohio's building energy codes without threat to its revenues.

Q: How could the Commission remove this disincentive toward energy efficiency?

A: The Commission could adopt revenue decoupling in FirstEnergy's service territory. In revenue decoupling, the Company's revenue to cover infrastructure costs and earn a reasonable income would be based on the number of customers in its service territory, rather than on the consumption of those customers. A decoupling mechanism can be designed to protect ratepayers from weather risk and excessive utility profits.

<u>Part 3: Smart Grid</u>

Q: How does the Company propose to deploy advanced metering technologies in its service territory?

A: The Company proposes to conduct an Advanced Metering Initiative (AMI) pilot program involving 500 residential customers. The Company will not seek recovery for the first $1 million of program expenditures. According to page 23 of the ESP application:

> "The purpose of the AMI pilot is to determine whether a program that combines Summer time-of-day generation rates with real time energy usage information can effectively change customer behavior and energy consumption. The program will provide participating customers with the ability to lower energy costs by shifting and/or reducing electricity usage during peak and critical peak times to off peak times when demand for electricity and rates are lowest."

Q: Is this a valid research question?

A: No. The research question has already been answered. The Community Energy Cooperative's Energy-Smart Pricing Plan ("ESPP") began in January 2003 with 750 participants and grew to 1500 participants in 2005. The ESPP, operating in ComEd's Illinois service territory, gives participants hourly electric rates that reflect the market price of electricity. Participants receive day-ahead hourly rates, notification of particularly high prices, a price protection cap, and energy management and price response information. The 2005 impact evaluation of the ESPP, attached as Attachment 3, concluded the following:

> "ESPP participants continue to respond to hourly prices in a manner similar to prior years, with an overall price elasticity of -4.7%."
>
> "Participants' response to hourly electricity prices varies by the time of day, with lower responses during the day, and higher responses during the late afternoon/evening."
>
> "ESPP participants' overall monthly summer energy usage suggests a conservation effect, that is, a reduction in usage of 3% to 4%, relative to what their usage was estimated to be had they not received hourly electricity prices."
>
> "Participants continue to show a significant response to the high-price notifications (i.e., when prices exceed $0.10/kWh). For example, on July 25, 2005, the day with the highest prices of the summer, participants reduced their peak hour consumption by 15% relative to what their consumption would have been on the standard flat ComEd residential rate"

The ESPP has already shown that summer time-of-day rates can change customer energy use behavior. It is difficult to see how repeating a similar experiment in the Company's service territory would produce a different result, especially because the company is not proposing to deploy any new infrastructure to facilitate customer communication.[7]

Q: How would you change the research question to generate useful information?

A: The AMI pilot as described will not generate data sufficient to evaluate the costs or customer benefits of Smart Grid technologies in the Company's service

[7] Deposition of Gregory Hussing by Ohio Consumers' Counsel, September 23, 2008.

territory. Pilot program funds would be better spent after the Company's proposed comprehensive Smart Grid study is complete to provide on-the-ground validation of the projected customer savings and benefits resulting from the deployment of Smart Grid technologies.

Q: Does this complete your testimony?

A: Yes.

Presented at the Conference of the European Council for an Energy Efficient Economy, June 2005

The Efficiency Utility: A Model for Replication

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Abstract

Four years ago, the state of Vermont created the first "Energy Efficiency Utility" in the United States. It chose to use a non-utility administrator to manage and implement energy efficiency services to all Vermont ratepayers. The administrator operates under a competitively awarded contract. While other jurisdictions have created similar non-utility administrators, none have had as broad a scope of responsibility. Vermont's experiment has had four years of field testing, feedback, refinement and evolution. By the end of this period, the new efficiency utility - called "Efficiency Vermont" - was providing approximately 3% of Vermont's electricity and had reduced Vermont's rate of annual load growth by 50%. A key factor in Efficiency Vermont's success is the structure of the performance contract between the efficiency utility and the state's utility regulatory body. While performance incentives have been used elsewhere for utility-administered efficiency programs, the way these indices and incentives have been used in Vermont has been particularly important in achieving not only specified on-time results, but also balance among a variety of sometimes competing policy objectives. Based on Vermont's experience, a number of other states and provinces are now looking into replicating or adapting this model. Their status is reviewed and discussed.

Introduction

Efficiency Vermont is the first statewide "energy efficiency utility" in the United States. This innovative model is responsible for cost-effectively reducing the long-term cost of electricity in Vermont as part of the utility regulatory system objective of providing least-cost energy service to the state's consumers. Efficiency Vermont invests in energy efficiency on behalf of all ratepayers in the state and is accountable to the state's utility regulatory agency, the Public Service Board (PSB). This model improves upon what formerly was a patchwork of energy efficiency programs delivered by over twenty individual electric utilities operating in the state. Under the former delivery model, each electric utility company was responsible for developing and delivering its own set of energy efficiency programs, with no statewide program coordination. In addition, utility companies had a mixed incentive; on the one hand, to sell electricity to customers, and on the other hand, to serve as the implementer of programs to reduce electricity usage. This model of providing energy efficiency through regulated electric utilities was widely used by states throughout the United States over the past twenty years, as well as in many other countries.

The concept of an energy efficiency utility was developed by agreement among a diverse set of interested parties who came to a negotiated consensus that it was in the public interest to move to a new mode for delivery of efficiency investments and services. Named Efficiency Vermont, it is operated by a private, nonprofit organization that operates under a direct contract to the PSB. The contract for the delivery of the efficiency utility is a fixed-price contract that is based upon the performance of the contractor. Gone are the days of lengthy contested proceedings with Vermont's electric utilities over efficiency program delivery; gone are the days of customer confusion over available services; and gone are the days of conflicting incentives. Electric customers throughout the state now have one resource to look to for energy efficiency savings - Efficiency Vermont.

Since its creation in late 1999, Efficiency Vermont has had four years of field testing, feedback, refinement and evolution. While a few other jurisdictions have since created non-utility administrators to implement ratepayer-funded efficiency efforts, none have had as broad a scope of responsibility and accountability. None has been as independent, nor have they generally been subject to as rigorous accountability for measurable results (Harrington, 2003; Kushler, York and Witte, 2004). Much has been learned by both the regulators and the implementers that may be of interest in other jurisdictions.

attachment 1

Funding & Structure

The structure for Vermont's efficiency utility is illustrated in Figure 1. The model uses a "Contract Administrator" who handles any day-to-day contract administration responsibilities on behalf of the PSB. Funds to support Efficiency Vermont are collected from as part of utility rates by all electric utilities. These funds are received and held by a "fiscal agent" who disburses funds against bills submitted by the Efficiency Utility upon approval by the Contract Administrator. Both are competitively solicited, independent contractors. In this structure, the funds collected never become "funds of the state," and are therefore less vulnerable to redirection and are less restricted by state procurement limitations.

The responsibility for the design, marketing and implementation of public-benefits energy efficiency in Vermont sits entirely with the PSB's efficiency utility contractor.

A separate state agency - the Department of Public Service (DPS) - has responsibility for reviewing and verifying the claims of energy savings made by the Efficiency Vermont contractor each year. The DPS engages with Efficiency Vermont in an ongoing process of review and update of prescriptive savings algorithms, and conducts an annual verification process of all savings claims. The DPS is also responsible for assessing and reporting on market potential, determining standard-practice baselines, program evaluation, and making recommendations to the PSB on directions and priorities for the future of Efficiency Vermont.

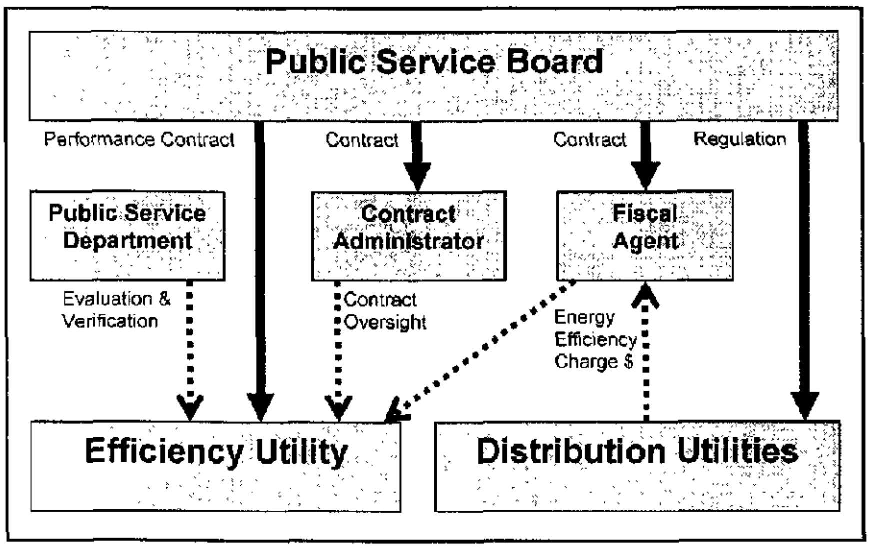

Figure 1. Structure and Relationships Surrounding Vermont's Efficiency Utility

The Performance Contract Mechanism

The contract between the PSB and the nonprofit contractor contains tightly specified indicators of performance designed to reflect and weight the multiple policy, resource acquisition and market transformation objectives of the state, as represented by the PSB. In the contract, the Efficiency Vermont contractor has the opportunity to earn a significant performance award, which is an incentive payment that is held back until the end of the contract. The contractor's performance relative to these indicators determines how much of the "holdback" it receives. The definitions of performance indicators, their targets and their individual award values are all set through negotiations involving the PSB, the Contract Administrator, the DPS and the Efficiency Vermont contractor (Hamilton and Plunkett, 2002).

Results

Resource Acquisition Impacts

The PSB's contract with the efficiency utility focuses heavily, but not exclusively, on short-term resource acquisition as an objective. Table 1 presents the annualized energy savings (first-year MWh) for each of the past four years, together with summer and winter coincident peak kW reductions (Efficiency Vermont, 2004). The average measure life for these annual savings is 14 years.

Table 1. Efficiency Vermont's Annualized Savings

	2000	2001	2002	2003	Four-Year Cumulative
Annualized MWh Savings	23,540	37,489	40,557	51,216	152,802
Summer Peak kW Savings	2,161	4,279	4,996	6,502	17,937
Winter Peak kW Savings	5,447	6,489	7,467	8,059	27,462

Figure 2 presents the impact of Efficiency Vermont's energy savings on Vermont energy consumption for 2000-2003. Overall, without Efficiency Vermont savings, Vermont energy consumption would have grown by 296 GWh over this period, an average rate of 1.5%. Due to Efficiency Vermont savings, actual consumption increased by only 140 GWh, 47% of what otherwise would have occurred and a growth rate of only 0.7%.

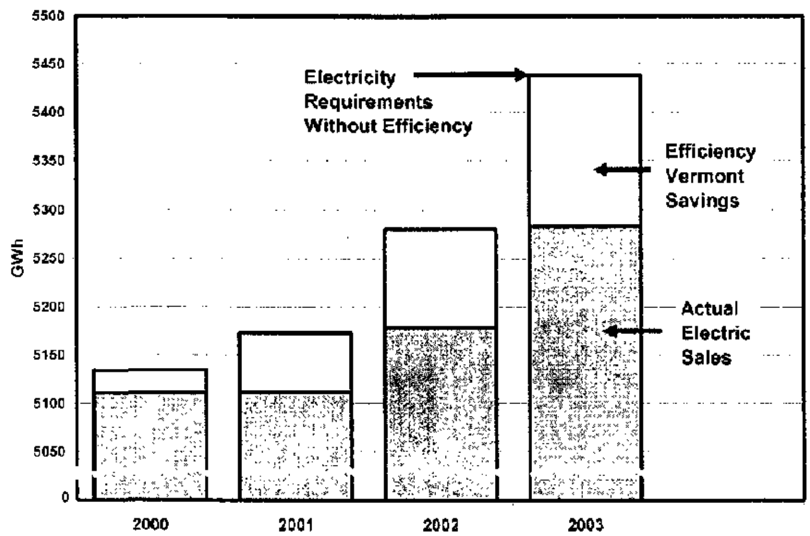

Figure 2. Efficiency Vermont's Contribution to Vermont Electric Energy Requirements

Based on Efficiency Vermont's expenditure of ratepayer dollars, the levelized cost of these savings is $.026 per kWh (.020 EURO). Given New England's high regional electric supply costs, particularly for long-term commitments, this compares very favorably against all other marginal supply resource options.

Market Results

In addition to the accomplishments of Efficiency Vermont in resource acquisition, it is notable that nation-leading market impacts have also been achieved. To name just a few:

- In 2002, Vermont had the highest market share of any state for ENERGY STAR room air conditioner sales (61%), and in 2003 the highest state-wide market share for ENERGY STAR clothes washers, with a remarkable third-quarter market share of 62%.
- In 2002, Vermont had the highest statewide market share in the lower 48 states for ENERGY STAR residential new construction (25%).
- All of the 74 retail appliance dealers with showroom floor space in Vermont have partnership agreements with Efficiency Vermont, promoting the sale of ENERGY STAR appliances and offering Efficiency Vermont rebates.
- Efficiency Vermont has approximately 155 retail partners who partner to promote Energy Star lighting products and accept Efficiency Vermont's instant discount coupons. This is estimated to represent well over 90% of hardware stores, lighting specialty stores, home improvement stores, and electrical supply houses who sell to Vermont consumers.
- For the larger (over 25,000 square feet) new construction market, it is estimated that over 90% of all new construction projects now engage with Efficiency Vermont and receive technical assistance and financial incentives to optimize energy efficiency. Overall, compared to a statewide estimated total of 500 annual

permitted commercial new construction projects, Efficiency Vermont worked with 142 commercial new construction projects that were completed in 2003.

Future Impact Projections

As noted above, Efficiency Vermont energy savings are currently calculated to be meeting 3% of Vermont's annual electricity needs. Based on experience to date and a continued annual investment at 2004 levels, it is projected that this share will grow by 1% each year. At this rate, efficiency will be meeting 10% of the state's electric energy needs by the year 2012.

Replicable Elements of the Efficiency Utility Model

The energy efficiency utility model, as it has been developed in Vermont, has been a success by many measures. It was, however, developed in a specific historical, geographic, regulatory and political context. So while the Vermont model has many attributes, it should be considered as a model to be adapted, or from which elements might be considered for replication. Based on the past four years of experience, certain elements of the energy efficiency utility model are suggested for consideration by those concerned with the administrative structure, scope and objectives of publicly-supported efficiency efforts.

1. Statewide Coverage

It is useful to plan and deliver energy efficiency services within geographic areas that match logical market boundaries. In the US and Canada, states and provinces correspond with many market-related boundaries, such as building and product codes, utility regulation, media and product sales and distribution channels. In smaller countries, national boundaries may be the most effective boundaries for planning and implementation of efficiency programs.

2. A Single Entity to Implement Efficiency For All Markets

There is a tendency in many energy service delivery models to segment and deliver services through different administrators or implementation contractors by program, major customer sector (e.g., residential, commercial, industrial) or even service element (technical support vs. marketing). The experience of Efficiency Vermont has been that having the responsibility for planning and delivery of all efficiency efforts vested in a single administrator has been far more powerful than expected. It has allowed recognition of opportunities and implementation of efficiency efforts that cut across traditional sector definitions (residential/commercial/industrial, new vs. existing, etc.) that can both better respond to markets and be more effective in delivering results.

Customers, trade allies, vendors, and design professionals don't neatly fit into discrete sectors. A lighting showroom typically sells products (and sometimes the same products) for both residential and business applications, to homeowners and contractors, and for both new construction and retrofit applications. Having them deal with multiple programs, each with a different program representative and perhaps different contractor or administrator, is inefficient, tends to result in customer confusion and can even result in competing program offers. Another example from Vermont is ski areas, whose efficiency opportunities range from industrial processes (e.g., snowmaking, lift drives) to base lodge and hotel facilities, to residential condominium development. Efficiency Vermont's experience has been that addressing these customers comprehensively has been critical to securing partnerships that have yielded high levels of investment and savings.

Vermont has the advantage of a relatively small size in being able to consider a single contractor and vehicle to deliver across all sectors. While there are challenges associated with using a single contractor in a larger jurisdiction, the compelling benefits of this approach in Vermont suggest that this option should nonetheless be considered.

3. The Type Of Entity to Act As the Implementer of Efficiency Efforts

The experience of Efficiency Vermont suggests several factors to be considered in choosing the ideal type of entity for delivering services.

- An entity not engaged in retail electric or gas supply will have no conflicts of interest with the provision of services that would reduce energy sales. In Vermont, any entity engaged in retail electric supply was prohibited from bidding to be or be part of the energy efficiency utility.
- In contrast with the private-sector contractor model used for the energy efficiency utility, several US states have chosen to implement statewide energy efficiency efforts within state government. While there may be other administrative efficiency issues affecting this choice, the notable experience of the past several years has been

that state government-administered efficiency programs have been subject of several funding "raids" by state legislatures.

- An entity that is not distracted by many other responsibilities or contracts is better able to focus on success of its goals. An entity whose mission is aligned with achieving the public benefits of energy efficiency contributes greatly to its success. In Vermont, the contractor selected by the PSB to operate Efficiency Vermont – Vermont Energy Investment Corporation - is a private, nonprofit corporation whose stated mission is "to reduce the costs, both monetary and environmental, of energy use."

4. The Use of Carefully Selected and Negotiated Performance Indicators

Sound energy resource portfolios inherently involve trade-offs to achieve both near- and long-term objectives. As a part of these portfolios, energy efficiency efforts also have multiple, potentially conflicting goals (resource acquisition vs. market transformation, maximizing benefit/cost ratios vs. equitable distribution of benefits among various groups, etc.). Vermont's experience suggests that the use of well-constructed performance indicators in a performance-based contract can be a highly effective vehicle for seeing that multiple resource acquisition and policy goals are appropriately balanced.

In the context of a performance-based contract, balancing is not just a theoretical discussion or set of objectives, but instead becomes a practical, applied activity of the contractor with consequences for time-sensitive results. Efficiency Vermont plans and budgets carefully for a mix of efforts to achieve multiple objectives, and then tracks actual experience and modifies efforts as needed.

In order for regulators to achieve the state's resource acquisition and policy goals, the choice of performance indicators and the values set for them has been extremely important. In Vermont these have included short term energy savings (MWh and MW), "total resource benefits" (present value of lifetime savings for all resources), and a range of market effects indicators (increasing market shares for a particular efficiency technology).

5. The Use of a Competitively Bid, Multi-Year Performance-Based Contract

The use of a competitively bid, performance-based contract with consequential impacts for delivering measurable results on a firm schedule has proven to be highly effective. It establishes a high level of accountability and it makes clear to both regulators and the contractor exactly what the goals of the contract are and how they will be measured.

A performance contract establishes that the contractor's term for acting as the energy efficiency utility is finite. If the contractor doesn't do a good job, the job will likely be given to someone else at the end of the contract period. This alone has proven to be highly compelling to the contractor, and a motivator to perform beyond the requirements of the contract.

The use of a performance contract also allows for a great deal of flexibility in design and delivery of efficiency program services. The first efficiency utility contract included a set of highly-defined "core" programs that the contractor was expected to deliver, along with individual budgets and expected savings for each program. This guidance was certainly reasonable at the time and highly typical of implementation elsewhere. However, Vermont has moved further and further away from this approach over the past four years, based on the conscious decision of both the contractor and the PSB.

The contractual/regulatory context that has evolved allows flexibility in how the contractor achieves goals. The regulators have clarified that their primary interest is in results. The contractor has wide latitude in defining and changing strategies, services, incentives and other tactics.

The use of a multi-year contract has also been found to be significant. It allows for a reasonable planning period for the contractor and allows the contractor to address opportunities with long lead-times (e.g., major new construction that may take many years from initial design to final construction).

The benefits of a performance contract have been quite significant as it has allowed: (1) increased flexibility to respond to changing markets in real time; (2) quick response to time-sensitive opportunities (e.g., tie-in to manufacturer rebate promotion, new technology opportunities, unforeseen customer or vendor-initiated opportunities); (3) reduced administrative cost associated with deliberation and formal approval processes over program changes; and (4) more timely response to feedback mechanisms, including both evaluation findings and the contractor's implementation experience. While this feedback process to improve program design is an objective of most energy efficiency efforts, the structure they operate under creates many barriers to adopting (or sometimes even paying attention to) changes, typically defaulting to annual reviews. Perhaps most important, it has encouraged an attitude and culture of ongoing flexibility and innovation at all levels of Efficiency Vermont.

Specific Examples of These Replicable Elements in Other Jurisdictions

There has been considerable interest in the energy efficiency utility model as an innovation that may be usefully replicated elsewhere. Over the past three years, interest has been expressed from various entities in a dozen other states and Canadian provinces, many of whom are actively pursuing similar approaches or variants suited to their particular circumstances.

- New Orleans – In December 2004, the City of New Orleans issued a competitive solicitation for a single, non-utility, private sector contractor to deliver a broad range of energy efficiency services within the city.
- New Brunswick – In September 2004, the Government of New Brunswick, Canada, announced plans to implement a new energy efficiency "system" for the province based on the Vermont energy efficiency utility model. A new "Crown Corporation" will be established to act as contracting agent of the government to a competitively-selected private-sector contractor.
- New Jersey – The state of New Jersey is moving from two decades of utility administration to administration by state utility regulators, with statewide, competitively-selected implementation contractors, covering two efficiency sectors plus renewables. Many aspects of the Vermont model have been incorporated.
- Connecticut, Massachusetts and Rhode Island – In these states, utility administration of statewide efficiency programs uses a system of performance indicators much like Vermont to measure and reward utilities for superior program implementation.
- Indiana – bills have been introduced in the legislature to create statewide, non-utility energy efficiency administration and implementation.
- Norway – In place of individual delivery by many local electric utilities, the quasi-governmental organization ENOVA is now responsible for unified country-wide energy efficiency and renewable energy efforts, with ten-year performance goals and funding.
- Other - Many other jurisdictions are considering elements of this model, including Manitoba, Kansas, Iowa, and New South Wales, Australia. Several provinces in China are also considering the applicability of the efficiency utility model to their circumstances.

Limitations

This efficiency utility model has had considerable demonstrated success in Vermont, because it is well-suited to the particular context in which it was developed and implemented. In other contexts, there may be aspects of this model that will be less appropriate, while other aspects may be more suitable. For example, as a small state, Vermont has relatively few very large industrial or institutional customers compared to many other jurisdictions, and therefore little involvement by energy service companies (ESCOs). In other states or countries with more and larger customers, there may a much greater role for ESCOs in delivering of efficiency services.

In a small state, it has also been practical to have a single contractor responsible for all efficiency services in all sectors. In larger jurisdictions, it might be that multiple organizations would be a practical necessity, with each serving different parts of the overall market. This approach would sacrifice, however, many of the benefits enumerated above from using a single entity.

It should also be noted that the model, as implemented in Vermont, is funded by electric ratepayers only and has a primary objective of achieving electricity savings. While Efficiency Vermont's programmatic efforts seek to address savings of fossil fuels, the lack of financial support to address these other savings opportunities has limited the savings which could be achieved of these other energy resources.

The length of the contract has also imposed limitations. While the short (three-year) term of the contract keeps the contractor highly concerned about its performance, it may discourage the contractor from adequately pursuing longer-term efficiency strategies that would not yield savings within the contract term.

Conclusion

The experience of a dedicated "Energy Efficiency Utility" to secure energy efficiency savings under a performance-based contract has demonstrated many innovative mechanisms and achieved many measures of success. Key features have been the multi-year performance contract, the use of a single, independent contractor for state-wide delivery of all services, and the use of carefully selected performance indicators. Many features of this model are being replicated or adapted in other locations.

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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

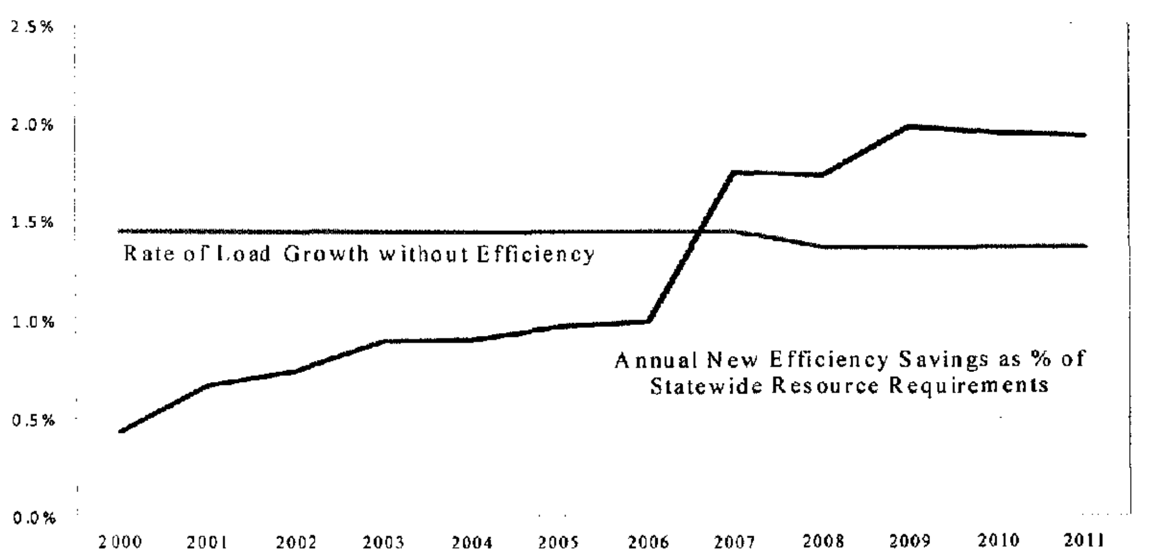
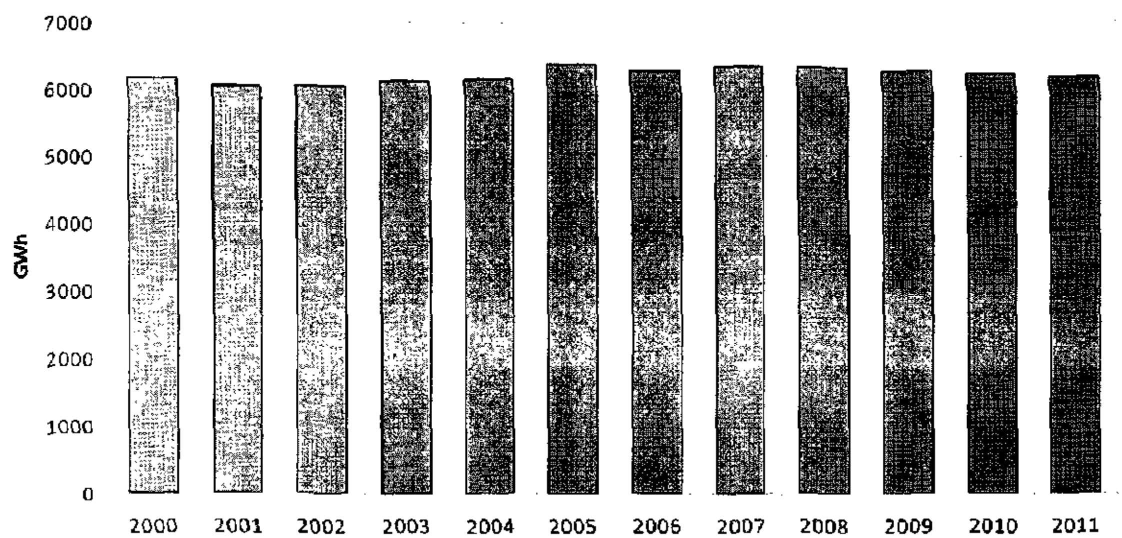


Figure 1 presents both efficiency savings as a percent of sales and the corresponding estimate of underlying growth rate for electric sales in Vermont. The Vermont Department of

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

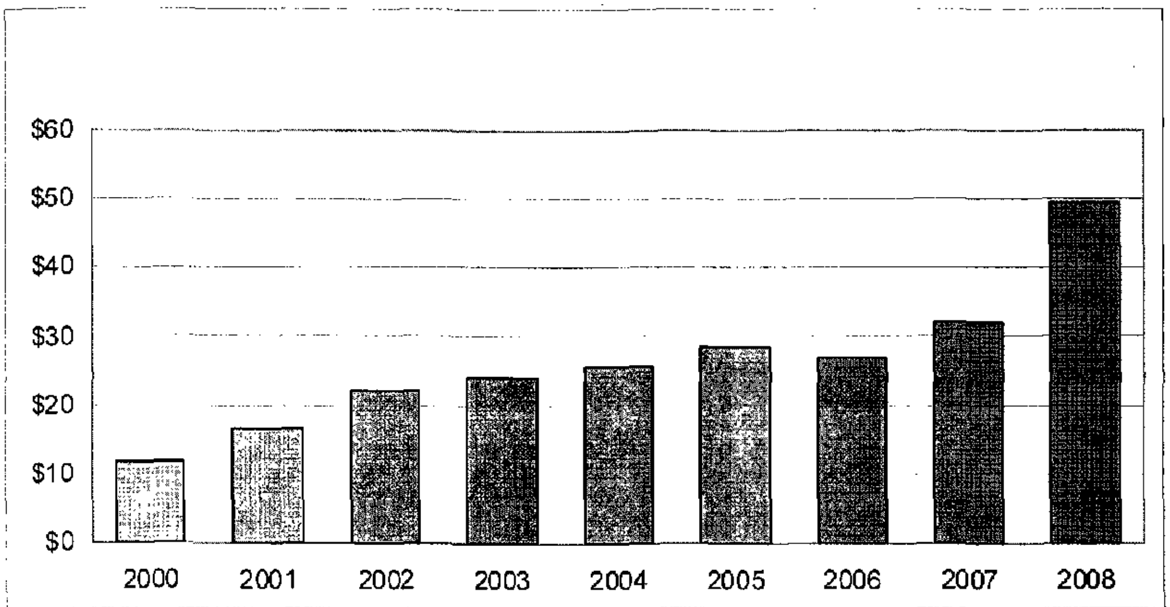
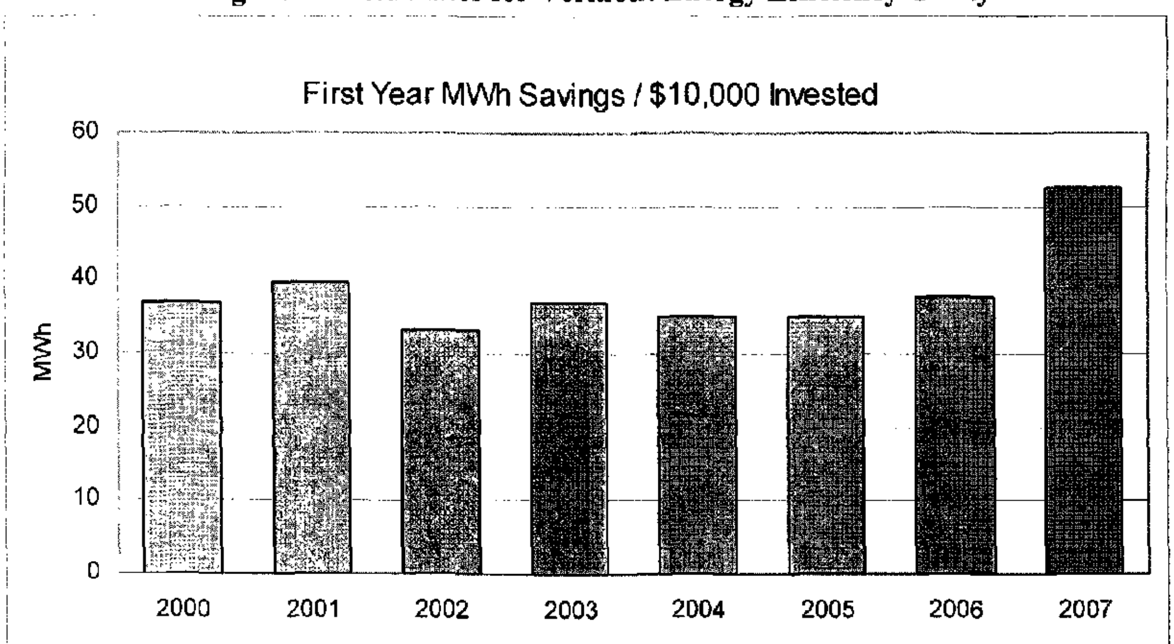


Figure 4. Yield Rates for Vermont Energy Efficiency Utility



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-soobvious 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 achieves[2]. 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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SUMMIT BLUE
CONSULTING, LLC

Evaluation of the 2005

Energy-Smart Pricing Plan^{SM}

Executive Summary

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Attachment 3

CONTENTS

E EXECUTIVE SUMMARY

This report presents results from an impact evaluation of the Community Energy Cooperative's Energy-Smart Pricing Plan SM (ESPP) residential real-time pricing (RTP) program for 2005. This analysis is a direct continuation of the impact evaluation of ESPP conducted by Summit Blue Consulting in 2003 and 2004.[1]

This effort is particularly timely given the passage of the U.S. Energy Policy Act of 2005.[2] Sections 1252(e) and (f) of the U.S. Energy Policy Act of 2005 (EPACT) state that it is the policy of the United States to encourage "time-based pricing and other forms of demand response." In addition, EPACT contains, under its amendments to the Public Utility Regulatory Policies Act (PURPA), provisions that **each *State regulatory authority*** shall conduct an investigation and issue a decision whether or not it is appropriate for electric utilities to provide and install time-based meters and communications devices for each of their customers which enable such customers to participate in time-based pricing rate schedules and other demand response programs (Section 115(i) of PURPA). This is to be undertaken within 18 months of the passage of EPACT. This legislation along with increasing pressures on energy costs has resulted in many regulatory jurisdictions taking an interest in time-based pricing such as the Community Energy Cooperative's day-ahead RTP Energy-Smart Pricing Plan. This impact assessment of the ESPP will be an important part of what should be a growing body of literature on time-based rates across all sectors.

This evaluation focuses on several key research questions including:

- Will residential customers respond to hourly market-based electricity prices?
- What is the magnitude of the effect, i.e., to what degree is electricity consumption affected by prices?
- How have the customers' responses changed over time (2003 to 2005), particularly given the fact that summer 2005 was considerably hotter than either 2003 or 2004 with correspondingly higher prices?

The hot 2005 summer temperatures coupled with the natural gas disruptions caused by the multiple hurricanes make this report of particular significance. These acted together to result in hourly electricity prices which were appreciably higher than in the previous summers. As a result, assessing how participants respond to the higher prices and repeated high price notifications was an important research effort.

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[1] The reports can be found at http://www.energycooperative.org/how-it-works.php.

[2] Public Law 109-58, August 8, 2005.

The continuing findings of the Community Energy Cooperative's ESPP program, as detailed in this evaluation, are important, given the national need to develop estimates of price responsive load in mass markets. These results will augment the few studies that have been conducted examining these mass market customers.

ES.1 Background on Real-Time Pricing Plans

The Community Energy Cooperative, in association with ComEd, has developed the first significant effort to introduce hourly market-based electricity pricing to residential customers. The goal is to allow both participating customers and the market as a whole to capture the benefits of having retail prices of electricity reflect the costs of providing that power to customers.

This project addresses some of the central issues associated with providing residential customers electric price signals that reflect the changing costs of providing electricity. While the hourly costs of electricity in wholesale markets can vary dramatically, retail pricing, particularly for residential and small commercial customers, has largely remained subject to regulated tariffs. These tariffs typically have provided customers with fixed rates, i.e., they pay the same price for electricity regardless of when and how much is used. This fixed rate does not reflect the true cost to the economy of consuming electricity at a given point in time, and therefore it distorts key market decisions.

Prices provide the market signals that are used to allocate resources. The question that needs to be addressed by those administering, regulating, designing, and participating in electricity markets is:

> ***How can we expect to have efficient electricity markets without having price signals that accurately price what is scarce, i.e., on-peak electricity use?***[3]

As long as consumers have flat rates, there is little incentive to manage what is scarce. With real-time pricing, residential customers still receive a monthly bill that represents an average of electricity costs across that month. However, these customers are now afforded an opportunity to manage their bills and reduce their energy costs by shifting some of their energy use from high price periods to lower price periods.

A rationally priced retail electric market can support business cases for innovation. Technology companies such as Microsoft, Carrier, Honeywell, and others are developing equipment that will allow customers to manage demand while increasing overall comfort and benefits from energy services. The business cases for the development of these technologies depend, in part, on both business and residential customers seeing cost savings result from managing peak demand. Appropriate pricing reflecting what is costly and scarce will allow customers to be passive and still save money. The technology companies will have the business case needed to innovate, develop, and market new energy management technologies to customers. They will drive changes in energy-using equipment and energy management technologies that will help customers shift and conserve energy during periods of scarcity and high prices.

The results of the Community Energy Cooperative's ESPP program, detailed in this evaluation, are important in demonstrating what a sustained RTP program might accomplish in the residential customer segments. ESPP is one of the few studies to address the future of innovative residential pricing programs.

[3] And similarly, accurately price what is abundant, i.e., off-peak electricity use.

ES.2 Community Energy Cooperative's Energy-Smart Pricing Plan^{SM} (ESPP)

The Community Energy Cooperative's (Cooperative) Energy-Smart Pricing Plan was started in January 2003. It provides customers with electricity prices that accurately reflect the hourly market price of electricity, and gives them the opportunity to make informed decisions about electricity use based on these prices. Details on the characteristics of ESPP can be found at the Community Energy Cooperative website: http://www.energycooperative.org/how-it-works.php.

This past year (i.e., 2005) represents the third year of operation for this pricing plan. ESPP had 750 participants in 2003 and this number grew to almost 1,500 customers in 2005. Features of ESPP include:

- Day-ahead prices. Prices for the next day are posted on the website or available by phone after 5 p.m.
- High price day-ahead notification. When the day-ahead price of electricity is over ten cents/kWh, ESPP customers are notified by telephone or e-mail. The purpose of this notification is to provide a mechanism for participants to become aware of relatively expensive prices and to adjust their consumption accordingly without relying upon expensive technology, i.e., metering and monitoring systems.
- Price protection cap. The Cooperative includes a price limit hedge at $0.50 per kWh, meaning that no customer participating in ESPP will see a net hourly price greater than $0.50 per kWh.
- Energy management and price response information. The Cooperative provides energy education and individual usage information.

ES.3 Estimation of 2005 Program Impacts

The previous evaluations of ESPP have shown that residential customers do respond to hourly prices. In this third year, the purpose of the evaluation was to determine if customers continue this trend and how this changes under different market conditions (e.g., the extreme summer weather and higher prices during 2005). In addition, the impact evaluation addressed the following key issues:

- What is participants' price elasticity, and how do they respond to high price notifications?
- Are there any differences in price response between participants who started in 2003, 2004, and new participants in 2005 given the different conditions in each year?
- How does the response to price vary by house types (single family and multifamily) and air conditioning technology (central, window, and none) and other customer characteristics?
- Have differences in the responses of participants in the Central Air Conditioner Cycling Option occurred, particularly when they have been controlled for very long periods of time, both in terms of the number of hours per day and the number of consecutive days?
- Does this program have an effect on energy consumption (in addition to the above demand impacts)? Does hourly energy pricing contribute to conservation?

In order to address these issues, several econometric models were estimated that combined monthly and hourly electricity consumption with the hourly electricity prices, census data, survey responses, and weather data. The results from each model are presented below.

ES.3.1 Energy Impacts Model

A regression-based model was developed to estimate the electricity consumption of each participant. The results show that ESPP participants consumed 35.2 kWh less per month during the summer months under ESPP relative to what their usage was estimated to be had they not received hourly electricity prices. This represents a savings of 3 to 4% of summer (June through August) electricity usage. During the winter months,[4] there was no statistically significant difference in monthly energy use between ESPP participants and individuals not facing hourly electricity prices. Therefore, ESPP results in a net decrease in **monthly** energy consumption.

ES.3.2 Hourly Price Response

The analysis developed several models to determine participants' response to hourly electricity prices. The first model was identical to the models that were used in the past two analyses to allow for comparison of results over time. The price elasticity estimated with this model is -4.7% (t-value of -16.6). This compares favorably to the elasticity estimate found in the evaluation of ESPP 2003 (-4.2% with a t-value of 12.6), i.e., a bit higher and a bit more significant.

The second model looked more specifically at individual customers' responses in order to understand the factors that influence a given customer's price response. Average results (weighted by the variance of each individual result) are presented below.

Exhibit ES-1. Aggregate Results (weighted by individual variance)

Period	Elasticity	T-Value
Daytime (before 4 PM)	-1.5%	-60.42
Late Afternoon/Evening (4 PM or later)	-2.6%	-106.42
Response on High Price Alert Days		
Daytime (before 4 PM)	-2.0% (.5% increment)	-5.77
Late Afternoon/ Evening (4 PM or later)	-4.8%(-2.2% increment)	-26.61

This shows that customers reduce consumption in response to higher electricity prices. This response varies from an elasticity of 1.5% during the day to 4.8% during high-priced late afternoon/evening hours.

One of the key aspects of ESPP is the personal notification (via phone or e-mail) to participants when the price the next day is expected to be greater than or equal to 10 cents per kilowatt hour. The hourly price elasticity model described above revealed that these high-price notifications do indeed increase a customer's response to prices, particularly if the high prices occurred during the late afternoon and evening.

The more detailed results report examines these individually-estimated elasticities and determines how these price responses are related to air conditioner cycling, notification success rate, customer characteristics (primarily from the census tract demographics), and air conditioner type (from participant database).

[4] Participants are on hourly electricity prices throughout the year.

These results demonstrate that residential customers do indeed respond to hourly electricity prices, and overall this response is consistent across years, despite great variation in weather and energy prices. This analysis has also shown that the degree to which residential customers respond to prices varies by the time of day, as well as by several observable characteristics of the customer.

ES.4 RTP Impacts on Energy Use

The overall results of the Energy Smart Pricing Plan, which provides customers with hourly prices that allow them to manage their energy bill and change their on-peak energy use, are shown below:

Key Findings

- ESPP participants continue to respond to hourly electricity prices in a manner similar to prior years, with an overall price elasticity of -4.7%. This means that a doubling of electricity prices results in a decrease in their hourly electricity use by nearly 5%.

- Participants' response to hourly electricity prices varies by the time of day, with lower responses during the day, and higher responses during the late afternoon/evening.

- ESPP participants' overall monthly summer energy (kWh) usage suggests a conservation effect, that is, a reduction in usage of 3% to 4%, relative to what their usage was estimated to be had they not received hourly electricity prices.

Additional Findings

- Participants continue to show a significant response to the high-price notifications (i.e., when prices exceed $0.10/kWh). For example, on July 25, 2005, the day with the highest prices of the summer, participants reduced their peak hour consumption by 15% relative to what their consumption would have been on the standard flat ComEd residential rate

- Participants reporting successful notifications essentially double their average response to changes in electricity prices.

- Automatic cycling of the central-air conditioners (turning the compressor on and off for short periods of time via remote control) during high-price periods added to a participant's response to electricity prices by as much as 2.2% for a total price response of 6.9%.

- Specific observable variables (or characteristics) that influence the participant's response to hourly prices were identified. For example, households with numerous individuals at home during the day are likely to be more price-responsive during the day, and customers who receive high-price notifications via e-mail are 2% more responsive (adding to their price response) on high-priced days.

- Customers' response to high-price notifications does decline somewhat as the number of consecutive notification days during the summer increases and as the length of a given high-price period increases, but there is a "recharge" effect as the number of days between high-price notifications increases, where customers' response recovers to initial levels.