Setting Priorities for Utility Investment in Cost-Effective DSM

Joseph M. Chaisson and Susan E. Coakley, Conservation Law Foundation

Recent events in New England have stimulated discussion about priorities for large-scale electric utility investment in cost-effective energy efficiency. Since 1988, New England's largest electric utilities have introduced comprehensive, direct investment energy efficiency programs to all customer sectors to acquire needed resources and maximize ratepayer benefits. Strong customer response has demonstrated the potential to acquire much greater efficiency savings in a given year than expected. This, combined with the availability of program evaluation results and refinement of program strategies, has poised these utilities to begin acquiring energy efficiency on a large scale. At the same time, the economic recession has lowered load growth projections and given rise to short-term rate impact concerns.

A more orderly and predictable efficiency investment process for the continued acquisition of cost-effective energy efficiency in New England can be accomplished through a three-part strategy that includes (1) ongoing cost-effectiveness screening of measures and programs to adjust investments in energy efficiency to match changes in avoided costs, (2) aggressive implementation programs to capture cost-effective energy efficiency in renovations, new facilities and facilities, and improve the efficiency of standard building and equipment purchase practices, and (3) controlled, discretionary investments in facility retrofits to balance market-driven program expenditures and address issues of resource need and cost, economic and environmental objectives, and equitable distribution of bill reduction benefits among customer groups.

Introduction

This paper describes a new conceptual framework for electrical efficiency program structure and investment policy in New England. This proposal is based on what is being learned from initial implementation of large scale comprehensive electrical efficiency programs in New England, an experiment that began in earnest during 1988.

While several aspects of this proposal are an outgrowth of ideas and research that originated in the Pacific Northwest, this proposal also relies on many new lessons being learned in New England.

Recent Events in New England

New England began to widely implement comprehensive electric utility efficiency programs in 1988. In that year, the region's electric utilities invested about $25 million in such programs. By 1991, utility efficiency investments had expanded nearly tenfold, to about $250 million. Through this period, the region's regulators and efficiency advocates held to an investment policy urging utility's to "get as much efficiency savings as possible, as quickly as possible".

1991 was a watershed year in the course of New England utility efficiency investment. During the year, several major events occurred that rendered obsolete the investment policy adhered to during the region's multi-year ramp-up to full scale efficiency investment:

- The New England Electric System (NEES), Northeast Utilities (NU) and others demonstrated that efficiency programs could acquire a much larger volume of efficiency savings than had been previously assumed. During the first quarter of 1991, the "open offer", vendor-delivered commercial retrofit programs offered by these utilities[1] received customer applications at rates requiring investment far beyond that budgeted for 1991. If these programs had remained open to applications for the entire year, this "oversubscription" could have doubled the entire DSM budget of at least one large utility (NEES). As this was a much larger and unexpected increase in investment than either utility management or their regulators were comfortable with, these programs were closed to new applications early in the year.

- One company (NEES) measured program savings from a full year of comprehensive efficiency program delivery and began using this information to refine programs. This was a unique event, as no other utility had ever measured annual results from a full range of

comprehensive programs. It also produced a nearly overwhelming array of information that could be used to improve the functioning of these programs. Several other New England utilities will begin to produce similar results measurement during 1992.

- Several New England utilities with substantial efficiency program experience began to modify their programs to adapt to what they are learning about their customer's efficiency market structure. These lessons include identifying more precise boundaries among customers having differing program requirements[2] as well as an emerging recognition of the need to distinguish between "market-driven" and retrofit customer situations.

  Market-Driven Programs are energy efficiency programs that rely on market forces and natural replacement cycles to initiate changes in customer buildings, facilities, and energy consuming equipment. Market forces and natural replacement cycles result in new construction, building renovation, building remodeling, facility expansion, equipment replacement, and process line change-outs.

  Retrofit Programs initiate changes to existing buildings, facilities, or equipment to improve energy efficiency. These changes are usually unplanned by the customer and often require utility personnel or a contractor to assess customer efficiency options and "sell" the customer on proceeding with the work.

- The severe New England recession collapsed forecasted load growth and sales revenues. Given the substantial efficiency investment levels achieved in 1991 (several major New England utilities invested from 4% to 5% of their 1991 gross revenues in efficiency programs--including New England Electric, Boston Edison, Western Massachusetts Electric, and Commonwealth Electric) and associated reduction in forecasted new capacity requirements, concern about efficiency investment rate impacts emerged as a key issue in several regulatory proceedings.

  The much lower load forecasts produced by the recession deferred the year of need for new capacity several years into the future for most New England utilities. This deferral of immediate need for new capacity raised concerns about the cost-effectiveness and need to continue large scale efficiency programs.

- Utilities and regulators began to seriously examine the potential long-term impacts of implementing recent Clean Air Act Amendments and other air quality control issues on all aspects of operating power systems in New England. It is anticipated that compliance with current law and additional emissions controls (CO_2, NO_X, CFC use phaseout, etc.) that will likely be enacted over the next decade could have a significant influence on future utility efficiency investment.

Thus, New England utilities are moving into a tumultuous period of broad and extensive "real world feedback" from the ongoing New England experiment in delivering aggressive and comprehensive efficiency programs. This poises the region to move utility efficiency investment into a new generation of programs and policies that respond both to changing regional economic and power supply conditions as well as to what is being learned by delivering a uniquely aggressive and varied set of efficiency programs.

Several important questions were raised by these recent events:

- How much efficiency investment should a utility make each year?
- How should programs be structured to best deliver this investment?
- How should this investment be distributed among programs and customer groups?

In response to these questions and the changing conditions that underlie them, this paper outlines a process for establishing efficiency investment levels as well as an associated efficiency program and investment structure.

A New Approach to Efficiency Investment

The new approach to efficiency investment consists of three parts:

- Ongoing cost-effectiveness screening of DSM measures and programs to adjust program investments to reflect changing avoided costs resulting from revised load forecasts, fuel prices and/or plans for capacity additions.
- A new structure for the set of programs offered by utilities that includes market-driven programs to capture efficiency investment opportunity in all such markets as well as retrofit programs.
- A new investment policy that uses utility-controlled retrofit to balance the volatility and uncertainty of

market-driven program budgets and considers that balance between customer bill and rate impacts to set overall investment targets.

Investment Cost-Effectiveness Procedures

Efficiency resource acquisition in all programs should be based on an annually updated investment "screening tool" that establishes the value of efficiency savings based on current system cost projections. Thus savings value and the eligibility of efficiency measures for program investment would automatically adapt to significant changes that occur in New England's economy and the electrical supply system. No measures would be delivered under these procedures whose cost exceeds the current projected value of savings that would be produced. For example, if a utility's year of need for new supply development were to be deferred by several years based on current load forecasts, efficiency savings value would be reduced accordingly and only measures (or programs) that are cost-effective under the revised forecasted need for new capacity would be delivered by that utility's programs. Such procedures have been adopted by most New England utilities. This has resulted in the removal of certain measures from 1992 programs, due to much lower projected avoided costs.

This is a quite important concept as it provides assurance that all program investments can be assumed to be cost-effective given current utility resource plans.

If long periods (several years) of highly unstable load occur forecasts, it may be appropriate to consider some form of smoothing associated annual changes in DSM measure investment criteria. To date, this has not been necessary in New England.

Proposed Program Structure

Efficiency programs would be organized into two categories: market-driven (lost opportunity) programs and discretionary (retrofit) programs. This recognizes that savings can be acquired from two distinct markets for energy savings--the customer-driven natural market for new buildings and equipment, and the utility created retrofit market to replace inefficient existing equipment prior to end of equipment life. Programs targeted to these markets have distinctly different characteristics that influence their structure, relative funding priority and management.

Market-Driven (Lost Opportunity) Program Characteristics.

- These programs target customers when they are building, expanding, replacing equipment or process lines, renovating, or significantly remodeling their buildings or facilities.[3]

- Because these programs target potential lost opportunities, their goal would be to obtain the maximum feasible annual market penetration.

  An initial working target for these programs is to achieve a 70% annual market share over a several year program introduction period. As these markets become better understood, program targets can be refined. They will likely vary by sub-market (for example building remodeling versus lighting ballast replacements), but these targets should be as aggressive as is practical to achieve.

- Volume of activity in these programs would be market-driven rather than budget driven. Investments would rise and fall over time reflecting local economic conditions. For example, investment in programs targeting new commercial construction would rise and fall with local business cycles and HVAC equipment replacement would generally track historic commercial construction cycles. It should, however, be possible to project levels of activity in these programs with some accuracy after a few years of experience in these markets.

- Efficiency investments delivered by these programs would generally be available at the incremental cost of high-efficiency equipment, which is generally much lower than the full equipment replacement costs characteristic of retrofit programs.

- Efficiency investments acquired by market-driven programs would generally have longer effective measure lives than similar investments acquired through retrofit programs, because the programs work when owners are making changes to their buildings and facilities. This reduces the likelihood that efficient equipment is removed during an owner-driven change in subsequent years.

- Efficiency resources acquired would thus generally have higher value and lower cost than those acquired in retrofit programs (due to longer effective measure lives and "incremental" cost structure).[4]

- Considerable opportunity exists in these program situations to reduce over time the utility cost and increase the net societal benefits (where participation is increased) of acquiring efficiency resources. This can be accomplished by progressively improving standard practice for building energy design and standard equipment efficiency through properly structured program incentives and design assistance targeted to builders and equipment vendors (e.g., pay the full incremental cost of efficiency improvements that occur when customers make normal market decisions about building design and modification and electrical equipment installation or replacement). Program-induced improvements in standard practice can provide additional savings through upgrades to building codes and equipment efficiency standards once standard practice becomes significantly more efficient. Then program incentives can be reduced (or eliminated) or higher efficiency standards established.

  Capturing as much of these potential cost savings as possible should be an explicit long-term objective of market-driven programs. To achieve success in doing so, utilities will have to work closely with government agencies, builders, energy professionals, and energy trade groups.

- Customers participating in market-driven programs may also receive concurrent retrofit investments to increase program benefits. Program benefits can be increased by reducing the cost of retrofit treatments (e.g., a program that targets efficiency in facility renovations may also retrofit inefficient equipment the owner was not planning to replace, but which is convenient and less expensive to retrofit during the planned renovations). Program benefits can also be increased by leveraging deeper savings through coordinated market-driven and retrofit strategies (e.g., a retrofit treatment to upgrade the efficiency of lighting systems can reduce building cooling loads sufficient to justify down-sizing of as well as efficiency upgrades to replacement HVAC equipment at the time of customer replacement).

Discretionary (Retrofit) Program Characteristics.

- Obtaining all cost-effective savings in treated customer facilities (comprehensive treatment) is a primary program objective, but such comprehensiveness could be achieved for large customers through a series of successive treatments over time. Successive treatments may not be suitable for smaller customer facilities (e.g., residential, small retail shops or offices, etc.) where the overhead costs to provide program services are not justified by the value of the remaining savings.

- Retrofit programs would be operated at or above (as a discretionary resource) a minimum level necessary to establish and maintain the capability to acquire such resources at higher levels.

  Minimum program delivery capability needs to be established both within utilities and also within the relevant market infrastructure (designers, equipment vendors and installers, program services delivery contractors, etc.). Such needs are likely to vary from being modest, in the case of programs that can be fielded quickly without substantial technical capability within utilities or private infrastructure (for example, vendor-delivered prescriptive rebate programs), to being quite substantial in the case of programs that require highly skilled and experienced utility staff and private infrastructure (for example, comprehensive industrial retrofit programs).

- Retrofit programs would be designed to be budget-driven. This means that they would include program features that would set and control program investment activity each year. Such features would typically include requiring utility-provided (directly or through contractors) energy audits before treatment and using audit access to control program entry. These programs would not have the "open offer" characteristic of market-driven programs.

Proposed Efficiency Investment Structure

Each utility's annual efficiency investment would be organized into two components:

- Core Investment; and

- Discretionary Investment.

Core Investment would accomplish the following:

- All programs targeting market-driven (lost opportunity) market situations would be funded to enable as high an annual penetration as is possible of these market situations.

  Investment in these programs would be largely driven by local economic conditions which would affect the amount of new construction, building occupation turnover and remodeling, industrial production levels,

and other activities that generate or influence customer market-driven investment opportunities.

- Programs targeting efficiency resources available at any time in existing customer facilities (retrofit resources) would be funded at a minimum capability maintaining level where the need to make significant investments in such programs is foreseen within the near-term future.

  The need for such activity would be influenced by the following considerations:

  - Projected need (amount and timing) for substantial investment above base levels to defer planned supply or transmission and distribution system improvements. This would affect how soon significant retrofit investment might be needed and at what volumes it would be needed--both of which would influence the current year needs (if any) for maintaining infrastructure capability.

  - Whether needed infrastructure capability (technical and managerial skills, a competitive contractor market, etc.) can be otherwise provided by either market-driven program activity or by currently planned discretionary program investment.

Thus, core investment would be determined by market activity during the year and by retrofit program infrastructure maintenance requirements.

Establishing Discretionary Activity Investment Levels

Investment in retrofit program activity beyond levels necessary to fully fund market-driven programs and to maintain retrofit program infrastructure would be reviewed annually. Discretionary investment would be made where a level of investment above that necessary to support core program activity was determined to be desirable for several reasons. These might include the following:

- to avoid more expensive planned supply resource acquisition or transmission and distribution investments in a timely and effective manner;

- to reduce long-term system costs;

- to reduce short-term costs and environmental externalities;

- to address serious concerns about the equity of distribution of program benefits. For example, it may be that very few small commercial customers would receive direct program benefits through an aggressive package of market-driven programs. If so, it might be necessary to deliver retrofit program services to these customers at a level above "capability maintenance".

- to provide an equitable share of efficiency program benefits to low-income customers.

- to progressively reach markets for retrofit conservation that are cost-effective, but sufficiently difficult to reach that achieving market saturation will take many years (for example, small commercial).

- to free up capacity for sale to other utilities where a market for such exists.

- to achieve environmental objectives. These might include specific emissions reductions, CFC use avoidance, and power-system related waste stream reduction.[5]

- create counter-recessionary employment that boosts the local economy with DSM investment that also improves the long-term economic productivity of a power systems.

Annual discretionary program investments would be "budget driven". Precise budgets would be set for such investments and programs would be designed to manage program investment activity so that budget targets would be met but not exceeded.[6]

The process for establishing annual discretionary investment budgets could focus on several objectives:

- Optimize program benefits. Specific considerations might include the following:

  - Geographically targeted investments to defer or avoid load-related transmission or distribution system improvements.[7]

  - Timing. Would certain program investments produce more net present value of benefits to ratepayers if deferred?

- Avoiding or mitigating potential excessive bill increases within selected customer rate classes in specific years. Relevant factors that would need to be considered to address the effect of various levels of discretionary investment would include:

  - rate impacts;

- bill impacts (for both participating and non-participating customers; and the

- distribution of participating customers over time.

The effect of these factors would need to be reviewed over a reasonable projection period (probably at least ten years).

Information on these effects should be balanced against the long-term system cost savings produced by each investment level.

- Target distressed customer classes, to include the following:

  - Customers otherwise likely to leave the electric system for self-generation;

  - Economically distressed customers. Customers with many employees and for which electrical and other associated savings[8] could be large enough to help maintain customer operations.

Summary

A more orderly and predictable efficiency investment process for the continued acquisition of cost-effective energy efficiency in New England can be accomplished through a three-part strategy that includes:

- Ongoing cost-effectiveness screening to adjust program investments to reflect changes in utility avoided costs and resource need.

- Aggressive implementation programs to capture cost-effective energy efficiency in renovations, new facilities and facilities, and improve the efficiency of standard building and equipment purchase practices.

- Controlled, discretionary investments in facility retrofits to balance market-driven program expenditures and address issues of resource need and cost, economic and environmental objectives, and equitable distribution of bill reduction benefits among customer groups.

Endnotes

1. These program were the NEES Energy Initiative (EI) Program, the Northeast Utilities Energy Saver Lighting Rebate Program, and the Commonwealth Electric Large Commercial and Industrial Retrofit Program.

2. For example, Northeast Utilities determined from field experience with their Energy Action Program that it was necessary to offer industrial customers higher incentive payments than those offered to commercial customers to successfully facilitate installation of efficiency measure related to industrial process equipment.

3. Exhibit JMC-2 to Direct Testimony of Joseph M. Chaisson in MDPU Docket 91-205, "Commercial and Industrial Customer C&LM Markets" describes customer situations within these markets.

4. Characteristics of commercial sector market-driven customer situations and associated efficiency measure lifetime linkages were explored in Gail Katz, David Baylon, and Fred Gordon, Lost Conservation Opportunities Created by Remodeling and Renovation in the Commercial Sector, prepared for the Bonneville Power Authority by Momentum Engineering and Ecotope, August, 1987.

5. An example of discretionary investment with substantial energy benefits are the residential appliance recycling program being offered by NU and NEES that recycle reusable materials, extract CFCs, and isolate and properly dispose of toxic materials like PCBs.

6. Two examples of such program are the Northeast Utilities (NU) Energy Action Program (EAP) for which customer intake and processing is tightly managed and under complete company control and the NEES (NEES) Small Commercial and Industrial Program which is marketed and delivered by company contractors under direct control of the program manager.

7. For example, the Central Maine Power Company initiated an extensive study to identify such opportunities throughout their service area during 1991.

8. Comprehensive industrial customer efficiency improvements often provide benefits beyond reducing electric bills. One example is the Kraft Foods ice cream plant in Framingham, Massachusetts. This plant recently participated in a Boston Edison Company program. Program treatment, which primarily involved replacing the plant refrigeration system, reduced electrical consumption by about 30% and also reduced maintenance costs and improved product quality. Together, these changes shifted the Framingham plant from the least productive ice cream plant owned by Kraft, to the most productive.