Foundations for Efficiency: How Industrial Energy Efficiency Programs are Structured in the U.S. and Canada

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ABSTRACT

As state and provincial governments and utilities look to the industrial sector for greater energy savings, they will require information not just on what types of programs to offer, but also on how to structure programs that target the industrial sector. Industrial energy efficiency program operators at the state and provincial level in the U.S. and Canada have years of experience developing and supervising energy savings delivery systems under contract or regulatory frameworks. However, this wealth of experience is not broadly known.

This paper examines a number of industrial energy efficiency programs overseen by states, provinces, and energy utilities. While these programs all have the same goal of acquiring energy savings for the least cost, the models used vary substantially. These differences reflect various ways to address key questions that arise during program design, including:

- What delivery institution should be used?
- What funds should be used? How should they be managed?
- What purchase targets should be set? Through what process?
- What type of contractual arrangements should be used?
- Who should be responsible for monitoring and verification?

This paper will show how many of these questions are addressed in five North American programs, chosen to highlight the various institutional structure across the continent: BC Hydro, Detroit Edison, Energy Trust of Oregon, Efficiency Vermont, and Wisconsin Focus on Energy. A qualitative discussion of the findings are presented for the practical consideration of other governments and utilities in their efforts to develop or upgrade their own industrial energy efficiency efforts.

Overview of Energy Efficiency Resource Acquisition

Energy efficiency resource acquisition programs seek to purchase energy savings in the public interest, often through financial or technical assistance. Although the decision process for creating these programs varies and can include government, utilities, consumer groups, and other stakeholders, it is usually a government entity that gives final approval of the volume of energy savings to be acquired and how it will be funded. The government entity may also assign responsibility for delivering the energy savings to one or more institutions in some form of contractual arrangement and supervise the results.

Why Pursue Energy Efficiency Resource Acquisition?

The main reasons that public authorities in North America encourage energy efficiency resource acquisition programs are to ensure least-cost resource development by energy utilities, reduce environmental damage from energy use, enhance energy supply security, and reduce consumer energy bills. The relative priority of these objectives varies and shapes how programs are developed and implemented.

Least-cost resource development. Delivery of electricity efficiency resources costs dramatically less than delivery of incremental electricity supply resources. In most electric power systems, delivery of reliable energy efficiency resources to meet electrical energy consumption (kWh) costs somewhere between 15-50% of the cost of new power supply sources, such as a new power generating plant (Lazard 2011). Energy efficiency resources offer similar cost advantages for meeting power capacity (kW) needs. Costs of improvements in the efficient use of natural gas also are substantially lower than acquiring new natural gas supply resources over the medium term,[1] although gas industry structure and economics are different from those of the power sector.

Environmental benefits. Environmental concerns rank high among the reasons for adopting energy efficiency resource acquisition schemes in most states and provinces because energy efficiency is arguably the cleanest energy resource from an environmental perspective. The unacceptable land footprint and ecological impacts, air and other local pollution impacts, and carbon emissions of many supply alternatives are avoided by deployment of energy efficiency. In environmental analyses such as air quality improvement or carbon emission reduction plans, tapping into energy efficiency resources usually ranks at or near the top of the list of cost-effective measures (McKinsey 2009).

Energy security. Especially where delivered as a portfolio of measures with medium- and/or long-term reliability, acquisition of energy efficiency resources can provide a valuable hedge against energy supply disruptions or shortages and energy price volatility, including price spikes. In the Northwest Power and Conservation Council's recent *Sixth Power Plan for the U.S. Pacific Northwest* (NWPCC 2010), for example, special attention is given to the role that energy efficiency resources can play in dealing with the risks of supply and price uncertainty.

Consumer benefits. Implementation of cost-effective energy efficiency measures reduces the energy bills of consumers. Although returns vary, life-cycle returns on energy efficiency investments are generally robust, especially if other non-energy benefits are counted (Chittum 2012). In addition, by relying on least-cost energy efficiency resources, utilities are able to avoid more expensive supply resources. This eventually results in lower rates (relative to a no-efficiency program scenario) as capital costs of new generation do not need to be recovered in these rates. Generally speaking, a small rate increase in the near term (for energy efficiency program costs) results in holding rates at lower levels in the long term.

[1] This remains true even in light of lower natural gas prices in North America due the shale gas boom. See (Young et al. 2012)

Elements of Program Design

Energy efficiency resource acquisition for the public interest is now a big business. Total expenditures on energy efficiency programs (of which resource acquisition is the dominant part) have been growing sharply in recent years. Expenditures in 2011 were US$7 billion in the United States and US$1 billion in Canada (ACEEE 2012, CEE 2011). In both countries, programs are run at the sub-national level: by U.S. states and Canadian provinces. Throughout the states and provinces there is great variation among programs, which provides particularly rich experience and food for thought for those interested in creating or improving their own energy efficiency resource acquisition programs. All of the programs have key elements in common, but include major differences in the choices made on those elements. The common elements and some key questions to consider for each include:

- Assignment of one or more entities to undertake the acquisition. What organizations can best arrange efficient delivery of the energy savings, preferably at lowest cost to the public?
- Designation of funding sources and amounts. What funds are to be used for the acquisition? How should funds be allocated for different parts of the program? Who decides this and how?
- A method and system for determining acquisition targets. How much energy savings should be acquired? Who decides that and how?
- Completion of performance targets and contractual arrangements. What is each delivery entity required to deliver, when, and at what cost? What are the consequences for over- or under-delivery? How can flexibility be introduced to accommodate changing circumstances?
- A system for evaluating, measuring, and verifying of energy saving results. What is the system for evaluating, reporting, and verifying the energy savings delivered? Who is responsible for what? What methodologies are used?

Institutional Program Structures

A qualitative assessment of five North American energy efficiency resource acquisition programs is presented below. They were chosen not necessarily because they are the "best" energy efficiency programs, but rather to show a range of program structures. Of particular importance is how program design is affected by local factors such as the relationship between state or provincial government, regulatory bodies, and utilities, as well where (if at all) the technical and administrative capabilities are within the state or province. Each of the examples below is accompanied by a program flow chart, showing government entities (in yellow), utilities (red), energy efficiency programs (blue), and energy consumers (green). While actual relationships are far more complicated than shown, the flow charts highlight the origin of regulatory authority, target setting, funds, and services. The questions discussed in the previous sections are manifested in the program models and illustrated in the flow charts.

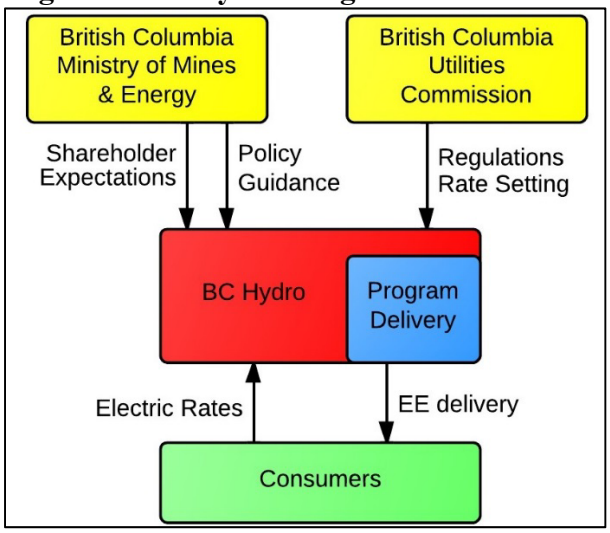
BC Hydro

BC Hydro is a commercial Crown Corporation owned by the Province of British Columbia that operates as a commercial entity separate from the Provincial Government. It reports to the government, its sole shareholder, through its Responsible Minister, the Minister of Energy, Mines and Petroleum Resources. BC Hydro receives government shareholder policy guidance through the Ministry of Energy Mines. Guidance is articulated in the Province's energy plans and legislation, including the 2007 BC Energy Plan and the 2010 BC Clean Energy Act, which called for energy efficiency acquisition to account for 66% of new power obtained by 2020.

BC Hydro is also regulated as a public utility by the British Columbia Utilities Commission (BCUC), who is charged with government authority to ensure that BC Hydro customers receive safe, reliable and non-discriminatory energy services at fair rates. BCUC is also responsible for ensuring that utility shareholders earn a fair return on their invested capital. BCUC regulates BC Hydro's electricity tariffs considering overall revenues, expenditures, and rates of return needs, balanced against needs to keep prices as competitive and least burdensome as possible. It also approves BC Hydro's regular service plans, including plans to acquire electricity resources from new generation, conservation and wholesale power purchases. In a 2008 Amendment to the Utilities Commission Act, BCUC also is required to consider needs to meet provincial greenhouse gas emissions reduction goals and to pursue energy conservation and efficiency, and other clean energy concerns.

BC Hydro develops detailed targets for acquisition in long-term plans that are subject to BCUC review and approval. The costs of operating BC Hydro's efficiency resource acquisition efforts are included in BC Hydro's overall resource acquisition and operating budget which is also approved by BCUC. All resource acquisition costs are built into the rate structure. Figure 1 below show's BC Hydro's program structure. (BC Hydro 2013, BC Hydro 2012, BCUC 2013)

Figure 1. BC Hydro Program Structure



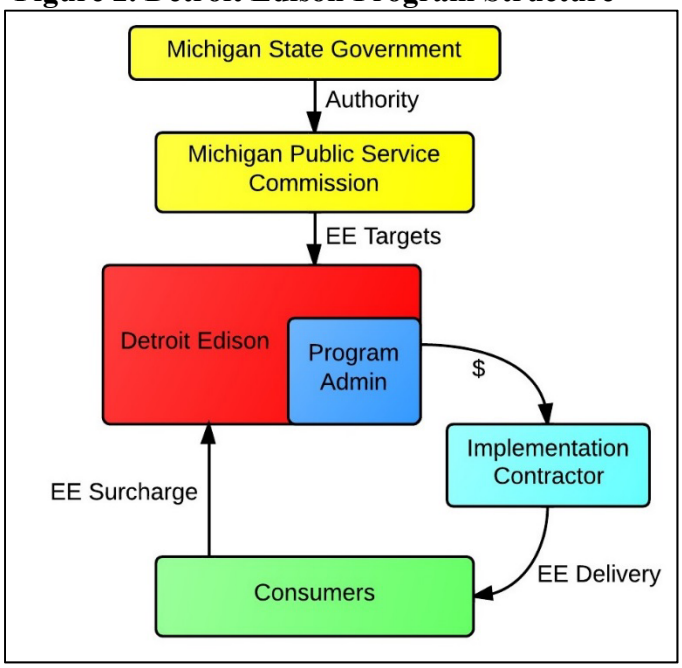
Detroit Edison

Michigan's largest electric utility, Detroit Edison (DTE[2]), is an example of one of the most common models of energy efficiency programs at the state level, in which the state government imposing energy savings targets on utilities operating within the state. Each affected utility is then legally obligated to achieve those savings

The Michigan state legislature established an energy efficiency resource standard (EERS) in 2008 and authorized the Michigan Public Service Commission (MPSC) to set energy savings targets for all electric utilities. To meet these targets, each utility is required to file an "Energy Optimization" (EO) plan to the MPSC that describes the programs the utility plans to offer to each customer class; the amount of funding needed; plans for cost recovery; cost effectiveness of the efforts; and independent third-part to verify savings

DTE's Energy Optimization is funded through a Public Benefit Fund (PBF) that is assessed on all electricity sales. These fees are collected by DTE and paid to its implementation contractors to provide energy efficiency services. DTE offers prescriptive rebates to industrial customers for installation of common high-efficiency systems. Custom incentives are available for projects outside the scope of prescriptive measures and are paid on a $/kWh per year basis for claimed energy savings. A third party evaluates overall program performance and reports to DTE and MPSC. DET's program structure is shown in Figure 2. (ACEEE 2013, DTE 2013, Lark 2007, MPSC 2013)

Figure 2. Detroit Edison Program Structure



[2] Although DTE Energy is the owner of both Detroit Edison and MichCon Gas, this paper uses DTE as shorthand to refer to the electric utility Detroit Edison.

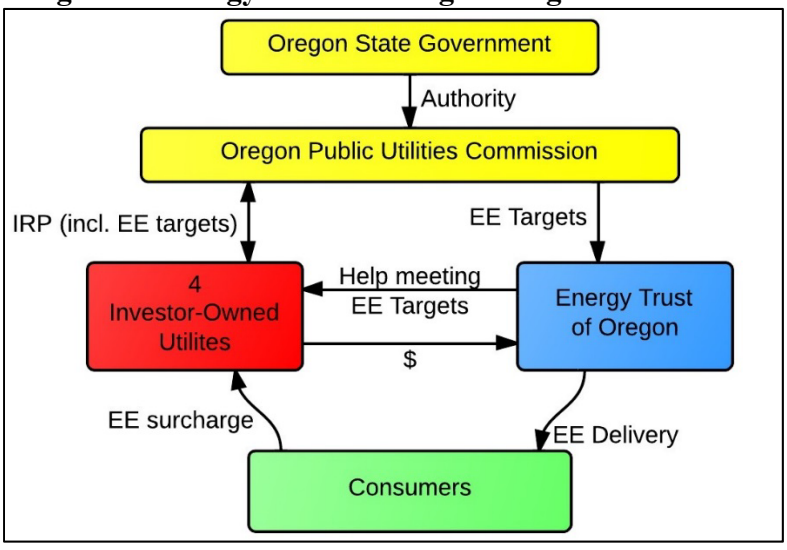
Energy Trust of Oregon

Launched in 2002, the Energy Trust of Oregon (ETO) is the entity entrusted by the state government of Oregon with the acquisition of energy efficiency resources. Energy efficiency resources are acquired on the state's behalf from the customers of the state's four large investor-owned energy supply utilities. In Oregon, energy efficiency acquisition previously undertaken by the supply utilities is now entrusted to ETO, a third-party entity solely focused on administering the government's energy efficiency and renewable energy incentive programs.

The agreement between ETO and the Oregon Public Utility Commission (OPUC) provides the legal foundation for the ETO to act on the State's behalf to acquire energy efficiency resources. OPUC provides guidance and sets performance metrics for ETO. It also evaluates ETO's performance against those goals. OPUC sets the minimum targets for ETO's delivery of energy efficiency and renewable energy as three-year rolling averages. OPUC also sets minimum targets for the ETO's natural gas efficiency acquisition program in a similar manner. ETO provides annual reports to OPUC. Large utilities collect fees through energy bills and provide those fees to ETO to conduct programs to acquire energy efficiency and renewable energy resources. ETO's program structure is shown in Figure 3.

ETO provides a matrix of programs, organized by industry and by process, so that it can meet customer needs with tailored technical and financial assistance. The industrial programs have consistently delivered between 25 and 35% of the total annual electricity savings reported by ETO and focus on providing training and implementation assistance to companies in targeted industries to adopt the Strategic Energy Management (SEM) Energy Management System. (ACEEE 2013, ETO 2013, OPUC 2013, PGE 2009)

Figure 3. Energy Trust of Oregon Program Structure



Efficiency Vermont

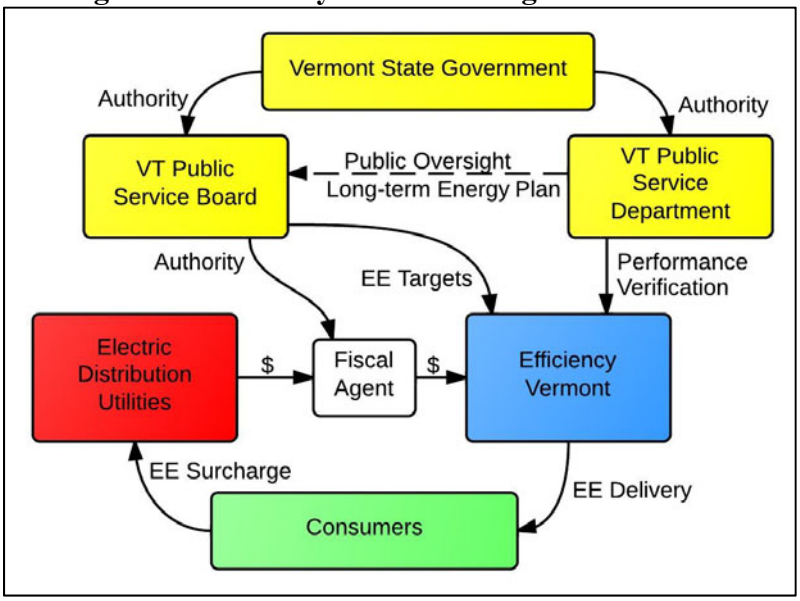
In 1999, Vermont's Public Service Board (PSB) consolidated the efficiency acquisition programs of all of Vermont utilities into a single, state-wide energy efficiency utility (except for a smaller program covering Burlington, Vermont's largest city). This was the first

implementation of a third-party administered state-wide resource acquisition program in North America.

Vermont's statewide Energy Efficiency Utility (EEU) is called "Efficiency Vermont" and is operated by an independent non-profit entity, the Vermont Energy Investment Corporation (VEIC). This entity was contracted following competitive procedures in 1999 and the contractual relationship between VEIC and the PSB was revised to a long-term appointment in 2010. Efficiency Vermont is paid for through an Energy Efficiency Charge (EEC) assessed on all customer energy bills. The PSB sets annual and three-year efficiency acquisition targets and budgets for Efficiency Vermont while Vermont's Public Service Department (PSD), an agency within the executive branch of the Vermont state government, is responsible for monitoring and evaluating service offerings. The PSB also appoints a Fiscal Agent to collect the energy efficiency charge from the utilities and direct the money to Efficiency Vermont.

Industry accounts for approximately 16% of energy use in Vermont. Programs for industrial customers include technical assistance in the form of auditing, project development, energy management training, and employee energy efficiency awareness. Financial incentives are available for investments in common-technologies such as lighting and motors, and for customized energy efficiency projects. Customized projects are the dominant source of efficiency acquisition, accounting for approximately 90% of the industrial project total. Efficiency Vermont's program structure is shown in Figure 4. (ACEEE 2013, EV 2013, VDPS 2011, VPSB 2013)

Figure 4. Efficiency Vermont Program Structure



Wisconsin Focus on Energy

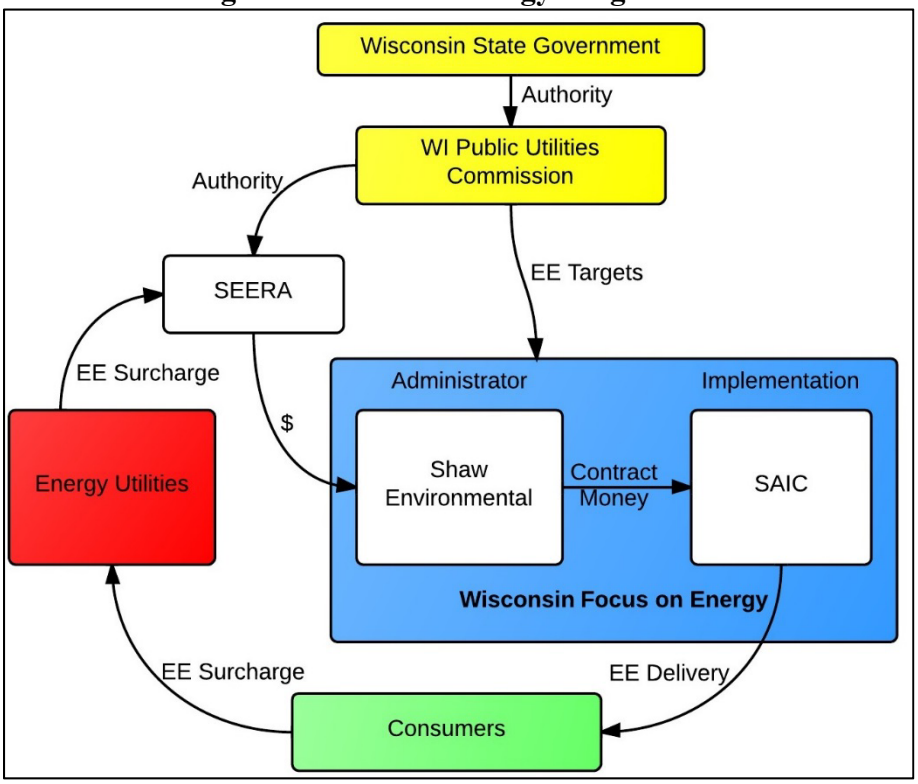
Wisconsin Focus on Energy is a state-wide energy efficiency and renewable energy program. It runs programs for utilities that serve 98% of state's electric and natural gas load. Focus on Energy was formed in 1999, when the Wisconsin state legislature enacted a Public Benefit Fee (PBF) to fund energy efficiency and renewable energy and created the state-wide program for deployment. Focus on Energy is operated by a third party administrator and serves

all customer types. Its structure and offerings have evolved over the years in response to changing goals, customer needs and political realities.

Focus on Energy and the PBF funds are overseen by the Wisconsin Public Service Commission (PSC), which sets electricity and natural gas savings targets for the program. Wisconsin's utilities assess the PBF through energy bills paid by all electric customers. The utilities pass these funds to the State-wide Energy Efficiency and Renewable Administration (SEERA), a panel comprised of utility and government representative created under authority of the PSC. SEERA was created to allow PBF funds to flow more directly from the utilities to Focus on Energy,[3] which in turn provides energy efficiency resource acquiring programs. Shaw Environmental currently manages the administration of funds and Science Applications International Corporation (SAIC) handles the delivery of services to the industrial sector. Both companies won competitive solicitations for their respective responsibilities. Wisconsin Focus on Energy's structure can be seen in Figure 5.

From its start, Focus on Energy has targeted specific energy-intensive industries such as food processors, pulp & paper mills, and plastic part manufacturers with technical and financial assistance. More recently large industrial customers have been allowed, with PSC approval, to fund and implement their own energy savings projects, although to date no large customers have taken advantage of this provision. (ACEEE 2013, FOE 2013, LAB 2011, WPSC 2013)

Figure 5. Focus on Energy Program Structure



[3] Prior to 2005, the PBF was administered by Wisconsin's Department of Administration. This allowed the state government to access the funds for other purposes. This is prevented by channeling the money through SEERA.

Conclusions and Recommendations

The five program models discussed above offer insight into how real programs address the elements of program design discussed the in the beginning of this paper. Below is a qualitative analysis and summary suggestions for weighing each of the five elements.

Delivery Entity

Although local circumstances will determine the best type of energy savings delivery entity, non-utility energy savings delivery entities are certainly worth considering. Circumstances that especially favor this model include:

- Broad total energy efficiency objectives and desires for holistic, cross-fuel end-user solutions;
- Complications in local energy utility industry structures (e.g., a large number of utilities or utilities without a history of promoting energy efficiency);
- Desires to blend together a variety of funding sources, including non-ratepayer fund; and
- Lack of interest on the part of local utilities to run programs.

However, the challenges faced in setting up an effective new non-utility entity should not be underestimated; these include heavy start-up investments in developing a market presence and consumer relations in addition to acquiring programs and implementation capacity. A long-term commitment is necessary. A local non-utility entity with the management skills, staff, and flexible procedures would be preferred.

If energy supply utilities are the preferred choice, notwithstanding the benefit of strong customer knowledge and infrastructure, the "throughput incentive" problem[4] must be dealt with through regulatory changes to overcome disincentives for promoting energy efficiency that exist under traditional ratemaking regulation. A preferred approach is adoption of decoupling regulation as well as some type of performance incentive.

If a government entity is the preferred choice, it is recommended that an entity one-step removed from government be used or established, such as a publicly owned corporation. These entities have more flexibility and may have more market experience than a government department.

Sourcing and Managing Funds

Although many sources of funding are possible in principle, key requirements are sustainability in funding over the medium-to-long-term and security and predictability in fund flow. Stops and starts in funding support make energy efficiency resource acquisition programs inefficient and almost unworkable, as these programs require a multiyear focus, in part to align programs to existing business decision making and investment cycles. Utility ratepayer financing

[4] The "throughput incentive" refers to utility revenue increasing with energy sales, while also being encouraged to help reduce customers' energy use through energy efficiency.

has proved a good choice for many states and provinces. The choice between a system benefit charge and financing through overall utility revenues depends on local circumstances; both have been successfully used. If a non-utility is chosen as the savings delivery entity for a ratepayer financed effort, it is easier, but not necessary, to use a system benefit charge. In setting up system benefit charges, it is recommended to include provisions and procedures to allow for periodic adjustments as energy efficiency resource acquisition demands change.

Reporting on use of funds allocated for energy efficiency resource acquisition (in addition to energy savings results) should be detailed and rigorous for utilities and non-utility delivery entities alike. Where used, mechanisms for transfer of funds from utilities to non-utility delivery entities should be efficient, transparent and as secure as possible from appropriation for other uses, a lesson learned in Wisconsin. Predictability of fund flow is very important for all delivery entities to operate their businesses properly.

Target Setting

At the heart of energy efficiency resource acquisition programs, clarity in setting acquisition orders (targets) and rigorous reporting on delivery are essential. The well-established programs include buyer and seller agreement on both a long-term view of acquisition requirements and on a detailed medium term program of targets and budgets (typically three years), against which annual energy efficiency resource delivery is reported and verified. Use of integrated supply and efficiency resource plans are the most elegant foundation for setting savings targets and budgets for utility-supplied energy, but this may not be practical in various cases, such as when utilities and regulators lack the skills or desire to do a solid credible analysis. Definition of percent of energy sales targets is a workable alternative. However, it may be useful to check prevailing percent of sales targets periodically with reviews of cost-effective energy-efficiency potential, including updates in avoided supply costs.

The energy savings product that is being acquired needs to be clearly defined. This includes clarity as to net or gross savings (and calculation methods) and some means to convey preference for persistence in energy savings. Targeting and reporting in net savings terms is especially important for programs where high incidence of ‘free riders’ or spillover is expected. Supervision entity approval of the planned medium-term acquisition program portfolios of delivery entities is recommended, in addition to targets, for a variety of reasons, including needs to consider savings persistence as a factor. Periodic surveys of the savings persistence of energy savings measures supported in previous years also are suggested, as is possible use of cumulative energy savings target reporting that takes persistence into account.

Contract Arrangements

Contracting arrangements between supervising entity “buyers” of savings and delivery entity “sellers” also need to be clear. Even though the “contracting” with utility delivery entities is often undertaken as part of larger regulatory proceedings, a strict contractual business approach is still needed. Targets, performance metrics, any performance incentives, detailed budgeting, cost-effectiveness indicators, and other operational topics need to be included and reported on. Non-utility entity contracts need at least as much detail. Experience also has led to longer contract durations (e.g., in Vermont), in the interests of program continuity and to encourage long-term strategic focus in program design and building up in-house capacity.

Program continuity is very important, and changes in delivery contractors can prove disruptive, due in part to the importance of trust between particularly industrial customers and energy efficiency delivery contractors.

Supervision entities, such as PUCs, should consider how best to meet sizable supervision demands. If supervision is perfunctory, program quality suffers. A number of PUCs overseeing the programs make arrangements for outside assistance.

Evaluation, Measurement and Verification (EM&V)

Sound measurement and verification is a critical aspect of energy efficiency resource acquisition schemes, enabling buyers to be reasonably sure that they have purchased the product they ordered. Although delivery entities may undertake the bulk of the work as they complete their savings claims, some type of third party review is also recommended. Nevertheless, delivery entities need as much upfront clarity as possible as to how technicalities of energy savings calculations will be approached, to inform their programming and to maximize verified energy savings delivery. The measurement and verification technical manuals issued periodically in a number of the energy efficiency resource acquisition programs are a good mechanism to guide all of the parties involved.

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