Energy Efficiency as the First Resource: Opportunities, Challenges, and Beating the Next Bust

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ABSTRACT

For a number of reasons, principally the growing need for cost-effective greenhouse gas reduction strategies, energy efficiency goals and spending levels have been rising steadily over the past few years. In this paper, we discuss the opportunities and challenges posed by the increasing reliance on energy efficiency as a preferred resource to help offset higher carbon resources. We then present a set of factors and metrics that we recommend be considered when developing firm energy efficiency savings goals. Finally, we suggest that it will be critical that energy efficiency programs and policies achieve high rates of success in meeting this new generation of goals in order to reduce the likelihood for a subsequent bust cycle, as has occurred following previous investment booms. Doing so, we submit, may mean moderating efficiency goal levels somewhat in the short term in order to ensure high-quality attainment and, consequently, more sustainable funding and greater yields over the long term.

Introduction

After three decades of booms and busts, energy efficiency has once again moved to the center of the energy and environment policy debate. Driven largely by the challenges posed by global warming, policymakers are increasingly turning to efficiency to deliver large reductions in energy consumption both quickly and inexpensively. The purpose of this paper is to discuss the opportunities and challenges posed by this increasing reliance on energy efficiency as a preferred resource and to provide recommendations regarding factors that should be considered when developing efficiency goals. The perspectives presented are informed by the authors' experiences conducting energy efficiency potential studies for the past two decades and recent work supporting the development of new efficiency goals in California.

The New Golden Child: Energy Efficiency as the First Resource

Regulatory and legislative policy makers are turning to energy efficiency as a preferred resource in a growing number of jurisdictions. For example, the California Public Utilities Commission (CPUC) explicitly requires that energy efficiency savings be counted first in the resource planning load order (CPUC 2004). The CPUC also sets specific energy efficiency goals for investor-owned utilities to achieve as part of its resource planning policy making (CEC 2003). Other states around the country, such as Connecticut, Vermont, Texas, and Nevada, have increasingly adopted formal goals for energy efficiency and preferences that such savings are counted on prior to planning construction of new supply resources (see ACEEE 2007 for examples). As a result, energy efficiency can be seen playing a major role in the resource plans of many utilities (Barbose, et al., 2008). At the same time, according to ACEEE (2007) estimates, the enactment of these more stringent energy efficiency goals and requirements has so far been limited to roughly 12 states that have developed formal energy efficiency resource standards (EERS). Nonetheless, there appears to be a growing trend toward EERS-type policies. For all of these reasons, numerous utilities are expanding their energy efficiency efforts, re-initiating efforts after years of dormancy, or initiating major programs for the first time.

A key difference between current policy making and that which characterized the integrated resource planning (IRP) era in the early 1990s is that many current policies aim to maximize energy efficiency savings rather than try to optimize the amount of savings through implementation of complex resource planning models. This shift in emphasis, from incorporation of energy efficiency as a resource that competes equally within resource planning exercises, to one that pushes energy efficiency savings to the fore of such processes, is likely due to several factors. These factors include increasing pressure on policy makers to develop energy strategies that significantly reduce greenhouse gas emissions (GHG), the expectation that simplified DSM screening models likely produce reasonably accurate estimates of energy efficiency cost effectiveness (thereby eliminating the need for more time consuming IRP modeling), the fact that many jurisdictions do not practice IRP (due to deregulation and other factors), and the belief that the environmental and other attributes of energy efficiency are simply superior to those of virtually all supply-side resources. The first and last of these factors appear to be the principal ones driving the current surge in energy efficiency preference policies. A related factor is that growing concern over climate change has brought energy resource planning into legislative houses and governor's mansions throughout the country. Policy makers in states with leading energy efficiency policies may have concluded that a requirement to achieve specified levels of energy efficiency is a relatively easy policy to adopt quickly to show GHG mitigation progress to constituents.

Opportunities and Advantages of First Resource Status

The growing placement of energy efficiency into a preferred or de facto first resource status presents a number of potential advantages and opportunities for the energy efficiency industry. First, preferred resource status is likely to increase and stabilize funding for efficiency programs, which previously have been prone to booms and busts. Increasing and stable funding should help to provide program administrators the resources and confidence necessary to diversify and deepen their portfolios and build the human capital and infrastructures necessary to deliver effective programs at larger scales. Preferred resource status is also likely to help build morale within efficiency organizations by increasing the profile of efficiency within utilities and government agencies and with the public at large. Increasing the importance of efficiency within utilities (where utilities implement programs) is also likely to increase the level of talent the efficiency group attracts within the larger organization. More stability in funding for efficiency programs should also lead to improved long-term, strategic planning. The need to generate efficiency savings over the long term is also likely to encourage program administrators to increase cross-jurisdictional cooperation (e.g., through national organizations like CEE and regional organizations like NEEP, MEEA, and NEEA), which should lead to increased economies of scale and greater collective effectiveness. Finally, the need to provide high levels of energy efficiency savings over the long term should spur increased investment in research and development and concomitant efforts to commercialize and fully deploy new efficiency technologies and measures that will be needed to continue efficiency improvements throughout the coming decades.

Challenges and Responsibilities of First Resource Status

While the increasing support for energy efficiency provides opportunities and advantages, it also comes with significant challenges and responsibilities. These include: meeting efficiency goal targets (and demonstrating so through measurement and verification of savings); significantly expanding energy efficiency program implementation and evaluation resources (human capital); reducing the uncertainty around energy efficiency potential forecasts; resolving ambiguities between energy efficiency potential forecasts and the amount of energy efficiency embedded in baseline load forecasts; improving the non-energy characteristics of existing efficiency measures; and developing new measures.

Meeting efficiency goal targets. Though perhaps self evident, it is important to explicitly acknowledge that it will be critical to the continued preferential status of energy efficiency funding and support that the increasingly aggressive energy efficiency savings targets are met. Policy makers and utility resource planners are now counting on savings from efficiency programs with a level of interest and focus that exceeds that from previous eras. Of course, the probability of meeting any particular energy savings goal is related to the size of the goal, the capabilities of the program administrators (PA) and other market influencing organizations (e.g., state agencies) charged with achieving it, and the level of resources available to get the job done. As discussed in the second half of this paper, these and other factors must be carefully weighed when setting energy efficiency targets given the potential effect on supply-side procurement decisions. As we discuss, there are both advantages and disadvantages to setting very aggressive stretch goals versus those that are more moderate but have a higher probability of being achieved. There is also the additional challenge associated with measurement of goal attainment. Even when program administrators believe they have achieved a particular goal, based on their own internal tracking of accomplishments and estimates of savings, policy makers are likely to require independent measurement and verification of claimed savings given the growing importance of demonstrating savings for procurement and GHG reduction purposes. Historically, there has been a wide range in the extent and depth of independent evaluation of savings across jurisdictions in the United States. Evaluation efforts will need to expand in many places and address difficult attribution issues as the number of energy efficiency policies and programs, and sponsoring actors (public and private), increases.

Expanding energy efficiency program implementation and evaluation resources. In order to achieve increasingly ambitious energy savings targets, efficiency organizations will need to greatly expand their implementation and evaluation resources. For several years, the demand for experienced efficiency professionals has exceeded supply, and the gap is expected to widen further over the next few years. The need for new professionals is widespread across expertise areas (e.g., implementation and evaluation), experience levels, and regions. One consequence of the boom and bust cycle of efficiency investment in the U.S. has been that talented professionals have left the field during each bust; while some have returned during subsequent booms, others left the field for good. This has reduced the pool of experienced professionals available to fill the increasing need for senior management positions. Numerically, there is an even greater need for entry and mid-level staff. Attracting qualified, first-time professionals into the field is made difficult by the fact that there are few academic programs in the U.S. that train students for work in the efficiency field. In particular, many organizations find it extremely difficult to find qualified engineers at all levels of expertise. Fortunately, these looming resource problems have been recognized over the past few years by many researchers, policy makers, and organizations. These efforts include long-term efforts to expand the importance of efficiency-related studies in academia and short-term efforts to provide practical training to current staff (AESP 2008). In the meantime, many program administrators have chosen to use outsourcing to address staffing shortages, training needs, and uncertainty in program funding over time. However, this mostly shifts staffing needs to private efficiency program services providers; although these companies are usually able to capture some economies of scale by leveraging their implementation knowledge and resources across multiple clients.

Reducing the uncertainty around energy efficiency potential forecasts. There are significant uncertainties in energy efficiency potential forecasts as evidenced by a fairly wide range in savings estimates across studies (Nadel et al. 2004), the relatively obvious uncertainties around key measure and market characteristic inputs to potential models, and the uncertainty around estimates of forecasted future efficiency measure adoptions (Rufo 2003). Some uncertainty is inevitable due to the nature and challenge of forecasting end use product and service adoption rates (Rogers 2003); however, some of the uncertainty can and should be reduced through much needed improvements in baseline data. Improvements in baseline data are needed for current equipment and measure saturations (via on-site as opposed to mail and telephone surveys), estimation of current end use consumption intensities, estimation of incremental measure costs (a chronic area of under investment), estimation of measure savings (through real-world field tests rather than simple engineering formulae), and tracking and analysis of the relationship between specific types of program interventions and incentive levels and end user measure adoption across a wide range of intervention intensities.

Resolving ambiguities between energy efficiency potential forecasts and the amount of energy efficiency embedded in baseline load forecasts. A fundamental challenge associated with energy efficiency savings attribution is the question of how much energy efficiency savings are captured and embedded into the baseline load forecasts in utility resource plans, which are usually the basis for decisions on procurement of supply-side resources, and whether these savings are similar to, or conceptually consistent with, those estimated from stand-alone energy efficiency potential analyses used to develop bottom-up forecasts of gross and naturally-occurring energy savings. Ideally, these two quantities would be internally consistent and equivalent; thus enabling net program savings (e.g., gross minus naturally occurring) from exogenous bottom-up analyses to be subtracted from baseline load forecasts. The result of this subtraction then becomes the load forecast for which supply-side procurement needs are determined (i.e., when energy efficiency comes first in the loading order). However, there are many issues that make such comparisons difficult, not the least being that many baseline load forecasts are econometrically derived and are unable to quantify the amount of embedded efficiency or to distinguish between efficiency from naturally occurring adoptions and those that are incrementally induced by energy efficiency programs and codes and standards (Hopper, et al., 2006). In California, staffs at the CPUC and California Energy Commission (CEC) have increased their focus on the importance of better understanding and decomposing embedded efficiency levels in the CEC's end use forecasts used to determine procurement needs (CEC 2008). In our experience, other jurisdictions have an even greater problem in this area since their forecasting models have little or no end use basis. For efficiency to have its intended and correct impact on reducing procurement needs, resolving the issue of quantifying any overlap between embedded efficiency levels in baseline forecasts, and stand-alone estimates of gross and net efficiency potential, will be increasingly important.

Stoking the efficiency pipeline with new and improved measures. For energy efficiency to provide both a large annual impact and a sustained annual impact over many years (i.e., decades), it will be critical for new cost-effective efficiency measures to regularly become available and for the non-energy characteristics of some existing measures to continue to improve. Several studies indicate that bottom up estimates of annual achievable potential tend to diminish significantly after 5 to 10 years under aggressive intervention scenarios. This is due principally to the fact that potential is reduced in the out years as measures saturate existing markets in the early years. Over the past three decades such diminishment has actually been mitigated in practice due to the emergence of new generations of efficient technologies, although much of the savings has been concentrated in a few end uses, principally lighting and HVAC. To avoid such diminishment in the future will require continued and even increased levels of energy efficiency technology innovation as well as increased success in acquiring savings from more complex and heterogeneous systems (e.g., nonresidential refrigeration and industrial processes).

Goal-Setting Considerations and Factors

In this section and the next, we shift our discussion to issues associated with developing energy efficiency savings goals. Our preceding discussion of the opportunities and challenges associated with the increasing importance of energy efficiency in resource planning provides important context. In the discussion that follows, we draw on our recent experience providing an analytical framework for developing energy savings goals for the California PUC (Itron 2008).

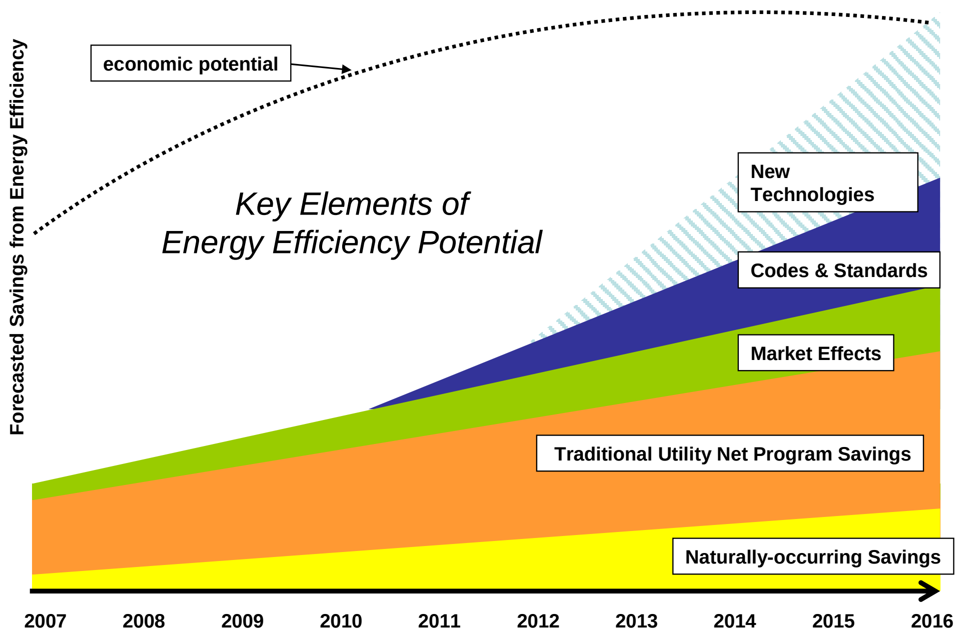
In order to help bridge the gap between forecasting energy efficiency potential and the practical issues faced by policy makers, regulators, and utility resource planners in setting efficiency goals, we have developed a set of policy factors to consider in such processes. The first set of factors relate to the scope of the savings mechanisms included in energy savings goals; that is, whether to include savings associated with policies that cut across multiple market influencing actors, e.g., including savings from state and federal codes and standards, market transformation efforts, and direct savings from voluntary incentive and information programs (see Figure 1). The second set of policy factors relate to the level of savings to expect, these factors include goal-setting philosophy, the importance of meeting or exceeding savings goals (and, conversely, the consequences of missing goals), implications for flexibility in program design, stimulation of innovation, and customer bill and rate impacts.

We note in this discussion that regulators and policy makers may want to set different goals for overall societal savings, which may be intentionally broader and more inclusive, than for utility shareholder incentives, which may be set to meet a stricter (and perhaps narrower) measurement standard.

Scope of Programs and Policies Needed to Achieve High Efficiency Targets

Given the wide array of energy savings policies available and likely necessary to achieve high levels of energy savings, it is important to be clear about the scope of proposed savings goals and what types of programs are eligible to help achieve them. Some of energy savings goals adopted by regulatory agencies and legislative directive have been restricted in scope to the direct energy savings attributable to voluntary, resource acquisition-type programs without inclusion of savings from market transformation programs or local, state, and federal efficiency policies (e.g., local ordinances and codes and standards). Given the importance of maximizing energy savings, policy makers should consider including codes and standards and efforts to transform markets in their savings goals (Hopper, et al., 2006), or at least ensure that exclusion of savings from these other mechanisms does not penalize program administrators with respect to goal attainment. These issues are discussed further below.

Figure 1. Example Elements of Energy Efficiency Potential Forecasts



Inclusion of potential savings from building/appliance standards in energy savings goals. Historically, building and appliance standards have produced levels of savings comparable to and, in many jurisdictions, greater than, savings from voluntary efficiency programs. The advantage of including savings from future building or appliance standards in energy savings goals is that it should provide energy efficiency program administrators (PAs) an incentive to work with other organizations like state agencies to maximize the overall savings achieved and allow PAs to gracefully exit from program areas after a standard is set. As a result, this would tend to reduce the amount of financial incentive dollars that would otherwise be needed to capture remaining "laggard" markets. It would also reinforce the need for PAs to pay attention to market actors who may not be complying with new standards and work with state staff and state and local building officials to develop strategies to increase compliance.

A potential disadvantage of including savings from future codes and standards in state energy savings goals is that some form of attribution analysis might be needed to determine what share of the savings achieved by new standards, or subsequent compliance programs, can be attributed to PAs and their programmatic efforts. Similarly, it might also require determining whether and how such savings would be counted towards any shareholder incentives that might be in place for utility program administrators. The shareholder incentive question is a secondary issue from achievement of the savings goals per se and need not necessarily include savings from new codes and standards. It may be sufficient to simply remove any inherent disincentives that can occur if new codes and standards capture savings that were previously included in utilities' goals without any adjustment that recognizes such savings have in fact been acquired. Another possible challenge is the potential for one or more program delivery organizations (e.g., efficiency PAs and state energy agencies) to assume that the other is responsible for capturing savings in a particular segment, end use, or technology and neither acts decisively as a result.

Inclusion of indirect energy savings and savings from program-induced market effects in energy savings goals. Another important question is whether energy savings associated with training, education, and other information-driven programs, as well as the market effects from resource acquisition programs should be evaluated and counted toward attainment of the overall savings goal. Allowing inclusion of such energy savings would likely have a significant influence on how program impacts from PA programs are verified and evaluated. Evaluation and associated net savings accounting policies in some jurisdictions (e.g., for California's IOUs for 2006-2008) focus on isolating the net savings from participants who can easily be identified as participating in programs by virtue of having received either a rebate and exclude savings from non-participant spillover or any program-induced market effects engendered from prior years' program efforts.

A more expansive whole-market savings perspective requires the use of both broader and deeper market surveys, and analyses designed to identify all efficiency adoptions, along with the portion of the population made knowledgeable and inclined to adopt from both program and non-program influences over time. This higher-level market perspective requires a shift in evaluation focus to measuring changes in market share of key measures in the entire population, as a control for total achieved savings, coupled with the data collection and analyses necessary to attribute those savings to the market interventions over time.

The advantage of expanding the scope of savings goals to include programs that stimulate energy impacts across the entire population is that administrators would have an incentive to change trade ally business practices and end-user decision making behavior in ways that increase the total, market-level energy savings resulting from their programs. It is important that PAs be able to actively encourage and enable private actors to promote energy-efficient products via PA-supported training or mass marketing messages without facing the risk that such efforts will reduce the pool of savings available to meet their own direct program participation goals (e.g., by being measured and counted against their accomplishments as free riders).

A primary challenge is that there is still considerable uncertainty in the measurement of program-induced market effects that produce demonstrable increases in sustainable societal energy savings. Even so, we believe that measuring and counting only the most obvious in-program effects is sub-optimal with respect to goals aimed at maximizing societal energy efficiency.

The question of whether to include program-induced market effects in any shareholder incentive mechanism is a separate issue from that of prioritizing and tracking whole-market efficiency adoptions and the resulting load impacts. With respect to shareholder incentives, which are not the primary focus of this paper, there is some risk that utilities could get credit for savings principally caused by other market actors if attribution studies are determined to be unreliable. Such concerns over measurement challenges are a primary reason why savings from program-induced market effects are currently excluded from consideration in some PAs' efficiency goals and associated shareholder incentive mechanisms. Note, however, that measuring whole-market savings is not nearly as difficult as the subsequent and separate task of partitioning savings into different attribution elements. When the overriding policy objective is to maximize societal savings, it is important to include goals that are measured by total whole-market savings, while at the same time working hard to attribute savings over time to program and non-program influences as accurately as possible.

Level of Energy Savings Goals

Separate from the policy issues related to choices about the scope of the energy savings goals; there are also a number of policy issues that should be considered when choosing the absolute level of savings expected from each mechanism and thus the total level of energy savings goals. These factors include the following: goal-setting philosophy; recent program performance; importance of meeting or exceeding savings goals; regulatory consequence of not achieving savings goals; implications for program design flexibility; stimulation of innovation; and rate impacts.

Goal-setting philosophy. Over the past few decades, policy makers have used a variety of different frameworks or philosophies for setting energy-related public policy goals. Some have preferred to set "stretch" goals that are not likely to be achieved in the near term but are designed to be transformative in the longer term, such as California's zero net emission goals for automobiles set in the 1990s. Decisions to set stretch goals are made simpler if there are no competing objectives or policies that may be unintentionally confounded by the stretch goal (for example, shareholder earnings may be such a competing objective or, as noted below, investment in renewable resources of other GHG mitigation policies). Other policy-making bodies have chosen to set more conservative goals that have a higher chance of being achieved, at least in the short run, but which may risk under achieving in the long term. In the regulated utility sector, lower savings goals could be considered for a variety of reasons related to uncertainty or the perceived importance of providing administrators with additional earnings opportunities beyond the traditional management incentive to increase electricity sales rather than reduce them. In this context, stretch goals could be considered as those having a relatively low chance of attainment (say 25% or less) while more conservative goals could be those set to ensure the administrator has a 50% or greater chance of achieving them.

Recent program performance. Goal-setting should also take into account the recent performance of PAs and other policy actors in achieving efficiency savings. PAs with proven track records of achieving high savings and well-developed implementation resources would be more likely to achieve savings goals that reach beyond historic levels than would PAs with low levels of savings accomplishments or who are just beginning to implement programs for the first time. Although policy makers may want to hold out the same long-term standard for all PAs, consideration should be given to ramping up savings targets gradually for those organizations with no or modest savings achievement records. As discussed previously, there are human resource constraints limiting the rate at which high-quality energy efficiency programs can be expanded. These constraints must be addressed if high ramp rate goals are to be achieved.

Importance of meeting or exceeding savings goals and failing to do so. There are a number of issues and objectives that have increased the importance of meeting or exceeding energy savings goals in recent years. In the past, the overriding policy goal for energy efficiency was generally to help meet utility resource needs at the lowest cost possible. However, a number of recent policy developments have increased the importance of capturing savings from energy efficiency. Perhaps principal among these are several states' increasing concern over how to reduce GHG emissions. Policy makers have placed increasing emphasis on maximizing all cost-effective energy efficiency savings in order to reduce the GHG emissions related to energy consumption and lessen the need for other, generally more costly, GHG-reduction investments and resources. Other policy objectives related to energy efficiency include reducing other environmental impacts associated with energy production and distribution, increasing system reliability, and reducing consumer electricity and natural gas bills. These latter concerns were characteristic of the previous energy efficiency booms in the mid-1980s and early 1990s.

From a procurement perspective, failure to meet energy savings goals increases the risk of under-procuring sufficient resources to meet load growth and reducing reliability. From a GHG perspective, failure to meet savings goals could have a double-edged effect in that, besides the loss of the GHG-reducing energy savings themselves, higher-than-expected load growth might require the use of supply-side resources with high GHG emissions that are more readily available and less costly than lower-emission supply alternatives in short-term energy markets that have yet to meaningfully internalize carbon costs. In addition, a failure to meet energy savings goals could result in increases in other pollutant emissions and increases in consumer energy bills. Failure to meet energy savings goals may also have other effects on longer-term efforts to reduce GHG emissions. To the extent that GHG reduction policies rely on utilities and market actors to meet a forecast of energy savings as part of an overall baseline load forecast, a shortfall in energy savings could result in near-term underinvestment in other supply-side strategies that require long lead times for development and implementation but play significant roles in meeting long-term emission-reduction targets (e.g., renewable energy resources).

The consequences of not meeting savings goals can also be considered from the perspective of regulated utility program administrators. Under the terms of some utility shareholder risk/reward mechanisms, the principal consequences of not meeting performance-related goals might be reduced or no shareholder earnings or potential penalties. Under a conservative (i.e., low) energy savings goal—designed with a high likelihood of attainment—this type of incentive structure is perhaps most appropriate but would come at the potential societal cost of reducing the likely total level of energy savings achieved. Under a stretch (i.e., very high) goal - with a low likelihood of attainment - it could be argued that a shareholder incentive mechanism should consequently be biased towards larger possible earnings relative to possible penalties. One possible alternative is to develop two sets of savings goals wherein a more short-term procurement-related goal might be a subset of a more aggressive and motivational longer-term societal goal.

Design flexibility. Design flexibility here refers to the flexibility allowed to a program administrator to change program designs or sector emphasis during the period leading up to goal assessment. Some recent energy savings goals have been tied to estimates of energy efficiency potential associated with maximum achievable savings estimates that themselves assume provision of incentives equal to full incremental measure costs (CEC 2003, Rufo and Coito, 2002). Setting energy savings goals for utility programs based upon the assumption that utilities will set rebates equivalent to full incremental measure costs may remove some important design flexibility for program managers. Under this level of savings goals, it is possible that IOUs would face pressure to focus primarily on short-term resource acquisition programs, while de-emphasizing longer-term market transformation or code-development strategies. Indeed, an entire portfolio of full incremental cost rebate programs might be more expensive, while achieving fewer savings, than a coordinated combination of resource acquisition, market transformation, and code and standard implementation strategies. Conversely, setting high goals that allow IOUs to claim savings from market effects and new codes and standards could result in an immediate shift in strategy towards more market-based approaches involving private sector trade allies and the explicit coordination and design of new codes and standards to limit the need to offer full incremental cost rebates to achieve complete measure penetration. The point here is that, in real energy efficiency program portfolios, tactics and strategies are usually designed based on a number of factors that vary widely by measure and market segment over time. As a result, care should be used when using estimates of achievable potential from modeling that assumes incentives are set at full incremental costs.

Stimulation of innovation. Innovation can be thought of as the emergence of new or better energy efficiency measures or program designs that yield increased adoptions (i.e., higher energy efficiency market share) and more kWh savings per program dollar spent. In theory, one would expect that, all else being equal, establishment of higher versus lower energy savings goals would put pressure on PAs to increase innovation, seeking new measures and more effective program strategies and tactics, at least for a portion of their portfolios. Lower goals are more likely to lead PAs to stick with more established tried and true or business-as-usual approaches.

Average bill and rate impacts. Rate impacts are a function of both absolute program funding levels, expected energy savings, and forecasted delta between marginal and average avoided costs. Proposing savings goals that require higher levels of savings per year is likely to increase the near-term rate impacts from these programs but will reduce overall bills in the long run as long as the TRC of the programs stays positive. Consideration of rate impacts is related to our discussion of design flexibility and innovation in that it may motivate development of program strategies that achieve high measure adoption levels for lower program costs than would be the case with a focus strictly on TRC (which is relatively insensitive to portion of measure costs paid for by incentives).

Conclusions and Recommendations

Energy efficiency is in the midst of a strong resurgence as a preferred energy resource in a growing number of states. As a result, energy efficiency goals and spending levels are dramatically on the rise as well. These increases present both opportunities and challenges to the energy efficiency industry over the years ahead. High reliance on energy efficiency may lead to increased and more stable funding, broader and deeper program portfolios, increased investment in human capital, improved morale and recruitment of talent, more attention to long-term strategic planning, further cross-jurisdictional cooperation, and greater investment in R&D and commercialization of new energy efficient technologies and practices.

However, with increased commitment to and reliance on energy efficiency come greater responsibility and a host of challenges. Primary among the challenges is to actually meet the aggressive efficiency goals that are being set and to demonstrate so through independent measurement and verification of savings. This will require significantly expanding energy efficiency program implementation and evaluation capabilities (principally through human capital), increasing energy efficiency innovation (in both technologies and program design), and creating greater integration across policy mechanisms (such as codes and standards, traditional voluntary incentive and information programs, and longer term market transformation efforts). Along the way, efficiency modelers will need to reduce the uncertainty around energy efficiency potential forecasts and resolve ambiguities between energy efficiency potential estimates and the amount of energy efficiency embedded in baseline load forecasts.

Given their importance, it is critical that energy savings goals be developed thoughtfully. We recommend that the following factors be considered when developing energy efficiency goals: the scope of programs and policies that count toward goal achievement; the likelihood of achieving the goal; the importance of meeting the goal and, conversely, consequences of missing it; and the effect of goal levels on program design flexibility, stimulation of innovation, customers' average bills, and rates. We also recommend that multiple metrics be utilized to benchmark and determine goal attainment, in particular both total gross market savings (cumulative efficiency adoptions and savings regardless of influence and mechanism) and net savings (marginal efficacy of particular programs and program cycles). Finally, we submit that to help reduce the likelihood of a future bust in the current wave of energy efficiency funding and support (as has occurred with each preceding boom), it is critical that energy efficiency programs and policies achieve high rates of success in meeting this new generation of goals. If the challenges discussed in this paper can not be adequately met, then increasing the probability of success may suggest moderating efficiency goals somewhat in the short term to ensure the requisite high-quality attainment and verification. On the other hand, if the challenges can be met, and the opportunities captured, then highly aggressive goals may yet prove attainable.

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