The Next Quantum Leap in Efficiency: 30% Savings in 10 Years

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ABSTRACT

In 2006, only Connecticut (1.2%), Rhode Island (1.2%) and Vermont (1.1%) achieved annual savings of more than 0.8% of electric sales. By 2014, 18 different states surpassed that level; Massachusetts and Rhode Island led the pack with savings of 2.5% or more. In other words, the bar has been raised substantially. This paper examines whether another major increase in savings is possible over the next ten years. Specifically, it assesses whether it is possible to achieve cumulative persisting annual electric savings of 30% nationally in ten years.

As daunting as that may seem, it is an achievable goal. However, getting there will require “out of the box” thinking about a range of topics, including the value of traditional efficiency potential studies in setting savings goals, the range of efficiency measures considered, the current regulatory emphasis on short-term resource acquisition, the type of performance metrics being employed, and policies or strategies that complement or even go beyond the current utility-run, system benefits charge-funded programs approach.

Introduction

Energy efficiency is often the cheapest electricity resource. The cost of savings from electric ratepayer-funded efficiency programs is only one half to one-third of the average cost of electricity from new power plants (Molina 2014). There are also substantial additional economic benefits to the electric utility system resulting from reduced investments in transmission and distribution (T&D) infrastructure (Neme and Grevatt 2015, The Mendota Group 2014), reduced exposure to fuel price volatility and other forms of risk, price suppression effects (Chernick and Griffiths 2014) and reductions in environmental compliance costs (Woolf et al. 2012) which will become even more important under any future greenhouse gas emission regulations. There are also substantial additional benefits to home-owners and businesses (e.g. gas savings, water savings and improvements to comfort, health and safety, building durability and business productivity) as well as additional environmental, public health, low income energy affordability, local economic development and other societal benefits.

Recognition of the value of energy efficiency has grown considerably over the past decade. In 2006, annual spending on U.S. electric rate-payer funded efficiency programs was just $1.6 billion (Gilleo et al. 2015) and only three states’ rate-payer funded electric efficiency efforts were achieving first year electric savings of greater than 0.8% of annual sales (Kushler, York and Witte 2009). By 2014, spending on ratepayer funded electric efficiency programs had nearly quadrupled to $5.9 billion and eighteen different states achieved electric savings of more than 0.8% of sales. Two states – Massachusetts and Rhode Island – were at or above 2.5% (Gilleo et al. 2015). Five others – Arizona, California, Connecticut, Maryland and Vermont – have policies in place that will require 2.0% annual savings or better in the coming years. This paper examines whether the bar could be raised substantially again. Specifically, we examine whether it would be possible to meet 30% of electricity system needs in ten years.

What Do We Mean by 30% Savings in 10 Years?

Savings targets can be defined in many different ways, with significantly different economic and policy implications. We define our "30% savings in 10 years" target as follows:

- **Only savings in homes and businesses**. We do not consider reductions in line losses, power plant heat rate improvements or other savings that occur on the utility's side of the meter. We do include the potential benefits of conservation voltage regulation which, though implemented on the utility side of the meter, primarily reduces consumption on the customer's side of the meter.
- **Just efficiency**. We do not consider impacts of customer-sited renewables that generate rather than reduce consumption of electricity. However, we do include potential from combined heat and power (CHP); though it involves on-site electricity generation, we treat CHP as an efficiency measure (as do a growing number of states) because it also reduces total (all fuels) on-site energy consumption.
- **Affecting electricity consumption 10 years from now**. Our focus is on savings that will be in effect at the end of a ten year period. Savings from measures installed in 2017 or 2018 but that last for only a few years would not count.
- **Relative to a "Business as Usual" Baseline**. We focus on incremental savings that would result from new policies or program interventions – or "net" savings. We do not count savings that are forecast to occur "naturally" as markets evolve or that will result from government efficiency standards that have already been promulgated.

Limitations of Efficiency Potential Studies

This is not an efficiency potential study, at least not in the way that term is commonly used in the energy efficiency industry. Such studies are inherently poor tools for assessing the limits of what is possible, typically grossly understating maximum achievable savings potential. Consider the nearly 40 different recent efficiency potential studies depicted in Figure 1. On average, they suggest it is only possible to achieve savings equal to about 1.3% of annual sales (black line); the average of the northeastern studies was only 1.5%, with no study above 1.8%.

In contrast, the Massachusetts utilities have ramped up to the point where they achieved 2.8% in 2014; National Grid in Rhode Island got almost 3.5% in 2014. In other words, the leading states are *actually* achieving on the order of twice as much savings as traditional potential studies suggest is possible.

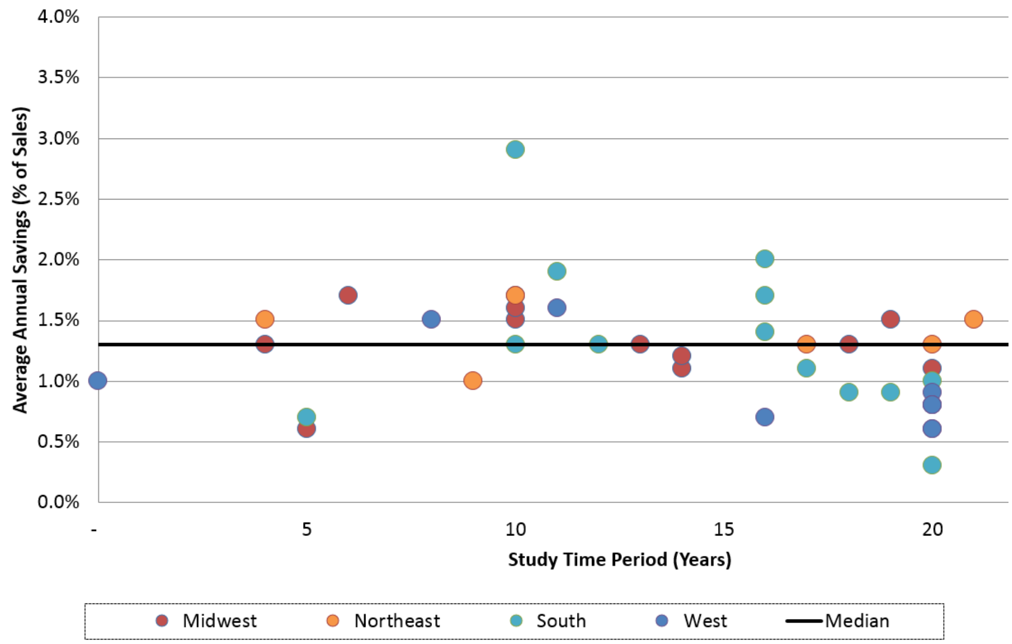

Figure 1: Estimates of Maximum Achievable Potential – Annual Savings as % of Sales. (Mosenthal 2015)

A variety of papers and reports have documented many reasons that potential studies under-estimate what is achievable, particularly in the long term (Goldstein 2008; Kramer and Reed 2012). A few are worth highlighting:

- **Focus limited to measures that are known today.** That is a big omission. For example, nearly half of the achievable electric energy savings identified in the Northwest Power and Conservation Council's Draft 7th Power Plan are from measures not included in the Council's 6th Plan produced just five years earlier (Grist 2015).
- **Custom measures are not addressed.** Most potential studies build up savings at the measure level, but it is impossible to characterize all possible custom measures, particularly for industrial applications.
- **No accounting for increasing savings or decreasing costs over time.** Both often occur as technologies evolve and as market adoption rates grow.
- **Overly-simplistic and inherently conservative assumptions about how customers react to cost vs. savings trade-offs.** Program participation rate assumptions are rarely calibrated against actual experience of the leading or most aggressive programs.
- **Limited (at best) accounting for long-term market transformation effects.**

Our Approach

We approach the question of how much is savings is achievable from a more "top down" perspective, focusing more on macro-level trends, lessons learned from past attempts to push the envelope, and strategic analyses of selected new ideas that have the potential to have big impacts. We started by trying to better understand what the states that are achieving ~2% incremental annual savings are doing today. Based on both the high level findings from that analysis and our own past experience we developed a list of both program and broader policy ideas for how savings levels in even the most aggressive states might be further increased. We then conducted interviews with nine national "thought leaders" from across the country,1 to both get their feedback on our initial ideas and to solicit any additional ideas that they might have. With that input, we conducted additional research into several promising ways to leverage additional savings. What follows is a synthesis of the results of that work.

Current Best Practice

Massachusetts and Rhode Island Utilities' 2014 Savings Levels

In 2014, the two states achieving the greatest level of electricity savings from rate-payer funded programs were Massachusetts and Rhode Island. Massachusetts' investor-owned utilities achieved savings equal to nearly 2.8% of sales in 2014, 2.75% if one excludes a few small CHP projects.[2] In Rhode Island, National Grid achieved savings equal to 3.5% of sales in 2014. However, roughly one-quarter of those savings were from a uniquely large CHP project, without which the savings would have been about 2.5% of sales (Narragansett Electric Company 2015).

Extrapolating 2014 Results into the Future

Based on the mix of measures (and measure lives) in their portfolios, we estimate that if Massachusetts and Rhode Island were to replicate their 2014 savings every year for the next ten years, the result (excluding CHP impacts) would be annual savings at the end of the tenth year of about 23% in Massachusetts and 19% in Rhode Island, or an average of 21%.

One would never expect the mix of efficiency measures in a portfolio of programs to remain static for ten years. Opportunities for some measures decrease over time while new opportunities arise. The question is whether opportunities for new savings will be greater than, equal to or less than the savings that can no longer be claimed. If new savings opportunities will not make up for the savings that can no longer be counted, then a downward adjustment to a ten-year extrapolation of 2014 results would be warranted.

It could be argued that changes in market acceptance of efficiency technology has always been followed by the introduction of new products with efficiency levels that exceed the standards. Under this line of reasoning, an efficiency program administrator's pursuit of savings from the new products could be used to offset the "loss" of savings from the products which they used to promote and are now (or will soon be) mandated and therefore considered part of the baseline. We believe that conclusion is appropriate, at least in aggregate, for most products. However, a case can be made for reaching a different conclusion with respect to changes to efficiency standards for residential light bulbs and linear fluorescent light fixtures which account for most of the lighting in commercial buildings. This is both because these measures account for such a large portion of current efficiency program portfolios and because, in the case of residential lighting, the increment of efficiency improvement is so large that it could not be offset

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[1] Tom Eckman of the Northwest Power and Conservation Council, Rafael Friedman of Pacific Gas and Electric, David Goldstein of the Natural Resource Defense Council, Fred Gordon of the Oregon Energy Trust, Marty Kushler of ACEEE, Mike Messenger of Itron, Phil Mosenthal of Optimal Energy, Steve Nadel of ACEEE and Steve Schiller of Schiller Consulting.

[2] Note that this is higher than the 2.5% reported in the 2015 ACEEE State Scorecard. The difference is that the ACEEE uses total state sales in its denominator, including sales by municipal utilities who do not run programs.

by the introduction of new, more efficient lighting products. Our analysis suggests that it is appropriate to reduce the 10-year effect of continuing the Massachusetts and Rhode Island 2014 savings levels by about one-fifth, to total of about 17% persisting savings in ten years.

Going Beyond Current Best Practice

In this section we explore several ways in which savings levels in even the most aggressive states could be increased in the coming decade. This includes defining efficiency technology more broadly, promoting new technology, and improving current efficiency program designs in ways that can increase market penetration rates of efficiency measures.

Expanding the Definition of End Use Efficiency Technology

Two “measures” that are not typically included in efficiency program portfolios – Combined Heat and Power (CHP) and Conservation Voltage Reduction (CVR) – could play important roles in helping to bridge the gap between the 17% that current best practice efforts could achieve over the next decade and a more ambitious target of 30%.

- **Combined heat and power (CHP)**: Aggressive promotion of CHP as an efficiency measure could lead to an average of 0.2% adjusted savings[3] per year, or 2.0% cumulative persisting annual savings in ten years.[4]
- **Conservation Voltage Reduction (CVR)**: Deployment of CVR on high value circuits is estimated to produce an average of 2.3% savings (York et al. 2015). Though CVR is implemented on the utilities’ side of the meter, we include it here because its principal effect is on the levels of electricity consumed by customers’ end use equipment.

Promoting New Technology

A variety of emerging technologies offer new opportunities for additional electricity savings. We have quantified the impact of only one such technology: LED troffers (alternatives to linear fluorescent light fixtures). As Table 1 shows, LED troffers with integrated controls are already capable of ~70% savings. They are also already cost-effective. And their efficiency is forecast to continue to improve while their costs are forecast to continue to decline. Put simply, they can become one of the next great reservoirs of electricity savings. Even if one assumes a baseline of an HPT8, they could potentially provide another 2.2% savings over the next decade.

A variety of other emerging technologies are also worth noting. In the residential sector, heat pump water heaters, heat pump dryers, new ultra-efficient and cold climate compatible ductless heat pumps, and smart thermostats all offer substantial new savings potential. In the commercial and industrial sectors, advanced rooftop HVAC systems and “smart” systems that use advanced sensors, controls, communications protocols and interconnectivity to optimize performance of a variety of building systems and/or manufacturing also offer substantial new savings potential. All of these technologies are commercially available today, but generally have

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[3] CHP systems consume more gas than would otherwise be needed to meet just the thermal load of a building or facility. Thus, rather than counting all of their electric output as “savings”, some jurisdictions apply a downward adjustment factor to their electric output. For the purposes of this report, we use an ACEEE adjustment method.
[4] Based on ACEEE estimate of CHP potential (Hayes et al. 2014) adjusted up by ~15% to account for limitations of their analysis (e.g. only systems >100 kW and <100 MW, no export to the grid, only gas-fired systems, no biogas).

very low market penetrations, even in leading states. A recent report suggests that these and several other emerging technologies could collectively save between 18% and 19% of estimated electricity sales over the next 15 years (York et al. 2015).[5]

Table 1: Comparison of LED Troffer Savings to HPT8 Savings[6]

			Savings	Estimated Upgrade Cost					
				Total Cost		Cost/Watt Saved		$/kWh levelized	
Type	Lighting Technology	Typical System Watts	% Saved vs. 2014 Baseline	Time of Natural Replace-ment	Early Retire-ment Retrofit	Time of Natural Replace-ment	Early Retire-ment Retrofit	Time of Natural Replace-ment	Early Retire-ment Retrofit
2012 Baseline	3-lamp F32 T8 (89 lpW) w/ 0.88 Ballast	88	-	-	-	-	-	-	-
2014 Baseline	3-lamp F32 T8 (89 lpW) w/ 0.88 HE Ballast	84	-	-	-	-	-	-	-
2018 Baseline	3-lamp F32 T8 (92 lpW) w/ 0.88 HE Ballast	81	-	-	-	-	-	-	-
HPT8	3-lamp F32 T8 High Lumen w/ 0.77 HE Ballast	75	11%	$15	$100	$1.67	$11.11	$0.03	$0.23
	3-lamp F28 T8 Reduced Watt w/ 0.77 HE Ballast	66	21%	$15	$100	$0.83	$5.56	$0.02	$0.11
LED	2015 LED 2x4 Troffer, 5200 lumens 112 lpW	46	45%	$115	$200	$3.06	$5.32	$0.06	$0.11
	2020 LED 2x4 Troffer, 5200 lumens 131 lpW	40	53%	$62	$147	$1.40	$3.32	$0.03	$0.07
	2025 LED 2x4 Troffer, 5200 lumens 156 lpW	33	60%	$30	$115	$0.60	$2.28	$0.01	$0.05
LED + Integrated Controls	2015 LED 2x4 Troffer, 5200 lumens 112 lpW	28	66%	$190	$275	$3.41	$4.94	$0.07	$0.10
	2020 LED 2x4 Troffer, 5200 lumens 131 lpW	24	71%	$114	$199	$1.91	$3.33	$0.04	$0.07
	2025 LED 2x4 Troffer, 5200 lumens 156 lpW	20	76%	$69	$154	$1.09	$2.42	$0.02	$0.05

We can also say with virtual certainty that *additional* new efficiency technology advances that we cannot identify today will surface in the next decade. Others that are recognized today, but are now too expensive to be cost-effective, will likely see costs decline. When assessing how much savings could be cost-effectively achieved in the future, we need to account in some way for the savings potential from new technology that we cannot specifically identify today.

Beyond new technology, there may be important new opportunities for efficiency that emerge as patterns of electricity use change. For example, as the market penetration of electric cars increases, there may be opportunities for promoting the purchase of the most efficient vehicles. Similarly, to the extent there is increased electrification of electric space heating, as a result of natural market forces or government policy designed to address concerns about climate change, opportunities for acquiring additional cost-effective electric heating savings will grow.

New Efficiency Program Approaches

There are also opportunities to achieve deeper levels of savings and greater market penetration of efficient technology within the construct of electric ratepayer-funded efficiency programs. Several approaches that have shown great promise merit further consideration:

- **Strategic Energy Management (SEM)**: SEM is aimed at improving operational efficiency in commercial and industrial settings in a systematic and sustained manner. It is increasingly being supported by energy efficiency program administrators. ACEEE recently estimated that aggressive adoption of SEM in the industrial sector could lead to a

[5] The report gives a mid-point savings estimate of 22%, including savings from CHP and CVR. The 18-19% figure reference here excludes those two technologies since we discuss them separately.
[6] Table was developed by Dan Mellinger, Vermont Energy Investment Corporation's Lighting Strategy Manager. As life of 15 years was assumed for both HPT8s and LED fixtures in computing levelized costs.

1.0% reduction in U.S. electric consumption, and that adoption of SEM in the commercial sector could lead to an additional 0.1%-0.3% reduction (York et al. 2015).

- **Upstream product rebates**: Several program administrators, including Pacific Gas & Electric (California), Efficiency Vermont, and the Connecticut utilities have tested upstream program models for a variety of HVAC products where incentives are aimed at distributors rather than end-use purchasers. As Figure 2 illustrates, such programs have seen large participation increases compared to traditional downstream models. Upstream approaches may not be the best approach for all products, but they can significantly increase participation and savings for those for which they are best suited.[7]

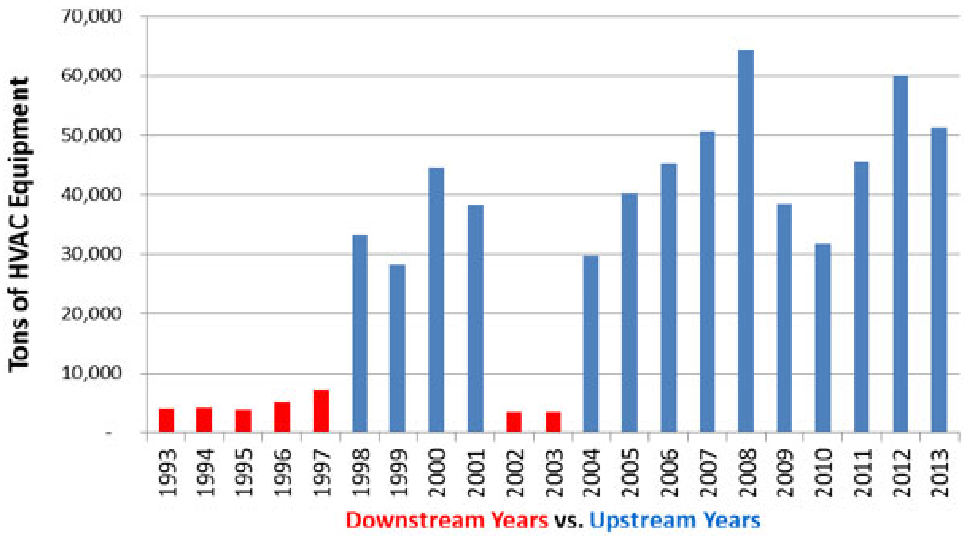

Figure 2: PG&E Commercial HVAC Participation – Downstream vs. Upstream Years (Mosenthal 2015)

- **Market-specific "deeper dives":** Many industries and market segments use energy in ways that are highly specific – even unique – when compared with other energy users in their rate class. Leading programs recognize that getting deep savings requires specific intelligence about the business needs of different market sectors. In several cases, industry-specific "deep dives" have identified ways to produce enormous savings. For example, Efficiency Vermont helped transform the market for "snow guns" sold to ski resorts to products that provide more than 95% electricity savings relative to standard products. We offer this example not because savings potential from snow guns is substantial nationally (though it is in Vermont and some other states), but rather to illustrate that savings in many niche markets – which *collectively* could be very substantial on a national scale – are potentially much larger than one might imagine.

Just as we have not quantified the potential from all possible new technology, we have not attempted to quantify the savings potential from new or enhanced efficiency program approaches. Indeed, the potential savings from some enhanced efficiency program strategies (e.g. industry-specific deeper dives) are likely to be challenging, at best, to forecast.

[7] Upstream approaches appear most beneficial when either (1) the incremental cost or per-unit savings of measures is small (making the transaction costs of the alternative of customer-specific rebates both comparatively expensive and challenging to implement given the potentially limited value provided to retailers or other trade allies); and (2) when the current market share for a product is relatively low (mitigating potential net-to-gross concerns).

Bridging the Gap to 30% Savings in 10 Years

Earlier we estimated that extending the Massachusetts and Rhode Island 2014 savings levels for the next ten years, after downward adjustments to remove anomalous CHP savings and to reduce lighting savings to account for the effect of new federal standards, would produce cumulative persisting annual savings of a little over 17%. In the discussion in this section, we identify a number of potential sources of savings that could be tapped to go beyond the adjusted Massachusetts and Rhode Island 2014 savings levels. We have only quantified three of those opportunities – CHP, CVR and LED alternatives to linear fluorescent lighting. As Figure 3 shows, adding those three opportunities would bring cumulative persisting annual savings levels to almost 24% over ten years. The combination of additional new technologies and improved program strategies that we have discussed only qualitatively would need to be able to produce an additional 6% savings in order for the 30% savings target to be achieved. Given the range of options for filling that gap, as well as historic experience with the emergence of new technology, new market approaches and what happens when efforts to significantly ramp up savings are undertaken, we believe it is possible to achieve 30% cumulative savings over ten years.

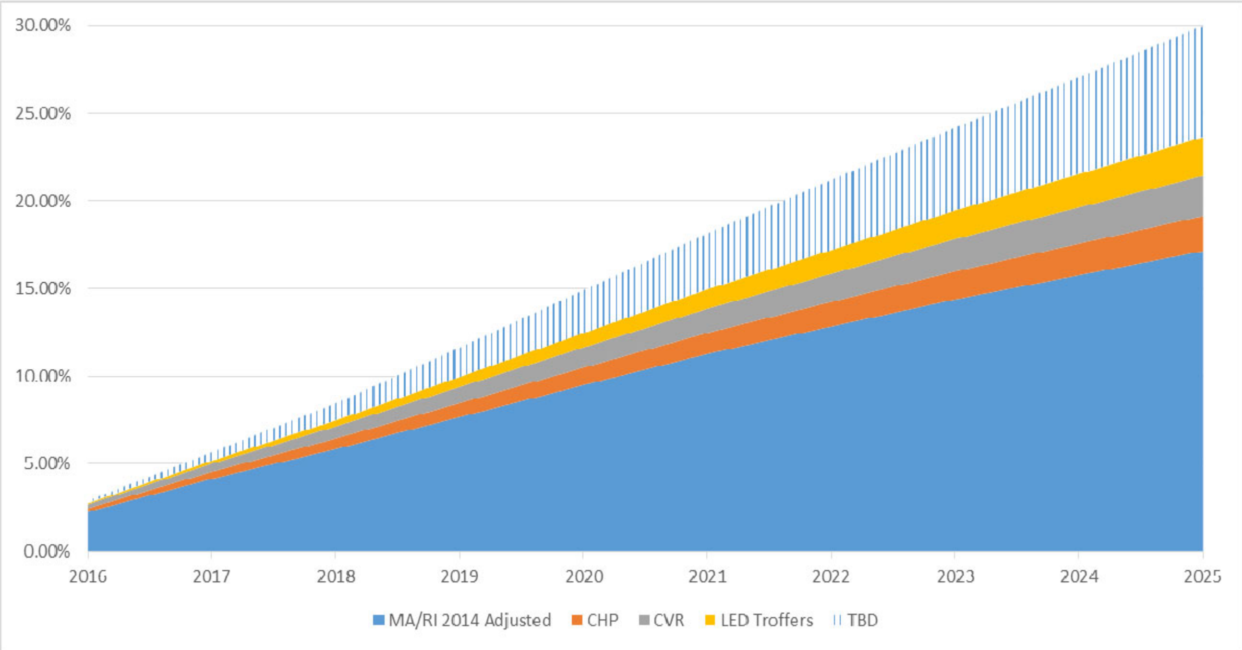

Figure 3: Path to 30% Cumulative Persisting Annual Savings in 10 Years

Policy Needs and Considerations

Cost-effective electricity savings potential, with all of the enormous economic and other benefits it can provide, will only be fully realized if policies are carefully designed to encourage least cost approaches to meeting long-term electricity demands. Specifically, significant changes will be necessary to address common policies and practices that:

- Artificially cap efficiency program spending;
- Inadequately address utility profitability concerns;

- Over-reward short-term savings;
- Limit investment in market transformation efforts;
- Under-value the diverse benefits of efficiency, and;
- Discourage innovation and appropriate levels of risk-taking.

In this section we discuss key policy changes that are either already clearly essential or warrant serious consideration as options for addressing these issues.

Increase Spending on Cost-Effective Efficiency Programs

The principal reason Massachusetts and Rhode Island are achieving much greater levels of savings today than most of the rest of the country is that both states endeavor to treat efficiency as a resource that should be acquired whenever it is less expensive than supply alternatives. There are no arbitrary budget limits that prevent utilities from maximizing the amount of efficiency being acquired as long as it is cost-effective. The mandate to pursue all cost-effective efficiency resulted in 2014 electric utility efficiency program spending of between 6% and 7% of revenues in both states. Vermont (5.95%) was the only other state with comparable spending levels; no other state spent more than 4.3% of revenues on ratepayer-funded electric efficiency programs (Gilleo et al. 2015).

While a portion of additional savings could be achieved through other policy instruments (e.g. more stringent equipment efficiency standards or building codes), it is hard to imagine how a target of 30% savings in ten years could be met without greater ratepayer funded expenditures. As discussed below, the form of such ratepayer funding could be different than the system-benefit-charge mechanisms that are common across the U.S. today. But whatever the vehicle for collecting the funds, the *magnitude* of the funding will almost certainly have to grow.

Make it Profitable to Pursue All Cost-Effective Efficiency

Policy-makers have long recognized that greater energy efficiency can have adverse effects on the profitability of electric utilities due to reductions in sales volumes. That barrier must be addressed if we are to reach 30% cumulative savings over ten years. Regulators must implement critical policy changes such as providing utilities the opportunity to earn shareholder incentives for meeting savings targets, decoupling (i.e. removing) the link between utility profitability and increased electricity sales, or simply collecting funds from the utilities and giving the job of running efficiency programs to independent third parties.[8] Numerous reports on these topics provide more detail on the nature of the barriers and options for addressing them (Hayes et al. 2011, Regulatory Assistance Project 2011).

Align Goals with Long-Term Objectives

Most utility system investment decisions are made with long-term economic, reliability, environmental and other objectives in mind. If efficiency is to be treated as a resource comparable to supply-side alternatives, then policy-makers should also focus not just on how much it can deliver in the next year or two, but for at least the next decade as well. Strategies to address climate change may demand consideration of even longer-term time horizons. However, energy efficiency goals are rarely – if ever – structured to consider impacts more than a few

[8] Where the third party route is taken, part of their compensation should be tied to their performance.

years into the future. Instead, they are often very short-term focused. Moreover, credit is commonly given only for savings that are easily "counted" at the individual measure (or building) level. As a result, most efficiency goals today reward and likely lead to efficiency investment decisions that are less (sometimes far less) than optimal. Several changes to the approach to typical efficiency goal setting practices are warranted:

- **Set goals based on lifetime savings**. Most jurisdictions establish savings goals based on the level of savings installed measures will produce in their first year, effectively treating measures with a 1, 3 or 5 year life the same as those with a 20 or 30 year life. The result has been an over-emphasis on shorter-lived savings.
- **Set goals for multi-year program periods**. Most jurisdictions set annual savings goals. The result is an inherent disincentive to make investments in technology or strategies that will take several years or more to bear fruit, even if such investments would provide greater long-run benefits.
- **Explore a shift in focus to actual levels of electricity sales**. Policy-makers should explore the possibility of establishing total electricity sales goals, or perhaps goals framed in terms of sales per unit of GDP or other measure of energy intensity. The performance of program administrators could be assessed relative to such targets, rather than by summing up estimates of savings from thousands of efficiency measures as is currently done. Basing goals on actual sales levels would have a number of advantages, including elimination of discord over evaluation of gross savings; elimination of debate over net-to-gross adjustments; explicitly rewarding market transformation effects; and explicitly rewarding non-incentive programs, information or education efforts, and savings from both operational efficiency improvements and capital investments[9] – provided they actually produce savings. To be sure, there would be challenges with this kind of shift. For example, regulators would need to establish mechanisms for weather-normalizing sales, adjusting for increased electrification of vehicles and buildings where deemed beneficial, and potentially adjusting for other factors such as changes in demographics and/or economic activity relative to forecasts at the time sales goals were set. However, the potential benefits are large enough to warrant further exploration.

Recognize the Full Value of Efficiency

In most jurisdictions cost-effectiveness screening fails to fully value the benefits of efficiency. Most jurisdictions do not fully value the electric system benefits of efficiency because they do not fully account for avoided transmission and distribution (T&D) costs, reductions in environmental compliance costs, the value of reduced risk, the value of price suppression effects and/or the full magnitude of reductions in T&D line losses. Also, most jurisdictions which use the Societal Test or the Total Resource Cost (TRC) test include the portion of efficiency measure costs borne by program participants but do not assign value to the often very large non-energy benefits that many efficiency measures provide to those participants. In addition, many

[9] Under this type of performance goal, all that would matter is whether targets for reduced sales levels (relative to a baseline forecast) were achieved. It would not be necessary to attribute portions of the overall impact to individual strategies. That is not to say evaluation would not matter. Rather, it would be used to inform program administrators on what is working and what is not, rather than for regulatory "score-keeping" (reliance on which typically leads to significant conservatism, to the point where either no credit or highly discounted credit is given for hard to quantify impacts that could potentially be substantial).

jurisdictions under-value future benefits of efficiency by using discount rates based on utilities' weighted average cost of capital – a measure of utility shareholders' time value of money – rather than lower discount rates that better reflect the time value of money to utility consumers or society as a whole. The result of these screening errors and omissions are cost-effectiveness results that are biased against efficiency investments (Wolf et al. 2014, Lazar and Colburn 2013).

Recognize and Reward Market Transformation

Achieving 30% savings in ten years will require greater emphasis on longer-term market transformation, both because transformed markets produce greater levels of savings and because they create new platforms for the development of the next generation of efficient technologies and processes. The biggest barrier to increased investment in market transformation is that efficiency program administrators are rarely given credit for market transformation effects of their efficiency programs. Instead, as Figure 4 shows, regulators and many stakeholder groups tend to narrowly focus on savings that are easily counted, which usually means savings for which financial incentives have been paid. Although such "resource acquisition" programs often still produce some market transforming effects, greater savings would be possible if the way savings are counted were better aligned with longer-term energy efficiency policy goals.

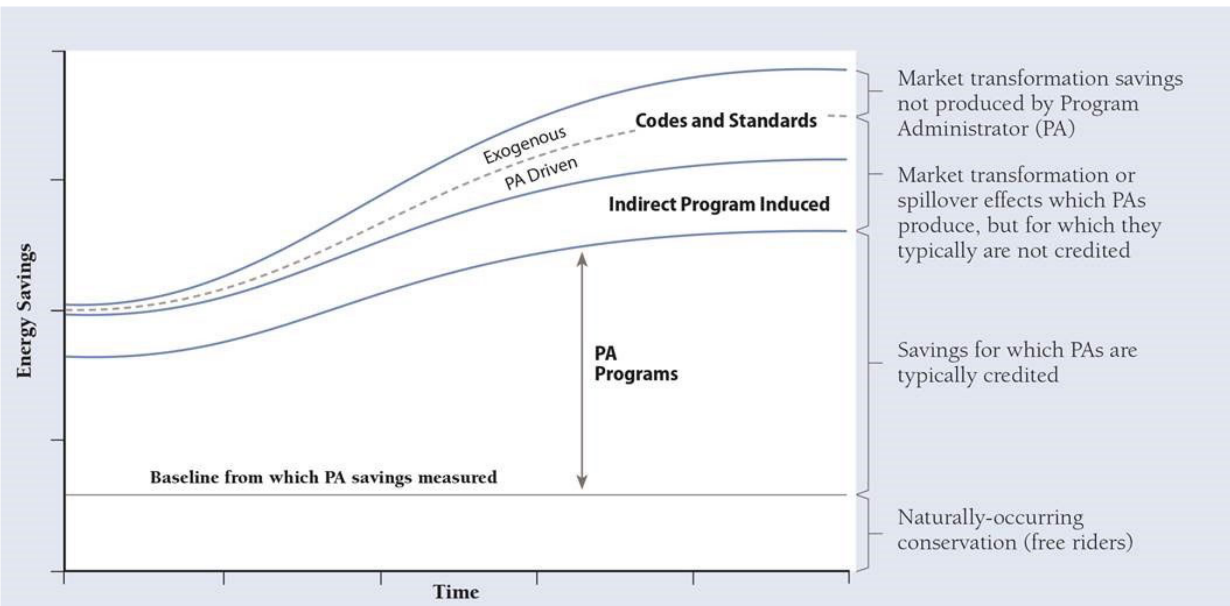

Figure 4: Common Divergence between Savings Generated and Credit Given

Re-Orient Regulatory Scrutiny to Focus More on the "Forest", Less on the "Trees"

The regulatory processes governing both efficiency program planning and approval of energy savings claims have become increasingly complex and rife with conflict. To some degree, that may reflect perceptions that increased scrutiny is necessary and commensurate with significant increases in both efficiency program spending and reliance on savings as an increasingly substantial portion of the electricity resource portfolio. However, one could argue that the result has been regulatory constructs and cultures that undermine our ability to maximize acquisition of cost-effective efficiency savings. Examples include:

- Not valuing savings from long-term market transformation (as discussed above);
- Placing greater emphasis on quantifying and adjusting for free rider effects than on quantifying spillover effects; and
- Discounting or ignoring altogether savings produced from changes in the way customers operate their buildings or production facilities (i.e. operational efficiency improvements).

These kinds of practices do not just result in giving less "credit" for current efficiency programs. They also effectively remove potentially valuable types of efficiency programs from consideration, provide false conclusions that other programs are not cost-effective, discourage community-based and other collaborative approaches to promoting efficiency, and discourage creativity and innovation in the design and delivery of programs. In other words, the focus on ensuring that efficiency program administrators do not "get away with something" or do not get to claim any savings that they did not create can produce an unintended effect of leading to far fewer savings than might otherwise be achieved. Ironically, because efficiency savings are typically so much less expensive to acquire than the alternative supply-side investments, reductions in "waste" by utility efficiency programs that result from some aspects of current regulatory constructs may simultaneously produce far more wasteful or unnecessary supply-side investment. This type of approach to regulation of efficiency investments will need to change if we are to reach 30% savings over ten years.

Consider New Models for Acquiring Efficiency Resources

Today, electric efficiency resources are almost universally acquired through a combination of (1) government codes and standards; and (2) efficiency programs that are funded through surcharges on electric bills, delivered by utilities or alternative administrators chosen by regulators, and based on designs that are scrutinized and approved by regulators. Several alternatives may merit consideration:

- **Competitive procurement**. Competitive markets can often drive innovation in areas that regulation could not foresee. Past experience with different forms of competitive procurement suggests it is no panacea and has some disadvantages if not very carefully tailored. However, the imperative of driving more innovation suggests further exploration of the concept – perhaps in a very targeted way to start – is warranted.
- **New Regulatory Paradigms**. There is growing interest across the country in exploring new approaches to regulating electric utilities. The state of New York's "Reforming the Energy Vision" (REV) proceeding is perhaps the most far-reaching example. Among other things, it would aim to make promotion of energy efficiency by distribution utilities a more integral part of the way they do business and endeavor to simultaneously animate the private market to help deliver cost-effective demand-side alternatives (including efficiency) to more traditional distribution system investments. The key to making this work for efficiency will be to include explicit customer efficiency metrics against which utilities will be judged and upon which their financial rewards will be based. Since the effectiveness of this new regulatory paradigm in promoting acquisition of all cost-effective efficiency has not yet been tested, it may be prudent to simultaneously establish minimum efficiency savings requirements as a "failsafe" or backstop.
- **Consider counting acquisition of some fossil fuel savings towards electric targets**. Studies in both the U.S. and Europe suggest that substantial electrification of both

building energy use (particularly space heating and water heating) and cars will likely be necessary if we are to affordably reduce greenhouse gas emissions by 80% by 2050, the level commonly seen as necessary to stabilize the global climate. In this context, it is worth considering whether to allow improvements, for example, to the insulation levels and air tightness of buildings that are currently heated with natural gas or other fossil fuels to count towards electric savings targets (e.g. translating gas savings to kWh equivalents). From a long-term perspective, if buildings are going to ultimately have to become electrically heated, the savings will ultimately become electric savings anyway.

Additional and More Effective Codes and Standards

Achieving 30% savings in ten years may also require policy changes beyond electric rate-payer funded efficiency programs. Indeed, additional policy changes may be necessary to enhance the effectiveness of such programs. Among those that could be of significant value are adoption of more aggressive building codes for new construction, adoption of building codes for existing buildings (e.g. rental energy codes), mandatory building efficiency labeling and disclosure, more aggressive product efficiency standards and adoption of the SAVE Act or other legislation requiring that the efficiency of homes be considered in mortgage underwriting.

Conclusion

30% electricity savings in ten years is a very ambitious target, requiring far greater savings than efficiency potential studies typically suggest is possible or than leading states are currently on the path to achieving. However, efficiency potential studies are inherently poor tools for assessing the boundaries of what is possible. And though the most aggressive states have dramatically increased savings in recent years, they are not yet fully addressing all currently known technological, programmatic or policy-driven opportunities for capturing cost-effective savings, let alone new opportunities that we know with virtual certainty will surface over the next decade. A high level examination of additional opportunities, including consideration of historic patterns in emerging technology and new market interventions, suggest that it should be possible to achieve 30% savings in ten years. That said, it is abundantly clear that such an achievement will only be possible if a variety of fundamental enabling policies are put in place.

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