Energy Savings Credits: Are Potential Benefits Being Realized?

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Abbreviations and Acronyms

ACEEE	American Council for an Energy Efficient Economy
ACES	American Clean Energy and Security [Act]
AEE	Association of Energy Engineers
AEPS	Alternative Energy Portfolio Standard
ASME	American Society of Mechanical Engineers
BAU	Business as Usual
CALMAC	California Measurement Advisory Council
CCX	Chicago Carbon Exchange
CDM	Clean Development Mechanism
CEE	Consortium for Energy Efficiency
CEEF	Connecticut Energy Efficiency Fund
CFL	Compact Fluorescent Light bulb
CHP	Combined Heat and Power
CLM	Conservation and Load Management
CL&P	Connecticut Light and Power
CO_2	Carbon Dioxide
DPUC	[Connecticut] Department of Public Utility Control
DSM	Demand-Side Management
EDC	Electricity Distribution Company
EE	Energy Efficiency
EERS	Energy Efficiency Resource Standard
EMV	Evaluation, Measurement and Verification
ESC	Energy Savings Credits
ESCO	Energy Service Company
EUL	Estimated Useful Life
GIS	[New England Power Pool] Generation Information System
GWh	Gigawatt-hour
HVAC	Heating, Ventilation and Air Conditioning
IEPEC	International Energy Program Evaluation Conference
kWh	Kilowatt-hour
MWh	Megawatt-hour
NAPEE	National Action Plan for Energy Efficiency
NASUCA	National Association of State Utility Consumer Advocates
NEEP	Northeast Energy Efficiency Partnerships
NREL	National Renewable Energy Laboratory
NYSERDA	New York State Energy Research and Development Agency
OCC	[Connecticut] Office of Consumer Council
PBF	Public Benefits Fund
PUC	Public Utility Commission
REC	Renewable Energy Credit
RPS	Renewable Portfolio Standard
RUL	Remaining Useful Life
TRM	Technical Resource Manual
UI	United Illuminating [Company]
VER	Verified Emission Reduction

Executive Summary

This report provides background on Energy Efficiency (EE) trading and its potential benefits, discusses existing American experience as to whether such benefits are being realized thus far and assesses why EE trading has not accelerated. It also looks at measurement of savings, which represents both the greatest barrier to EE trading as well as its greatest benefit.

Energy savings credits (ESCs) are intended to monetize energy savings from EE projects and programs to allow those savings to be traded. EE trading potentially could lower the cost of compliance with energy efficiency resource standards (EERS), target resources and benefits to where they are most valuable, increase funding for energy efficiency programs and increase transparency and credibility.

While there has been much discussion of ESCs over the last decade and suggestion that EE trading is on the verge of rapidly growing, actual experience is very limited, including modest amounts in Europe and only one U.S. state (Connecticut) in which EE trading actually occurs, although such trading is allowed in some other states. No interstate trading has yet occurred.

EE trading requires that there be several elements in place, including: (1) implementation of EE measures; (2) measurement of energy savings; (3) verification and certification; (4) issuance of credits; (5) tracking of credits; and (6) price determination.

This report finds that most EE trading is compliance driven and its greatest potential is in compliance markets, such as for EERS and carbon offsets. Thus far 22 states have EERS either as a stand-alone provision or as part of a renewable electricity standard (RES), and there is the prospect for a national EERS or RES with EE components. Yet, again, few states so far allow EE trading and only one engages in it.

EERS stringency – how much additional energy savings is required beyond what was already occurring – is a major determinant of the value of ESCs and the extent to which they are traded. Stringency is also affected by the structure of the EERS or RES. For instance, the Pennsylvania RES places EE in the same category as various supply options that have dominated that compliance market. In response Pennsylvania has created a separate stand-alone EERS. Definitions of eligible EE measures, eligible savings, and baselines against which savings are measured are among determinants of EERS stringency. Some states' EERS provide little motivation for additional savings

Allowing EE credit trading can make a weak EERS effectively weaker if some utilities can be credited for essentially achieving business-as-usual (BAU) savings. But if all the utilities or regulated entities faced strong EERS, trading would not dilute stringency. In the case of interstate or nationwide trading, there could be challenges if different states use different bases for determining EERS compliance, such as differing states' baseline or BAU savings assumptions or whether states will credit savings achieved by utilities as a result of codes, standards, and other regulations. Under a national EERS, not allowing state utilities to count such savings may result in a "race to the bottom" in which states weaken their requirements to allow utilities to take credit for essentially BAU savings.

There are costs and challenges to certifying and tracking ESCs. Certificates must be issued to the rightful owners and tracked properly, which could become an important issue if EE trading becomes widespread.

The greatest barrier to EE trading may be measuring energy savings. Evaluation, measurement and verification (EMV) of EE savings is vexed with the problem of the counterfactual – what would have happened if not for the program? A large literature points to challenges to attributing savings to particular programs, the heterogeneity of project and program types, and the need to balance certainty and cost of EMV, including how that balance may differ according to evaluation purpose (e.g., load forecasting, EERS compliance, carbon offsets, cost-effectiveness calculation, portfolio analysis). There are also wide variations in EMV methods and assumptions in estimating savings and making attributions of savings to particular measures, projects, and programs.

Measurement of energy savings may represent both the greatest barrier to EE trading and its greatest benefit. Costs of EMV have hampered implementation of EE trading, but EE trading, like other performance-based mechanisms intended to increase EE investment or reduce EE costs, creates vested interests in savings estimates that shines a light on savings measurement methods and data. The measurement challenges are not unique to EE trading – energy savings measurement could prove to be the greatest barrier to a national EERS, carbon offsets from EE programs, and a sustained ramp up in EE programs generally. Thus, addressing the measurement challenge is critical.

It is difficult to make generalizations on the prospects for EE trading in other states or nationally based on the experience of Connecticut but that state's system serves as a laboratory that can expose challenges likely to occur elsewhere and, thus, may be instructive.

First, this report finds that Connecticut's EERS is driving increased funding for EE, not the trading. Second, trading is reducing the cost of compliance with the EERS, but it is not clear that it is reducing the cost of EE projects and programs. Third, trading has so far not enabled significant participation by non-utility project developers or program implementers, beyond a particular provider of combined heat and power (CHP). We are not aware of any ESCs being issued for end-use energy efficiency programs or projects beyond the savings generated by programs overseen by the state's two large distribution utilities. Fourth, the CHP credits do not appear actually to affect the clearing price, since there is already a large surplus of ESCs from the existing utility-managed programs.

The primary function of the ESC trading system in Connecticut is as a compliance mechanism for the state's EERS. But, ultimately, its greatest benefit may be the increased transparency of EE program evaluation. Like other performance-based mechanisms – including most notably the California shareholder incentive and Duke Energy's Save-a-Watt program in Ohio and North Carolina – EE trading in Connecticut has created a process in which various interests have a financial stake in how program savings are measured.

Some of the programs that have been proposed by third parties present particularly difficult savings measurement and evaluation challenges. Whether or not trading and third party participation is allowed, widely accepted methods for attributing savings to behavioral measures and EE measures for which there are significant related policies or programs need to be developed.

While at first blush it might appear that EE trading is driving the need for more rigorous program evaluation, the real driver is increased program funding and pursuit of deeper savings (i.e., "higher hanging fruit"). EE trading has simply shined a light on the evaluation challenge. Without the spotlight on evaluation, existing state EERS, and any future national EERS, could easily become paper tigers that allow EE program savings to be claimed with little actual savings. Perhaps more important, without good evaluation, we may not get the greatest energy savings for our money.

The *potential* benefits of EE trading are fairly clear: lower cost EE deployment, increased investment in EE, and targeting of investment where it provides the greatest value. Despite a decade of discussion about the potential of energy saving credits, the extent to which the potential benefits are actually being realized is far less clear.

The authors of this report favor state and, prospectively, national EERS subject to consistent and rigorous EMV standards, including methodologies for establishing baselines and BAU projections to which EERS are compared. Further, we favor ESC trading, both intra- and interstate, but only if subject to rigorous and consistent EMV. We emphasize that even without trading, credible EMV is critically important. Without a strong EMV system and one that is consistent among trading entities and jurisdictions, there is a great probability that energy savings will be overstated, claimed emissions reductions and grid reliability benefits will not materialize, and that EERS compliance and (in some states) financial compensation from ratepayers will be improperly applied.

The greatest legacy and benefit of EE trading could very well be increased scrutiny of how savings are measured. This is perhaps ironic since savings measurement is often cited as the greatest barrier to EE trading. Credible savings measurement will be a vital part of a sustained scale-up of energy efficiency programs. Perhaps EE trading can help address the measurement challenge.

Introduction

Energy savings credits (ESCs) monetize energy savings from energy efficiency (EE) projects and programs to allow those savings to be traded. EE trading potentially could lower the cost of compliance with energy efficiency resource standards (EERS), target resources and benefits to where they are most valuable, increase funding for energy efficiency programs and increase transparency and credibility.

There has been much discussion of ESCs over the last decade. Numerous articles and reports have touted their potential benefits while at the same time pointing to the numerous challenges to the widespread implementation of ESC mechanisms.[1]

Despite the potential benefits and anecdotal suggestions that EE trading[2] is on the verge of taking off, so far it has been extremely limited. While it is occurring to a modest degree in a few European countries, the U.S. experience is essentially limited to Connecticut, where EE trading is used for EERS compliance. There is no interstate trading occurring.

This report discusses a range of issues related to EE trading, including barriers, with emphasis on four Northeast states – Connecticut, Massachusetts, Pennsylvania and Vermont – that have expressed interest in learning more about the potential benefits and challenges associated with development of interstate and intrastate EE trading mechanisms. We provide background on EE trading and its potential benefits, assess the extent to which EE trading is actually occurring and whether the potential benefits are being realized, and provide an assessment of why EE trading has not taken off.

We then turn our attention to the measurement[3] of savings from programs and projects, which represents both the greatest barrier to EE trading and one of its greatest benefits. On the one hand, the transaction costs associated with savings measurement have hampered the implementation of EE trading. On the other hand, EE trading, like other performance-based mechanisms intended to increase EE investment or reduce EE costs, can create vested interests in savings estimates that shine a light on savings measurement methods and data, which can result in more reliable estimates of programmatic savings, and increased confidence in savings claims.

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[1] Recent reports and articles on ESCs include Dr. Jan Hamrin, Dr. Edward Vine and Amber Sharick, *The Potential for Energy Savings Certificates (ESC) as a Major Tool in Greenhouse Gas Reduction Programs*, Center for Resource Solutions, 2007; B. Friedman, L. Bird and G. Barbose, *Considerations for Emerging Markets for Energy Savings Certificates***,** National Renewable Energy Laboratory, Technical Report NREL/TP-679-44072, October 2008, http://www.nrel.gov/docs/fy09osti/44072.pdf; Steven Meyers and Steve Kromer, "Measurement and verification strategies for energy savings certificates: meeting the challenges of an uncertain world," *Energy Efficiency*, v. 1, n. 4, 2008, p. 313-321; Paolo Bertoldi and T. Huld, "Tradable Certificates for Renewable Electricity and energy Savings," *Energy Policy*, 32(2), January 2006, p. 212-222; and P. Bertoldi and S. Rezessy, *Tradable Certificates for Energy Savings (White Certificates): Theory and Practice*, Institute for Environment and Sustainability, JRC, European Commission, Luxembourg: Office for Official Publications of the European Communities, Reference EUR 22196 EN, 2006.

[2] Meaning the trading of energy savings credits.

[3] Throughout the report, we use the term "measurement," but, as discussed, energy savings cannot be directly measured.

About Energy Savings Credits

EE trading requires the creation of some form of certificate representing eligible energy savings. These credits are called energy savings credits (ESCs) or energy efficiency credits.[4] ESCs generally represent a megawatt-hour (MWh) of "savings" from a project or program. Various attributes of the savings – e.g., carbon emissions reductions, capacity reductions – can be sold separately or as part of the ESC. ESCs are a direct analog to the more common renewable energy credits (RECs), except that ESCs represent energy savings rather than renewable energy output.

While the focus of this report is on ESCs, much of the discussion could apply to other performance-based incentive or compliance mechanisms, including utility shareholder incentives, demand-side management (DSM) bidding, standard-offer policies, and rebates or tax incentives. All of these involve the demonstration of program or project savings and allow an entity other than the entity implementing the program to receive credit for the savings.

Prerequisites for EE Trading

EE trading involves more or less the following basic steps:

1) Implementation of the energy saving measure, project, or program – Generally, there are few legal restrictions on the types of measures, projects, or programs that are eligible, except that they reduce energy consumption from an established business as usual (BAU) projection. Some restrictions may be imposed on power generation or combined heat and power (CHP) projects due in part to concerns that the size of these projects relative to other energy saving activities could swamp the market and devalue the ESCs.

2) Measurement of energy savings – Generally an approved methodology (protocol) established by a government regulator (such as a utility commission) or private sector certifier is used to evaluate savings. These protocols are often set out in a technical resource manual (TRM) and may include savings calculations for commonly implemented efficiency measures. The protocols may be more or less prescriptive depending on jurisdiction and project or program type. Some measurement protocols provide great levels of specificity while others leave more to the judgment of the evaluator. Protocols vary in their ability to accommodate custom measures and programs. However, generally it is far easier, though not necessarily more accurate, to evaluate projects and programs for which the assumptions and methods are provided in a TRM.[5] For interstate trading of ESCs to be viable, there may need to be some degree of uniformity and specificity in terms of how energy savings are estimated.

3) Verification and Certification – Some entity must verify that the measures, projects, or programs meet eligibility requirements; that they were implemented as claimed; and that the evaluation methods and assumptions are consistent with established protocols. As we

[4] "White tags" is a term trademarked by Sterling Planet and also commonly used as an analog to renewable energy "green tags."
[5] Saying that it is easier does not mean the evaluation results are necessarily more accurate.

discuss below, ensuring the independence of verification and certification bodies is a key challenge for EE trading, as it is for other performance-based mechanisms. Interstate trading of ESCs does not necessarily require that a single entity be designated as the certifier, but the verification and certification process must be credible to the stakeholders in other states.

4) Issuance of credits – The ESCs and their various attributes – e.g., carbon emissions reductions, demand reductions – must be issued in a manner that ensures they are not issued to more than one entity or the same entity in more than one jurisdiction. The credits must also be issued to the lawful owners – e.g., the owner of the home where the air conditioner was installed, the program administrator that provided the air conditioner rebate, or the air conditioner installer.

5) Tracking of credits – Systems must be in place to track ESCs. Tracking of ESCs is more difficult if trading occurs for a variety of attributes over multiple jurisdictions by numerous parties. The tracking of ESCs is no different from the tracking of RECs. Systems for tracking RECs are fairly mature and widespread in the United States and could be used for tracking ESCs. A tracking system must include some process for retiring credits and ensuring that once they are retired, they remain retired.

6) Price determination – A key element of an EE trading system is price determination. Prices may be determined through public auction or through bilateral agreements. Some programs implement price floors and ceilings, which offer price certainty to savings providers and ratepayers but can mute market signals. Whether ESCs are auctioned or privately traded, it is important that the price determination process be transparent, and that numerous buyers and sellers participate, or else market efficiency will suffer. Reduced market efficiency compromises the ability of market participants and society at large to exploit the lowest-cost EE resources, maximize the value of those resources and most efficiently employ limited program funds to best achieve EE and other goals (such as emissions reductions).

Most EE Trading is Compliance Driven

ESCs can be issued for trading in compliance markets or voluntary markets. The ESCs are sometimes sold in voluntary markets to businesses and individuals to offset their carbon footprint, but EE represents only a tiny share of the overall voluntary carbon credit market, which is dominated by renewable energy, agriculture and forestry projects.

The greatest potential for EE trading is in compliance markets, including carbon offset programs and EERS. Most proposals for a federal cap-and-trade regime to regulate carbon emissions include provisions that would allow regulated entities to claim credit for reducing carbon or other greenhouse gas emissions that are not covered under the cap. A portion of the carbon allowances that they are required to submit under the cap could be "offset" by reducing those uncapped emissions.[6] While not the focus of this report, many of the issues we discuss in this report – especially those related to measurement of energy savings -- are also applicable to efforts to allow carbon emissions reductions from EE programs to get credit in a carbon offset program.

[6] Note that reductions in emissions that covered by the cap are not eligible for carbon credits.

The Clean Development Mechanism (CDM), by far the most mature and extensive carbon offset program, continues to wrestle with savings measurement from EE programs (and projects).[7]

Energy Efficiency Resource Standards

EERS are government requirements that a certain amount of energy savings must be achieved through implementation of EE programs or projects by electric (and gas) utilities. Twenty-two states have adopted EERS, including 13 since 2007.[8] The first state EERS were established in Texas (1999) and Vermont (2000). The Appendix includes a table of states with EERS and provides further detail on the EERS in Connecticut, Massachusetts, Pennsylvania and Vermont.

An EERS may be subsumed within a renewable energy standard (RES). EE may be included within a category that includes other renewable and alternative energy supply options (for instance, Class II of Pennsylvania's Alternative Energy Portfolio Standard) or it may exist as a separate category (such as Class III in Connecticut's RES). Some RES stipulate a maximum contribution of EE to meeting the standard, such as Nevada allowing EE to meet no more than 25 percent of the state's RES.

There are also stand-alone EERS in which states require electricity savings as some percentage of a BAU or base year sales or as a percentage of load growth. Massachusetts requires utilities to implement all cost-effective EE measures. Stand-alone EERS and those within RESs are not mutually exclusive. Pennsylvania, for instance, allows EE to count toward its RES but also has a separate EERS requiring electricity use reductions.

State EERS vary in other ways too. They differ in how they are financed, structured, administered and evaluated as well as in the scope of eligible EE measures, participating parties and the tradability of ESCs. For instance, Vermont contracts with a private program administrator to operate as an EE "utility" funded by public benefit charges on electric bills. Such charges also fund Connecticut's program, which is operated by the state's two leading utilities, who sell intrastate tradable ESCs to electric generators, though third parties may also create ESCs through self-financed programs. Pennsylvania allows interstate as well as intrastate trading of certificates (including those created by EE programs) to meet its RES requirement, but

[7] The CDM was created as part of the Kyoto Protocol to enable participating developed countries to meet part of their carbon reductions commitments through investment in carbon reduction projects in developing countries. For discussion of the CDM Board's efforts to credit EE programs, see Christiana Figueres and Michael Philips, *Scaling Up Demand-Side Energy Efficiency Improvements through Programmatic CDM*, Energy Sector Management Assistance Program and Carbon Finance Unit, World Bank, 2007.

[8] This report is focused on EERS and ESCs for electricity savings but the EERS approach is also applicable to natural gas. The American Council for an Energy-Efficient Economy (ACEEE) counts 20 states as having EERS requirements but does not include Massachusetts and Rhode Island, which have requirements for pursuit of all cost-effective electricity EE opportunities. Note that the following reference does not list Delaware, which has recently adopted an EERS. Steven Nadel, testimony before the U.S. Senate Committee on Energy and Natural Resources, hearing on Energy Efficiency Resource Standards, April 22, 2009, pp. 7-8, http://www.aceee.org/tstimony/042209NadelEERS.pdf. Also see: Alliance to Save Energy, "Energy Efficiency Resource Standard (EERS) Overview," 2009, http://ase.org/content/article/detail/5562; ACEEE, "Energy Efficiency Resource Standard (EERS)," March 17, 2009, http://www.aceee.org/energy/national/FederalEERSfactsheet_Mar09.pdf; and ACEEE, "Energy Efficiency and Resource Standards: Experience and Recommendations," March 2006, http://www.aceee.org/pubs/e063.htm.

its new EE-specific requirements must be achieved within each electricity distribution company's (EDC's) service territory. Massachusetts does not allow ESC trading at all.

Enactment of a national EERS is being considered as part of several energy and climate bills. Most notably, the American Clean Energy and Security Act (ACES, a.k.a. Waxman-Markey, H.R. 2454), as passed by the U.S. House of Representatives, would establish an RES applicable to retail electricity suppliers that could be partially met by EE measures. While the focus of this report is on EE trading in the context of state EERS, most of the discussion is relevant to design and implementation of a national EERS.

EERS stringency – how much additional energy savings is required beyond what was already occurring – is a major determinant of the value of ESCs and the extent to which they are actually traded. EERS stringency is a function of the required percentage reductions, the BAU level against which reductions are measured, the amount of potential savings available, the definition of eligible activities and other EERS design elements including how the energy savings are counted. If the EERS requires programmatic savings levels that do not significantly exceed BAU savings, the ESCs will be worth relatively little. If the definition of energy efficiency includes, for example, pre-existing combined heat and power, relatively large percentage reduction requirements could induce little additional program savings.

Programmatic Savings Requirements

Requiring a certain level of energy savings from programs creates a number of measurement challenges. The creation of ESCs is more challenging than the creation of RECs, since the "output" captured in the ESCs cannot be directly metered. Energy savings are estimated by comparing energy use after a measure is taken (actual energy use) to projections of what the energy use would have been if the measure had not been taken (BAU energy use). As discussed below, measuring and verifying energy savings is the biggest barrier to broad implementation of EE trading schemes.

Some argue that instead of a programmatic savings requirement, EERS should be based on an absolute reduction in load. For example, if electric sales are 10 GWh in a given year, the standard could require that the actual sales be 9.8 GWh the following year. In a carbon-constrained world in which the objective is to dramatically reduce US greenhouse gas emissions, requiring reductions in energy consumption is perhaps more compelling than requiring programmatic savings. Achieving dramatic reductions in CO_2 emissions will require substantial reductions in energy consumption, not just slower growth in emissions.[9]

Standards based on absolute reductions would certainly be easier to enforce. If an EERS were based on absolute targets, ESCs could be issued according to the number of MWh by which a regulated entity was below its allocated load; entities whose sales were higher than the allocation

[9] For example, Senate and House climate cap and trade legislation, if fully implemented, would cover about 85 percent of U.S. greenhouse gas emissions and reduce covered emissions by about 83 percent below 2005 levels in 2050. By most accounts, much of these reductions will need to come from energy efficiency improvements. For more information, see Alliance to Save Energy, "Climate Change Legislation," 2009, http://ase.org/content/article/detail/5949.

could then purchase credits in lieu of paying penalties – a sort of energy cap and trade program. This would basically be an energy cap and trade. Existing models of this concept include sulfur dioxide and nitrogen oxide emissions trading programs overseen by the U.S. Environmental Protection Agency's Clean Air Markets Division.[10]

The primary argument against an absolute reduction is that compliance will be determined in large part by factors that are beyond the control of the utility or program administrator – for example, economic growth, federal appliance standards or weather. These factors must be parsed out for an EERS based on measured programmatic savings. In addition, some mechanism would be needed to ensure that reductions in electric load were not simply the result of shifting from electricity to direct fuel use.[11]

So far the consensus seems to be for programmatic evaluation. While a few states have toyed with targets based on absolute reductions, all of the state EERS, as well as proposals for a national EERS, are based on programmatic savings.

[10] For more on these programs, see EPA, "Clean Air Markets," 2009, http://www.epa.gov/airmarkt/.
[11] For discussion of uncertainty associated with bottom-up evaluation versus load forecasting, see Joe Loper, Steve Capanna, Rodney Sobin and Tom Simchak, *Scaling up Energy Efficiency Programs: the Measurement Challenge*, Alliance to Save Energy, forthcoming.

Potential Benefits of Trading

EE trading offers at least four possible benefits, including: lower cost of compliance with energy reduction requirements, the targeting of resources and benefits to where they are most valuable, increased funding for energy efficiency programs and increased transparency and credibility.[12] Since state EERS are the context in which most EE trading occurs in the US, we focus here on trading for EERS compliance.

The scope of allowable trading under an EERS can include one or more of the following:

- Trading can be limited to sales by third-parties of delivered energy savings to a utility within the utility's service territory for EERS compliance.
- Trading can be limited to trading among utilities and other entities within a geographic jurisdiction, such as a state or nation.
- Trading can be allowed between entities in different jurisdictions.

Throughout this section, we use the term "trading" where the point being made would be applicable regardless of the scope of the trading; we specify the scope of trading if the point we are making would be affected by the scope.

Lower cost of compliance

Trading allows non-regulated entities to participate in meeting energy reduction goals or requirements. To the extent that lower-cost energy efficiency opportunities are available elsewhere, the overall cost of meeting the EERS requirements will be reduced. Of course, if one objective of an EERS is to encourage EE investments by the regulated entities, trading may not help much, since those entities will be allowed to simply purchase ESCs from others and pass the costs (in essence a "tax") through to their customers.

Third parties such as state agencies, energy service companies (ESCOs), appliance manufacturers and retailers, industrial plants, building managers and others could have an interest in developing their own energy efficiency initiatives, earning ESCs for the savings and selling the ESCs to the regulated entities. Opening the system to non-utility ESCs could create non-traditional EE markets and reduce the cost of overall EERS compliance.

Without trading (or some form of bidding or standard offer for DSM), utilities have an effective monopoly on efficiency programs to meet their EERS requirements. If trading is allowed, utilities (subject to state regulation) could still choose to conduct their own programs, but by demonstrating that savings can be achieved at lower cost, third parties (or other utilities) could put strong pressure on utilities to reduce their own costs or to buy the savings from more cost-effective providers. Also, a diversity of market participants may bring more innovative and

[12] This section draws significantly from Joe Loper, Jeff Harris, Lowell Ungar, Steve Capanna, Selin Devranoglu, *Deal or no Deal? Pros and Cons of Trading under an Energy Efficiency Standard*, Alliance to Save Energy, August 2008, http://ase.org/content/article/detail/5211.

entrepreneurial approaches to the EE market, though some innovative approaches may add to evaluation, measurement and verification (EMV) challenges.

Targeting Resources and Benefits

EE trading can increase the benefits of an EERS. It is often unclear what the exact motive is for enacting an EERS. Existing EERS legislation and regulations at the state level cite multiple and sometimes conflicting objectives, including: reducing greenhouse gas emissions, enhancing air quality, reducing new supply requirements and associated investment, economic development and jobs, reduced energy costs and less reliance on energy sources outside the state. For example, policymakers' desires to employ more in-state energy resources and reduce energy imports may conflict with the objective of reducing energy costs.

An EERS is a blunt instrument for achieving each of these objectives since it does not distinguish between reductions in energy demand and efficiency potential in one region versus another. It would require the same level of energy efficiency to be achieved regardless of local demand constraints, air quality restrictions, concerns about climate change, or other factors. If the objective of an EERS is to reduce the need to build power plants or transmission lines, the location in which the energy efficiency improvement occurs will be critically important – efficiency improvements in California, for example, will not relieve capacity constraints in Connecticut. Likewise, efficiency improvements in Washington State will have far less impact on carbon emissions than comparable reductions in the Southeastern states, due to the differences in the carbon intensity of their generation stock.

Allowing trading could make an EERS less blunt by facilitating the transfer of resources from areas where efficiency improvements have lower value and/or higher cost to areas of greater value or lower cost. Utilities with capacity constraints could, at least theoretically, be willing to sell ESCs for a lower price than utilities without any new capacity needs. Similarly, areas trying to meet local air quality standards could be willing to sell ESCs for a lower price than they would in the absence of air quality problems.

Moreover, if states are allowed to restrict the areas from which in-state utilities are allowed to buy ESCs, the EERS could help address local air problems arising from distant pollution sources. For example, a state concerned about emissions from an upwind state may encourage in-state utilities to buy ESCs from that state. Similarly, if climate change mitigation is a driving concern, states could require in-state utilities to buy ESCs from utilities with a carbon-intensive generation mix.

Increased Investment

In voluntary markets, issuance of ESCs could create a significant revenue stream to fund EE activities. For instance, the New York State Energy Research and Development Authority (NYSERDA) is creating ESCs based on energy savings from existing programs, which it proposes to sell in voluntary markets with the intent of increasing the pool of program funding. Given the size of NYSERDA's programs and related savings, the number of ESCs issued could be significant – NYSERDA had acquired 200,000 MWh of energy savings from over 800 projects as of May 2008[13] and began its voluntary pilot ESC program soon after. Whether anyone will actually buy the credits in a voluntary market remains to be seen.[14]

EE trading in compliance markets (under an EERS) does not drive additional energy savings or more resources for energy efficiency investments. The EERS is the driver of the savings, not the trading. If no trading was allowed, the regulated entities would have to acquire the required program savings through self-administered or contracted programs.

Increased Transparency and Credibility

EE trading and other performance-based compensation schemes, especially combined with increased spending for EE programs, have increased focus on program performance and hence to performance measurement. This can force more rigorous measurement, which can bring greater accountability and motivate program administrators to ensure high-quality program delivery.

Performance-based compensation mechanisms can change the political dynamic surrounding EE programs, which may be even more important than impacts on EMV methods and data. Utilities and large customers that opposed EE programs in the past could now have an incentive to tout the success of their programs to strengthen claims to credits. EE advocates, who might have tended in the past to overstate savings, could be more judicious if large amounts of compensation are at stake. ESCOs, other private program developers and even large electric customers could be interested in critically examining utility programs' savings claims if those claims affect the price of ESCs or are suspected of being less rigorous that the EMV requirements imposed on ESCOs' and third parties' own projects. Meanwhile, ratepayers, who ultimately pay for the ESCs, will be interested in making sure that they pay as little as possible, or at least that they do not pay for savings that did not occur.

As discussed below, it is important to note that a focus on performance also has costs. Increased measurement rigor requires funding, which is then not available for program deployment. It can increase acrimony between stakeholders. It can bias programs toward those that are most readily measurable, which may or may not be the most effective programs. It could delay feedback to programs. And ultimately, we can never know for sure whether the results are more accurate or not.

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[13] Friedman, et al., 2008, pp. 23-24. Also B. Friedman, L. Bird and G. Barbose, *Energy Savings Certificate Markets: Opportunities and Implementation Barriers*, National Renewable Energy Laboratory, Conference Paper NREL/CP-6A2-45970, Presented at the American Society of Mechanical Engineers (ASME) Third International Conference on Energy Sustainability, San Francisco, California, July 19-23, 2009, p. 7-8, http://www.nrel.gov/docs/fy09osti/45970.pdf.
[14] We have been unable to confirm whether NYSERDA has actually sold any ESCs yet.

Current EE Trading Mechanisms

There is currently very little trading of EE savings in either voluntary or compliance markets. The small amount of EE trading in voluntary markets is in the form of carbon credits rather than ESCs representing electricity savings.[15] But according to a report by Ecosystem Marketplace and New Carbon Finance, EE projects represented only four percent of 2008 transaction volume in the global over-the-counter voluntary carbon market and six percent of the Chicago Carbon Exchange (CCX) credits traded.[16]

Few States Allow Trading

EE trading in compliance markets suggests far greater promise, but still little has been realized. Of the 22 states with a stand-alone EERS, or that allow energy savings to fulfill their renewable energy standards (RES), only four allow trading as part of their energy saving requirements: Connecticut, Pennsylvania, Nevada and Michigan. Only in Connecticut are regulated entities actually purchasing energy savings from other parties in lieu of implementing program savings themselves.

In Nevada, regulated electricity suppliers are allowed to meet up to 25 percent of their renewable energy standard with energy efficiency program savings. In 2008 they achieved programmatic savings beyond the maximum 25 percent without the purchase of additional energy credits. They are projected to do so again in 2009.[17]

Up to ten percent of Michigan's renewable electricity standard can be met with "energy optimization" credits. However, Michigan's RES does not take effect until 2012, so it remains to be seen whether utilities will take advantage of the ability to buy and sell credits.

In Pennsylvania, energy efficiency is included along with a number of supply options (including waste coal utilization) in Tier II of its Alternative Energy Portfolio Standard. The supply of non-energy efficiency Tier II resources comfortably exceeds the current Tier II requirements, as well as the annual requirements through 2021.[18] This has led the Pennsylvania Department of

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[15] Friedman, et al., 2008, p. 22.

[16] Katherine Hamilton, Milo Sjardin, Allison Shapiro and Thomas Marcello, "Fortifying the Foundation: State of the Voluntary Carbon Markets 2009," Ecosystem Marketplace and New Carbon Finance, 2009, p. iv, http://ecosystemmarketplace.com/documents/cms_documents/StateOfTheVoluntaryCarbonMarkets_2009.pdf. Of 126 voluntary emissions reduction projects listed by Gold Standard Registry, with expected annual carbon dioxide offsets on the order of 10 million metric tons, only 14 were in the energy efficiency category. Eleven of those were for developing country cook stove or charcoal projects, two were for Chinese industrial heat and gas recovery, and there was one U.S. paper industry project (expecting 31,000 metric tons CO_2 reductions annually). See The Gold Standard, "VER Projects," accessed October 2009, https://gs1.apx.com/myModule/rpt/myrpt.asp?r=111.

[17] Nevada Power Company, "Application seeking acceptance of its Triennial Integrated Resource Plan, 2010-2029," Volume 5 of 26, 2009 Demand Side Plan Book 1 of 3, p.19, http://www.swenergy.org/news/2009-07-NV_Power_DSM_Plan_01.pdf .

[18] Pennsylvania AEPS Alternative Energy Credit Program, accessed October 16, 2009, http://paaeps.com/credit/listqualified.do?todo=qualified&qualifiedsubset=DE and http://paaeps.com/credit/listqualified.do?todo=qualified.

Environmental Protection to conclude that "vast over-subscription to Tier II by waste coal and other Tier II resources is proving to be a disincentive for energy efficiency."[19]

Fewer than three percent of the facilities[20] (project locations) that have qualified as suppliers of Pennsylvania's alternative energy credits generate the credits by achieving energy savings. Five of the twelve are located outside of Pennsylvania. Should energy savings begin to be used to comply with the Tier II requirements, this would represent not only trading, but potentially interstate trading. To date, none of the energy efficiency facilities have actually been used towards compliance with the Tier II requirements.[21]

Pennsylvania passed legislation in 2008 to establish an EERS for electric distribution companies (EDCs) serving at least 100,000 customers. The program savings must equal one percent in the 12 months after June 1, 2010 and the following year and three percent annually in the 12 months following June 1, 2012 and every year thereafter compared to the projected energy consumption between June 1, 2009 and May 31, 2010.[22]

EDCs are not allowed to achieve all of the savings through their own programs; each must contract with at least one PUC-approved conservation service provider to comply with all or part of its energy savings requirements. EDCs must achieve the savings in their own service territories, so although they can (and must) use energy savings generated by an ESCO or end-use consumer, they cannot trade ESCs with other EDCs. Since the requirements do not take effect until June 1, 2010,[23] the extent to which EDCs will use ESCs from others in their service territories is not yet known.

Connecticut Leads the Way

Connecticut is the only state in which regular trading of ESCs already occurs.[24] Most of the Connecticut ESCs are based on energy savings achieved by the state's two major EDCs, which jointly implement a wide variety of EE programs, called Conservation and Load Management Fund (CLM) programs. The EE programs are supported through the Connecticut Energy Efficiency Fund (CEEF), an EE public benefits fund (PBF) whose revenues come from a 3 mill ($0.003) per kWh levy on electricity sales.[25]

ESCs generated from these CLM programs are owned by the CEEF or by the program participant, who typically surrenders ownership of the ESCs to the CEEF in exchange for

[19] Pennsylvania Public Utility Commission, "2007 Annual Report: Alternative Energy Portfolio Standards Act of 2004," 2008, p. 16, http://paaeps.com/credit/client/docs/AEPSReport_07.pdf.
[20] Twelve of the 442 facilities, as of October 16, 2009.
[21] Pennsylvania AEPS Alternative Energy Credit Program, as of October 16, 2009.
[22] PA PUC Implementation order, Docket M-2008-2069887, 1/15/09, p. 2, http://www.puc.state.pa.us/electric/pdf/Act129/EEC_Implementation_Order.pdf.
[23] *Ibid.*, p. 2.
[24] Note, the system could be changed by the time this report is released since the program is the subject of an active Connecticut Department of Utility Control (DPUC) docket (D05-07-19RE02).
[25] Connecticut Energy Info, "Combined Public Benefits Charge," 2009, http://www.ctenergyinfo.com/dpuc_combined_public_benefits_charge.htm.

program incentives. The CEEF then sells a portion of the ESCs to electric generators, who are responsible for compliance with the state EERS.

The CEEF was created in 1998 and generated substantial energy savings before the Connecticut EERS took effect in 2005. The CEEF savings are the primary source of savings being used to comply with the state's EERS.[26] The sale of ESCs produced from CLM programs are funneled back into the CEEF, creating revenue for additional energy saving programs.

In 2007 and 2008, the CLM programs generated more savings than required under the EERS[27] Despite the substantial oversupply of Connecticut ESCs, in 2007 ESCs sold for an average price of $24.40 per MWh,[28] which is well above the floor price of $10/MWh. Interestingly, the average sales price is closely in line with the reported average cost of the CEEF programs.[29]

As shown in Table 1 below, this oversupply is projected to grow through 2011, due to declining demand for ESCs due to flat or negative load growth and because the EERS' does not increase in 2010 and 2011.[30]

Table 1: Connecticut Energy Savings Certificate Demand and Supply Forecast

DEMAND	**2009**	**2010**	**2011**
UI System Requirement Forecast (MWh)*	5,591,000	5,428,000	5,382,000
CL&P System Requirement Forecast (MWh)*	24,150,000	23,910,000	23,883,000
	29,741,000	29,338,000	29,265,000
Percentage of generation supply that electric suppliers are required to obtain from energy savings certificates	3%	4%	4%
Estimated Demand**	**892,230**	**1,173,520**	**1,170,000**
SUPPLY			
UI Certificate Creation Forecast from CLM Measures	201,718	309,502	388,545
CL&P Certificate Creation Forecast from CLM Measures	806,871	1,238,010	1,554,179
Certificate Creation Forecast from Others***	460,000	650,000	650,000
Estimated Supply	**1,468,589**	**2,197,512**	**2,592,724**
Estimated Excess Demand / (Supply)	**(576,359)**	**(1,023,992)**	**(1,422,124)**

[26] Energy savings requirements are referred to as 'Class III RPS' in the Connecticut program
[27] See testimony of United Illuminating Company in United Reporters, Transcript of the Hearing of Docket 09-02-18, 4-28-09, for instance.
[28] Earth Markets, "Brief for Docket No. 05-07-19RE02 DPUC Proceeding to Develop a New Distributed Resources Portfolio Standard (Class III) – 2009 Revisions," August 25, 2009, p. 6.
[29] Dividing 2008 CLM fund residential and commercial & industrial electricity program expenditures by estimated lifetime kWh savings from those programs yields about $24 per MWh. Energy Conservation Management Board, "An Investment in Connecticut Energy Efficiency: Report of the Energy Conservation Management Board, Year 2008 Programs and Operations, March 1, 2009," p. 34, http://www.ctsavesenergy.org/files/2008%20ECMB%20Annual%20Legislative%20Report.pdf.
[30] UI Response to EL-15 in D05-07-19RE02, July 7, 2009.

Notes:
* Source: 2009 Forecast Reports to the Connecticut Siting Council on Loads and Resources and assumes all Last Resort Service load is competitively priced.
UI = United Illuminating Company; CL&P = Connecticut Light and Power
** One MWh = one ESC certificate
*** Estimate based on approved projects as of July 7, 2009

Adapted from Earth Markets, Brief for Docket No. 05-07-19RE02 DPUC Proceeding to Develop a New Distributed Resources Portfolio Standard (Class III) – 2009 Revisions, August 25, 2009, p. 5.

The supply of ESCs from the state's two dominant electric utilities alone is projected to exceed the annual demand for compliance ESCs through 2011. Additional ESCs are expected to be issued to third-party providers, with an increasing share in future years. Most of these third-party savings appear to come from large CHP installations, but some of the projected savings are from end-use EE programs as well.[31] The total supply of ESCs is expected to be about 1.6 times the EERS required amount in 2009 and 2.2 times the required amount on 2011.

[31] Some potential third party providers, e.g. Coolnrg and Earth Markets, have decided not to proceed with their projects due to changes in the amount of savings that would be recognized by the DPUC. However, their projected ESCs are still included in the table above. Earth Markets alone has withdrawn savings of about 140,000 MWh annually in 2010 and 2011. Earth Markets, 2009. Coolnrg made a similar determination in a letter submitted as part of Docket No. 09-02-18, dated July 30, 2009, p. 5. The DPUC ruling changing the way CFL savings would be calculated was made in the DPUC's "Decision," Docket No. 09-02-18, July 15, 2009.

Are the Potential Benefits of EE Trading Being Realized?

Since Connecticut has the only significant EERS compliance ESC market in the nation, it is worth asking if EE trading in the state has brought about the potential benefits ascribed to EE trading that were discussed above: 1) lower cost energy savings, 2) targeting of resources toward their highest value, 3) additional EE funding and 4) increased transparency and credibility of EE programs. While the prospects for EERS and trading in other states cannot be assessed based on the experiences of a single state, Connecticut's experience suggests challenges that could await other states trying to implement EE trading systems.

Lower-Cost Energy Savings

While trading has lowered the cost of EERS compliance, there is no way to know whether it has lowered the cost of energy efficiency program deployment. The Connecticut trading regime serves as an EERS compliance mechanism, allowing electric generators to meet their EERS requirements through acquisition of ESCs rather than having to develop their own programs. That merchant generators are willing to buy ESCs at a price above the floor price suggests they have no lower cost alternatives and that trading has allowed for lower cost EERS compliance than would have been possible without trading.[32]

Presumably, the merchant generators would not buy the CEEF ESCs if they could deliver the savings at lower cost, and there is nothing stopping the ESC price from falling to the legal floor price of one cent per kWh. As explained in the previous section, the ESCs created by the two large EDCs through their CLM programs represent savings that would have been generated by the CEEF even without the EERS. So the marginal cost of selling these credits is essentially zero. The CEEF should be willing to sell the ESCs for the floor price or, absent a legal minimum price, any non-zero price.[33] Thus, if third-party participants can deliver program savings at very low cost, the EDCs will be able, and have every incentive, to lower the price of ESCs so that the regulated generators buy the CEEF ESCs instead of deploying their own programs or buying ESCs from others.

Table 2: Vintage Year 2007 ESCs Sold by the EDCs on behalf of the CEEF

EDC	# of ESCs Sold	Estimated % of EERS	Sales Price	Average ESC Price
CL&P	237,718	76.7%	$6,163,473	$25.93
UI	80,012	25.8%	$1,587,037	$19.83
Total	**317,730**	**102.5%**	**$7,750,510**	**$24.40**

Allowing savings created from CEEF funds to be sold for EERS compliance purposes essentially guarantees the EDCs will be the "lowest cost" provider of ESCs until the CEEF savings have all

[32] Could also suggest that the merchant generators do not want to bother with DSM, but this is a function of learning and other transactions costs. Note also, generators compete for customers in Connecticut, which allows retail competition for electric sales. Thus, for the generators the ESCs represent a cost of service like any other. If their competition can achieve the savings at lower cost, they will have a competitive advantage or higher profits.

[33] To be clear, this does not mean that the cost of the energy savings is zero, just the cost of selling the CEEF-generated savings.

been sold. In 2006, the last year before the EERS took effect, the CEEF generated approximately 328,000 ESCs.[34] In 2007, as Table 2 above shows, the EDCs sold fewer than 318,000 ESCs, enough to meet Connecticut's one percent EERS for that year. There is every reason to believe that all of those savings would have been generated anyway through the CEEF.

But while the electric generators' cost of compliance with the state EERS is reduced by trading, whether those programs will be more cost-effective or less than previous programs or than the programs that the generators might have done on their own is unknown. The generators are giving the CLM funds to administer more programs in the future and there is no requirement that the CLM achieve additional savings equal to the ESCs that were sold. The cost per kwh savings from the future CLM programs is unknown.

Over time, the EDC's programmatic savings could become less dominant. First, the EERS requirement will continue to ramp up. Second, program savings are likely to get more costly and thus fewer kWh of savings will be achieved from the same level of CEEF funding.[35] As Connecticut's legislature grapples with reduced revenues due to the economic slow-down, CEEF funds could be tapped by the state legislature to be used for general purposes.[36] Until that time, the EDCs will be able to undercut the cost of any other parties' energy savings programs, squeezing them out of the ESC market and precluding the purchase and sale of lower cost EE savings.

Of course, there are other ways that Connecticut could facilitate competition from third party providers and perhaps lower the cost of program, if not project, savings. For one, the EDCs could be required to compete for administration of CEEF programs. Whether this would facilitate involvement of many small third party participants or just replace one or two large third party administrators with another is an open question. Where competitions to administer programs have been instituted, they are usually given to a single large program administrator (e.g., Vermont Energy Efficiency Inc.) rather than many, or even several, administrators.[37] There are few examples of small entities successfully competing to provide significant programmatic savings.[38]

Targeting Resources to Their Highest Value

States often enact EERS with multiple objectives in mind, such as improving air quality, reducing greenhouse gas emissions, relieving grid constraints and enhancing in-state economic opportunities, including development of indigenous energy resources. At least theoretically, ESC trading could provide a mechanism for targeting resources for these other objectives. As

[34] Energy Conservation Management Board, *Energy Efficiency: Investing in Connecticut's Future. Report of the Energy Conservation Management Board Year 2006 Programs and Operations*, March 1, 2007, p. 4.
[35] If nothing else, many CFL programs are being ramped down due to market saturation and federal lamp standards that become effective beginning 2012. At least for the last decade, CFL programs have represented a major source of low-cost program savings.
[36] CEEF has already been subject to raids by legislature. Energy Conservation Management Board, 2008, p. 25.
[37] Note the distinction here between programs and projects; many programs offer funding or incentives for projects within a service territory.
[38] Energy services performance contracts provide individual *project* savings as part of some programs – these are not programs.

previously mentioned, a state or locality could encourage or require purchases of ESCs from projects that mitigate local air quality problems. A utility with capacity constraints may more highly value EE projects that relieve stresses on its infrastructure and, thus, be willing to pay more for ESCs from such projects.

We have not seen data indicating that ESC trading in Connecticut has facilitated such targeting of resources as compared to what might happen with an EERS absent trading. In Connecticut, generators must comply with the EERS by buying ESCs but it is the utility EDCs that own and operate infrastructure that may be subject to congestion and other stresses. These same EDCs administer the CLM programs.

Connecticut is a small state so there is likely much less opportunity for trading to target resources to meet these other objectives than there may be in larger states or with interstate trading of ESCs. Connecticut policy, including the state's 2005 Energy Independence Act, gives preference to CLM program projects that also mitigate congestion. About 50 percent of CLM program funding targets the transmission constrained Southwest Connecticut Towns.[39] Still, we are not aware that ESC trading has played a role in targeting grid support, air quality, employment, or other benefits relative to other EE projects.

More information about individual projects and programs – including who bought and sold the ESCs, what the sales proceeds were used for, and the location of the sellers and buyers – would be needed to be able to assess whether resources are being targeted to their highest uses as a result of trading.

Additional EE Funding

At first blush, one might think that Connecticut's EE trading program creates additional funds for EE since revenues from the sale of ESCs to generators is additional to and does not displace existing PBF funding. But, as noted earlier, it is the EERS itself that creates the additional funding for EE. ESCs do not create additional funding if they are part of an EERS.

As a related aside, it is worth noting that some prospective ESC market participants argue that all ESCs offered into the market should be purchased at the floor price of one cent per kWh.[40] The DPUC is examining this issue in an active docket.[41] A requirement to buy all available ESCs would essentially be a requirement to purchase all EE program savings that is cost effective with a one-cent per kWh subsidy. In other words, if the most expensive cost-effective EE projects that would be done without a subsidy cost 10 cents/kWh, the requirement to buy ESCs from all cost effective projects would in effect induce projects costing up to 11 cents/kWh.

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[39] Cathy Lezon, "Energy Efficiency and Load Management in Connecticut," presented at the 2006 NASUCA Annual Meeting, Miami, FL, November 12-15, 2006.

[40] See, for instance CPower, Brief of CPower, Inc., August 25, 2009 in D05-07-19RE02, p. 3. Potential ESC providers argue that a floor price has no significance if it is not guaranteed for all ESCs on offer. Other observers, such as the Office of Consumer Control (OCC) counter that the law prohibits providers from selling ESCs for less than $10 per MWh, but it does not require anybody to buy them.

[41] Connecticut Docket No. 05-07-19RE02 DPUC Proceeding to Develop a New Distributed Resources Portfolio Standard (Class III) – 2009 Revisions, January 23, 2009.

Transparency and Credibility in Energy Savings Programs:

The opportunity for ESC trading has attracted proposals from several prospective third-party participants. Commission proceedings on these proposals have created a public record of discussion, including questions and arguments about the operation of the Connecticut EERS. This critical and, at times, adversarial process has already increased the transparency of the Connecticut system.

Whether credibility is enhanced as a result of this process and whether this transparency will be sustained remains to be seen. The examination currently underway by the DPUC may, in the short term at least, raise questions about system credibility. If criticisms leveled at the system are satisfactorily addressed, then the process will lead to a more credible EE program. If not, then credibility of the system and of EE's role as an energy resource could suffer.

A central part of this discussion relates to how program savings are evaluated for CEEF-funded programs versus proposals by third-party participants. A number of prospective third-party EE service providers allege that the Connecticut system places them at a disadvantage. Earth Markets, for instance, alleges that while third-party participants and the utilities follow the same project approval process for Connecticut RECs, ESCs issued to non-utility participants face more stringent requirements than ESCs issued to utilities.[42]

Among the additional measures the non-utilities must meet that utilities do not, according to Earth Markets, are preparation of certified third party EMV plans, quarterly third party verification of savings and DPUC approval of the savings before they are registered with New England's ESC tracking system. Earth Markets asked, "Why is one system benefit fund following the same process as the private sector in regards to process qualification, approval and supply transparency and the other one is not?"[43]

Another example of questioning by stakeholders seeking greater program transparency is that Connecticut's Office of Consumer Counsel has charged that the utility-administered programs are not transparent and that costs are not being sufficiently divulged to consumers.[44] Other docket participants also suggest uneven treatment and differing EMV procedures for ESCs created by non-utility participants.[45]

In sum, as a result of Connecticut's EE trading program, these issues are being debated more publicly. Whether or not the allegations and criticisms are correct or justified, the point is that the questions are being asked and criticisms leveled. If responses to the criticisms result in more open and improved processes and procedures, then transparency and credibility may be enhanced. If the problems cannot or are not addressed, the price of greater transparency could be lower credibility.

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[42] Earth Markets, 2009, p. 5.
[43] *Ibid.*
[44] CPower, 2009, pp. 11-12.
[45] Kimberly-Clark Corporation, Brief for Docket No. 05-07-19RE02; DPUC Proceeding to Develop a New Distributed Resources Portfolio Standard (Class III) – 2009 Revisions, August 25, 2009, p. 2.

Why So Little Trading?

Given the potential benefits of EE trading, why is trading only occurring in Connecticut? Major possible barriers to EE trading include:[46]

1) Weak EERS stringency;
2) Trading makes a weak EERS weaker;
3) Giving away capital and jobs;
4) High transaction costs, including certification, tracking and trading of credits; and
5) High costs and uncertainty associated with savings measurement.

Below we discuss each in turn. Savings measurement, by far the greatest challenge to creating EE trading mechanisms, dominates the remainder of this report.

Weak EERS Stringency

Some states' EERS do not drive energy savings significantly beyond business-as-usual. Existing programs and policies are usually counted as part of eligible savings and those savings may by themselves exceed the EERS requirement. Thus even if trading is allowed, there would be no need for anyone to buy ESCs to meet EERS mandates. Recent large increases in EE spending as part of efforts by the federal government to stimulate the economy will further erode the impact of state EERS requirements, or at least call into question whether the EERS-induced savings are additional.

Over time, the *effective* stringency of an EERS could be increased through:[47]

1) Higher EERS requirements – Most EERS requirements start at low levels and ramp up over time. While low now, they will be higher later. EERS requirements could be further increased through changes in EERS laws or regulations.

2) Narrower definition of EE – Energy savings from some types of programs, projects or measures could be made ineligible, discounted or reclassified with a separate savings requirement.

3) More narrow definition of program savings – Existing BAU program savings could be excluded. Along the same lines, the methods used for evaluating savings could be tightened to allow only directly measurable energy savings, for example.

4) Adjusting BAU forecasts – EERS are typically stated as electricity savings required during different years relative to a base year, but the EERS stringency is based on estimates of EE potential, which may be based in part on forecasted BAU demand. If actual BAU demand growth is lower or higher than forecasted, the effective stringency of the EERS will be different too.

[46] This section draws significantly from Loper, et al., 2008.
[47] Examples given here are not intended as recommendations, but simply ways that the effective stringency of the EERS could be increased.

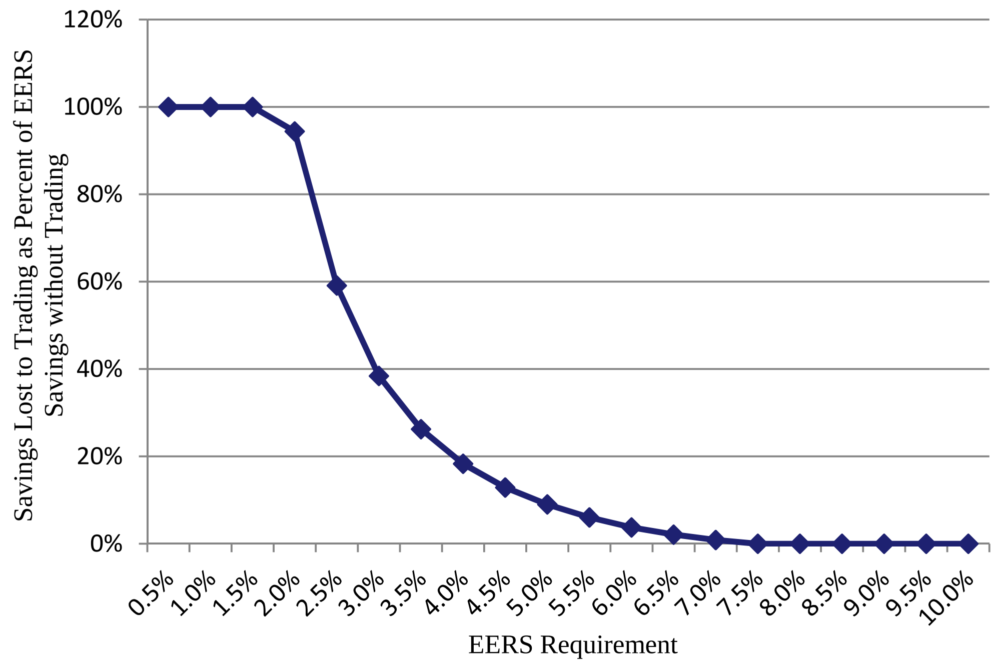
Some states' EERS provide little motivation for programmatic savings beyond BAU. And, as discussed below, the effective stringency of EERS could be less than the official stringency if estimated savings used for determining EERS compliance exceed actual savings. If savings are not real, an EERS could be a paper tiger.

Trading Makes a Weak EERS Weaker

As discussed above, some state EERS and proposed national EERS require little savings beyond business as usual. Contrary to the objectives of EERS proponents, allowing trading of EE credits could reduce the effective stringency of the EERS if the EERS requirement is below the BAU efficiency gains of the utilities with the highest savings.[48]

If one or more utilities are already producing more BAU savings than the EERS would require, they would be able to sell their extra savings to another utility in lieu of that other utility achieving additional savings to meet its EERS requirement. In this case, trading among utilities would allow credit for more BAU programs and thus reduce the effective stringency of the EERS. If the EERS requirement exceeds the BAU savings of every utility, then trading would not affect overall stringency. The key point is that trading makes a weak EERS even weaker. The savings from a strong EERS would not be affected by trading.

Figure 1: Electricity Savings from EERS Lost to Trading



Source: ASE analysis based on data from York & Kushler, 2005. (Calculations based on total retail electricity sales and total electricity savings from utility programs and PBFs in each state in 2003, pp. 14-15.)

[48] This discussion assumes that efficiency improvements that would be achieved anyway through pre-existing state EERS requirements, public benefit funds, or other policies are counted toward the national EERS requirement.

The reduced stringency resulting from trading could be significant, especially at low EERS requirements. Although the focus of the paper is on state EERS, a national example illustrates how trading can make a weak EERS weaker. According to the American Council for an Energy Efficient Economy, current reported BAU savings from programs and policies nationally is about 1.5 percent annually.[49] Without trading, a 4-percent national EERS thus would require 2.5 percentage points of additional (beyond BAU) savings. As shown in Figure 1, trading would reduce those savings by another 20 percent, leaving an effective EERS of about two percentage points. For higher EERS requirements, the reduction in savings resulting from trading decreases. For example, trading would not affect the stringency of a 10-percent EERS at all, since no state has BAU savings exceeding 10 percent.

Of course, if the reduced stringency from trading is problematic, the EERS requirement could be increased. A significant increase in the EERS percentage requirement could make an EERS politically less palatable, however, especially for states without significant programs. As discussed below, the increased transfer of funds to pay for credits bought to meet the higher standard – in part for programs that other states are doing anyway – could raise objections. In other words, it could be seen as a windfall for utilities in progressive states that have already met the EERS effectively paid for by a "tax" on laggard utilities. On the other hand, if BAU programs are not allowed to be counted toward EERS requirements, progressive states are disadvantaged. It is difficult to know whether the desire for lower cost compliance outweighs the various equity concerns – i.e., whether trading increases or decreases the political viability of a national EERS.

Another option would be to allow utilities to use their own BAU programs to meet their requirements under the EERS, but not allow them to take credit for savings that are either required or funded under state law or rules. If enforceable, this could solve the problem of trading increasing the eligible BAU savings and reducing the effective EERS stringency. However, under a national EERS, not allowing state utilities to count savings from laws and regulations in their state could also create a "race to the bottom" in which states weaken or rewrite their laws and regulations in a way that will allow utilities in the state to take credit for the programs implemented under those laws.

Giving Away Capital and Jobs

The economic theory behind EE trading for EERS compliance is well-established. Trading allows regulated entities with high compliance costs to purchase programmatic savings from low cost suppliers, thus lowering the overall cost of compliance. If not for the EERS, the buyer of the ESCs would presumably not have made the EE program investments and, thus, its main

[49] See Dan York and Marty Kushler, *ACEEE's 3rd National Scorecard on Utility and Public Benefits Energy Efficiency Programs: A National Review and Update of State-Level Activity*, American Council for an Energy Efficient Economy, 2007, pp. 14-15. The ACEEE savings estimates are based on bottom-up estimates reported by various program administrators. These numbers could be high. A recent econometric analysis of electric demand reductions due to DSM programs over the 18 year period 1989 through 2006 estimates cumulative annual savings of 1.1 percent of total annual electricity sales. See Toshi H. Arimura, Richard G. Newell, and Karen Palmer, *Cost Effectiveness of Electricity Energy Efficiency Programs*, Resources for the Future, Discussion Paper, October 2009.

objective is to minimize the burden imposed by the EERS. As long as there is nothing preventing the buyer from meeting the EERS requirement through its own programmatic savings, it will purchase ESCs only if they are less expensive than meeting the EERS through its own devices. From this perspective, EE trading helps achieve the EERS at lowest cost.

Despite the economic efficiencies that trading could bring to the table, it may face significant political opposition. It is easy to see how entities that must comply with the EERS might be reluctant to pay other entities, including possible competitors, to improve their efficiency or their customers' efficiency, especially in states with retail competition. Similarly, states could oppose a national EERS with trading if they perceive interstate ESC purchases as a transfer of investment capital, jobs and local air quality benefits from their state to another state. In states that already have strong state EERS, local developers of EE projects, who avidly support intrastate trading and the opportunity to generate and sell ESCs to the electric suppliers, may oppose interstate trading since it would allow ESCs projects from outside the state to be submitted in lieu of local projects.[50] For the same reason, developers from outside the state could be supportive of interstate trading.

Cost of Certification and Tracking of Credits

It is important to distinguish between costs associated with EE trading and the costs of actual EE program deployment. The costs of program deployment occur whether EE trading is allowed or not, and include costs of installation, rebates, technical assistance, program marketing, etc. EE trading could even reduce some of these costs since one of the primary objectives of ESCs is to identify and procure lower cost energy savings.

Similarly, EMV costs are not necessarily higher when an EERS includes trading. Programmatic savings must be estimated to determine compliance with an EERS whether or not trading is allowed. It is not clear why savings measurement needs to be more rigorous for trading than for EERS compliance and, for that matter, why we would allow savings measurement for developing program portfolios to be less rigorous than measurement for EERS and/or EE trading.

Incremental transaction costs associated with EE trading include the development and maintenance of systems for certifying and tracking credits. These costs revolve around locating, negotiating with and contracting with more diverse market participants.[51]

Double counting – sale of a certificate or the attributes it represents to more than one person at one time – is one of most challenging issues.[52] Issuing certificates requires a system for collecting documentation verifying savings and ensuring that the savings and/or certain attributes of the savings (e.g., carbon reductions, load impacts) have not been claimed or sold as part of another voluntary or compliance trading system. This involves the difficult task of looking for something (claims in other systems) which may or may not exist. It is hard to know when to stop

[50] Developers of renewable energy projects have expressed these concerns with respect to interstate trading of RECS in an Alliance workshop on ESCs and RECs February, 14 2008.
[51] Friedman, et al., 2008, p. 14.
[52] Hamrin, et al., 2007, p.78.

looking. Without a reliable tracking system, credit issuers would have to rely heavily on the assurances of the project principals and self-policing of participants.

Certificates must also be issued to the proper rights holder. The first question is who *should* the rights holder be? For example, who should receive credits for a project when it is implemented in a privately owned building by an ESCO using utility rebates and federal tax incentives? Connecticut, after some back and forth, developed clear guidance for projects using ratepayer incentives, awarding the ESC ownership rights to the owners of the EE measures or building in which the project was implemented, but requiring transfer of ESCs to the utility or third party administrators if a public incentive is used for the measure or project.[53]

If EE trading were to become widespread, double counting of savings could become a major issue. The federal government could, for example, award ownership of savings from tax credits to the building owner, while a state awarded credits to the utility providing the incentive. If the project relied on both federal tax incentives and utility rebates, ownership of the credits could be subject to dispute.

Tracking of savings certificates once they have been issued can involve significant additional costs, especially if the tracking system is developed from scratch. Fortunately, there are relatively mature Generation Information Systems for tracking RECs covering most of the United States, including the New England Power Pool GIS, which is used by Connecticut. These systems digitally create and track uniquely numbered certificates. APX, a company that provides web based platforms for most of the REC trading schemes, says incorporation of ESCs into these systems should be seamless once verification and certification requirements are provided by states.[54]

But in order to certify and track savings, savings must first be measured.

The Savings Measurement Challenge[55]

Savings measurement could be the greatest barrier to EE trading, as well as to EERS themselves. At the heart of the measurement challenges is a counterfactual – what would have happened if not for the program? We never actually know how much energy was saved as a result of the program activity. While we can estimate savings, we can never fully know whether the estimates are correct or the direction of bias. Thus we cannot recalibrate estimation methods and assumptions based on “actual” savings. This is not to say we cannot usefully and adequately estimate savings – just that there is considerable uncertainty and thus room for reasonable people to argue.

[53] Connecticut Department of Public Utility Control, Interim Decision, Docket 05-07-19, February 16, 2006, pp.15-16.
[54] Personal correspondence and presentation, Joe Kerekman, Managing Director, APX, February 7, 2008.
[55] For detailed discussions of EE program measurement issues, see Loper, et al., forthcoming; Steven R. Schiller, *Model Energy Efficiency Program Impact Evaluation Guide*, National Action Plan for Energy Efficiency (NAPEE) and Schiller Consulting, November 2007, http://www.epa.gov/RDEE/documents/evaluation_guide.pdf; and International Energy Program Evaluation Conference 2009 proceedings, http://www.iepec.org/.

A full discussion of measurement issues could – and does – fill rooms full of reports and conference halls full of people. The International Energy Program Evaluation Conference has drawn hundreds of evaluation experts every other year since the early 1980s.[56] The California Measurement Advisory Council maintains a database of California evaluation studies and the Consortium for Energy Efficiency maintains a database of studies from other states.[57]

Frequently discussed issues include (but are not limited to):

- *Attributions of savings* – EE programs are intended to induce energy savings that would not have happened otherwise. Attribution of savings to certain EE programs requires netting out savings that are the result of other government policies, changes in economic growth or energy prices, and other outside factors while adding in the savings that result from policies that were made possible by the programs. Attribution has always been difficult, but it is getting more difficult due to increases in federal and state spending on EE programs and the plethora of new EE policies. As a result of more aggressive energy programs and policies, the boundaries between programs have become increasingly blurred.
- *Program heterogeneity* – A wide variety of program approaches (direct install, rebates, technical assistance, awareness, etc) are used by a wide range of people and organizations with various management capabilities (work effort, enthusiasm, charisma) targeting different measures (e.g., electric motors, appliances, lights) at different stages of development (e.g., emerging, mature) for different types of participants (low income renters, middle income home owners, small retailers, large manufacturers, early adopters, etc) at different times in different climates in different jurisdictions with different policies (codes, standards) for different purposes (e.g., compensation, compliance, cost-effectiveness).[58] A diversity of methods and assumptions is required to accommodate the diversity of program characteristics.
- *Balancing certainty and cost* – Increased certainty requires funding, which is then not available for the programs themselves. It requires time, which could impede the ability to provide feedback to programs. The quest for increased certainty may result in lost opportunity if overemphasis on "measurable" savings limits the scope of programs, for example behavioral programs. Different levels of certainty, and types of certainty (reduced bias, increased precision), may be appropriate for different evaluation purposes (e.g., portfolio analysis, cost-effectiveness calculations, load forecasting, carbon offsets, EERS compliance). But while the cost-certainty tradeoff is often discussed, there is to date no meaningful guidance or framework for deciding how much certainty or how much money to spend.
- *Variation in methods and assumptions* – The assumptions and methods for estimating program savings vary widely among states. National and regional policies such as EERS, carbon offset programs, and regional capacity markets will require that EMV practices be

[56] Traditionally held in the US in odd numbered years, the IEPEC will hold its first conference in Europe in Paris in 2010.
[57] The CALMAC database can be accessed at http://www.calmac.org. The CEE database is available at http://www.cee1.org.
[58] For discussion of these various program dimensions, see Nick Hall and Patrick McCarthy, "Portfolio Evaluation Versus Program Evaluation: Is There a Balance?," International Energy Program Evaluation Conference, 2009.

harmonized.[59] The Northeast Energy Efficiency Partnerships has created the EMV Forum to help Northeastern and Mid-Atlantic states harmonize methods and assumptions; all states in the region are participating except Pennsylvania.[60] It remains to be seen the extent to which common evaluation protocols will be adopted, but the recent development and adoption of EE evaluation protocols for use in forward capacity markets in the region offers some hope for success.

- *Behavior change* – Many EE measures can affect how and how much consumers operate energy-using equipment. "Smart meters" are intended, in part, to allow immediate feedback to consumers about their energy consumption and costs in the hope that increased awareness will drive increased investment in EE or EE behavioral changes (say, turning off unused equipment or running full dishwasher loads). In the other direction, there is often some "rebound effect" that occurs as, for example, people replace their incandescent bulbs with CFLs and then leave them on more than they did in the past because they are cheaper to operate. These are just two of a multitude of examples of how behavior can complicate and increase the uncertainty associated with savings measurement.
- *Interactive effects* – Many EE measures will affect other energy-using systems. Replacing incandescent lamps with CFLs, for example, can increase heating needs and reduce air conditioning loads. Installing a more energy efficient heating, ventilation and air conditioning (HVAC) system will reduce the energy saving associated with an energy management control system. Better insulation or windows can reduce HVAC loads. Occupancy sensors will lower savings attributable to new light fixtures. Understanding and modeling these relationships in a single building presents significant engineering challenges. Accounting for interactive effects for many projects or within or between programs is even more difficult.
- *Persistence* – Few measures save energy by themselves. Their performance depends on whether they are installed correctly and how they are maintained and operated. There are many stories of EE measures not operating as specified. For example, Energy Star created a programmable thermostat specification in 1995. At the end of 2009, however, it will suspend its specification due to concerns that under its current specifications, programmable thermostats, while an important EE device when used correctly, are not achieving net energy savings because "consumers are not consistently using them in an effective manner."[61] Persistence can be reduced by many other factors, including (for example): equipment breakage or malfunctioning, equipment decommissioning, factory closing, or demolition of building in which the project was installed.
- *Useful life* – Measuring energy savings from a project requires comparing energy consumed during the estimated useful life (EUL) of the new equipment or measure being implemented to the energy consumed during the remaining useful life of the equipment being replaced plus the energy consumed by the equipment that would have replaced the original equipment at

[59] Julie Michals and Elizabeth Titus, *The Need for and Approaches to Developing Common Protocols to Measure, Verify and Report Energy Efficiency Savings in the Northeast*, Northeast Energy Efficiency Partnerships, 2006, p. 6.
[60] Pennsylvania has not yet joined the NEEP EMV Forum and it is not clear the extent to which participating states will be willing to change their evaluation practices.
[61] Environmental Protection Agency, "Letter to Stakeholders with a Revised Proposal for the Specification Revision Process," October 25, 2007, http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/thermostats/PTLetterFinal.pdf. For more discussion, see http://www.energystar.gov/index.cfm?c=revisions.thermostats_spec.

the end of its life.[62] Rigorously determining the EUL of various measures can be costly and takes a long time (perhaps even the life of the equipment). Unfortunately, by the time the data are available they may no longer be relevant.[63] Alternatively, modeling or otherwise indirectly estimating the life of equipment and any degradation of performance can introduce uncertainty and possible error.

Ironically, the measurement of energy savings may represent both the greatest barrier to EE trading and its greatest benefit. The transaction costs associated with savings measurement have certainly hampered the implementation of EE trading. But EE trading, like other performance-based mechanisms intended to increase EE investment or reduce EE costs, creates vested interests in savings estimates that shines a light on savings measurement methods and data. The measurement challenges are not unique to EE trading – energy savings measurement could prove to be the greatest barrier to a national EERS, carbon offsets from EE programs, and a sustained ramp up in EE programs generally. Thus, addressing the measurement challenge is critical.

[62] For example, if a light fixture being replaced has an expected useful life (EUL) of 10 years and is 6 years old, the RUL is 4 years. After 4 years, the light fixture would be replaced by a new fixture. Let us say this baseline replacement fixture also has a EUL of 10 years, and it will consume 200 kWh per year compared to the current fixture which consumes 300 kWh per year. If the new more efficient light fixture consumes 150 kWh per year and has a EUL of 10 years, then the savings (all other things equal) would be 900 kWh (4x300 + 6x200)-10x150 = 900).

[63] See Michael Rufo, "Evaluation and Performance Incentives: Seeking Paths to (Relatively) Peaceful Coexistence," International Energy Program Evaluation Conference, 2009, p. 1036.

Conclusion and Recommendations

Despite its many potential benefits, EE trading has not taken off. To date, significant trading of ESCs is occurring in only one state – Connecticut. The degree to which EE trading in Connecticut has demonstrably achieved the stated objectives of EE trading is mixed.

It is hard to generalize about the prospects for EERS and trading in other states or the national level based on the Connecticut experience. Nevertheless, the Connecticut trading system is a living laboratory which is exposing many of the challenges that are also likely to occur elsewhere. As the first and only active trading system in the United States, the issues and problems that have arisen in Connecticut's EE trading can be instructive for future programs.

First, it is Connecticut's EERS that is driving increased funding for EE, not the trading. Second, trading is reducing the cost of compliance with the EERS, but it is not clear that it is reducing the cost of EE projects and programs.[64] Third, trading has so far not enabled significant participation by non-utility project developers or program implementers. While some ESCs have been generated from CHP projects, we are not aware of any ESCs that have been issued for end-use energy efficiency programs or projects beyond the savings generated by the CLM programs overseen by the state's two large distribution utilities.[65] Fourth, the CHP credits do not appear to actually affect the clearing price, since there is already a large surplus of ESCs from the existing CLM programs.

The primary function of the ESC trading system in Connecticut is as a compliance mechanism for the state's EERS. It is a means to convert the state's EERS into a tax on electric generators, revenues from which are used to fund additional EE programs. But, ultimately, its greatest benefit may be the increased transparency of EE program evaluation. Like other performance-based mechanisms – including most notably the California shareholder incentive and Duke Energy's Save-a-Watt program in Ohio and North Carolina – EE trading in Connecticut has created a process in which various interests have a financial stake in how program savings are measured.

Some of the programs that have been proposed by third parties – e.g., consumer feedback programs (through advanced metering) and large CFL give-away programs (in light of new federal lighting standards)[66] – present particularly difficult savings measurement and evaluation

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[64] As discussed in a previous section, electric generators' cost of compliance with the state EERS is reduced by trading, since they are able to purchase existing program savings from the CLM, whose marginal costs of selling the CLM credits is effectively zero. The generators in effect are giving the CLM funds to administer more programs in the future. Whether those programs will be more cost-effective or less than previous programs or than the programs that the generators might have done on their own is unknown, since there is no requirement that the CLM achieve additional savings equal to the ESCs that were sold.

[65] Third party projects have been approved as ESC providers, but it's not clear that any of them have actually created ESCs to date. And some third parties that were approved to provide ESCs have opted not to do so because they decided it would not be profitable. See, for example, Coolnrg, Letter to the DPUC, July 30, 2009, Docket 09-02-18 or Earth Markets, 2009, p.5.

[66] The Energy Independence and Security Act of 2007 phases out general purpose incandescent lamps beginning in 2012. Connecticut – like some other states – is ramping down DSM programs intended to promote the use of general purpose CFLs.

challenges. Whether or not trading and third party participation is allowed, widely accepted methods for attributing savings to behavioral measures and EE measures for which there are significant related policies or programs need to be developed.

While at first blush it might appear that EE trading is driving the need for more rigorous program evaluation, the real driver is increased program funding and pursuit of deeper savings (i.e., "higher hanging fruit"). EE trading has simply shined a light on the evaluation challenge. Without the spotlight on evaluation, existing state EERS, and any future national EERS, could easily become paper tigers that allow EE program savings to be claimed with little actual savings. Perhaps more important, without good evaluation, EE programs may fail to generate the maximum amount of savings per dollar.

In sum, the *potential* benefits of EE trading are fairly clear: lower cost EE deployment, increased investment in EE, and targeting of investment where it provides the greatest value. Despite a decade of discussion about the potential benefits of ESCs, the extent to which these benefits are actually being realized remains unclear.

The greatest legacy and benefit of EE trading could very well be increased scrutiny of how energy savings are measured. This is perhaps ironic since savings measurement is also the greatest barrier to EE trading. Credible savings measurement will be a vital part of a sustained scale-up of EE programs. By forcing EE programs to become more transparent, perhaps EE trading can help address the measurement challenge.

The authors of this report favor state and, prospectively, national EERS subject to consistent and rigorous EMV standards, including methodologies for establishing baselines and BAU projections to which EERS are compared. Further, we favor ESC trading, both intra- and interstate, but only if subject to rigorous and consistent EMV. We emphasize that even without trading, credible EMV is critically important.

Without a strong EMV system and one that is consistent among trading entities and jurisdictions, there is a great probability that energy savings will be overstated, claimed emissions reductions and grid reliability benefits will not materialize, and that EERS compliance and (in some states) financial compensation from ratepayers will be improperly applied. If these were to occur, EERS would be justifiably viewed as paper tigers and the credibility of EE for achieving economic, environmental, and energy reliability and security benefits would be severely questioned. EMV, developed and applied through transparent and credible processes, is critical to the EE enterprise and fulfilling its promise.

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Appendix

Status of State EERS

Focus states

Connecticut

- **EERS Targets:** Electricity providers to provide "conservation & load management" savings and CHP equal to 1% (2007), 2% (2008), 3% (2009), 4% (2010 and beyond) of retail sales. Generators must buy ESCs to meet EERS. The two electric distribution companies (EDCs) design and administer EE and load management programs funded by public benefit fund (PBF) that create ESCs, which they then try to sell to generators. Sales of those ESCs funneled back into further EE and load management programs. Generators can also develop their own savings programs. Third parties can also run independent programs to create ESCs, subject to department of public utility commission (DPUC) approval.
- **Behavioral programs included?** Current DPUC docket is examining how to quantify behavioral program savings.
- **Trading allowed?** Yes, intrastate trading allowed.
- **Trading occurring?** Yes, although access to the market of third-party-created ESCs is minimal to date.
- **Compliance mechanism?** $31 per MWh alternative compliance payment.
- **Goals met so far?** Yes; there is an excess supply of ESCs that is projected to increase through at least 2011.
- **Evaluation:** DPUC must approve the creation of all ESCs. Evaluator hired for PBF-funded programs. DPUC also approves verification for deemed savings. For third-party-administered programs DPUC must approve EMV plan and licensed professional engineer must submit savings verifications for DPUC approval.

Massachusetts

- **EERS Targets:** Green Communities Act (2008), starting in 2010 directs electric and gas EDCs and municipal aggregators (collectively "PAs") to "first acquire all available cost-effective EE that's less than the cost of supply." Goal for 2010-2012 set at 2.4% of electric load. Electric and gas Pas' statewide plans must be approved by the Energy Efficiency Advisory Council and submitted to the DPU.
- **Behavioral programs included?** Several behavioral pilots will be implemented. Additionally, statewide education and messaging initiatives will be implemented under a "hard-to-measure" category.
- **Trading allowed?** No.
- **Compliance mechanism?** Department of Public Utilities has the ability to fine PAs up to $50 per MWh short of their EE plan goals (self-created) if they are found not to be attempting to meet their goals in good faith. But existing penalty mechanisms have not previously been used for EE, and processes and standards would need to be established before they could be, so no near term actions expected. A joint proposal from the PAs would allow for a 3-part performance incentive based on savings, value and specific metrics if approved by the Energy Efficiency Advisory posits.

- **Goals met so far?** Too early to tell; goals do not kick in until 2010.
- **Evaluation:** Under supervision of the Energy Efficiency Advisory Council, PAs are developing specific areas of practice (e.g. "Large Commercial Industrial) and will hire third party evaluators to evaluate all statewide electric and gas programs in each practice area**.** Evaluation results reported in Annual Reports are incorporated into current programs and iteratively included in succeeding year plans, and submitted to the Department of Energy Resources and the Department of Public Utilities.

Pennsylvania

- **EERS Targets:**
  1. EE included as Tier II of Alternative Energy Portfolio Standard (AEPS) along with various supply options. EDCs and generators to meet 4.2% (2006), 6.2% (2010), 8.2% (2015), 10% (2020) of annual sales from Tier II resources.
  2. Separate law requires EDCs reduce electric demand in their territories 1% in 12 months following June 1, 2010 and 3% in 12 months following June 1, 2012 and each following year compared to the 12 months following June 1, 2009. EDC must contract with at least one conservation service provider to provide part or all of energy savings requirement. Other savings can come from programs the EDCs administer.
- **Behavioral programs included?** For the EE law, yes. Savings calculated based on impact evaluations using statistical techniques incorporating consumption histories, demographic information, surveys, etc.
- **Trading allowed?**
  1. Yes, interstate trading allowed for ESCs to meet AEPS. No EE trades identified thus far because of surfeit of credits from other qualifying (electricity supply) sources of Tier II AEPS credits.
  2. EDC EE targets must be met from within an EDC's service territory so no trading with other EDCs or others outside territory is allowed. EDCs are required to buy ESCs from at least one third-party provider.
- **Compliance mechanism?**
  1. $45 per MWh shortfall of target, not recoverable from ratepayers.
  2. No alternative compliance payment or penalty for non-compliance yet established; PUC required by law to ensure compliance.
- **Goals met so far?**
  1. EDCs have easily met Tier II AEPS requirements without using EE resources.
  2. Too early to tell; goals do not apply until June 1, 2010.
- **Evaluation:** A Statewide Evaluator has been hired by the EDCs to perform annual audits of the EE program and a 2013 overall program review.

Vermont

- **EERS Goals:** Public Service Board contracts with company to manage the state's "energy efficiency utility," Efficiency Vermont, which designs and implements EE programs funded by a PBF. Efficiency Vermont to achieve 360 GWh savings '09-'11, or about 2% of annual demand, with 1.2 gross benefits to spending ratio. Specific total resource benefits goals for each county.

- **Behavioral programs included?** No behavioral programs mentioned in TRM or in Efficiency Vermont's annual reports.
- **Trading allowed?** No.
- **Compliance mechanism?** None, except that poor performance could result in contractual penalties and change of contractor.
- **Goals met so far?** Yes. Annual report states 2006-08 contract goal exceeded by 12% and 2008 savings achieved at an average $25 per MWh.
- **Evaluation:** Department of Public Service hires third-part evaluation contractor(s) annually to review and verify past year's energy and capacity savings and total resource benefit claims.

Table 5: Other States' EERS

California	≈8% by 2020	**New Jersey (pending)**	n/a
Colorado	≈11% by 2020	**New Mexico**	10% by 2020
Delaware*	15% by 2015	**New York**	15% by 2015
Hawaii	20% RES with EE eligible	**North Carolina**	5% by 2021
Illinois	18% by 2020	**Ohio**	22% by 2022
Iowa	5.4% by 2020	**Rhode Island (pending)**	n/a
Maryland	15% by 2015	**Texas**	20% reduced load growth by 2009
Michigan	10% by 2020	**Virginia**	10% by 2022
Minnesota	1.5% per year	**Washington**	All achievable cost-effective measures, ≈10% by 2025
Nevada	5% by 2020		

* Delaware passed an EERS in July of 2009 so is not included in some EERS listings.

Adapted from: Laura Furrey, "State Renewable Portfolio Standards and Energy Efficiency Resource Standards," American Council for an Energy-Efficient Economy, June 2009, http://www.aceee.org/energy/national/Keystone_6.10.09.pdf.; Delaware Energy Office, "Energy Efficiency Resource Standards (EERS) Workgroup," 2009, http://www.dnrec.delaware.gov/energy/information/Pages/EERSWorkgroup.aspx.