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Energy Savings Certificate Markets: Opportunities and Implementation Barriers

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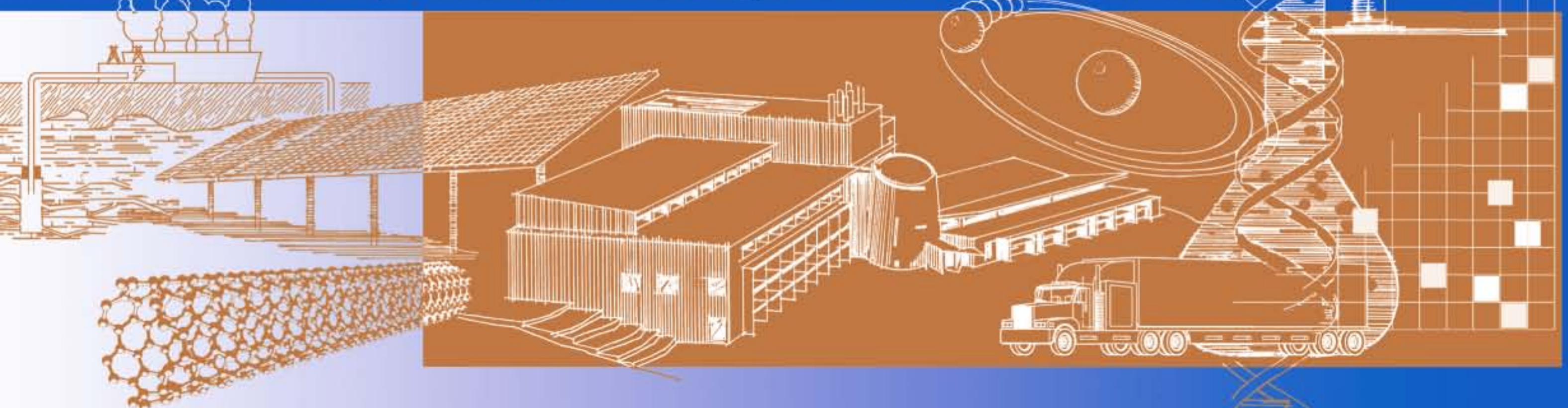

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ENERGY SAVINGS CERTIFICATE MARKETS: OPPORTUNITIES AND IMPLEMENTATION BARRIERS

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ABSTRACT

Early experiences with energy savings certificates (ESCs) have revealed their merits and the challenges associated with them. While in the United States ESC markets have yet to gain significant traction, lessons can be drawn from early experiences in the states of Connecticut and New York, as well as from established markets in Italy, France, and elsewhere. The staying power of European examples demonstrates that ESCs can help initiate more efficiency projects. This article compares ESCs with renewable energy certificates (RECs), looks at the unique opportunities and challenges they present, and reviews solutions and best practices demonstrated by early ESC markets. Three major potential ESC market types are also reviewed: *compliance*, *voluntary*, and *carbon*. Additionally, factors that will benefit ESC markets in the United States are examined: new state EEPS policies, public interest in tools to mitigate climate change, and the growing interest in a voluntary market for ESCs.

Keywords: energy efficiency, energy savings certificates, white certificates, white tags, efficiency market, carbon, renewable energy certificates

1. INTRODUCTION

The concept of creating and trading verified fixed units of energy savings, through energy efficiency or load management, has been proffered as a vehicle to increase the amount of savings implemented in the United States. However, the country only started to adopt energy savings certificates (ESCs) in 2006. ESCs, the energy savings analog to renewable energy certificates (RECs), have the potential to bring the same market-based flexibility to energy efficiency that RECs have brought to renewable energy.

To date, four U.S. states, three European countries, and New South Wales have incorporated ESCs into policies that establish energy efficiency targets, often referred to as energy efficiency portfolio standards (EEPS). In addition, the European Commission is examining whether it should propose an ESC trading scheme across Europe. In the United States, only Connecticut is actively trading ESCs.

This article explores how ESC trading can work in the United States using the Connecticut example as a model, and takes a closer look at each design feature using European examples. These components include rules for the types of projects for which ESCs can be issued; the parties who can buy and sell them; rules for issuing ESCs, tracking their ownership, and retiring them; rules for who can verify and certify that a given ESC is what it purports to be; and the monitoring and verification (M&V) protocols to be used for that verification. Policy makers in other states and actors in voluntary markets can observe how these various elements are treated in existing ESC schemes, and how each translates into the desired result: increased cost-effective energy savings activities.

2. DEFINITION AND PARAMETERS OF USE

An ESC is an instrument representing a unit of energy savings that has been measured and verified. ESCs allow parties to trade the attributes of energy savings, representing an ownership right to the bundle of societal and environmental benefits created by the fixed quantity of energy savings with which the ESC is associated.

An ESC can be represented in units of electricity savings, such as 1 megawatt hour (MWh); or in common energy units that enable direct comparisons between gas efficiency and electricity savings, such as British thermal units or tons of oil equivalent. ESCs can be designed to incorporate estimated savings over the expected lifetime of the efficiency measure or to represent energy savings accrued annually. Assigning 1 MWh to an ESC simplifies its use, making it more easily comparable to a REC [1] and aligning it with most EEPS policies in the United States, which focus on electricity savings.

ESCs can be used to buy and sell their societal and environmental benefits as a separate commodity, either bilaterally or at auction, with the bundle of benefits belonging to each successive owner. The ESC is credited to the owner of the ESC when it is retired, and that owner may make the associated claims concerning the energy savings. Similar to RECs, ESCs are intended to be retired only once, for one purpose only. **Figure 1** presents the various stages involved in the life cycle of ESCs.

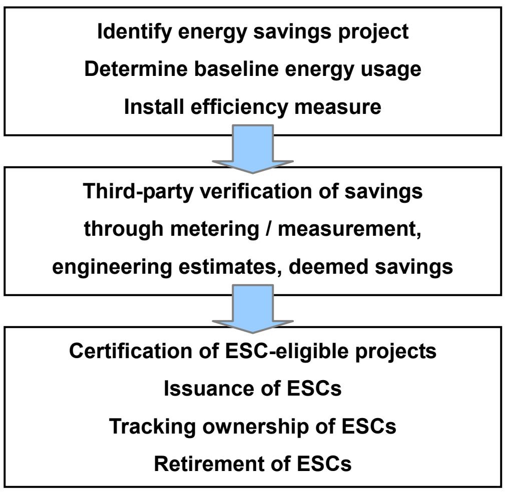


FIGURE 1: STEPS IN ESC TRADING SCHEMES

2.1 ESCs compared to RECs

REC markets have shown that there may be potential to broaden and integrate markets for tradable commodities that represent a public good and an opportunity for consumers to "vote with their wallets." ESCs can benefit from the traction that RECs have gained in the marketplace, along with the existing infrastructure developed for REC markets, such as tracking systems. These systems could be relatively easily modified to accommodate ESC trading. ESCs can also benefit from existing M&V protocols and other data acquired through long-standing efficiency and public benefit programs. However, with a somewhat different value proposition, it is unclear whether ESCs will mirror RECs market progress.

2.2 ESC Interaction with REC Markets and RPS / EEPS Policy

ESCs can interact with REC and RPS markets in a number of ways. If ESCs are denominated in MWh units and represent electricity savings, they potentially could be used interchangeably with RECs in voluntary REC markets. Consumers could purchase ESCs to offset each MWh of electricity consumed, similar to how RECs are used by customers today. They also could be used essentially interchangeably with RECs in those compliance markets in which both efficiency and renewables are eligible to meet a single target.

The amount of efficiency stimulated by an EEPS or RPS policy is a function of the cost of efficiency compared with the resources against which the efficiency competes. The tier structure—and specifically what other resources are in a given tier together with energy savings—is an important design element of any RPS or EEPS policy.

In cases where both efficiency and renewables can be used to meet the same portfolio standard, the introduction of ESCs could streamline the compliance process through a more liquid market by combining REC and ESC trading into a single platform and tracking registry.

3. BENEFITS OF ESCs

As a tradable commodity, the main benefit of ESCs is their potential to free market forces to drive capital and capabilities to energy savings opportunities.

Most would agree that if the benefits of private markets can result in greater energy savings, then public benefits accrue. ESCs offer a tool to reduce payback periods and thereby encourage more energy efficiency projects to move forward. The benefits of energy savings and energy efficiency are well understood, including reduced emissions from fossil fuel-generated electricity that contribute to climate change, acid rain, and smog and other health effects; reduced water consumption; increased energy security; and improved ecosystems.

The decrease in electricity and fossil fuel demand brought about by efficiency also benefits the economies by delivering cost savings. The cost savings created by efficiency may serve to offset the higher energy prices resulting from a cap-and-trade system [2]. The economic benefits of energy efficiency can be particularly important to impoverished households disproportionately affected by increasing energy costs. Additionally, improved energy efficiency can provide a competitive edge for businesses in difficult economic climates [3].

3.1 Market Benefits

ESCs have potential benefits for both voluntary and compliance markets, such that the owner who retires an ESC may do so for private purposes, such as reducing a carbon footprint, or to comply with a legal obligation, such as an EEPS. In some cases, an ESC may be used as a tool to demonstrate a reduction in carbon emissions. An ESC also can be an accounting tool, used to demonstrate energy efficiency implementation, or eligibility for certain tax incentives or other public subsidies associated with implementing energy efficiency or load reduction [4].

3.2 Third-party Benefits

ESCs can enable energy efficiency to be acquired more cost-effectively. For example, by opening up trading to third parties, ESCs could increase participation by private energy service companies (ESCOs) in state EEPS compliance markets—a potential advantage because of ESCOs' unique experience and expertise with energy efficiency projects and technologies. In some cases, private actors are better able than utilities to identify and access high-value energy efficiency opportunities because of their economic interest in reaching market segments and geographic regions not easily tapped by utilities. In some cases, ESCOs' advantage may be simply a better ability to acquire energy efficiency savings at lower costs.

A similar argument could be made for other third parties in optimal positions to implement energy efficiency, such as appliance manufacturers and retailers, commercial and industrial energy end users, aggregators for residential measures, and others. Trading programs that open markets to third parties could see greater overall savings at a lower overall compliance cost, by virtue of empowering these third parties to derive value from ESCs. The competition also could result in utilities being pressured to implement their own programs more cost-effectively [5].

4. KEY STRUCTURAL ELEMENTS OF ESC PROGRAMS

EEPS programs differ significantly in how broadly they define project eligibility, and they are not always consistent. In some cases, ESCs may be derived from projects that save energy by making use of thermal waste or another byproduct, such as combined heat and power (CHP). Certain project types, such as solar hot water systems and geothermal heat pumps, may be treated as renewable energy by one program and as efficiency in another.

In some cases, EEPS and ESC regimes also may include demand-response or load-management measures that shift electricity load from peak to off-peak hours. Eligible project types and practices are listed in **Table 1** and include smart metering, sensors to anticipate heating or cooling, or remote monitoring and control of various energy-intensive applications.

Table 1. ESC Schemes and Eligible Project Types

ESC Program, Year Effective	Eligible Technology Types and Practices	Major Stipulations
Connecticut, 2007	• CHP plants • Demand response • Load management	• Electricity suppliers must meet a percentage of their total supply in energy efficiency and CHP [6]
France, 2006	• Double glazing of windows • Heating controls • Insulation • Lighting • Variable speed motors • Wood-firing heating systems	• Favors standardized measures with set energy savings; customized or less-common projects are assessed case-by-case.
Italy, 2005	• Bio-climatic architecture • Control of radiation entering through windows • Electricity in thermal uses • Heating/cooling and heat recovery with nonrenewable energy • On-site renewable energy • Passive cooling • Promotion of electric and natural gas vehicles • Reduction of air-conditioning electricity consumption • Reduction of passive-draw power • Solar water heating • Substitution of electricity to other sources	• Half of the goal set for each year must be obtained by reductions in the consumption of electricity and gas by end-users
New South Wales, Australia, 2003	• Demand-side abatement • Energy efficiency projects reduce or replace energy consuming equipment or processes • Forest sequestration of carbon • Fuel switching with reduced GHG emissions • New energy efficient equipment • On-site electricity generation with reduced GHG emissions • Reduction of GHG emissions by non-electricity sector industries [6]	• Required "benchmark participants" (i.e., major electricity producers) must meet a percentage of the total benchmark greenhouse gas (GHG) emissions reductions relative to their contribution to the grid.
United Kingdom, 2002	• CHP plants • Fuel-switching programs • High efficiency hot water tanks • Window glazing	• Half of the savings generated for compliance must be derived from low- or moderate-income family home

4.1 Measurement and Verification (M&V) Protocols

Each ESC trading program develops its own protocols for M&V. They often use established templates, such as the International Performance Measurement and Verification Protocol (IPMVP), as a guide. Focused on commercial and industrial applications, the IPMVP covers a broad range of measures, including fuel savings, water efficiency, load shifting, and equipment upgrades [7]. Others rely on existing protocols that already have been developed for public benefits funds that support efficiency measures. ESC programs also generally require licensed engineering contractors to conduct the work or independently verify the savings.

The most accurate methods for determining savings involve measuring end-use consumption and then imputing savings based on a projection of baseline energy use, or conducting whole building measurement. End-use measurement can be conducted on a project-specific basis or for samples of similar projects. End-use M&V can entail different levels of accuracy and expense, depending on what parameters are monitored instead of spot-measured, the accuracy of the instrumentation, and the duration of the monitoring period.

The use of an automated, web-based tracking system can ensure each ESC is identified by a unique serial number that need not be identified manually while controlling ESC program administrative costs. Such tracking systems streamline registration and chain of custody, minimize the risk of double-counting, and efficiently generate the necessary reports for certifying bodies. The parameters for ESC-tracking software already exist and need only be licensed for further need-specific development.

4.2 Lifetime Length of ESCs

For the integrity of a trading program, projects should generate ESCs only for the period they are actually generating the savings, which varies depending on project type and other variables. ESCs from a given project can be either reissued annually for a fixed number of years, which is the norm, or issued the entire lifetime's worth of ESCs up front. The length of the lifetime may be based on a "one-size-fits-all" approach to projects, such as a five- or 10-year maximum lifetime. Alternatively, lifetimes may be defined for individual technology types, reflecting the actual length of time during which savings can reasonably be expected for that type, based on the history of the project type and other variables.

5. MARKET OPPORTUNITIES

EEPS policies that create long-term targets for energy efficiency have emerged in 15 U.S. states (**Figure 2**) [8]. The fact that all but three of these states have done so in the past three years demonstrates a clear trend and a renewed state interest. Now that a large number of EEPS have been adopted in recent years in the United States, there is an increased opportunity for ESC trading to emerge.

There are three major markets or potential markets for ESCs: *compliance*, *voluntary*, and *carbon*; carbon markets also include both voluntary and compliance markets.

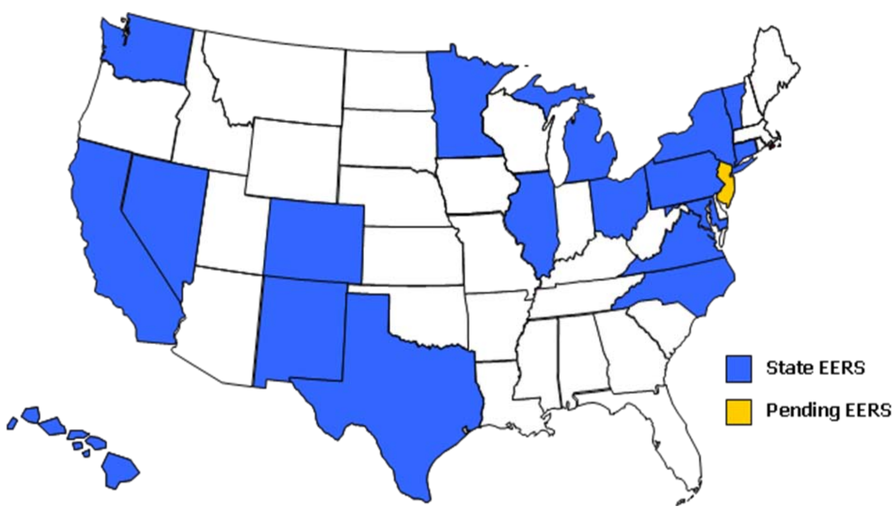


FIGURE 2. STATES WITH AN EEPS
Source: American Council for an Energy-Efficient Economy

5.1 Compliance Markets

EEPS policies generally apply to utilities or load-serving entities, requiring them to demonstrate a quantity of energy savings that usually increases during the life of the requirement. In some instances, energy efficiency targets have been incorporated into an expanded RPS. In other cases, EEPS policies are enacted with targets that are entirely separate from and independent of RPS targets; often, this occurs in states with an already well-established RPS. [6]

EEPS targets may be expressed as a percentage of demand, peak demand, load growth, or retail sales. In some cases, this is because of varying policy objectives such as reduction in load growth to reduce the need for new power plants, reduction in peak demand, promoting economic growth, or a combination of factors. They also vary in the types of projects that qualify. In some cases, they include a "weighting" multiplier feature that effectively increases the incentive to implement preferred projects.

In compliance markets making use of ESCs, the size of the market, the number of actors involved, and the role that utilities would like to play typically determine whether trading is allowed. For example in France the two utilities with the largest targets, EDF and Gas de France, tend to implement projects by themselves to position the companies as energy service providers, while in Italy the majority of ESCs are delivered to ESCOs [9].

Where trading is allowed, utilities that exceed the requirements of an EEPS can sell ESCs to other obligated parties that fall short of their requirement. The result, in theory, is a less-expensive route to achieve an equivalent savings amount.

Only four states have introduced ESCs into their EEPS policy – Connecticut, Nevada, Pennsylvania, and most recently Michigan. Only in Connecticut have ESCs been actively traded for compliance purposes. North Carolina and Illinois have opened dockets or are gathering input on ESC trading within an EEPS policy.

5.1.1 Compliance Market Size Potential

Although only Connecticut, Pennsylvania, Nevada, and Michigan currently allow the use of ESCs for compliance, progress in addressing some of the technical and institutional challenges to implementing ESCs could lead to broader state adoption. Until such time, current U.S. market activity is limited to Connecticut.

As an upper-bound benchmark for gauging the potential ESC compliance market in the United States, this analysis estimates ESC market volume under the scenario where all 15 U.S. states with existing long-term energy efficiency obligations allow the use of ESCs for compliance (and assumes universal adoption among these 15 states). However, additional states may enact long-term energy efficiency obligations over time, potentially widening the opportunities for ESCs as a compliance instrument. Additionally, ESCs potentially could be used for compliance in states without any form of long-term energy efficiency obligation, but where regulators establish shorter-term utility energy efficiency program budgets and savings targets.

Approximating the size of the compliance market at such an early stage is somewhat speculative. **Table 2** presents the ESC market potential among the 15 states currently with long-term energy efficiency obligations, based on the premise that ESC trading will gain traction in compliance markets. We estimate a potential market volume of more than 35,000 GWh in 2010, growing to approximately 86,000 GWh in 2015, and 125,000 GWh by 2020. To put these figures into context, 125,000 GWh is more than one-and-a-half times the total U.S. electric utility energy efficiency savings in 2006 [10]. Illinois, New York, Ohio, Michigan, California, and Maryland represent the largest-potential ESC compliance markets among the 15 states, comprising about 77% of the total market potential in 2020.

5.2 Voluntary Markets

A voluntary market for ESCs has been lauded by energy efficiency advocates based on their potential to provide the same level of market flexibility and incentives to energy efficiency opportunities as RECs have to renewable energy. The concept is that parties who have exhausted their own opportunities to reduce their energy consumption should have a mechanism to reduce their footprint by supporting projects regardless of geographic location. Capital investment could flow toward the most cost-effective opportunities, competition would be increased along with consumer awareness and demand, and payback times could be shortened.

A voluntary U.S. market for ESCs has been very slow in developing. There are at least three significant reasons why the voluntary ESC market has not yet become a significant market tool in the United States:

- Difficulty communicating the value proposition;
- Difficulty measuring and verifying energy savings; and
- Absences of an objective third party acting as the "certifying body" to address M&V and additionality issues.

5.2.1 New York Voluntary ESC Pilot Program

The New York State Energy Research and Development Authority (NYSERDA) is developing a pilot voluntary ESC program designed to create environmental benefits by increasing the implementation of energy efficiency measures, improving the transparency and credibility of ESC markets, and addressing potential emissions "leakage" (i.e., shifting power generation to outside of the regulated region) that could undermine the goals of the Regional Greenhouse Gas Initiative (RGGI), in which New York is a participating state.

Table 2. Potential ESC Compliance Market in States with Existing Long-Term Energy Efficiency Obligations

State	ESC Market Potential (GWh)		
	2010	2015	2020
Stand-alone EEPS			
CA	15,491	18,654	11,021
CT	1,125	1,330	1,400
CO	1,101	1,171	1,233
IL	1,604	11,441	24,449
MD	2,441	7,470	10,298
MI	885	6,372	11,564
MN	684	4,255	7,361
NM	401	936	1,604
NY	6,438	16,255	21,979
OH	1,115	7,523	17,160
TX	3,193	4,463	4,769
Subtotal	*33,766*	*80,507*	*114,996*
Energy Efficiency Included in Broader Portfolio Standard			
HI	308	878	1,316
NC	0	2,713	6,902
NV	1,062	2,119	2,525
PA	0	0	0
Subtotal	*1,370*	*5,711*	*10,742*
Total	**35,136**	**86,217**	**125,738**

General methodology:

(1) Several states (CA, NY, MD and MN) have adopted EEPS policies that encompass policy interventions beyond utility or third-party administered energy efficiency incentive programs – including, for example, building codes and appliance standards. For these states, the values shown in the table reflect only the portion of those broader targets required (or likely) to be met through energy efficiency incentive programs.

(2) States with standalone EEPS policies typically specify their targets in terms of either (a) incremental annual savings as a percentage of retail sales or (b) cumulative savings over some time span as a percentage of retail sales in a given year. To translate these targets into an ESC market volume, we assume that energy efficiency measures installed to meet the standard would be eligible to receive ESCs for ten years following installation, which is consistent with the ESC eligibility period adopted in Connecticut and is in line with typical energy efficiency measure lifetimes.

(3) States that allow energy efficiency measures to qualify as an eligible resource within a broader portfolio standard typically place a cap on the percentage of the total target that can be met with energy efficiency. Except where noted below, we assume that energy efficiency is used for compliance to the maximum extent allowed: 25% of total portfolio resources in Nevada, 25% for IOUs in North Carolina, and 50% in Hawaii.

(4) For most states, GWh targets were derived from percentage targets, which required a retail sales forecast. We developed retail sales forecasts by applying the census region-based growth rates from EIA's 2008 Annual Energy Outlook to actual 2006 retail sales in each state. In deriving the GWh targets from retail sales forecasts, we account for any exemptions included in each state's RPS or EEPS policy (e.g., exemptions for publicly owned utilities or for large customers).

Key state-specific assumptions, conventions, and data sources:

(1) California: The market potential estimate shown for 2010 is based on the 2004-2013 goals adopted for the state's IOUs. The CPUC recently adopted Total Market Gross goals for 2012 -2020, which encompass energy efficiency activities beyond utility programs. The 2015 and 2020 market potential estimates shown in the table reflect only the portion of the Total Market Gross goals achievable through utility programs, as determined in the study [11] upon which the goals are based.

(2) Colorado: State law requires that the Colorado PUC establish an EEPS for the state's two IOUs, and specifies the minimum cumulative savings through 2018. The Colorado PUC has established a more-aggressive EEPS for Xcel, but has not yet established an EPPS for the state's other IOU, Aquila. As such, the market potential estimates shown in the table reflect the targets established for Xcel by the Colorado PUC and, for Aquila, the statutory minimum target.

(3) Connecticut: We assume that ESCs from all C&LM-funded C&I measures will be used to the extent available (accounting for the 10-year credit life), and that any remaining EEPS requirement will be met through CHP.

(4) New Mexico: The state's EEPS specifies targets for cumulative savings through 2014 and through 2020. To estimate the ESC market potential for 2010 and 2015, we assume a linear ramp-up to the 2014 and 2020 cumulative savings goals.

(5) New York: The values shown in the table for 2010 and 2015 are taken directly from a NY PSC order that developed annual savings targets for utility and NYSERDA-implemented programs, based on the overall statewide EEPS of 15% reduction by 2015. The 2020 market potential estimate assumes that programmatic efforts continue past 2015 at the same level as projected for 2015.

(6) North Carolina: Unlike IOUs, publicly owned utilities (POUs) have no cap on the portion of their RPS target that can be met with energy efficiency. In estimating the ESC market potential, we assume that, after all RPS set-asides are met and the large hydro allowance (30%) is fully exhausted, POUs meet 75% of their residual RPS target with efficiency.

(7) Pennsylvania: The state's Alternative Resource Portfolio Standard has two tiers, one for renewables and another for various "alternative" resources, including energy efficiency, large hydroelectric power, clean coal, municipal solid waste, and various other generation resources. Given that sufficient existing large hydroelectric generation exists to fully meet Pennsylvania's Tier 2 standard, we assume that a market for tradable ESCs is unlikely to develop in that state, and thus the market potential shown is zero for all years.

(8) The Texas EEPS is specified in terms of minimum peak demand savings as a percentage of peak demand growth, and applies only to the state's regulated distribution utilities. We developed a peak demand forecast for the distribution utilities, based on the statewide peak demand forecast in Eliot et al. (2007). We estimated energy savings based on the ratio of energy-to-peak demand savings from energy efficiency programs implemented during 2003-2007 [12].

Under the program, NYSERDA is aggregating ESCs from qualifying energy efficiency projects, auctioning them to brokers or consumers, and using the proceeds to fund additional energy efficiency projects. Revenues from the ESC sales will supplement funds available under NYSERDA's public benefit fund program for energy efficiency.

NYSERDA plans to use the M&V system already in place for its existing energy efficiency program to determine the savings and number of ESCs issued for projects. Therefore, the ESC program will require very little additional cost with respect to M&V. [18]

Two key features of the NYSERDA program could be emulated by other states' systems benefit fund administrators who want to use ESCs to make limited funds go further: Relying on existing efficiency programs and infrastructure to provide a foundation for credible ESCs, and leveraging the existing M&V data and protocols to minimize transaction costs and to streamline the process of verifying and issuing ESCs.

5.3 Carbon Market Interaction

Efficiency has played a substantial role in international carbon offset markets, comprising 18% of the global voluntary carbon offset transactions in 2007 [13]. Energy savings are being traded as voluntary carbon offsets in the Chicago Climate Exchange (CCX)—a trading platform through which businesses or institutional entities commit to GHG emissions reductions and trade with one another to meet their target—and through a small number of bilateral transactions. Currently there are six energy efficiency-based offset projects registered on the CCX out of 106 total registered projects.

One key value of ESCs in these markets will be how seamlessly they can be integrated, or "converted" into offsets, so that the same ESC instrument can participate in voluntary ESC or carbon markets. While energy savings clearly offer carbon dioxide (CO_2) emissions benefits and may be a key strategy in achieving GHG mitigation goals, their role in carbon markets will be shaped by the design of future policies and by standards adopted for voluntary markets. Emerging compliance markets could be the largest opportunity for ESCs, especially in the event of a federal carbon cap-and-trade program.

6. CHALLENGES

Still in an early stage of development, ESC markets can play a role in fostering energy efficiency, but not before the principles of a well-designed ESC trading platform are understood. The challenges associated with ESCs include: managing transaction costs; establishing clearly defined and understood standards for verifying that savings are real, credible, and accurately measured; and accurately tracking ESC ownership.

6.1 Transaction Costs

Higher transaction costs associated with ESCs include those associated with the complexity of a greater number of parties involved in implementation of savings measures; the complication and cost of issuing, tracking, and certifying ESCs and related activities; and the need to pay special attention to M&V standards to ensure market integrity. Transaction costs include the direct costs of carrying out an ESC transaction, such as the cost of locating, negotiating with, and contracting with transaction counterparties. Also, ESC energy savings data for the same volume of energy as produced by renewable electricity are diffuse and would need to come from many more sources [6], resulting in increased transaction costs.

6.2 Monitoring and Validation

Unlike RECs, ESCs cannot rely on readily verified metered data to demonstrate measurable results, but depend instead on comparatively complex measurement and verification protocols, which can vary from one compliance regime to another. The emergence of a credible, independent national certifying body and consistent set of protocols, as well as the success of early examples, most likely will influence whether a voluntary market for ESCs will develop as it has for RECs.

M&V savings resulting from energy efficiency improvements is considerably more complicated and can add significant costs to ESC transactions. Often M&V is not a straightforward exercise because measuring reductions in energy consumption depends on a baseline or reference scenario, a "before" picture, which is generally a moving target that must be accurately projected. Very often, by the time energy savings are achieved, "business as usual" (BAU) is no longer business as usual, because facility demand or energy use patterns have changed.

ESC markets may be broader than individual utility service territories or states, requiring M&V standards to be harmonized across jurisdictions. More robust markets for ESCs may include a broader range of energy efficiency measures that may be implemented in a broader range of applications, potentially requiring additional M&V protocols to be developed. A larger and more diverse set of entities may be involved in implementing projects as well, requiring some combination of training and the development of simplified M&V options.

6.3 Credibility

Ensuring that savings are "real and additional" is crucial to the success of voluntary ESC markets. Measures must be real, surplus, verifiable, and permanent. Because many efficiency measures are cost-effective over a relatively short period of time, determining standards for what measures are additional to those that would have occurred under "business as usual" is important. The most fundamental balance of interests is the need to create verification procedures that ensure credibility while controlling transaction costs.

Although ESCs have the potential to bring market-based flexibility to energy efficiency, that opportunity remains largely untapped. Public and stakeholder understanding of, or belief in, ESCs is likely low, which is similar to early experiences in the REC market. This is partly fed by a somewhat persistent perception that energy efficiency measures are unreliable, unpredictable, or unenforceable [6].

6.4 Tracking Ownership

Carefully tracking ESCs' chain of ownership is necessary to ensure against double-counting; yet tracking ownership must be accomplished at a reasonable cost, to avoid undercutting the small operating margins many efficiency projects carry. REC markets have demonstrated the ability of web-based systems to accomplish this task at lower costs than via a paper contract trail and third-party audit. Web-based electronic systems also better address the potential need in future trading regimes for tracking systems to integrate ESCs with RECs and carbon offsets to avoid confusion, duplication of efforts, and the potential for double-counting.

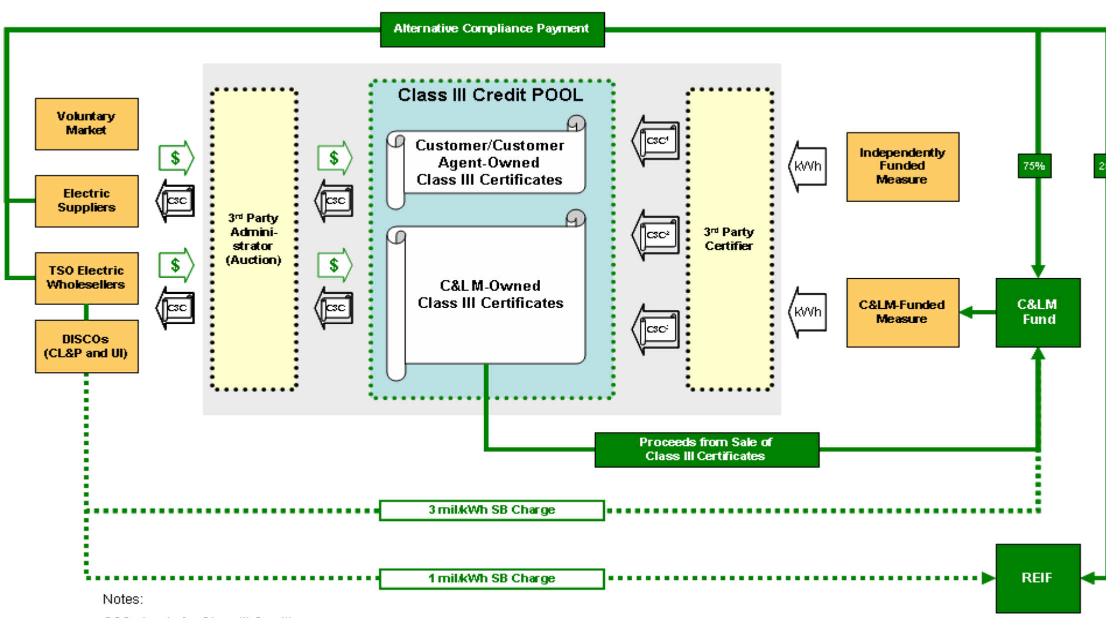
In Connecticut, rule-makers have attempted to "piggy-back" on automated generation attribute tracking systems currently used for RECs, using the New England Power Pool (NEPOOL) Generation Information System (GIS). Of existing United States REC tracking systems, only the North American Renewables Registry was designed to track ESCs for a contemplated voluntary market.

7. ESC TRADING IN CONNECTICUT

As the only actively trading ESC market in the U.S., the Connecticut program provides an early indication of the significance of ESC trading. As of mid-2008, the Connecticut C&LM fund was approximately $70 million, while the total value of the ESCs auctioned from the fund in 2008 was estimated at about $3.3 million. This suggests revenues from ESC trading will likely be sufficient to stimulate a reasonable investment in new projects.

Connecticut expanded its RPS in 2005 [14] to include an energy efficiency portfolio standard, called "Class III," to meet a 1% energy efficiency savings target for 2007, ramping up to 2% for 2008, 3% for 2009, and 4% for 2010 and thereafter. Obligated suppliers can purchase Class III credits to meet their obligations on a quarterly basis; ESCs are issued each quarter for each project over the life of the project, with a maximum of 10 years.

The targets include a broad array of eligible savings projects, including combined heat and power (CHP), as well as load management and demand response. In 2007, further legislation [15] expanded the eligible savings measures to include certain waste heat recovery systems. The Connecticut Department of Public Utility Control (DPUC) serves as the certifying body, approving projects for Class III credit issuance on a quarterly basis. **Figure 3** depicts the flow of ESCs in the Connecticut compliance trading scheme.



Notes:
C3C stands for Class III Credit
[1] Credits generated by projects financed through Independent Funding are allocated 100% to the Customer / Customer Agent.
[2] Credits generated by projects financed through the C&LM Fund are allocated 100% to the C&LM fund.
[3] Credits generated by CHP projects are allocated 100% to the Customer / Customer Agent.

Figure 3.
The flow of ESCs in the Connecticut Compliance Trading Scheme

Source:
Connecticut DPUC [16]

7.1 Context for the Connecticut ESC Program

Connecticut is one of the U.S. states that has been deregulated, or restructured, for retail electricity. Unlike other EEPS states that are regulated and have generally only a few investor-owned regulated utilities responsible for most EEPS compliance, Connecticut has more than 20 competitive suppliers responsible for a share of EEPS compliance [17]. Conversely, the two major Connecticut distribution utilities—United Illuminating (UI) and Connecticut Light & Power (CL&P)—had been administering the energy efficiency programs paid for by public benefit funds, with DPUC oversight, since 2000 (about five years prior to the enactment of the EEPS). Various suppliers have opted to buy ESCs from those issued through the Conservation and Load Management (C&LM) fund administered by UI and CL&P.

7.2 Connecticut Trading Experience

The Connecticut ESC market mechanism is working as intended: t independent suppliers are complying with the EEPS policy via their most cost-effective option, which is buying credits (ESCs), primarily from UI and CL&P, the two major investor-owned distribution utilities without Class III obligations of their own.

The total Connecticut Class III requirement for calendar year 2008 is about 627,000 MWh, enough to cover 2% of retail sales. The available information on approximate eligible quantities of these credits derived from the C&LM for both 2007 and 2008 is in **Table 5.**

	2007	2008
CL&P Residential Savings	178,500	257,500
CL&P Commercial and Industrial Savings	368,000	483,000
UI Total Savings	98,000	110,000
Expected Available from CL&P and UI, Combined	644,500	850,500
Expected Total State Obligation	300,000	627,000

Table 5. C&LM Class III Credits Available from CL&P and UI (MWh)

7.3 Program Structure and Lessons Learned

Several of the structural elements in the Connecticut trading scheme support a reduction in the utilities' administrative burden and transaction costs. For the first 18 months of the program, the emphasis was on streamlining the way that ESCs were issued and traded for compliance, keeping it simple with the idea that the program could be expanded later. As of July 2008, some of these simple rules were being revisited.

There are several examples demonstrating this approach toward establishing clear, simple rules meant to keep the difficulty of compliance, administrative burdens, and transaction costs to a minimum. The DPUC was able to work with NEPOOL, APX, and other pertinent stakeholders to piggyback the tracking of credit ownership through the GIS, an automated system that was already in existence for tracking RECs in New England. The GIS tracks parties' transfer of credit ownership, establishing a traceable record of the chain of ownership for the Class III credits. The paper-free Web-based platform allows these tasks to be accomplished at a low cost.

7.4 Other Notable Provisions

Two of the Connecticut rules are somewhat unusual and particularly worth watching. The most important is the inclusion of CHP projects. Every MWh generated at a CHP plant that came online after January 1, 2006, with an overall efficiency level of at least 50% and with useful electrical energy that is at least 20% of the total output, qualifies. Because the plants will generate large quantities of eligible credits, some stakeholders have anticipated that the inclusion of CHP will make the targets too easy to attain and result in fewer non-CHP efficiency projects.

Connecticut also established a "price protection" floor price of $0.01/kWh for the credits, designed to ensure that the risk of oversupply does not degrade the value of the credits and hurt the long-term health of the market by limiting the open-bidding process.

8. SOLUTIONS AND BEST PRACTICES

ESCs can benefit from existing markets and mechanisms to reduce costs. They can benefit from the traction RECs have gained in the marketplace, along with the existing infrastructure developed for REC markets, such as tracking systems. These systems could be modified relatively easily to accommodate ESC trading.

Also, ESCs trading programs can benefit from adopting existing M&V protocols and other data acquired through long-standing efficiency and public benefit programs. Clear, consistent M&V protocols are crucial to the long-term success of ESC trading schemes. Where ESCs are issued up front for the life of a project, M&V determines how much the future value of ESCs should be discounted based on risks that the shelf life might be altered during the period of expected savings, a task that is something of a hybrid between policy and engineering considerations.

With only a few ESC markets established, it will be useful for policy makers to use guides like the IPMVP and existing protocols. Consistency among trading regimes as they form will lower barriers to interregional and international ESC trading. Also, given the innovative nature of ESCs, it is critical to the long-term health of the markets that a credible, established organization certifies ESCs.

If ESCs are developed with a solid, well-planned foundation and the support of authorized, objective third-party certifying bodies, they can establish themselves as an accepted consumer product and have a beneficial effect on the broader voluntary demand for energy efficiency. Lastly, the opportunity to use ESCs in the compliance context is promising, not only as an end in itself but as a means to apply lessons learned, gain public and stakeholder acceptance, and pave the way for the voluntary market.

9. CONCLUSION

Early experiences with ESCs prove they are worth careful consideration, especially in the context of EEPS compliance. The results from early pilot programs will be important to those considering emulating such programs. For the voluntary market, the emergence of a credible, independent national certifying body and consistent set of protocols is paramount. Similarly, the success of early examples of the use of ESCs for EEPS compliance, such as the program in Connecticut, will be watched closely by stakeholders.

Not entirely different from the early experience of REC markets, the development of robust markets for ESCs will depend on consistency and clarity in standards and protocols as well as the ability of the industry to speak with a central voice. Ensuring that savings are real, verifiable, and additional is necessary for the market to gain credibility. Proper handling of monitoring and verification is particularly important to preserve market integrity, especially on the voluntary side of the market, which depends so heavily on public perception.

Keeping administrative, certification, and tracking costs low will enable market traction, given the relatively low profit margins to be expected with the product. Large programs that involve more parties also can help diffuse these costs and help ensure adequate M&V oversight.

As the general public and policy makers continue to warm to the idea of requirements that build in market-based flexibility, such as REC and carbon offset trading, the potential exists for ESCs to play a role in expanding markets for energy efficiency.

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14. ABSTRACT *(Maximum 200 Words)*
Early experiences with energy savings certificates (ESCs) have revealed their merits and the challenges associated with them. While in the United States ESC markets have yet to gain significant traction, lessons can be drawn from early experiences in the states of Connecticut and New York, as well as from established markets in Italy, France, and elsewhere. The staying power of European examples demonstrates that ESCs can help initiate more efficiency projects. This article compares ESCs with renewable energy certificates (RECs), looks at the unique opportunities and challenges they present, and reviews solutions and best practices demonstrated by early ESC markets. Three major potential ESC market types are also reviewed: compliance, voluntary, and carbon. Additionally, factors that will benefit ESC markets in the United States are examined: new state EEPS policies, public interest in tools to mitigate climate change, and the growing interest in a voluntary market for ESCs.

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