

# Advancing Residential Energy Efficiency through the Use of Tradable, Verifiable, and Credible Energy Savings Certificates

Connecticut's Class III Energy Efficiency Resource Standard  
June 2009



*"Innovative government programs and incentives are needed to accelerate the diffusion of energy efficient products throughout American society and to gain potential energy, cost and carbon emission savings"<sup>1</sup>*

Connecticut has some of the most advanced public policies on clean energy and energy efficiency in the U.S. The state has established award-winning ratepayer-supported incentive funds through the [Connecticut Clean Energy Fund](#) (CCEF) and the [Connecticut Energy Efficiency Fund](#) (CEEF) that invest collectively over \$125 million per year. It has established progressive [Renewable Portfolio Standards](#) (RPS) for Class I and II, and an Energy Efficiency Portfolio Standard (EEPS) for Class III resources to support least-cost and market-based solutions to advance clean energy and energy efficiency. These public policies have created approximately a \$250 million market for clean energy and energy efficiency in Connecticut – \$ 120 million for clean energy and \$115 million for energy efficiency in 2008 alone (see Appendix I). Connecticut residences pay at least \$50 per year on average to support the cost of these public policies. The EERS market provides an opportunity for residential households in Connecticut to benefit directly from these public policies by receiving energy savings that are greater than the costs of the public policies combined.

## The Opportunity

*"As McKinsey points out, there are still hundreds of billions of dollars' worth of unfulfilled but potentially profitable opportunities in energy efficiency available to households and companies. What is holding investors back?"*

*"...Often, consumers are poorly informed about the savings on offer. Even when they can do the sums, the transaction costs are high: it is a time-consuming chore for someone to identify the best energy-saving equipment, buy it and get it installed."*

The Economist  
The Elusive Negawatt  
May 8, 2008

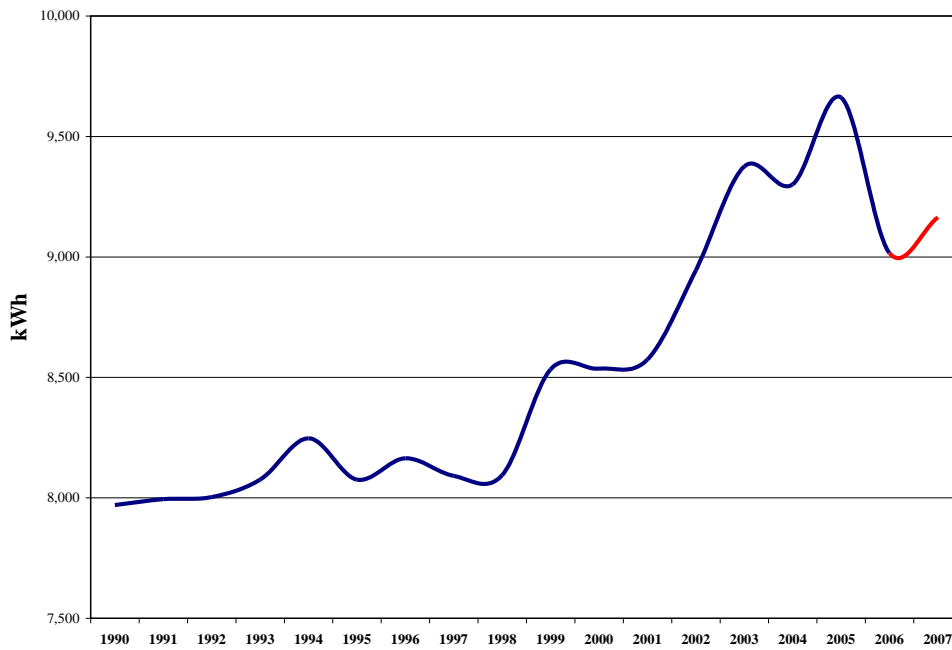
Connecticut households are increasingly recognizing that energy efficiency is an action that individuals can take to help reduce global warming. According to Nexus Market Research, 61% of survey respondents believe that energy efficiency is an action that individuals can take to help reduce global warming – up two-fold in 2007 from 28% in 2006.<sup>2</sup> Despite significant incentives to encourage household energy efficiency and the economics of rising energy costs, since 1990 Connecticut households have continued to increase their use of electricity by up to 20% - nearly 15% on average since 2000 (see Figure 1), while increasing their overall electricity costs by over 90% - over 40% on average since 2000 (see Figure 2). Connecticut households in aggregate paid over \$2.5 billion in electricity costs for 2007. Connecticut households use and pay 25% more for electricity than households in the other New England states. Electricity consumption by end uses in New England includes: kitchen appliances (33%), lighting

<sup>1</sup> Saving Energy at Home and On the Road: A Survey of Americans' Energy Saving Behaviors, Intentions, Motivations, and Barriers by Yale University and George Mason University (January 2009).

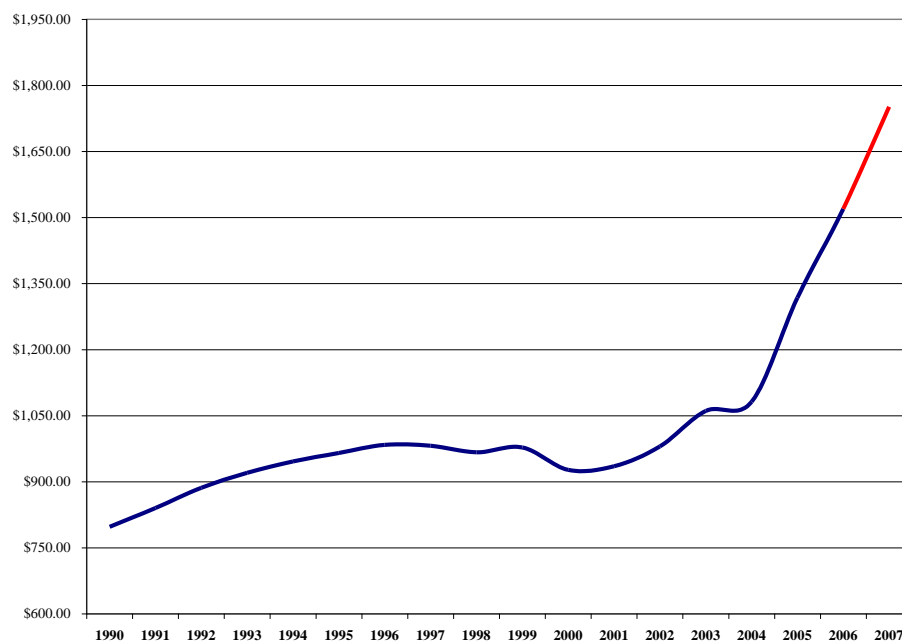
<sup>2</sup> Annual Report of the Connecticut Clean Energy Fund's Public Awareness, Education, and Voluntary Market Demand Initiatives. Nexus Market Research (June 2008).

(13%), home electronics (11%), laundry appliances (9%), water heating (8%), air conditioning (7%), space heating (7%), other equipment (5%), HVAC appliances (5%), and other end uses (4%).<sup>3</sup>

**Figure 1. Average Annual Household Electricity Usage (kWh) and Percent Increase Since 1990 in Connecticut<sup>4</sup>**



**Figure 2. Average Annual Household Electricity Costs and Percent Increase Since 1990 in Connecticut<sup>5</sup>**



## The Policy

Connecticut has established an EEPS (Public Act (PA) 05-01 “An Act Concerning Energy Independence” and amended in PA 07-242 “An Act Concerning Electricity and Energy Efficiency”) that requires competitive electricity

<sup>3</sup> Electricity consumption by end uses in New England households (2001)

<sup>4</sup> EIA Data: residential sales (kWh) and customers (2009)

<sup>5</sup> EIA Data: retail electricity price for residential customers, residential sales (kWh), and customers (2009)

suppliers and standard service providers to derive 4% of their electricity from Class III resources<sup>6</sup> by the end of 2010 – 1% by 2007, 2% by 2008, 3% by 2009 and 4% by 2010 and beyond.<sup>7</sup> The reductions in electricity usage for 2010 from the EEPS are equivalent to the power produced from a 150, 500, or 1,000 MW fuel cell, wind, or solar power farm respectively. EEPS requirements apply to customers located in Connecticut Light & Power (CL&P) and United Illuminating (UI) territories and can be satisfied by purchasing Energy Savings Certificates (ESCs) created in Connecticut from residential,<sup>8</sup> commercial and industrial projects. An ESC is essentially 1 MWh (1 ESC = 1 MWh = 1,000 kWh) of independently verified electricity savings resulting in a calendar year from a Class III qualified project. The “Community Energy Savings Project – Lighting,” approved by the DPUC through Docket No. 09-01-18, seeks to aggregate energy and demand savings from residential lighting measures (see Figure 3). The production of the ESCs and subsequent market price will finance this community project, yield energy savings to participating households, reduce greenhouse gas emissions, and generate a financial return for investors – delivering people, planet and profit returns.

**Figure 3. Example of an ESC Created from the Earth Markets Community Energy Savings Project – Lighting**



Given the EEPS in Connecticut, an ESC has a price and has created a market for such certificates in Connecticut of an estimated \$8-\$10 million in 2007, \$16-\$20 million in 2008, \$26-\$30 million in 2009, and \$34-\$38 million in 2010.<sup>9</sup> The floor price of an ESC is \$10 (set by statute) with a ceiling price of \$31 (set by regulatory rule).<sup>10</sup> By statute and subsequent regulatory ruling, the value of the ESC for residential ratepayers differs in the following manner:<sup>11</sup>

- For residential projects that receive funding from the CEEF, 100% of the Class III ESC will go to the CEEF; and
- For residential projects that do not receive funding from the CEEF (independently funded projects), a minimum aggregation of 100 kW must be met in order to receive 100% of the Class III ESC for the aggregator. In addition, the project aggregator and the residential participant must sign affidavits attesting to not having received CEEF funds for the EE project.

<sup>6</sup> Class III resources include (1) customer-sited CHP systems with a minimum operating efficiency of 50% installed at commercial or industrial facilities on or after January 1, 2006; (2) electricity savings from conservation and load management programs that started on or after January 1, 2006; and (3) systems that recover waste heat or pressure from commercial and industrial processes installed on or after April 1, 2007.

<sup>7</sup> See Sections 42-44 of PA 07-242

<sup>8</sup> Earth Markets presented a case in Docket No. 05-07-19RE01 that was accepted by the DPUC to allow independently funded residential energy efficiency projects to receive 100% of the financial value from the sale of ESCs. Prior to this decision, the statute was silent on how to treat residential energy efficiency projects that did not receive funding from the CEEF.

<sup>9</sup> Assumes the estimated annual electric demand for 2007, 2008, 2009, and 2010 is based on the Connecticut Siting Council’s “Review of the Ten Year Forecast of Connecticut Electric Loads and Resources” times the RPS targets (1%, 2%, 3%, and 4%) times \$27 for each ESC.

<sup>10</sup> By statute, the ACP is \$55, but can be changed by the DPUC through an administrative process.

<sup>11</sup> It should be noted that C&I projects that receive CEEF funding will receive 25% of the value of the ESCs only if an accompanying reduction in incentive from the CEEF is provided. Otherwise, 100% of the value of the ESCs goes to the CEEF. If a C&I project does not receive CEEF, then it can keep 75% of the value of the ESC’s and must give the remaining 25% to the CEEF through an ESC transfer on the NEPOOL GIS.

The EEPS creates an opportunity to increase the implementation of privately financed Energy Efficiency (EE) measures in Connecticut households. It should be noted that Docket No. 05-07-19RE02 is currently taking up the issue of behavior-based energy efficiency and conservation strategies being eligible to participate in the Class III EEPS.

Other notable public policy provisions in support of residential EE in PA 07-242 include, but are not limited to:

- **Utility Bill Financing** – Section 14(4) provides an opportunity for financing of comprehensive residential conservation measures to be on the electric and gas utility bill.
- **Long-Term ESC Procurement** – Section 71(1) allows the electric distribution companies to purchase Class III ESC through long-term contracting mechanisms for not more than 15 years.
- **Corporate Tax Credit** – Section 72 provides 100% of the total cash amount invested by a business in EE projects directed at low income (150% of poverty level) and non-profit organizations (charitable corporations, foundations, or trusts).
- **Statewide Campaign** – Section 87 allows the Department of Public Utility Control (DPUC) working with the CEEF to develop a statewide energy efficiency and outreach marketing campaign for residential ratepayers. Third party entities can assist with its development and implementation.
- **EE Partner Program** – Section 94 allows the DPUC to develop a partnership program to support the purchase and deployment of energy efficient technologies. Any person can apply to the DPUC for certification and funding as a partner. The DPUC will consider the portion of funding from the customer and the ratepayers and is seeking a 2:1 payback ratio. Annual ratepayer contributions to the program will not exceed \$60 million. Those seeking funds through the partnership can't receive additional incentives from the CEEF.
- **Smart Meters** – Section 98 requires the distribution companies to submit a plan to deploy advanced metering systems to support net metering and hourly consumption. After January 1, 2009 any customer may obtain a meter on demand.

## The Market

Class III ESCs are being registered, exchanged and sold through the NEPOOL Generation Information System (GIS) – see Figure 4.

Despite the number of registered ESCs (907,891) exceeding the estimated demand (640,740) for the EEPS in 2008, the price appeared to be near the DPUC-established ACP of \$31. One would expect if the market for ESCs is in surplus (267,151), then the associated price would approach the floor price of \$10, but this has not been the case. This market inconsistency presents market price risks for private sector investors interested in using the EEPS to finance EE projects in Connecticut. Due to this over-supply of ESCs in the EEPS in Connecticut, Earth Markets has recommended to the DPUC through Docket No. 05-07-19RE02 that there be a cap of 25% on the number of ESCs that can be registered and sold by the CEEF.

**Figure 4. ESCs Registered, Estimated Demand, and Price for Connecticut**

ESCs	Q1	Q2	Q3	Q4	2007
Registered	209,431	49,078	58,655	120,690	437,854
Estimated Demand <sup>12</sup>	79,160	79,160	79,160	79,160	316,640

<sup>12</sup> Assumes the estimated annual electric demand for 2007 is based on the Connecticut Siting Council's "Review of the Ten Year Forecast of Connecticut Electric Loads and Resources" times the RPS target (1%) times 25% for each quarter.

Surplus/(Deficit)	130,371	(30,082)	(20,505)	41,530	121,214
Market Prices <sup>13</sup>		\$27.00			

ESCs	Q1	Q2	Q3	Q4	2008
Registered	76,743	135,346	84,822	610,980	907,891
Estimated Demand <sup>14</sup>	160,185	160,185	160,185	160,185	640,740
Surplus/(Deficit)	(83,442)	(25,989)	(75,363)	450,795	267,151
Market Prices		\$27.00	\$26.75		

It should be noted that in 2008 the CEEF reported energy savings from their programs of 246,000 MWh and 122,000 MWh for commercial and industrial (C&I) and residential ratepayers, respectively.<sup>15</sup> If all energy savings from the CEEF were to be registered as ESCs for the incremental increase in the EEPS of 1% for 2008, then there would not be a private sector market for ESCs in Connecticut given that supply of ESCs by the CEEF (368,000 MWh) would exceed the estimated incremental demand of 1% from the Class III EEPS (316,640 MWh) by over 50,000 ESCs.

Due to the CEEF's significant presence in the Class III EEPS, it will be important for more ESC volume and price transparency from the CEEF to be consistently and continuously reported for the market to develop and encourage least-cost private sector EE investments in Connecticut. The CEEF programs have been successful in achieving a 4:1 benefit-cost ratio. The EEPS may provide the private sector with an opportunity to achieve a better benefit-cost ratio for Connecticut ratepayers; however the lack of transparency in the market to date by the CEEF presents challenges for investors. Earth Markets would also like to see more frequent and independent measurement & verification practices being undertaken by the CEEF of its programs in order for credible energy and demand savings to justify credit in the Class III RPS and the Forward Capacity Markets (FCM). The Technical Reference Manual (TRM) represents a good start, but ongoing, transparent, and independent quarterly measurement and verification should be required of all projects that are participating in the EEPS.

## Additional Resources

- *Considerations for Emerging Markets for Energy Savings Certificates* by the National Renewable Energy Laboratory and the Lawrence Berkeley National Laboratory. Technical Report NREL/TP-670-44072 (October 2008)
- *CL&P and UI Program Savings Documentation for 2008 Program Year* (also known as the Technical Reference Manual) by the Connecticut Light and Power Company and The United Illuminating Company (September 2007). There is currently an updated version for the 2009 program year being approved by the DPUC.
- [www.dsireusa.org](http://www.dsireusa.org) for information on state, local, utility and federal incentives on clean energy and energy efficiency
- *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost* by McKinsey & Company and The Conference Board (December 2007)

## Key Acronyms

- ACP – Alternative Compliance Payment
- CCEF – Connecticut Clean Energy Fund
- CEEF – Connecticut Energy Efficiency Fund (or “C&LM Fund”)
- DPUC – Department of Public Utility Control
- DR – Distributed Resources
- EE – Energy Efficiency

<sup>13</sup> Market prices based on Evolution Markets monthly market update reports for that quarter.

<sup>14</sup> Assumes the estimated annual electric demand for 2008 is based on the Connecticut Siting Council's “Review of the Ten Year Forecast of Connecticut Electric Loads and Resources” times the RPS target (2%) times 25% for each quarter.

<sup>15</sup> *An Investment in Connecticut Energy Efficiency*, a Report of the Energy Conservation Management Board Year 2008 Programs and Operations (March 1, 2009).

- EEPS – Energy Efficiency Portfolio Standards (or “Class III RPS”)
- ESCs – Energy Savings Certificates (or “white tags”)
- FCM – Forward Capacity Market
- M&V – Measurement and Verification
- NEPOOL GIS – New England Power Pool Generation Information System
- RGGI – Regional Greenhouse Gas Initiative
- RECs – Renewable Energy Certificates
- TRM – Technical Reference Manual (or “Program Savings Document”)

## Other Notable Facts

- Investor Network on Climate Risk Climate Change Action Plan – a consortium of 50 state pension funds and institutional investors managing nearly \$2 trillion of assets, committed in February of 2008 to invest collectively \$10 billion in clean technology over a two year period – 0.5% of assets under management. Connecticut’s pension fund manages over \$26 billion in assets – 0.5% of assets under management for clean energy is equivalent to \$130 million. Please see a short excerpt called [“Think Globally – Invest Locally”](#) for a case on how state pension funds and university and foundation endowments can profit from local investments in clean energy, energy efficiency, and climate change solutions.
- Docket No. 05-07-19, No. 05-07-19RE 01, and No. 05-07-19RE02 – are the key DPUC dockets for the Class III EEPS in Connecticut.

## Earth Markets

Earth Markets is a social venture that develops and finances residential energy efficiency projects that provide cost savings to consumers, reduce energy usage, and reduce greenhouse gas emissions. Earth Markets marries a consumer-focused community marketing and social networking approach on the front-end with an environmental markets and project finance approach on the back-end.

We make it affordable to bring energy efficiency technologies into the homes of a community. Our goal is to start a conversation with households in a community and build a relationship with them around sustainable energy usage, moving them up the “food chain” of smart energy behaviors and purchases over time.

Our services in the residential energy efficiency space include:

- Program design and implementation;
- Community-based marketing program development;
- Innovative financing strategies;
- Aggregation of residential energy savings; and
- Policy development.

For more information contact:

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## Appendix I

### Connecticut Household Costs of Public Policies from Clean Energy and Energy Efficiency for 2008

<b>Ratepayer Supported Incentive Funds</b>				
	Estimated 2008 Electric Demand (MWh)	Mill Rate (\$/kWh)	Estimated Total Cost of Policy	Estimated Household Cost of Policy <sup>16</sup>
CL&P and UI <sup>17</sup>	31,363,000			
CCEF	31,363,000	\$0.001	\$31,363,000	\$9.00
CEEF	31,363,000	\$0.003	\$94,089,000	\$27.00
<b>Total Costs</b>			<b>\$125,452,000</b>	<b>\$36.00</b>

Connecticut ratepayers contributed over \$125 million to support the incentives provided by the Connecticut Clean Energy Fund and the Connecticut Energy Efficiency Fund with households each contributing on average approximately \$35.

<b>Connecticut Renewable Portfolio Standards</b>				
	Estimated 2007 Electric Demand (MWh)	REC Price (\$/MWh) <sup>18</sup>	Estimated Total Cost of Policy	Estimated Household Cost of Policy
CL&P and UI	31,363,000			
Class I <sup>19</sup> RPS @ 5.0%	1,568,150	\$55.00	\$86,248,250	\$24.75
Class II <sup>20</sup> RPS @ 3.0%	940,890	\$55.00	\$51,748,950	\$14.85
Class III <sup>21</sup> EEPS @ 2.0%	627,260	\$31.00	\$19,445,060	\$5.58
<b>Total Costs</b>			<b>\$157,442,260</b>	<b>\$45.18</b>

Connecticut ratepayers paid between \$50-\$155 million for the standard offer service providers and competitive suppliers to comply with the Renewable Portfolio Standards with households each contributing on average between \$15 to \$45.

Connecticut **ratepayers contributed approximately \$120 million in total for clean energy**, or \$35 per household between the Connecticut Clean Energy Fund and the Class I and II RPS.<sup>22</sup>

Connecticut **ratepayers contributed approximately \$115 million in total for energy efficiency**, or \$30 per household between for the Connecticut Energy Efficiency Fund and the Class III EEPS.

<sup>16</sup> Assumes an average estimated annual household electricity use of 9,000 kWh based on recent EIA 2009 data.

<sup>17</sup> Estimated annual electric demand for 2008 is based on the Connecticut Siting Council's "Review of the Ten Year Forecast of Connecticut Electric Loads and Resources"

<sup>18</sup> Maximum price if the Alternative Compliance Payment (ACP) price set by statute (i.e. Class I and II) and regulation (i.e. Class III). The actual cost to the ratepayer is somewhere between the ACP and the market price. Based on Evolution Markets July 2008 price data, the Class I, II and III RPS would cost about \$15.00 per household.

<sup>19</sup> Class I resources include solar, wind, new sustainable biomass, landfill gas, fuel cells (using renewable or non-renewable fuels), ocean thermal power, wave or tidal power, low-emission advanced renewable energy conversion technologies, and new run-of-the-river hydropower facilities with a maximum capacity of five megawatts (MW). Air emissions limits regulations apply to electricity generated by biomass. Electricity produced by end-user distributed generation (DG) systems using Class I resources also qualifies.

<sup>20</sup> Class II resources include trash-to-energy facilities, biomass facilities not included in Class I, and certain hydropower facilities.

<sup>21</sup> Class III resources include (1) customer-sited CHP systems with a minimum operating efficiency of 50% installed at commercial or industrial facilities on or after January 1, 2006; (2) electricity savings from conservation and load management programs that started on or after January 1, 2006; and (3) systems that recover waste heat or pressure from commercial and industrial processes installed on or after April 1, 2007.

<sup>22</sup> The cost of the Class II RPS was not included.