SUSTAINABLE ENERGY UTILITY DESIGN: OPTIONS FOR THE DISTRICT OF COLUMBIA

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DDOE
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Energy is a critical part of our modern economy. For over a century, the energy used to generate electricity, heat homes and businesses, and power our transportation system has come mostly from fossil fuels – coal, oil, and natural gas. The challenges associated with our reliance on fossil fuels have been brought into sharp focus by concerns over fuel price volatility,[1] dependence on imported energy, peak oil, pollution, and the climate crisis.[2]

In response to these challenges, cities and states around the country are playing a leadership role in enacting innovative policies to promote energy sustainability. These include policies such as public benefit funds, net metering, green power marketing, and renewable portfolio standards. Even without strong federal policies targeting climate change, state and local sustainable energy programs are projected to result in reductions in carbon dioxide emissions of nearly 670 million tons by 2010, and 1.7 billion tons by 2020.[3] These figures are probably conservative since states and cities are continually strengthening existing policies. For example, twenty-nine states and the District of Columbia have passed renewable portfolio standards that require or encourage utilities to derive a percentage of their electricity from renewable sources.[4] Of these, fifteen states either enacted or significantly strengthened their RPS policies during the first eight months of 2007.[5] Given the magnitude of the present energy challenges, a growing number of states and cities are seeking even more aggressive policies in order to fundamentally alter energy demand from the bottom up.

This trend has given rise to the concept of the *sustainable energy utility*, which was first established through legislation by the State of Delaware in 2007. A sustainable energy utility is an independent and financially self-sufficient entity responsible for delivering energy efficiency, energy conservation, and customer-sited renewable energy[6] to end users. An SEU targets all sectors and

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[1] Between 1998 (when electricity and natural gas deregulation were legislated) and 2006, U.S. residential electricity prices increased by 38%, residential natural gas prices by 99%, residential heating oil prices by 200%, and gasoline prices (regular grade) by 146%. See U.S. Energy Information Administration, *Short Term Energy Outlook – Monthly Prices*. Available at: http://tonto.eia.doe.gov/steo_query/app/pricepage.htm

[2] The most recent report of the Intergovernmental Panel on Climate Change indicates evidence in support of a finding of human impact on climate that exceeds a 90% probability standard. See IPCC, (2007). *Climate Change 2007: The Physical Basis – Summary for Policymakers.* Available at: http://www.ipcc.ch/SPM2feb07.pdf Over 70% of the observed warming effect is attributable to fossil fuel combustion.

[3] Byrne, J., Hughes, K., Rickerson, W., & Kurdgelashvili, L. (2007). American policy conflict in the greenhouse: Divergent trends in federal, regional, state, and local green energy and climate change policy. *Energy Policy* 35(9), 4555-4573.

[4] See Database of State Incentives for Renewables and Efficiency (2007). Available at: http://www.dsireusa.org

[5] Rickerson, W. (2007). What can the U.S. learn from the German experience with renewable energy policy? Presented at the Capitol Hill Climate Change Lunch Series, Washington, DC, August 27 (sponsored by the German Marshall Fund of the United States and the Heinrich Böll Foundation).

[6] Customer-sited renewables are often called "distributed renewable energy sources" or "distributed renewables" – see the 2005 report by the University of Delaware's Center for Energy and Environmental Policy (CEEP), *Policy Options to Supported Distributed Resources*. Available at: http://ceep.udel.edu/publications/energysustainability/2005_es_policy_options_distributed%20resources%5B1%5D.pdf. Key advantages of customer-sited renewables are: decongestion of transmission and distribution lines, allowing the postponement or cancellation of costly upgrades; reduced outage rates; and reductions in energy related emissions (while new utility-scale renewable energy plants built to serve expected demand growth can slow the rate of future increases in CO_2 (for example), customer-sited renewables reduce the need for existing plant operation and avoid the need for future capacity increases, thereby directly lowering actual emissions).

fuels, including transportation. This is a major departure from supply-side approaches, and from traditional demand-side policies, which tend to address only certain types of fuels (e.g. electricity, but not heating or transportation), or limited “silos” of end users (e.g. residential but not municipal consumers).

This report reviews the sustainable energy service delivery models of several leading jurisdictions and compares their structure, function, and design to that of the sustainable energy utility concept. The paper then examines the potential energy and environmental impacts of a sustainable energy utility adopted by the District of Columbia.

II. LEARNING FROM PIONEERS IN SUSTAINABLE ENERGY DEVELOPMENT

The states and cities in the Northeast and the mid-Atlantic are increasingly playing a leadership role in sustainable energy policy development. During the late 1990s, East Coast states were among the first in the country to establish renewable portfolio standards and public benefits funds. These policies have since diffused rapidly across the country to both regulated and deregulated states. To date, twenty-two states have established public benefits funds to support renewable energy, energy efficiency and/or low-income weatherization. These funds have supported the majority of the customer-sited sustainable energy service programs around the country during the last decade.

The structure and governance of each of these funds varies, and this section reviews the design and management of funds in several states as a point of comparison for the Sustainable Energy Utility Model. The District of Columbia occupies a unique position in the US as neither entirely a municipality nor a state. The District is the nation's capital "city," but it's policy making – particularly in the field of energy policy – resembles that of surrounding states rather than neighboring municipalities. In addition to having its own utility regulatory body, the District also has established a renewable portfolio standard, net metering standards, and a public benefits fund through legislation. This report focuses on state models of sustainable energy service delivery because they more accurately represent the range of options the District can pursue than do more limited municipal strategies.

The Center for Energy and Environmental Policy has surveyed all of the public benefit funds in the United States, characterized them according to criteria such as structure, governance, funding, etc., and conducted a number of in-depth case studies. This report focuses on initiatives developed by Massachusetts, Vermont, and New Jersey, each of whom has ten or more years of experience in sustainable energy service delivery. Importantly, the three states represent the major types of energy management and service delivery structures in use in the U.S.: utility-managed, state managed, and third-party managed systems. Massachusetts is noted for its use of utilities to deliver energy efficiency services; New Jersey has pioneered a public sector approach in which regulatory and economic development-focused agencies oversee sustainable energy service delivery, often using competitive bidding procedures; and Vermont is acknowledged as the first jurisdiction to evolve a sustainable energy service delivery system planned and organized by a non-profit corporation employing competitive bidding procedures for implementation of goals set for it by a public sector regulatory body. Recently, Cambridge, Massachusetts has taken the Vermont model a step further in designing a similar approach for municipal use. Because this innovation has just begun, it cannot be discussed in the same detail as the efforts of the three states. Nonetheless, the Cambridge Energy Alliance offers an indication of further thinking on sustainable energy service delivery.

In addition to employing different energy service models, Massachusetts, New Jersey and Vermont are all recognized as having had comparatively successful sustainable energy programs. All three of the states have had greater than five years of experience in offering programs promoting energy efficiency and/or customer-sited renewable energy, and each state is an acknowledged leader in the field of sustainable energy development.[7]

[7] See the following references: Blumstein, Carl, et al (2005) « Who should administer energy efficiency programs?" *Energy Policy* 33: 1053-1067; CEEP (2000) *Environmental policies for a restructured electricity market: A survey of state initiatives*. http://ceep.udel.edu/publications/energy/reports/2000_energy_restructured_market.pdf; CEEP (2004)

Table 1 compares the states discussed in this report using several broad demographic and economic indicators. As will be discussed in greater detail in later sections of this report, the choice of sustainable energy service delivery model is not closely correlated with demographic or economic indicators. Instead, programmatic goals, such as those discussed in Section 4, tend to dictate energy service fund structure and governance. Elements of the innovative third-party management model introduced by Vermont (the state with the lowest median income and total energy consumption), for example, have now been adopted at least partially by New Jersey (the state with the largest population and highest household income), and also by the City of Cambridge, a municipality of only 88,000.

Table 1. Key Indicators for Four States and Washington, DC

State	Population	Median Household Income	Total Energy Consumption (Trillion btu)	Total Energy Consumption per Capita (Million btu)
Delaware	853,476	$52,833	305	368
District of Columbia	581,530	$51,847	190	328
Massachusetts	6,437,193	$59,963	1543	240
New Jersey	8,724,560	$64,470	2630	303
Vermont	623,908	$47,665	169	273

Sources: US Census (2007) and US Energy Information Administration (2007)

This Section describes the approach taken in Massaachusetts, New Jersey, and Vermont in order to capture the organizational and financing elements that make their models work. The impacts of each model on energy affordability and environmental sustainability are documented. This section also includes a brief discussion of the Cambridge Energy Alliance.

Following the review of these jurisdictions' efforts, the sustainable energy utility model and its implementation in the State of Delaware is examined. While also new, the model learns from the efforts Massachusetts, New Jersey and Vermont and seeks a more comprehensive energy focus – addressing all fuels and all end users – while pioneering a financing model that is self-sustaining without the need to increase utility rates or taxes.

2.1 Massachusetts – A Utility-led Service Delivery Model

Massachusetts was one of the first states to pursue electricity restructuring in 1997. As part of its restructuring legislation, the state established two separate system benefits charges (SBC) on each kilowatt-hour of electricity sold in the state: one for energy efficiency and low-income weatherization, and one to support renewable electricity. The state also established three distinct governance structures for the energy efficiency, low-income weatherization, and renewable electricity funds. The experience and design of each of the three programs is reviewed below.

2.1.1 Energy Efficiency

Transportation strategies to improve air quality. http://ceep.udel.edu/publications/sustainabledevelopment/reports/sd_transport_strategies/2004_transport_strategies.pdf; CEEP (2001) *Planning for sustainable communities: A survey of sustainable practices among twelve communities in the United States.* http://ceep.udel.edu/publications/sustainabledevelopment/reports/sd_sustainable_communities/2001_sustainable_communities.pdf

Utilities in Massachusetts are responsible for managing the energy efficiency funds and programs within their own service territories. This is the most prevalent model of energy efficiency program management in the US, though some states are moving away from this model as will be discussed in more detail below.

The gas and electric utilities in Massachusetts have provided energy efficiency programs to their customers since 1980. The initial focus of utility programs was on maximizing the number of residential energy audits performed each year. After program reviews revealed that few residents were adopting the efficiency measures proposed following the audits, however, the programs were redesigned in 2000 to attempt to provide greater incentives for energy efficient technology adoption.

The SBC rate supporting the state electric utilities is 2.5 mills for each kWh. The SBC was first collected in 1998 and will be reviewed in 2012. Since 2002, the fund has collected approximately $124 million annually, and it is projected that $1.71 billion will be collected during the life of the program. The SBC funds are used to provide rebates for residential, commercial, and industrial electrical efficiency. Electrical utilities are also responsible for developing incentives to encourage thermal efficiency in residences that use oil heat.

In order to support the energy efficiency programs of the state natural gas utilities, an energy conservation charge is included in the natural gas rates. In 2006, the aggregate natural gas utility program budgets were $25 million. Natural gas utilities provide rebates, grants, and loan programs to encourage thermal efficiency improvements such as insulation, high-efficiency boiler installation, and duct insulation.

Energy Efficiency Program Structure

The Massachusetts Division of Energy Resources (DOER) provides oversight and coordination all the utility programs, while the utilities administer the programs (Figure 1). Evaluation and cost-effectiveness oversight for the programs was the responsibility of the Department of Telecommunications and Energy until it ceased to exist in April 2007. Its successor organization, the Department of Public Utilities, is now responsible for program evaluation. DOER encourages collaboration between utilities for services offered, and approves individual utility plans, programs, and budgets. In 2001, the state grouped the residential energy efficiency programs of each utility under the umbrella of the MassSAVE program. MassSAVE, which is administered by DOER, is a web-based clearinghouse for residential energy efficiency resources. Residential customers enter their zip codes and heating fuel type and get a list of energy rebates, programs and services they can take advantage of. Each utility also maintains separate programs for commercial and industrial customers, which are not centrally coordinated through MassSAVE.

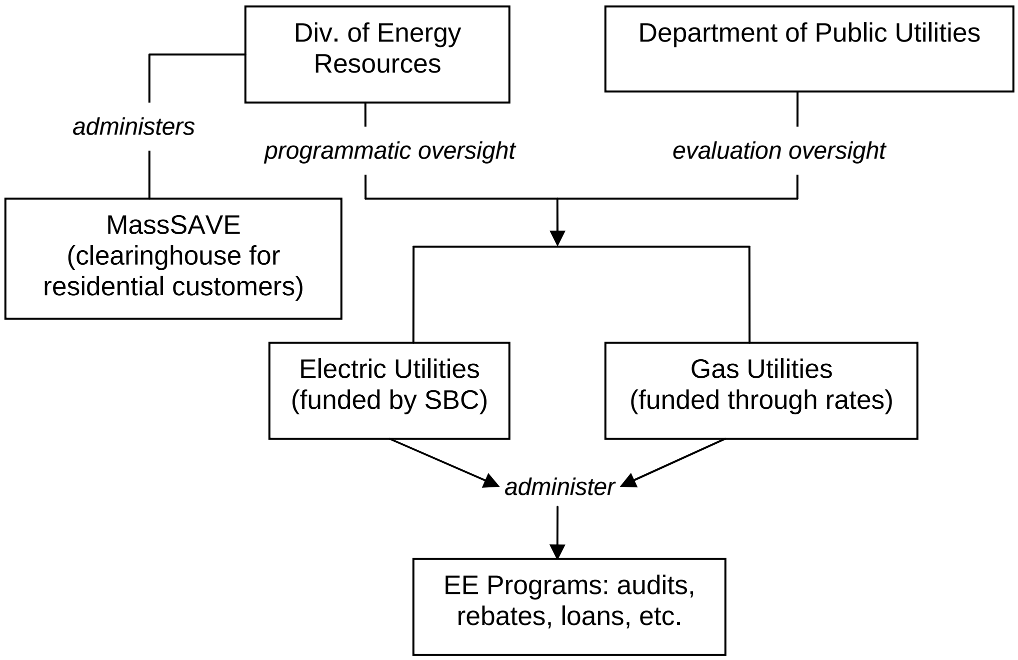

Figure 1.

In order to implement the energy efficiency programs, each utility also hires private sector contractors (e.g. ICF International, Conservation Services Group, Honeywell, etc.) to implement the programs themselves.

2.1.2 Affordable Energy[8] Services

In addition to standard energy efficiency programs, Massachusetts also offers a range of assistance programs to low-income customers. All utilities (gas and electric) are required to offer rate discounts for residents at 175% of poverty level or below. In 2004 this totaled $42.5 million for both gas and electric. Discounts for customers range from 20% to 42% of their bills.

In addition to the rate discounts, utilities also offer energy efficiency programs to low-income residents. These programs are funded from an earmarked portion of the efficiency SBC: 0.25 mills per kWh out of the total 2.5 mill surcharge. In 2005, revenues from this surcharge were approximately $14 million. For gas utilities, a conservation charge is built into the rate, equating to approximately $7 million in 2005. The total spending for gas and electric utilities was $21.2 million in 2005.

In 2006 Federal Low Income Home Energy Assistance Program (LIHEAP) funding totaled $82.76 million, serving 134,756 households. From the LIHEAP funding, $8 million is dedicated to HEATWRAP, a heating system repair/replacement program. In 2006 Federal Weatherization Assistance Program (WAP) was funded at $6.94 million.[9]

[8] In this report, "affordable energy services" refers collectively to low-income energy efficiency, weatherization, renewable energy, and bill assistance programs

[9] LIHEAP funds are used to reduce low-income households' energy bills and to prevent fuel or electricity shut-off due to bill non-payment. WAP services improve a household's energy efficiency, thus reducing energy consumption and energy expenditures

Total annual funding for affordable energy programs is $160.9 million (Figure 2). Approximately 134,000 households receive fuel assistance annually, reducing the average household bill by 20%-42%.

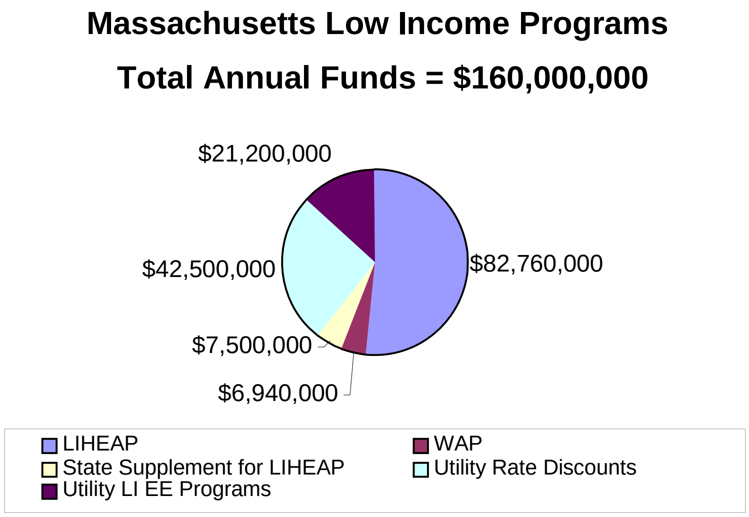

Figure 2. Total Annual Budget for Affordable Energy Programs in Massachusetts

Structure and Governance

LIHEAP and WAP are administered through the Department of Housing and Community Development's Community Services Unit. The services are delivered by Community Action Agencies (CAAs).[10] Residents must be at 200% of the federal poverty level or lower to receive LIHEAP and WAP funding.

Similar to the standard energy efficiency programs, the services offered under the affordable energy efficiency programs are managed by (and vary by) the individual utilities, and include audits, free weatherization (insulation, air sealing, and heating system replacement), lighting retrofits, clock thermostats, and appliance management.

National Grid's Appliance Management Program (AMP), for example, is only available to customers located within the utility's service territory. The program is administered through the local CAAs and provides funding for home appliance surveys, education about energy use of appliances, and appliance energy efficiency installations. The AMP program is unique in its service delivery model: the service personnel work closely with the homeowner in a co-learning atmosphere, instead of dictating behaviors or making adjustments without informing clients. National Grid spends about $4.5 million each year on AMP.

All of the affordable energy services in the state are overseen by the Low-Income Energy Affordability Network (LEAN), which was created by the 1997 restructuring legislation. LEAN is a collaborative organization with representatives of all affordable energy agencies in the state, and

[10] Also known as Community Action Programs, CAAs are private, non-profit service and advocacy organizations that provide services to low-income residents.

works to ensure that all of the services are coordinated, cost-effective, high-quality, convenient, and accessible. LEAN also negotiates on behalf of low-income ratepayers in rate cases.

2.1.3 Renewable Energy

The revenues from the state renewable electricity SBC are not managed by the individual utilities. Instead, the revenues are collected as the Massachusetts' Renewable Energy Trust, which is managed by a quasi-public agency called the Massachusetts Technology Collaborative (MTC). The MTC is overseen by its own board of directors with no direct oversight from any other state agencies. MTC administers its programs through grants, solicitations, feasibility studies, support for outreach programs, and other incentive agreements.

The Trust is funded by an SBC of 0.5 mills per kWh for investor-owned utilities and municipal utilities that choose to participate, and by proceeds from the renewable portfolio standard's alternative compliance payment (ACP). The RPS ACP, which is adjusted for inflation and currently set at $57.12 per kWh, accounted for $19.6 million in Trust revenue in 2005.[11] The ACP revenues are placed in a separate account, and used only for projects that maximize the commercial development of new renewable energy generation facilities. During 2003-2006, MTC spent an average of $48 million annually (Figure 3), which amounts to $7.56 per capita or 0.77% of utility revenues.

MTC has used the Trust to support over 6.6 megawatts (MW) of onsite renewables through programs such as the Small Renewables Initiative, the Community Wind Collaborative, and the Large Onsite Renewables Initiative, with many more in-line to receive these incentives in the coming years. The Trust also manages several programs that promote clean energy economic development, rather than emphasizing end-user services. These accounted for 11% of the Trust budget in 2006.

Among the Trust's more recent programs is the Green Affordable Housing Initiative, through which MTC has awarded $25 million to state, city, municipal, and private sector partners to manage the installation of up to 1.5 MW of distributed renewables on affordable housing developments around the state.[12]

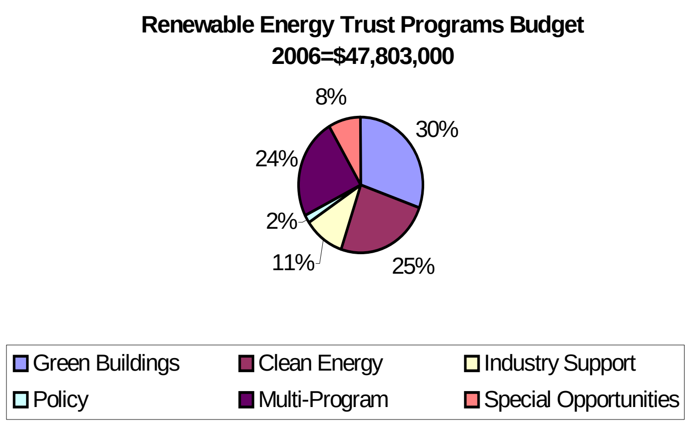

Figure 3. MTC Renewable Energy Program Budget for 2006

[11] MA DOER (2007) http://www.mass.gov/doer/rps/rps-2005annual-rpt.pdf
[12] MTC (2007). Green Affordable Housing Initiative. http://www.mtpc.org/renewableenergy/afford_housing.htm

Structure and Governance

The Trust is overseen by the MTC Board of Directors, which consists of senior managers from industry, universities, and government. The Board has statutory authority and fiduciary responsibility for the management of the Trust. A RET Committee oversees the management of the Trust and several advisory committees support various initiatives within the Trust. Twenty-seven staff members work for the Trust directly, not including MTC support staff and directors.

Programs are managed by MTC staff but are often contracted out through grants, contracts, loans, rebates, and investments. Some programs are handled in-house and some fully contracted out. For example, the Small Renewables Initiative rebate program is fully managed within MTC, but the Public Awareness Initiative operates wholly by distributing grants for media advertising, trainings, workshops, information distribution, etc.

2.1.4 The Cambridge Energy Alliance

In addition to the state programs for sustainable energy services, the City of Cambridge has launched an ambitious sustainable energy service delivery program known as the Cambridge Energy Alliance (CEA). The CEA is a non-profit founded through a partnership between the City, the Henry P. Kendall Foundation, NSTAR, and other stakeholders to create "a large-scale, $100+ million cross-sector conservation initiative that involves massive energy efficiency implementation, along with distributed generation (CHP and renewable energy) and demand-response resources, with the goal of reducing peak demand by 50 megawatts, approximating 15% of the City's total energy load."[13]

The CEA is responsible for designing, managing, and financing programs to achieve these goals. A central part of the CEA model is the establishment of a revolving loan fund with which to finance aggregated sustainable energy services. Savings from the financed projects will then be used to replenish the fund. Initial funding is being provided by the Kendall Foundation, the Barr Foundation, and the Chrous Foundation. While its priority goal is to shave peak electricity load, the CEA plans to eventually affect energy use for heating and transportation (including electricity, natural gas, oil, gasoline, diesel fuel), as well as water usage. There is also an affiliated and parallel effort to create a Boston Energy Alliance.

2.2 New Jersey – A Governmental Service Delivery Model

Like Massachusetts, New Jersey initially established energy efficiency and renewable energy funding as part of its electricity restructuring legislation in the late 1990s. New Jersey's Electric Discount and Energy Competition Act was signed into law in February 1999, and the New Jersey Board of Public Utilities underwent a rulemaking process to establish regulations for governing clean energy fund collection and distribution. In its initial iteration, the New Jersey Clean Energy Program (as its renewable energy and energy efficiency programs were collectively known) was managed in manner similar to Massachusetts's programs: energy efficiency programs were managed by individual utilities, while renewable energy funds were managed by a state agency: New Jersey's Office of Clean Energy.

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[13] See http://www.cambridgeenergyalliance.org

The recently reorganized New Jersey Clean Energy Program (NJCEP) has transitioned away from a largely utility- and state-administered model, however, and toward a competitive model. While state agencies have authority over the goal-setting, program design and program monitoring and evaluation processes, the new NJCEP relies on competitive bidding for service delivery. Overall administration is supplied by state agencies, but day-to-day implementation relies on third parties.

2.2.1 Sustainable Energy Funding

The Clean Energy Program is funded by a Societal Benefits Charge ('SBC'). The SBC is collected as a non-bypassable charge imposed on all customers of New Jersey's seven investor-owned electric and gas utilities. Through rulemaking, the BPU determines the amount that will be collected. A total of $358 million was collected in 2001, 2002 and 2003, while $124 million was collected 2004. A total of $745 million will be collected in 2005, 2006, 2007 and 2008. Of this, 63% will be allocated for energy efficiency, and 37% will be allocated for renewable energy (Table 2).

Table 2: Clean Energy Program Funding Levels (2005-2008)

Year	Total Funding Level	Energy Efficiency	% of Total	Renewable Energy	% of Total
2005	$140,000,000	$103,000,000	74%	$37,000,000	26%
2006	$165,000,000	$113,000,000	68%	$52,000,000	32%
2007	$205,000,000	$123,000,000	60%	$82,000,000	40%
2008	$235,000,000	$133,000,000	56%	$102,000,000	44%
Total	$745,000,000	$472,000,000	63%	$273,000,000	37%

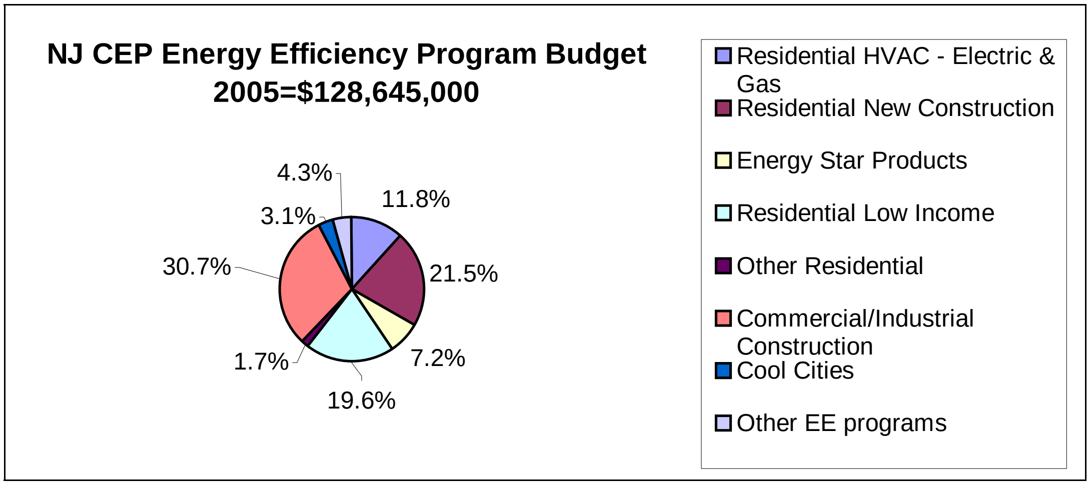
Source: BPU Docket EX04040276

The NJCEP budget is set through BPU rulemaking. The SBC rate therefore depends upon the size of the annual NJCEP budget as set by the BPU. The ACEEE[14] estimated that the average mill rate for energy efficiency has been $0.00102/kWh, and $0.00086/kWh for renewable energy.[15] There is also a separate SBC of $0.00006/kWh[16] for affordable energy programs (see below).

The services and incentives available under the NJCEP include both residential and nonresidential energy efficiency programs. Residential programs include energy audits, weatherization incentives through the EPA ENERGY STAR Home Performance program, and heating and cooling efficiency rebates. Nonresidential[17] programs include incentives for standard electrical and thermal efficiency technologies,[18] and emerging technologies such as geothermal heat pumps and combined heat and power systems. The total amount of energy efficiency funding available in 2005 was $128 million (Figure 4).

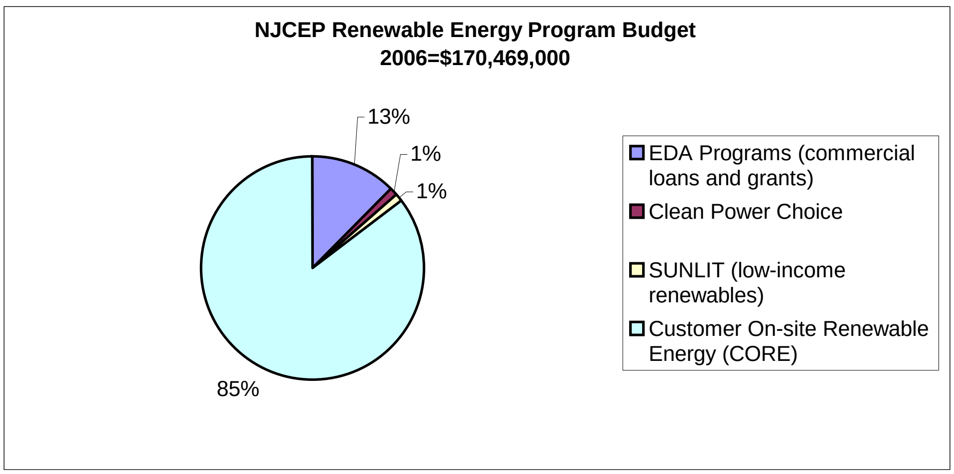
The NJCEP renewables programs include low interest loan programs, competitive grants for large renewable energy systems over 1 megawatt in size, and the Clean Onsite Renewable Energy (CORE) program, which provides rebates to customer-sited renewable systems. Like the MTC programs, the NJCEP also provides incentives for clean energy businesses. Of these programs, the majority of the NJCEP renewable energy funds were historically allocated to the CORE program (Figure 5).

[14] ACEEE (2007). Summary table of public benefit programs and electric utility restructuring (August 2007) Available at: http://www.aceee.org/briefs/aug07_04.htm
[15] That is, 1.02 and 0.86 mills, respectively.
[16] That is, 0.06 mills.
[17] Commercial, industrial, agricultural, state, and municipal
[18] E.g. lighting retrofits and controls, HVAC, boiler upgrades, variable frequency drives, motors



Source: NJ BPU Sept. 14, 2006 Order on Docket EX04040276

Figure 4. NJCEP Energy Efficiency Program Budget for 2005



Source: NJ BPU Sept. 14, 2006 Order on Docket EX04040276

Figure 5. NJCEP Renewable Energy Program Budget for 2006

NJCEP incentives have encouraged the installation of over 26 MW of renewable energy since 2001, of which the large majority has been solar (Figure 6). The rapid growth of New Jersey's PV market is the result of its CORE funds coupled with a progressive renewable portfolio standard (RPS) requiring 2% of state electricity be supplied by solar energy by 2020. Because of this policy, solar renewable energy certificates (SRECs) in New Jersey sell for $200-$250 per MWh in the state market. It should be noted, however, that New Jersey is transitioning away from CORE funding for PV to an entirely SREC-based system of PV support,[19] and the CORE PV rebates will be phased out by October of 2008.

[19] Winka, M. (2006). "Transition to a market-based REC financing system," in *New Jersey's Solar Market* (White Paper series) (pp. 2-7). Trenton, NJ: New Jersey Clean Energy Program.

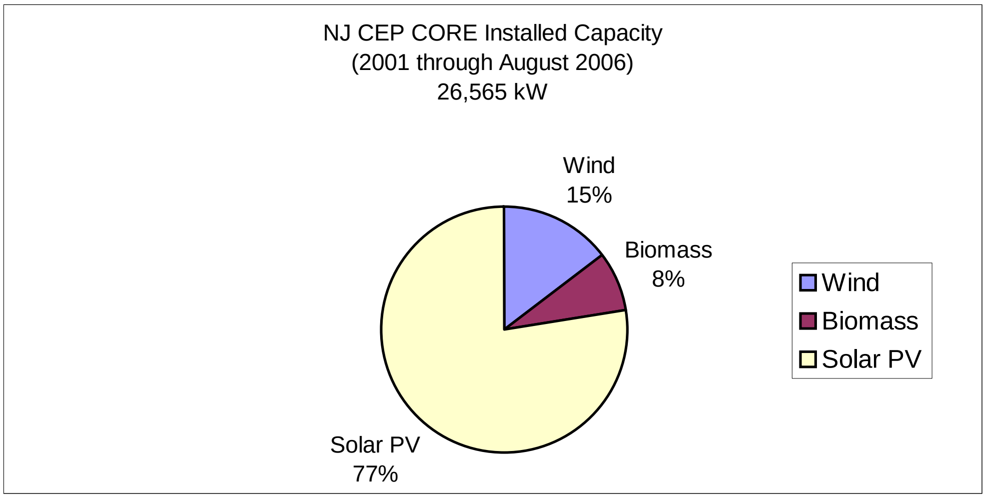


Figure 6. Renewable Energy Capacity installed through the CORE Program

2.2.2 A New Structure for NJCEP

As discussed above, the New Jersey's Clean Energy Program (CEP) is undergoing a transition to a third-party management structure. Under the new structure, the Board of Public Utilities will continue to be responsible for overseeing the regulatory process that governs the Clean Energy Program. The Clean Energy Council, composed of renewable energy stakeholders, will advise the BPU on the design, budgets, objectives, goals, administration, and evaluation of the Clean Energy Program.

The biggest change under the new structure is that clean energy program management will be competitively bid out to third party organizations. The New Jersey Office of Clean Energy, which formally managed the renewable energy programs, will hire a state-employed Contract Manager. The Contract Manager is responsible for releasing competitive contracts for a Fiscal Agent, a third-party Program Coordinator, and an evaluation agent. The Program Coordinator will supervise three Market Managers, who will manage programs for Residential Efficiency, Commercial and Industrial Efficiency, and Renewable Energy, respectively. The Fiscal Agent will be an independent entity responsible for collecting and disbursing Clean Energy Program funds, while the evaluation agent will conduct program monitoring and verification, and report back to the BPU and Clean Energy Office. At present, the evaluation role is to be performed by the Center for Energy, Economic & Environmental Policy at Rutgers University

The Office of Clean Energy will no longer be responsible for managing the renewable energy program, but will be responsible for carrying out and enforcing the regulations created by the BPU, and working with the third-party Program Coordinator to develop policies and procedures to carry out the Clean Energy Program.

2.2.3 Affordable Energy Services

In addition to the renewable energy and energy efficiency SBCs, New Jersey's restructuring legislation also established an SBC of approximately $0.00006/kWh for affordable energy programs. As with the other SBCs, the affordable energy SBC must be approved by the BPU. The SBC funds three programs: the Universal Service Fund, which helps low-income households pay no more than 6% of their annual income on combined gas and electric services, up to a cap of $1,800 per household; the New Jersey Lifeline, which provides low-income seniors and disabled residents with a $225 yearly credit on utility bills; and New Jersey Comfort Partners, which provides weatherization services. New Jersey's Department of Human Services administers each program.

Applications for all affordable energy programs are accepted and processed by non-profit organizations under contract in each of the 21 counties in the state. Households with income at or below 175% of federal poverty guidelines are eligible for all three programs. The amount of the energy assistance benefit is determined by the applicant's income, household size, fuel type, and heating region. The Department of Human Services also administers the federally-funded LIHEAP program (FY 2006: $77,346,024), while the NJ Department of Community Affairs administers the federally funded WAP program (FY 2006: $5,266,959 million). The same application form applies for LIHEAP, WAP, and the state Universal Service Fund.

A summary of New Jersey's affordable energy programs are included in Table 3 below.

Table 3: New Jersey's Affordable Energy Efficiency and Fuel Assistance Programs

Program	Funding (2006)	Funding Source	Administration
Low Income Home Energy Assistance (LIHEAP)	$77,346,024	Federal	Department of Human Services
Weatherization Assistance Program (WAP)	$5,266,959	Federal	Department of Community Affairs
Universal Service Fund (USF)	$156,400,000	SBC	Department of Human Services
NJ Lifeline	$72,000,000	SBC	Department of Health and Senior Services
NJ Comfort Partners (Part of NJ Clean Energy Program)	$21,300,000	SBC	Gas and electric utilities

Source: NJ LIWAP and NJ Comfort Partners Comparison of Programs and Evaluation Findings. APPRISE, 2004.

2.3 Vermont – A Third Party-led Model

For most of the 1990s, Vermont's energy efficiency programs were utility-administered, similar to the approach in Massachusetts. In 1999, Vermont pioneered the concept of an *energy efficiency utility* in which an independent entity is created to manage the energy efficiency programs in aggregate. Management of the energy efficiency utility is competitively bid out, and the utility is now known as Efficiency Vermont. Although Efficiency Vermont has proved to be a highly successful model for energy efficiency delivery, renewable energy and affordable energy services are still administered by government agencies.

2.3.1 Energy Efficiency

Vermont electric and gas utilities were first required to offer comprehensive energy efficiency services in 1991. With over 21 distribution utilities in Vermont, program coordination was confusing for customers and inefficient for utilities to administer. In 1999 the regulated utilities and the Department of Public Service developed a Memorandum of Understanding[20] which led to the creation of a statewide energy efficiency utility (EEU), later called Efficiency Vermont.

Currently Efficiency Vermont is financed by an energy efficiency surcharge, the amount of which is determined each year by the Vermont Public Service Board. The charge is collected by the distribution utilities, but used to support Efficiency Vermont activities. The charge is equivalent, on average, to 2.82% of total electricity payments (3.2 mills per kWh), and the FY 2006 budget was $14.8 million (Figure 7). In August 2006, the Board released an order that expanded the allowable budget of the energy efficiency utility to $24 million for 2007, and $30.75 million for 2008. In order to pay for these increases, the Board is conducting workshops and meetings to investigate different options for financing energy efficiency projects. These options include establishing an entity with bonding authority to implement EEU financing, securitization, commercial financing, and making energy efficiency projects available for reduced cost funding under the Sustainable Priced Energy Enterprise Development (SPEED) program.

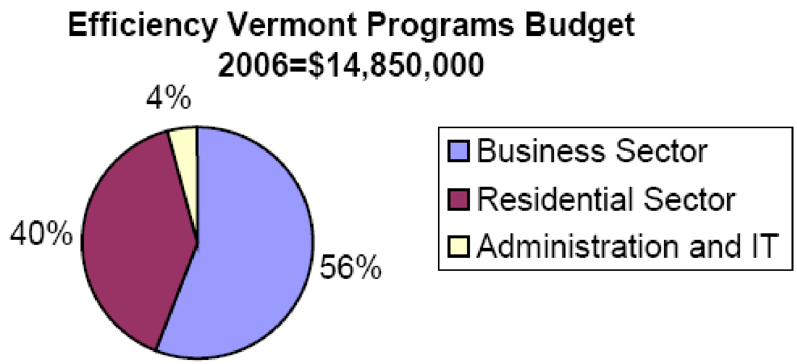


Figure 7. Efficiency Vermont Energy Efficiency Program Budget for 2006

Vermont's goals for the Efficiency Vermont include: (1) maximizing societal net benefits while acquiring comprehensive cost-effective electric efficiency savings; (2) using markets to increase the level of and comprehensiveness of energy efficiency services; (3) effectively capturing lost opportunity markets; and (4) striving for distributional equity across customer classes and geographic regions. To better accomplish these goals, Efficiency Vermont shifted from a programmatic approach to energy efficiency to a market approach. This shift away from rigidly defined programs was justified in the 2004 Annual Plan:

> "[Goals include] simplifying customer and strategic partner participation, working more effectively throughout supply chains to impact energy affecting decisions, and eliminating gaps in services. Service gaps occurred when customers did not fall into the traditional residential or business segments, (and) did not fit pre-conceived 'program' definitions…Efficiency Vermont has transitioned organizationally to this market-focused perspective by developing a team approach to better serve the breadth of the markets…".

[20] Docket No. 5980

Efficiency Vermont's current programs offer energy efficiency audits, outreach and education, rebates, grants, and loans to a broad range of customer types across the state. In addition to standard residential and commercial programs, Efficiency Vermont has also developed customized programs to address market sectors that might be overlooked by conventional efficiency programs (e.g. ski areas, dairy farms, multifamily buildings, schools, and wastewater treatment facilities).

From 2000 to 2005, the EEU spent $77 million, and saved Vermonters over $220 million (2003 dollars) in total benefits. The EEU has also saved 50,915 MWh of electricity (Figure 8).

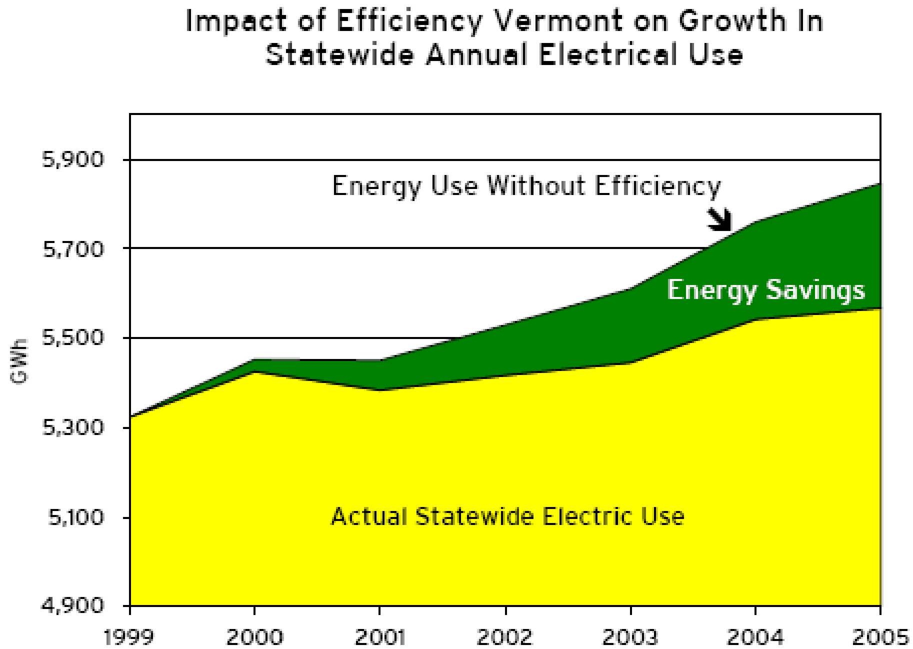


Figure 8. Impact of Efficiency Vermont Model

Structure and Governance

The energy efficiency utility (EEU) operates as an independent contractor to the Public Service Board under the name Efficiency Vermont. The Vermont Department of Public Service (DPS) is an executive agency that evaluates the EEU's performance and makes recommendations to the Board. The Board contracts with the EEU to run Efficiency Vermont for three-year contracts, with the option of renewal after the first three years. If renewed, the contract must be put out to bid again after the sixth year. Vermont Energy Investment Corporation, a non-profit organization, won the contract for 2000-2002, for 2003-2005, and again for 2006-2008. In addition a program adminstrator, the Board also hires a Contract Administrator to manage the Board's contract with the EEU, and a Fiscal Agent to receive and disburse funds. The Board also appoints a multi-stakeholder Advisory Committee (Figure 9).

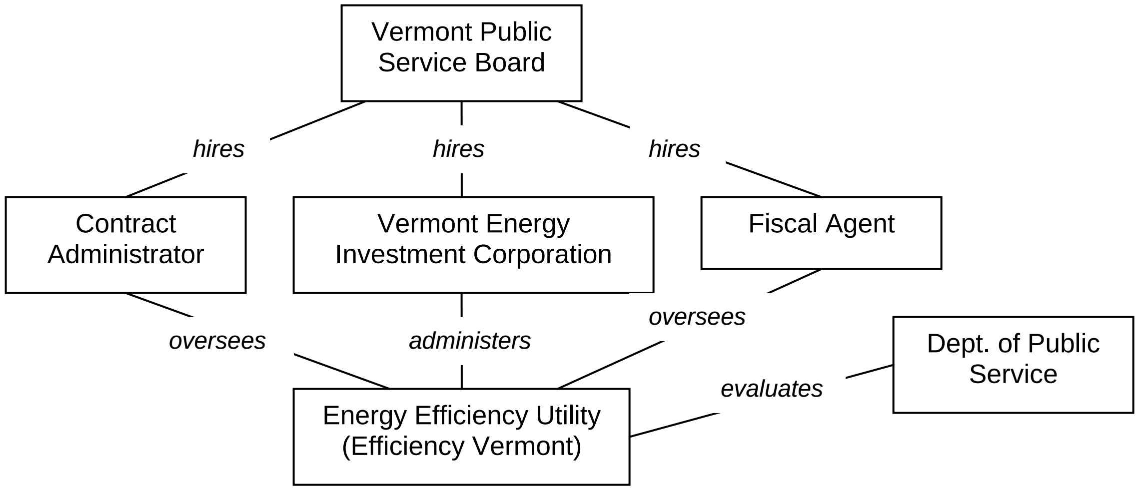


Figure 9. Efficiency Vermont Organizational Structure

Efficiency Vermont has 108 staff members. Staff categories include: Business Services (42), Residential Energy Services (19), Marketing and Business Development (16), Integrated Services (10), Planning and Evaluation Services (8), Customer Service (4), Executives (3), Finance (3), and Human Resources (3).

2.3.2 Affordable Energy Services

In addition to federal funds, affordable energy services in Vermont are also supported by EEU funds, but the programs themselves are managed by state agencies.

In 2006, Vermont received $13.68 million in federal LIHEAP funding, and $1.35 million in WAP funds. To be eligible to receive the federal funds, participants must generally be at 125% of the federal poverty level, although some services are provided at 150% of the poverty level.

The federal programs are supplemented by statewide affordable energy programs, which include the Weatherization Trust Fund and affordable energy programs funded through the SEU. Established in 1990, the Weatherization Trust Fund provides additional funding for WAP services, and is financed through a 0.5% gross receipts tax on regulated utilities and all non-transportation fuels, except wood ($4 to $6 million annually). In 2005 $4.9 million was spent out of the WAP. The money can be spent on weatherization or moved over to supplement LIHEAP funds if necessary.[21]

In addition to federal and Weatherization Trust Fund monies, the EEU contract also stipulates that 15% of funds must be spent on affordable energy services ($2.23 million in 2006). The EEU's programs target low-income single-family homes and multifamily homes. Each of these programs offers weatherization services. The EEU weatherizes approximately 1,000 low-income single-family homes each year, in addition to almost all subsidized affordable multifamily housing.

In providing affordable energy services, the EEU has a goal of eliminating historic geographic gaps in energy efficiency services. The EEU has two affordable energy programs: Low Income Single Family (LISF) and Low Income Multifamily (LIMF).

[21] In 2006, $3.5 million was used from the Weatherization Trust to support LIHEAP funding).

The EEU provides all single family affordable energy services through the existing WAP administering organizations (Community Action Agencies) by supplementing the services they offer and providing training for the WAP auditors; guidelines, screening tools, and technical resources; and financial resources for the incentives, fees, and administrative expenses. Efficiency Vermont's Low-Income Housing Services supplements the weatherization program by paying for efficient lighting installation, free refrigerator replacement, sealing doors and windows, insulation, low-flow shower heads, replacement of electric heat with oil, gas or propane (WAP pays for 25%, EEU pays for 75%), and referral to other loans, mortgage products, or energy services.

Almost all subsidized affordable housing in Vermont receives services from the EEU. The EEU provides customized technical assistance and incentives, such as design assistance, fuel switching, and efficiency lighting and water systems. Individual renters are referred to the WAP program for further services. The EEU is also beginning to work with private, non-subsidized low-income multifamily residences as well. EEU programs are fuel neutral and the EEU partners with Vermont Gas and Burlington Electric District (BED) to provide consistent services for all customers.

Approximately $22 million is spent annually on affordable energy efficiency and fuel assistance in Vermont. About 20,000 households receive fuel assistance annually, and 1,000 receive weatherization services (Figure 10).

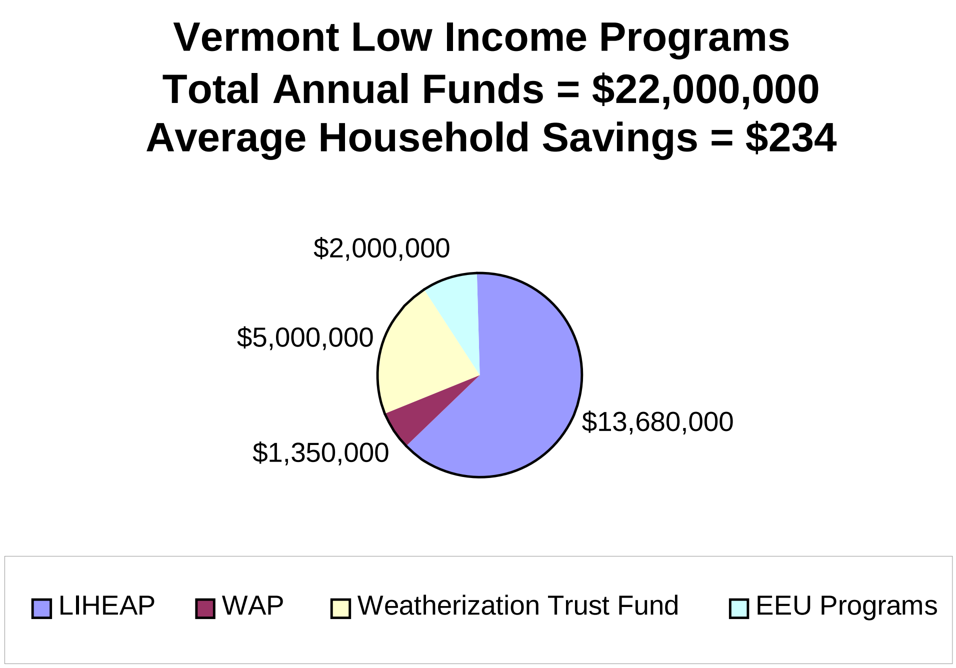


Figure 10. Vermont's Typical Affordable Energy Program Budget

Structure and Governance

LIHEAP and WAP are administered by the Economic Services Division (ESD) within the Department of Children and Families, as are the affordable energy funds collected through the SEU

(Figure 11). A network of 21 local Community Action Agencies and nonprofit entities is responsible for administering the affordable energy programs, and they receive technical assistance and training from SEU staff.

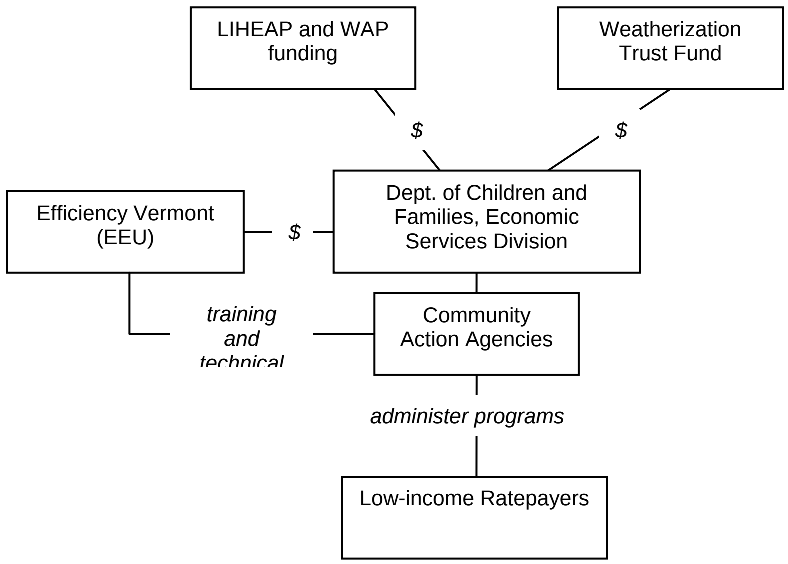


Figure 11. Organizational Structure of Vermont's Affordable Energy Program

2.3.3 Renewable Energy

Compared to its support for energy efficiency and affordable energy, Vermont's program for promoting renewable energy is relatively new. The Clean Energy Development Fund (CEDF), which began in 2005, supports the Solar and Small Wind Incentive Program, a rebate-style incentive program for solar energy and wind electricity systems, and loan and grant programs for CHP and biomass. The Fund receives money through two Memoranda of Understanding between the state and Entergy regarding the utility's nuclear facility. Funding for the CEDF will be between $6.2 and $7 million annually until 2012. Prior to 2005, the Solar and Small Wind Incentive Program had been funded with money from the petroleum violation escrow fund.

Since 2003 the Solar and Small Wind Incentive Program has helped install 345 renewable energy systems with an electrical capacity of 434 kW and solar water heating capacity of 1,500 million Btu/yr. The Vermont Small-Scale Wind Energy Demonstration Program, a separate program supported with funds from the US Department of Energy, has installed 20 ten kilowatt wind turbines.

Structure and Governance

The CEDF is administered by the Department of Public Service with the support of: a Fund Administrator, who writes RFPs, grant agreements, and annual reports, and Advisory Committee that reviews program design, 5-year strategic plans, annual plans, and operating budgets; and Investment Committee that approves plans and budgets, and helps review large grant and investment proposals. While the Department of Public Services manages the CEDF, the management of the Solar and Small Wind Incentive Program has been bid out, and is currently administered by the Renewable Energy Resource Center, a project of the Vermont Energy Investment Corporation.

III. DELAWARE'S SUSTAINABLE ENERGY UTILITY

3.1 Evolution of the Sustainable Energy Utility Model

The sustainable energy utility (SEU) builds on, and offers an alternative to, the energy service delivery models discussed in the sections above.

As demonstrated by the experience of Vermont and New Jersey, state energy programs have begun to reorganize to emphasize competitively selected third-party program implementers and comprehensive services that cross fuels and energy end uses. This strategy is particularly important considering that buildings are responsible for almost half of U.S. energy consumption, and three-quarters of U.S. electricity consumption,[22] while transportation represents the largest source of imported energy use and is the fastest growing source of greenhouse gas emissions. Achieving a sustainable energy future will require: significant gains in buildings-based energy efficiency for all fuels and end uses (including weatherization and other building envelope improvements); rapid introduction of customer-sited renewable energy to reduce demand for conventional energy in heating, cooling and eventually transport markets: a major shift to clean vehicles, and green transport/transit options (including carshare, free/low-fare transit, employee commute planning); adoption of comprehensive affordable energy solutions that enable all families and small businesses to participate in the daily affairs of the society and economy. The task is to make these options typical choices in daily household and business life. The SEU model seeks to provide the full spectrum of sustainable energy services to end-users through a third-party management model.

Moreover, the SEU seeks to streamline customer-sited energy service delivery. Many traditional sustainable energy service models discourage prospective participants because of their complexity. Conventional energy suppliers are highly organized and able to market and deliver their products.[23] By contrast, energy users who are interested in improving energy efficiency, lowering their energy bills, and using renewable energy are faced with a fragmented array of equipment distributors, consulting firms, contractors, energy services companies; and participants often have little access to financing for sustainable energy choices, and must negotiate complex, bureaucratic labyrinths to secure funds. The traditional approaches for supplying sustainable energy services do not address this problem.

The most important feature of the SEU concept is that energy users can build a relationship with a single organization whose direct interest is to help residents and businesses *use less energy* and *generate their own energy cleanly*. Simply stated, the sustainable energy utility (SEU) becomes the point-of-contact for efficiency and self-generation in the same way that conventional utilities are the point-of-contact for energy supply. Further, it offers an infusion of funds and other resources to provide a broader and better supported array of affordable energy services. It is important to note, however, that:

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[22] Dan Wrightson (for the American Institute for Architects), Presentation to the Task Force, February 20, 2007. Available at http://www.seu-de.org/docs/Wrightson_AIA_Presentation_2-20.pdf

[23] The energy supply industry in the U.S. and elsewhere has received significant and sustained subsidies over the past century. See, for example: Richard F. Hirsh (2002) *Technology and Transformation in the American Electric Utility Industry* (NY: Cambridge Press); Vaclav Smil (2005) *Energy in World History* (Boulder, CO: Westview Press); and Byrne et al, eds. (2006) *Transforming Power: Energy, Environment and Society in Conflict* (New Brunswick, NJ and London: Transaction Publishers). The achievements and current costs of this industry depend upon past and current subsidies.

- The SEU does not supplant other private-sector activities, but complements them by providing a focal point for energy efficiency, affordable energy and renewable energy information, expertise, and incentives.

- The SEU is a public/private partnership that uses public funding sources, consumer savings, and renewable energy credit markets, combined with private sector funds and management skills, to address the shortcomings of traditional approaches.

These concepts form the core of the Delaware Sustainable Energy Utility. The sections below describe the SEU in detail, an include overviews of the SEU's legislative history, the SEU structure, and the SEU's funding strategy.

3.2 Creating the Delaware SEU

The Delaware SEU concept was first proposed by Delaware Senator Harris McDowell and Dr. John Byrne (director of the Center for Energy and Environmental Policy (CEEP) at the University of Delaware) in spring 2006, in response to high gasoline prices and a 59% increase in electric rates after a seven year cap on residential rates was lifted. The Delaware General Assembly passed Senate Concurrent Resolution 45 in June 2006 to create the Sustainable Energy Utility Task Force. The SEU Task Force, which is co-chaired by Senator McDowell and by Dr. John Byrne, consists of members of eight state legislators form both houses and both major parties of the Delaware General Assembly, the Delaware Public Advocate, the State Energy Coordinator (Delaware Energy Office), and three representatives of community and environmental organizations. The Task Force worked for eight months to develop a set of recommendations for how best to structure the SEU.[24] These recommendations directly informed the final version of legislation that defined the SEU and set the following SEU performance goals:

- Provide market development for residential and business purchases of high-efficiency alternatives in energy-using equipment to enable 30% savings in household and company energy use, with 33% of Delawareans participating by 2015 – this is estimated cut annual household energy costs by $1,000
- Provide expanded weatherization services to residences, with a focus on the needs of low- and moderate-income families, doubling the number of annually weatherized units by 2015.[25]
- Assist Delaware households and businesses to install at least 300 MW of customer-sited renewable energy by 2019 through the use of incentives and other policy measures. These renewable energy systems will include at least 100 MW of solar photovoltaics and at least 200 MW of solar thermal, wind, geothermal, and other renewable resources.

On June 28th, 2007, Delaware Governor Ruth Minner signed Senate Bill 18 into law and created Delaware's Sustainable Energy Utility.

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[24] Full details of the SEU Task Force structure, meetings, and reports can be found online at http://www.seu-de.org.

[25] Energy costs for low-income households account for a much larger proportion of household income than for others (see CEEP, 2006, *Energy, Economic and Environmental Impacts of the Delaware Low-Income Weatherization Program*; available at http://ceep.udel.edu/energy/publications/2006_es_weatherization%20program_evaluation_Delaware.pdf). Low-income renters and homeowners also reside in homes that consume significantly more energy per square foot than other housing. At the same time, there is a backlog of about five years for low-income consumers eligible for weatherization projects to improve home energy efficiency.

3.3 SEU Structure and Governance

Delaware's SEU draws inspiration from and completes the model for competitively delivered sustainable energy services begun chiefly by Vermont and New Jersey. Alhough both Vermont's EEU and New Jersey's Clean Energy Program are remarkably successful, they have yet to capture the synergistic benefits of having a single statewide clearinghouse coordinate sustainable energy services across all end-use markets and all end-use fuels. The SEU model relies on competitive contracts and performance incentives to build in-state markets for sustainable energy services. The SEU can leverage private sector investment in energy services to help overcome the disincentives that can prevent people from benefiting from cost-saving and carbon-saving energy improvements. The SEU also minimizes administrative costs compared to other states by providing end-users with a single point-of-contact.

The SEU is overseen by the Delaware Energy Office, led by the State Energy Coordinator, and an Oversight Board. The SEU is an independent nonprofit entity unaffiliated with any Delaware utility. Similar to Vermont and New Jersey's competitive processes, the Energy Office will hire an SEU Contract Administrator through a competitive bidding process. The SEU Contract Administrator will plan all SEU programs and will competitively select Implementation Contractors to deliver actual services. The Energy Office will also contract for an independent Fiscal Agent who will act as the treasurer of the SEU funds. An Oversight Board will oversee the SEU's operations and set yearly and multi-year targets for sustainable energy service levels and impacts. The Delaware Energy Office has funding and the authority to ensure compliance with performance targets and to provide policy recommendations to the legislature that would improve SEU operations. The responsibilities and roles of each of the SEU participants are as follows (see also Figure 12):

The Delaware Energy Office is responsible for:

- Preparing requests for proposals to contract the SEU Contract Administrator and the Fiscal Agent
- Determining the contract terms, including length of contract (3-5 years) and performance incentives
- Reporting biannually to the Oversight Board
- Ensuring congruity between contract periods
- Ensuring compliance with performance targets

The Oversight Board is responsible for:

- Reviewing and approving RFPs for the Contract Administrator and the Fiscal Agent
- Reviewing and approving contract SEU performance targets recommended by the Contract Administrator
- Reviewing and approving modifications to performance targets or program designs
- Contracting with an independent agency to provide third-party review of monitoring and verification of results reported by the SEU Contract Administrator

The Fiscal Agent is responsible for:

- Oversight of all financial transactions at the program and implementation contract levels as the SEU's treasurer
- Receiving and disbursing SEU funds, interacting with bond and revenue authorities, and overseeing REC and solar lifeline financial transactions

The SEU Contract Administrator is responsible for:

- Program research and design and administration of implementation contracts
- Ensuring monitoring, and verification and program performance
- Reporting on overall program efficacy while also balancing services between customer classes, energy sectors, income levels, and technology types
- Ensuring that the work of the SEU targets efficiency improvements in electricity, natural gas, oil, propane, and gasoline
- Maintaining a high level of customer satisfaction by creating a comprehensive virtual utility that acts as a clearinghouse for all of its services.

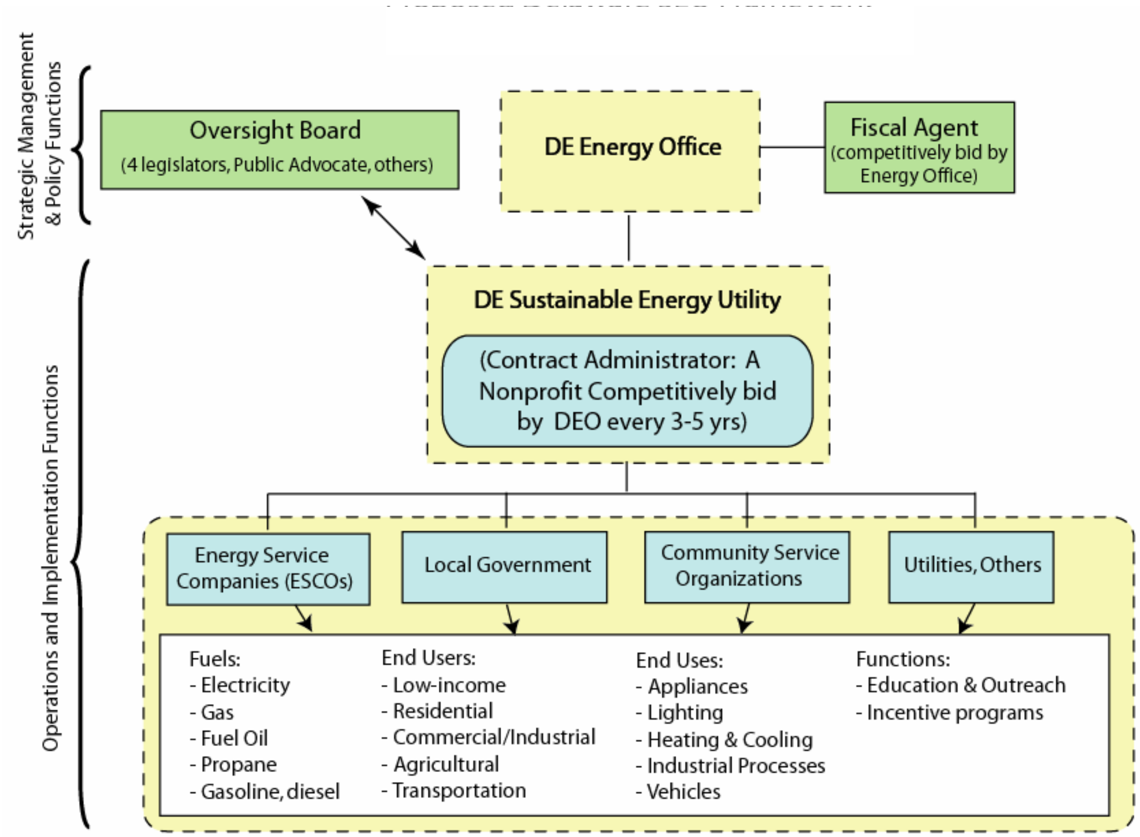

Figure 12. Organizational Chart of the Delaware Sustainable Energy Utility

3.4 Delaware's Sustainable Energy Funding Strategy

In addition to using a competitive management model to address all fuels for all customer classes, another distinguishing feature of the SEU is that it is designed not only to be financially self-sufficient, but to expand its programs as its revenues grow. This represents a fundamental shift away from energy efficiency and renewable energy programs that rely primarily on a fixed annual income from energy surcharges.

The SEU Task Force Research Staff developed an economic model for the SEU. This model took the estimated costs of building efficiency programs in the residential and commercial/industrial sectors, transportation energy efficiency programs, renewable energy programs, marketing and education, and SEU administration into account. The Staff then examined four potential funding sources: the green energy fund, sales from RECs, energy shared savings programs, and tax-exempt bonds. The model demonstrated that the SEU could meet ambitious performance targets with minimal public liability and maximum leveraged private participation.

Under the SEU legislation, the SEU was given bonding authority with a cap of $30 million to support initial SEU programs and operations. The bonding is "special purpose" and will not add to the State's General Obligation bonding. Bonds will be sold in two or more offerings to match expected expenditures during the early years of SEU operation. The bond debt will then be paid for by SEU revenues from three sources:

- Shared savings agreements with participants
- Partial proceeds from the sale of Renewable Energy Credits in local and regional markets
- Green Energy Fund monies.

Once the bond debt is repaid, these revenue streams will be fully directly to expanding the SEU's budget and its programs. Each of the revenue streams is discussed below, followed by a discussion of SEU cash flows.

3.4.1 Shared Savings Agreements

The SEU will cover the full incremental cost of high-efficiency equipment for all participating households. This includes the difference in price between qualifying ENERGY STAR®[26] and standard appliance and equipment models, and the difference in price between average and high-efficiency passenger vehicles.

In return for this investment, SEU clients enter into a shared savings agreement,[27] pledging to share 33% of the estimated savings created by the installed measures for a period of 3-5 years. Customers reap 67% of the gains from energy efficiency upgrades during the first 3-5 years of operation without the obligation to cover the incremental investment cost for their installation. In other words, customers incur no added investment cost and receive of 67% of total savings as revenue during the first 3-5 years. After the shared savings period ends, the customer receives 100% of the savings from the investment.[28]

Employing the shared savings model, the SEU will be able to substantially increase Delaware's investment in energy efficiency in a short period of time. During the period 2008-2010, average SEU efficiency spending is projected to be $6.7 million annually. However, increased revenues will allow the average annual expenditure to expand to $8.7 million per year overall through 2019 (Figure 13). A two-part table including the analyses that these revenue projections are based on can be found in Appendix 1.

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[26] The Energy Star© rating was developed jointly by the U.S. Department of Energy and the U.S. Environmental Protection Agency. See the following website for details: http://www.energystar.gov/

[27] Shared savings agreements have been used for several years by energy services companies (ESCOs), utilities and municipalities to secure investments in energy efficiency. See, for example, the program by Madison Gas & Electric http://www.mge.com/images/PDF/Brochures/Business/SharedSavingsOverview.pdf

[28] This assumes the client maintains or decreases energy consumption for the affected use(s) (i.e., appliances, vehicles, building envelope, etc.) during the lifetime of the installed measures.

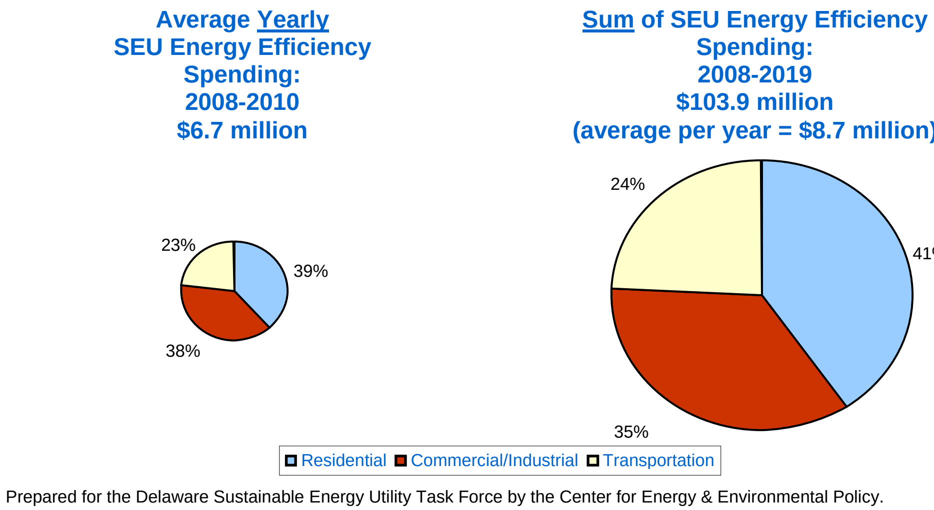
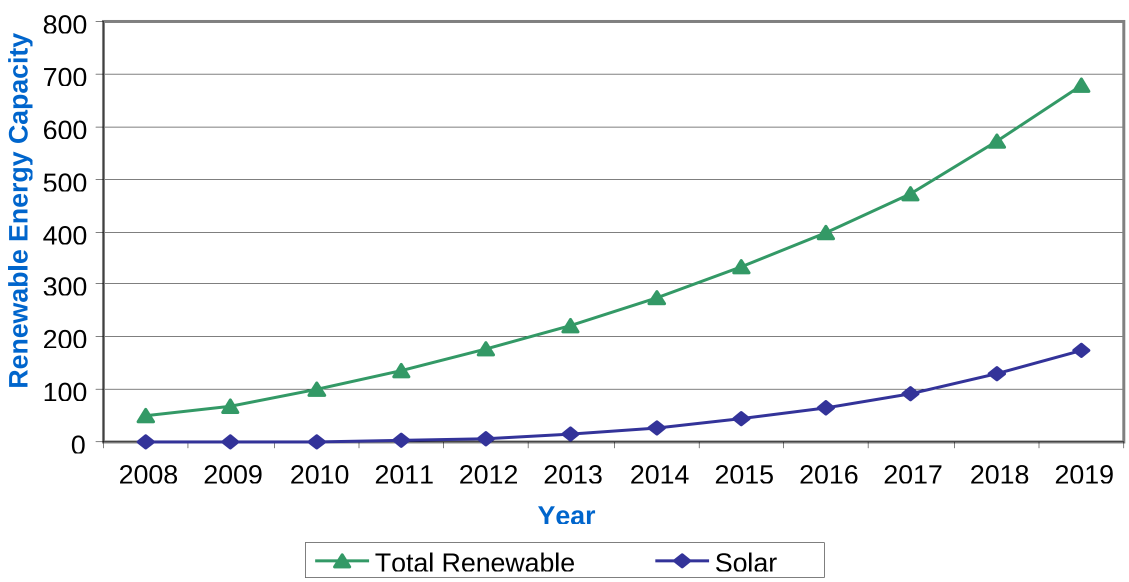


Figure 13. Projected SEU Investments in Energy Efficiency

3.4.2 SEU Fees for Renewable Energy Credits

A second revenue stream for the SEU will derive from renewable energy credit sales. Delawareans who site renewable energy on their premises will be eligible to receive SEU incentives equal to the difference in incremental cost of conventional energy supply and that provided by renewables. The planned investment in customer-sited solar thermal, wind, geothermal and solar electric technologies is significant. The forecast of SEU-incentivized renewable energy capacity is given in Figure 14.



Prepared for the Delaware Sustainable Energy Utility Task Force by the Center for Energy & Environmental Policy.

Figure 14 Cumulative Installed Renewable Capacity from SEU Investments

In return for providing rebates, the SEU will seek 25% of the proceeds from the sale of Renewable Energy Credits (RECs) for systems in which it invests. RECs are a commodity separate from the actual power produced by a renewable energy system. Producers of "green" power can sell RECs and utilize the energy generated by their system. REC buyers include companies seeking to improve their public image and utilities seeking to comply with RPS obligations. When RECs are traded, the entity purchasing the REC gains the right to claim associated environmental benefits.

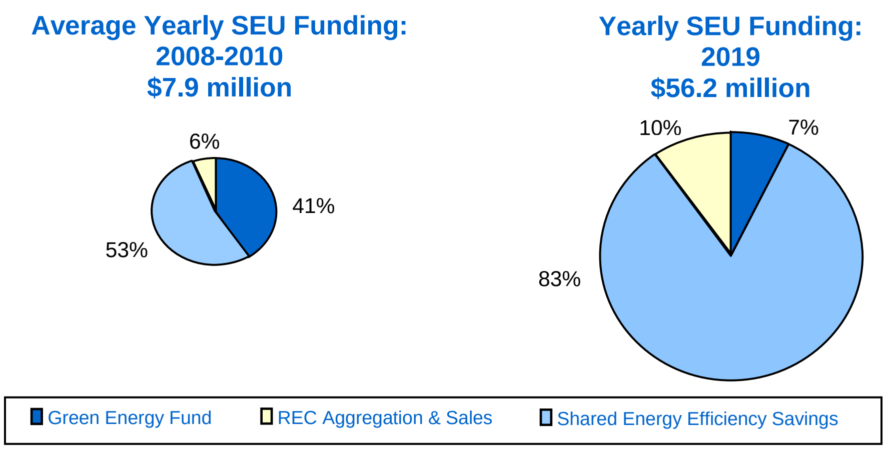
REC markets are well-established in the Mid-Atlantic region, with multi-year purchase contracts being the norm. In 2007, Delaware's RPS policy was upgraded and now includes a mandate that 20% of the electricity sold in the state must derive from renewable sources by 2019, and that 2% of the state's electricity must be supplied by solar resources specifically.

The SEU can save owners of small- to medium-scale renewable energy systems the transaction costs of participating in the solar RPS by aggregating and selling customer RECs. In this way, the system owners benefit, and the SEU will earn a 25% share of REC revenue created by its incremental investment on behalf of SEU clients. Estimates of the yearly revenues earned by the SEU from its Distributed Renewables Program are summarized in Appendix 2.

3.4.3 Green Energy Fund

Delaware's Green Energy Fund (GEF), which was created by Delaware's restructuring legislation in 1999, collects revenue from electricity sales of its default electricity provider (Delmarva Power).[29] In 20007, the Delaware General Assembly passed legislation increasing the GEF surcharge rate from 0.000178 cents per kWh to 0.000356 cents per kWh. It is projected that this increase will double the Green Energy Fund's annual revenue from to approximately $3.2 million.

GEF funds have historically been managed directly by the Delaware Energy Office. Under the SEU, GEF revenues will play a strategic role in meeting the new utility's early financial needs. This can be shown by comparing the relative shares of SEU finances received from shared savings agreements, REC sales and the GEF during 2008-2010 and 2019 (Figure 15). In 2008-2010, the GEF will account for approximately 41% of the SEU's revenues. By 2019, shared energy savings revenues will account for 83% of SEU funds, while the GEF's contribution will be only 7%.



Prepared for the Delaware Sustainable Energy Utility Task Force by the Center for Energy & Environmental Policy.

Figure 15. Evolution of Funding Sources for Delaware SEU Activity

[29] Municipalities and the Delaware Electric Cooperative are not obligated to contribute to the Green Energy Fund. But several of these electricity providers have chosen to create their own versions of this Fund.

3.4.4 Projected SEU Cash Flows

Given the three projected revenue streams discussed above, the CEEP research team built a financial model to estimate SEU costs, revenues and early capital investment needs. The cash flow output of the model is provided below.

Table 4 Projected Cash Flow of the SEU

	Expenditures					Revenues	Balance
Year	SEU Contract	SEU Program Costs (Rebates, Incentives, EM&V, etc.)	SEU / DEO Education & Marketing	Bonus Fund	Expenditure Totals	SEU Revenues: 0.25RECs + 0.33SS (yrs 1-5) + GEF Revenues	Annual Cash Balance
2008	-$800,000	-$5,953,981	-$300,000	-$100,000	-$7,153,981	$3,140,411	-$4,013,569
2009	-$816,000	-$8,823,059	-$300,000	-$175,000	-$10,114,059	$7,630,898	-$2,483,161
2010	-$832,320	-$10,520,922	-$300,000	-$192,962	-$11,846,205	$12,864,141	$1,017,936
2011	-$848,966	-$17,429,788	-$261,447	-$288,291	-$18,828,492	$19,219,402	$390,910
2012	-$865,946	-$21,628,684	-$432,574	-$392,609	-$23,319,812	$26,173,902	$2,854,090
2013	-$909,243	-$32,364,351	-$647,287	-$664,624	-$34,585,505	$33,231,192	-$1,354,313
2014	-$954,705	-$38,569,611	-$771,392	-$759,003	-$41,054,712	$37,950,155	-$3,104,557
2015	-$1,002,440	-$42,212,500	-$844,250	-$841,412	-$44,900,602	$42,070,590	-$2,830,012
Sub-totals	-$7,029,621	-$177,502,896	-$3,856,950	-$3,413,900	-$191,803,367	$182,280,690	-$9,522,677
2016	-$1,052,562	-$41,052,588	-$821,052	-$937,295	-$43,863,498	$46,864,759	$3,001,262
2017	-$1,105,191	-$44,887,443	-$897,749	-$1,020,003	-$47,910,386	$51,000,162	$3,089,776
2018	-$1,160,450	-$45,173,259	-$903,465	-$1,068,534	-$48,305,708	$53,426,697	$5,120,989
2019	-$1,218,473	-$42,744,016	-$854,880	-$1,123,466	-$45,940,835	$56,173,305	$10,232,470
Totals	-$11,566,296	-$351,360,203	-$7,334,096	-$7,563,199	-$377,823,794	$389,745,614	$11,921,820

Prepared for the Delaware Sustainable Energy Utility Task Force by the Center for Energy & Environmental Policy.

As is commonly seen in start-up operations, the SEU has negative cash flow in its initial two years (Table 4). When projected investments in distributed renewables ramp up in the 6th program year,[30] negative cash balances reappear. By the 9th year of its operations, however, the SEU is earning positive cash balances at a compound rate.

To address the SEU's early working capital needs, the SEU Task Force recommended that the SEU be given bonding authority to issue "special purpose," tax-exempt bonds.[31] Tax-exempt bonds do not add to the State's General Obligation bonding, and are not tied to a specific revenue source. The legislation that created the SEU granted the SEU bonding authority with a $30 million cap. A prospectus for the SEU revenue bonds is included as Appendix 3. Based on a conservative analysis of revenues and financing, and using upper-bound expectations of program and administration costs, the SEU's cash flow is expected to be positive after approximately two years. Thereafter, the SEU will be self-sustaining.

[30] Logically, the SEU is expected to concentrate its attention in the first 5 years of operation on energy efficiency market development.

[31] Although Delaware chose to employ a bond, other financial mechanisms and approaches are available to create a financially self-sustaining SEU. As discussed in Section 2.3.1, Vermont is currently reviewing several different types of financing mechanisms to expand its energy efficiency programs.

3.4.5 Projected Economic, Energy and Environmental Impacts of the SEU

Through the implementation of energy efficiency, affordable energy and renewable energy programs across all sectors, the SEU is expected to deliver significant economic, energy and environmental impacts. A summary of these impacts is shown below:

- The SEU will eliminate the need for *any* new electricity generation built outside of Delaware's RPS requirements

- An average participating household will be able to reduce annual energy expenditures by more than $1,000. Reductions of this magnitude have important positive implications for the local economy.

- The State will be made less vulnerable to fossil fuel and electricity price spikes in the future. Energy efficiency and renewable energy provide "hedges" against price increases and will dampen price volatility.

- Energy efficiency and customer-sited renewables will help to reduce grid congestion and its associated costs. Congestion costs are borne by electricity ratepayers in the form of higher rates, regardless of supplier.

- Aggressive, energy efficiency and customer-sited renewable energy development can also stimulate thousands of new jobs in Delaware by creating an active in-state energy service market within the state. Jobs would also be created in the critical manufacturing sector, historically a source of stable, high-paying employment.[32]

- Delaware is unique in applying the SEU concept to transportation. Many of the State's air quality problems can be traced to emissions from gasoline and diesel-fueled vehicles. The State will benefit from lower vehicle emissions caused by the SEU's Green Vehicles Incentive Program, its Carsharing Program, and new thinking about transit and employee commute planning incentives, all of which will improve the State's capacity to meet EPA Clean Air standards.

Finally, the State's Carbon Footprint will be reduced by 33% due to SEU-sponsored investments in energy efficiency and customer-sited renewables, amounting to a cut in 2020 emissions compared to business-as-usual of 5.5 million metric tons of CO_2. While strategies that build cleaner energy facilities to meet future demand growth can slow, delay or even flatten future CO_2 releases, the SEU *cuts* carbon emissions by lowering the utilization of or eliminating altogether the need for current, as well as future, energy supply facilities. Indeed, the *Delaware SEU impacts are expected to sufficient to allow the State to lower its 2020 emissions to 2003 levels*. The impacts on carbon emissions are shown in Figure 16:

[32] CEEP's 2005 Briefing Paper on RPS impacts reviews several studies showing job growth associated with sustainable energy market development. Available at http://ceep.udel.edu/energy/publications/2005_es_Delaware%20Senate_RPS%20briefing%20paper.pdf (see especially, pp. 9-12 of the Briefing Paper).

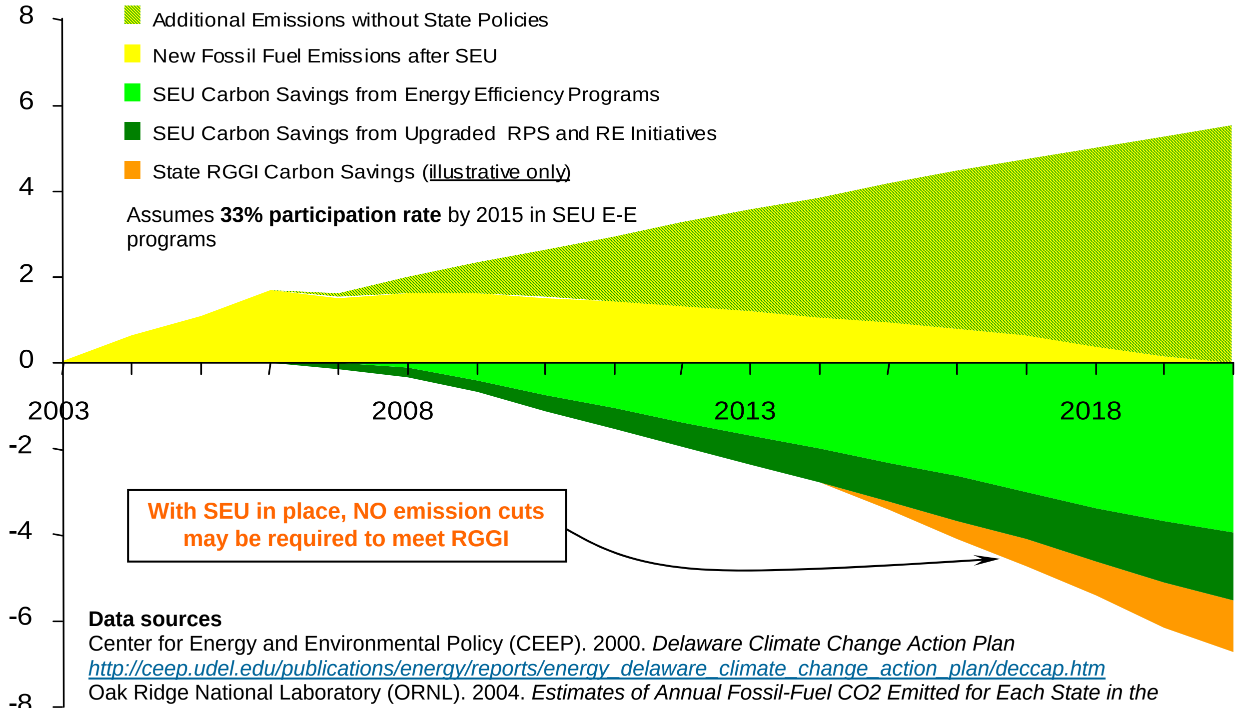


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Figure 16. Carbon Emission Reductions from SEU Policies

IV. SUSTAINABLE ENERGY UTILITY DESIGN CONSIDERATIONS

The Delaware Sustainable Energy Utility builds off of the experience and best practices of states like Massachusetts, Vermont, and New Jersey, and represents a new chapter in the evolution of sustainable energy service delivery. This section summarizes the policy and structural innovations embodied SEU model, and discusses how each of the state models discussed in this report measure up to these criteria. These innovations include:

- Central coordination: Sustainable energy services coordinated by through a single point of contact.
- Comprehensive programs: Programs target efficiency, conservation, and renewable energy across all fuels (electricity, heating, transportation) and customer classes (low-income, government, industrial, commercial, residential, etc.), regardless of utility service territory.
- Flexible incentives: Sustainable energy services are not constrained by strict programmatic criteria that might exclude, or inadequately serve, certain customer groups
- Self-sufficiency: A financing plan that ensures self-sufficiency by generating revenue through the supply of customer-sited sustainable energy services
- Independence: A governance system based on competitive procurement of independent management services

In addition to these criteria, an important component of SEU success is the existence of a policy framework that supports customer-sited sustainable energy services. Key policies include an RPS that encourages distributed generation, net metering regulations, green building mandates, and alternative fuel vehicle incentives.

4.1 Coordinated Sustainable Energy Services

Central coordination is key for avoiding customer confusion, creating cross benefits between incentives, reducing administrative costs. As noted above, Massachusetts has three different systems for renewable energy, energy efficiency, and affordable energy services. Moreover, on the energy efficiency side, energy service delivery is further subdivided by utility service territory and fuel. To a certain extent, the state has tried to organize resources through clearinghouses like MassSAVE and networks like LEAN. However, these resources do not cover the full spectrum of available services.[33] A commercial customer attempting to procure sustainable energy services for its facility, for example, would most probably have to submit separate applications to MTC for renewable electricity, to a gas utility for thermal

Navigating a Confusing System in Massachusetts

Even with the MassSAVE coordination for residential customers, residential incentives can still be confusing. As an example, a residential customer in Boston that purchases electricity and also uses oil to heat its home would rely on NSTAR to provide incentives for both electrical and thermal efficiency. KeySpan, the gas utility, offers significant incentives to upgrade to more efficient natural gas heating systems. If the customer switches to gas, the customer only has access to KeySpan's thermal rebates (although electrical rebates are still available through NSTAR). KeySpan's thermal rebates are actually lower than NSTAR's, however. NSTAR offers a 50% upfront rebate on insulation, while KeySpan only offers a 20% reimbursement. These kinds of discrepancies can lead to complicated opportunities for gaming, where a customer with oil heat should take NSTAR's richer thermal rebates first, before taking KeySpan's incentives for switching to more efficient gas. The SEU avoids this type of confusion and discrepancy.

[33] As noted above, MassSAVE is only for residential, not commercial customers

efficiency, and to an electric utility for electrical efficiency. The transaction and learning costs of this process can be a barrier to sustainable energy technology adoption. Moreover the lack of coordination across programs can cause significant customer confusion and create unnecessary programmatic discrepancies (See text box). Vermont and New Jersey have sought to partially address these problems through Efficiency Vermont and the NJCEP, but these organizations only coordinate energy efficiency, and renewable energy and energy efficiency, respectively. The SEU is unique in that it serves as a central clearing house and point of contact for *all* statewide sustainable energy services, regardless of fuel type.

4.2 Market-responsive Programs that Target All Fuels and All Customer Classes

As discussed above, one of the goals of Efficiency Vermont is to move away from a programmatic model that would exclude or inadequately serve certain classes of customer. The SEU has adopted a similar market-responsive stance, but has expanded it to include all fuel types and income levels. The SEU is empowered to provide customers with a comprehensive set of sustainable energy services, customized to customer needs, and targeting electricity, heating, and transportation. This approach allows the SEU to supply services that are not possible under more programmatic approaches. For example, SEU funds can be used to target reflective roofs on low-income households, whereas federal affordable energy programs cannot. Similarly, the SEU can support the simultaneous installation PV and solar water heating systems at sites that have high electrical and hot water demand. The MTC by contrast, is limited to providing incentives only for renewable electricity, and cannot support renewable heat. As a result, customers seeking to install technologies like solar water heating are not eligible for an incentive in Massachusetts.[34] Finally, the SEU has the flexibility to serve all income levels: programs are designed to cover the full incremental cost of sustainable energy services for its customers, but incentives be adjusted to more deeply subsidize affordable energy clients. In many states, the cost-share required under sustainable energy service programs prevents many low-income end-users from taking advantage of the SBC-funded incentives they help support. This is not the case under the SEU model.

4.3 A Financing Plan for Self-Sufficiency

As discussed in Section 3.4, the SEU's business plan requires initial working capital, but envisions that this capital will be paid back through revenue-generating activity. Moreover, revenues generated through REC sales and shared savings agreements will allow the SEU to continually expand the size and scope of its programs. This entrepreneurial business plan is unique among state clean energy service models, and allows the SEU to increase its budget without the need for legislation. This not only creates an environment under which new energy service businesses can flourish, but it also ensures reliable and continuous service provision. This kind of certainty is lacking under programs like Vermont's CEDF, which is supported through utility funds that have a predetermined sunset clause, or MTC's Green Affordable Housing Program, which is effectively a one-time funding allocation of funds to the affordable housing community.

4.4 Competitively Procured Independent Management Services

The SEU's financing plan is enabled by the fact that the programs are managed by competitively procured and independent entities. Energy efficiency and customer-sited renewable energy systems reduce utility sales and revenues. Utilities therefore lack an incentive to exceed energy efficiency

[34] KeySpan Energy Delivery offers rebates for solar heating applications (water heating and air heating) as part of its natural gas energy efficiency programs, but similar programs are not available statewide.

and renewable energy targets mandated by law. Shifting management to independent entities removes this sort of conflict and provides an incentive to *exceed* performance targets in order to be competitively positioned for subsequent rounds of contract renewal.

4.5 Comparison of Different Models for Sustainable Energy Service Delivery

The approach to program coordination, service provision, financing, and management for each of the four states is summarized and compared in Tables 5 and 6, below. The Tables also include information on the Cambridge Energy Alliance, which is similar in many ways to the Sustainable Energy Utility model. The primary differences between the SEU and the CEA are: 1.) the SEU has direct responsibility for ratepayer-funded clean energy funds, while the CEA is not affiliated with the MTC or utility funds; 2.) the SEU has public bonding authority which can be replicated by other public agencies, while the CEA is relying on charitable foundation support to provide working capital; 3.) the SEU is designed to cover the full incremental cost of sustainable energy services for all income levels, while cost share is required under the CEA model; and 4.) at least initially, the CEA is focused on electric load peak shaving as its principal goal, while the SEU is organized from the outset to address all fuels and all end uses.

Table 5. Program Scope & Coordination

State/City	Energy Efficiency		Renewable Energy	Affordable Energy
	Electricity and Gas	All Other		
Delaware	Sustainable Energy Utility			
Massachusetts	Utilities (programs distinct)	N/A	MTC	DHCD (federal) and Utilities (state)
New Jersey	New Jersey Clean Energy Program	N/A	New Jersey Clean Energy Program	NJ Department of Human Services
Vermont	Efficiency Vermont	N/A	Department of Public Service	Department of Children and Families
Cambridge, MA	CEA	Initially focused on electricity	CEA (initially focused on renewable electricity)	TBD

Table 6. Program Structure

State/City	Service Approach	Financing Plan	Program Management
Delaware	• All fuels targeted • Flexible programs • Incremental cost covered	• Self-sufficient through revenue generating activities • Initial funding from bonding	Third party
Massachusetts	• Electricity and gas targeted • Rigid programs	• Renewable SBC • Energy efficiency SBC	• Utilities for efficiency • Quasi-state for renewable electricity
New Jersey	• Electricity and gas • Rigid programs	• Renewable + Efficiency SBC • Low-income SBC	Third party
Vermont	• Electricity, gas, some heat targeted • Flexible programs	• Efficiency and low-income SBC • MOU with utility for RE	Third party
Cambridge, MA	• All fuels targeted • Flexible programs	• Self-sufficient through revenue generating activities • Initial funding provided by foundations	Third party

4.6 A Policy Framework for Customer-Sited Sustainable Energy Services

The SEU model benefits from the existence of other policies designed to support customer-sited sustainable energy services. In addition to public benefit funds, the most significant polices for customer-sited renewable energy are the renewable portfolio standard and net metering. There are also a range of policies that support alternative fuel vehicle ownership. The policy framework for all four states are summarized below and in Table 7.

Renewable Portfolio Standards: As discussed in Section I, renewable portfolio standards (RPS) have diffused rapidly around the country during the past few years. All RPS policies set targets for achieving a certain percentage or renewable energy[35] by a certain date, but the mechanisms for meeting these targets vary widely from state to state. Although RPS is generally a supply-side policy, most states allow distributed generators to participate, and ten states have requirements within their RPS to support customer-sited resources.[36] Of the states discussed above, Vermont has a voluntary goal that utilities supply load growth from 2005 to 2012 through power purchase agreements with new renewable generators, Massachusetts has a requirement that utilities supply 4% of electricity sold in the state from renewable sources by 2009, and New Jersey has a mandate for 22.5% by 2021. Distributed generators are not permitted to participate under Vermont's RPS. Distributed generators are allowed to participate in the Massachusetts RPS, but receive no preferential treatment under the law. As discussed in Section 2.2.1, New Jersey's 2% solar RPS tier targets customer-sited PV and has driven very rapid PV market growth during past few years. The SEU Task Force recommended that Delaware harmonize its RPS with that of New Jersey, and in 2007, Delaware increased its RPS from 10% by 2019 to 20% by 2019 and established a 2% photovoltaic requirement. In addition Delaware include solar heating as an eligible resource under its main RPS tier.

Net Metering: Net metering is a policy that permits onsite renewable energy owners to receive credit from utilities for excess electricity that they generate. Net metering is available in 44 states and the District of Columbia. In Vermont, systems up to 15 kW in size are eligible for net metering, and farm-based systems up to 150 kW are eligible. In Massachusetts, systems up to 60 kW are eligible, and in New Jersey, systems up to two megawatts are eligible for net metering. Delaware previously had a system cap of 25 kW for its net metering policies, but the SEU Task Force again recommended that the state harmonize its policy with that of New Jersey. In 2007, Delaware passed legislation that expanded the state's net metering cap to two megawatts for investor-owned utilities and 500 kW for cooperative and municipal utilities

Clean Vehicle Incentives

In addition to policies to support renewable electricity many states have also established policies to support alternative fuels and efficient vehicles.[37] Vermont and Massachusetts currently have no incentives for alternative fuel vehicles, although the Massachusetts legislature is considering bills that would award tax deductions, HOV lane driving rights, and parking discounts to alternative fuel vehicles. In New Jersey, hybrid vehicles may use the HOV lanes on the NJ Turnpike regardless of number of passengers inside, and The AFV Rebate Program, and local governments can get rebates

[35] Or capacity in the case of Texas and Iowa.
[36] AZ, CO, DE, MD, NV, NH, NJ, NM, NY, PA. Information available at http://www.dsireusa.org
[37] See US Department of Energy (2007). Alternative fuels data center: State & Federal incentives & laws. Available at: http://www.eere.energy.gov/afdc/laws/incen_laws.html

of up to $12,000 to purchase alternative fuel vehicles or hybrids, or convert conventional fuel vehicles to alternative fuels. In addition to the programs that will be available through the SEU, Delaware waives sales tax on the purchase of alternative fuels. Grants for biodiesel are also available on a case-by-case basis from the non-profit Delaware Soybean Board.

Table 7. Policies to Support Sustainable Energy Services in DE, MA, NJ and VT

State	RPS	Net Metering	Clean Vehicle Services
Delaware	• 20% by 2019 • 2% solar electricity • DG eligible for main tier	• 2 MW (IOUs) • 500 kW (coops and munis)	Alternative fuel sales tax exemption
Massachusetts	• 4% by 2009 • DG eligible	60 kW	None
New Jersey	• 22.5% by 2021 • 2% solar electricity • DG eligible for main tier	2 MW	• HOV rights for hybrids • Rebates for municipal fleets
Vermont	• Load growth between 2005-2012 • DG ineligible • Voluntary goal	• 15 kW • 150 kW for farms	None

V. A SUSTAINABLE ENERGY UTILITY FOR THE DISTRICT OF COLUMBIA

5.1 Building from Organizational Strength

The District of Columbia is well positioned to create a Sustainable Energy Utility. The District already supports sustainable energy services, energy efficiency and affordable energy options. It has done this by relying on utility- and government-administered programs, similar to Massachusetts and New Jersey's models (prior to that state's reorganization of its service delivery mechanisms).

In 2005, the District established a renewable portfolio standard of 11% by 2022, and renewable energy credits for its main tiers are currently being actively traded.[38] The District's RPS also has a requirement that 0.005% of its electricity must derive from solar energy by 2007, rising to 0.386% in 2022. This solar tier has the potential to rapidly expand DC's solar electric market, in combination with other renewable energy policies. The District also established net metering for renewable electricity systems up to 100 kW in 2005, and the DC Public Service Commission approved Pepco's net metering tariff in January 2007.

Perhaps most significantly for a future SEU, the District created the Reliable Energy Trust Fund (RETF) through its restructuring legislation in 1999. The RETF is funded by a surcharge on every kilowatt-hour of electricity sold within the City. The surcharge is set annually by the DC Public Service Commission, and can be set as high as $0.002/kWh, or as low as $0.0001/kWh. The RETF was authorized to collect up to $8 million annually from 2001-2004, but the PSC only allowed the fund to collect $2 million each year. In 2006-2006, the Fund was authorized to collect between $9 million and $23 million annually, and collected $9.5 million and $10.5 million in 2005 and 2006, respectively. The Fund will also collect $10.5 million in 2007. The District Department of the Environment is responsible for programmatic and financial management of the Fund, as well as evaluation.

The District Department of Environment serves as a central point of contact for the sixteen programs supported by the Fund. These programs encompass grants for institutional energy audits, rebates for solar energy systems and energy efficiency, low-income weatherization and LIHEAP support, and numerous targeted outreach and education programs.[39] By focusing on energy efficiency, renewable energy, and affordable energy services, the RETF is already more coordinated that most of the state programs around the country.

The current policy framework in the District of Columbia lays a solid foundation for a Sustainable Energy Utility. In evaluating a transition to an SEU structure, the District will need to consider whether to add transportation services and other fuels, whether there are programmatic holes that could be addressed through a more flexible approach to incentive design, whether to establish a third party management structure, and how best to design an SEU for financial self-sufficiency.

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[38] See Evolution Markets LLC (2007, August). Monthly Market Update: REC Markets. Available at http://www.evomarkets.com/mmu/

[39] District Department of Environment, Peach, G., Freeman, L., & The Polling Company. (2006). *Reliable Energy Trust Fund funded programs: Program interim evaluation report*. Washington, DC: District Department of Environment. Prepared for the Washington, DC Public Service Commission.

5.2. Building Sector Energy Sustainability – A Key Challenge

Because the District of Columbia is a densely settled municipality, a large share of its energy use derives from the characteristics of its building stock and equipment, as well as the nature and volume of activity in its buildings. One method of assessing the available energy efficiency potential in the District is to compare electricity intensity for its residential and commercial/public buildings with other jurisdictions. Given the District's economic, social and spatial features, residential building electricity intensity is readily measured as electricity use (in kWhs) per unit of residential floor area (in the U.S., this is measured in square footage). Similarly measuring electricity intensity for commercial/public buildings would be appropriate, but data on commercial/public floor area is not available for many jurisdictions. A reasonable proxy is electricity use per commercial/public sector employee – a widely available statistic.[40] Building energy performance measured by the above indices can be calculated for Washington, DC and compared with jurisdictions with well-documented, well-performing energy efficiency programs, namely, California, Connecticut, Massachusetts, New Jersey, New York and Vermont.[41] To ensure completeness in the comparative analysis, two states in the Mid-Atlantic region not previously ranked highly for their energy efficiency efforts – Delaware and Pennsylvania – are included.

To enable this comparison, an econometric model was constructed to predict residential electricity intensity as a function of sector electricity prices, sector per capita income, weather conditions, and policy/program infrastructure. Residential electricity consumption and price data were gathered from the U.S. Energy Information Administration. Residential income data were obtained from the U.S. Bureau of Economic Analysis for the same period. Floor area for each jurisdiction was calculated using the U.S. Energy Information Administration residential energy consumption survey data series and housing stock data for each jurisdiction reported by the U.S. Bureau of the Census. Weather data (heating and cooling degree days) for each jurisdiction were taken from the U.S. National Oceanic and Atmospheric Administration's records.[42]

Yearly data for the period 2001-2005 for each jurisdiction was collected and entered into the econometric model. In this manner, trends rather than single points in time are investigated, enabling statistically robust estimates of the model's parameters.

The resulting model of electricity intensity of residential buildings in the nine jurisdictions performed very well. It successfully explains over 99% of the variance in electricity intensities among the nine jurisdictions. All estimates of the explanatory variables are robust and all act in the expected manner.[43]

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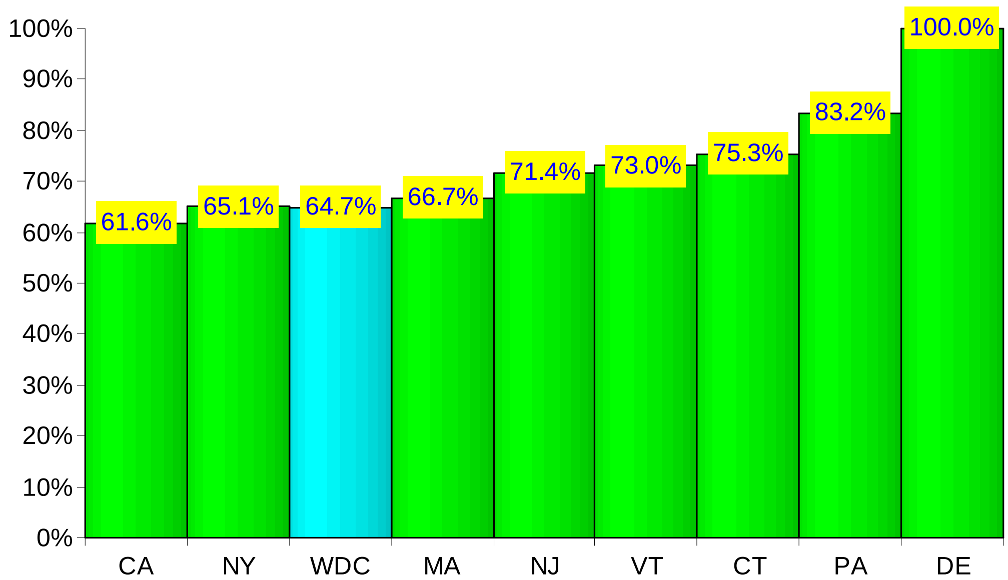
[40] Because building activity in this sector is significantly related to the size of staff housed in each building, this alternative measure can offer a valid means of estimating building electricity intensity.

[41] See the Delaware SEU Task Force *Briefing Book*, Sections F and H, and Appendix A for details. Available at: http://www.seu-de.org/docs/SEU_Full_Report.pdf

[42] For residential electricity consumption and price data, see: Energy Information Administration (EIA). 2006. *Electric Power Annual 2005 - State Data Tables.* For income data, see: Bureau of Economic Analysis (BEA). 2007. *Regional Economic Accounts*. For weather data, see: National Oceanic and Atmospheric Administration. 2007. *Historical Climatological Series 5-1* and *Historical Climatological Series 5-2.*

[43] See Appendix 4 at the conclusion of this report for statistical details regarding the model's performance. While a version of the model which included residential electricity prices was examined, this variable proved to add little to the predictive strength of the model and was therefore removed in order to increase statistical accuracy. Statistics for both

Using the model's results and setting Delaware's electricity intensity at 1.000, we can numerically compare the effects of policy and program commitments *after* adjusting for price, income and weather differences among the nine jurisdictions (Figure 17).



Prepared for Washington DC by the Center for Energy & Environmental Policy.

Figure 17: Comparison of Residential Building Sector Electricity Intensities (DE = 1.000)

The results are instructive. The District's residential electricity intensity compares favorably with well-known pioneers in the field such as California and New York. The reason is clear: as a municipality, Washington, DC has a higher proportion of its housing stock sharing common walls (this can be a boon to building energy efficiency) and it has the smallest average building area per household. These characteristics significantly reduce energy use per square foot in the residential sector regardless of policy commitments. Importantly, if average floor area is artificially increased by changing the composition of the City's housing stock so that the jurisdiction appears more suburban, the District's comparative efficiency quickly falls.

This advantage should be used to guide policy. The City's housing stock provides important benefits for sustainable energy development but it also means that an SEU in the District must focus on energy saving measures appropriate to this asset. An obvious implication in this vein is the need to address envelope quality for older housing stock which may offset efficiency features such as lower floor area per household and higher incidence of common walls with poorly insulated walls and ceilings and comparatively higher air leaks. Weatherization and affordable energy services would seem to be important performance targets for the District to maintain its low electricity intensity ranking among residential sectors.

A comparable analysis of the commercial/public building sectors of the nine jurisdictions finds Washington, DC in a less attractive standing in the rank order. Delaware has the least energy

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versions of the model are provided in Appendix 4 – see variations (1) and (2) of the residential building sector econometric model. The stability of the rankings across the two variations of the model suggests it is statistically robust.

efficient commercial/public building stock, but the District and the state are statistically indistinguishable. Once more, the model provides a robust estimate of electricity intensity, explaining 92% of the variance in the data. Differences in commercial sector electricity prices and weather are not found to be statistically significant.[44] Commercial building construction tends to be a regionally competitive market and commercial electricity prices, especially along the East Coast, tend to differ little as a result. Also, multistory commercial/public buildings generate heat from their operations that can be more significant than variations in outdoor temperature, thereby lessening the importance of weather differences.

In this sector, New York, Connecticut, Massachusetts and California are leaders in electricity efficiency, using 75-80% of the electricity that Washington, DC and Delaware buildings consume per employee to serve customers.

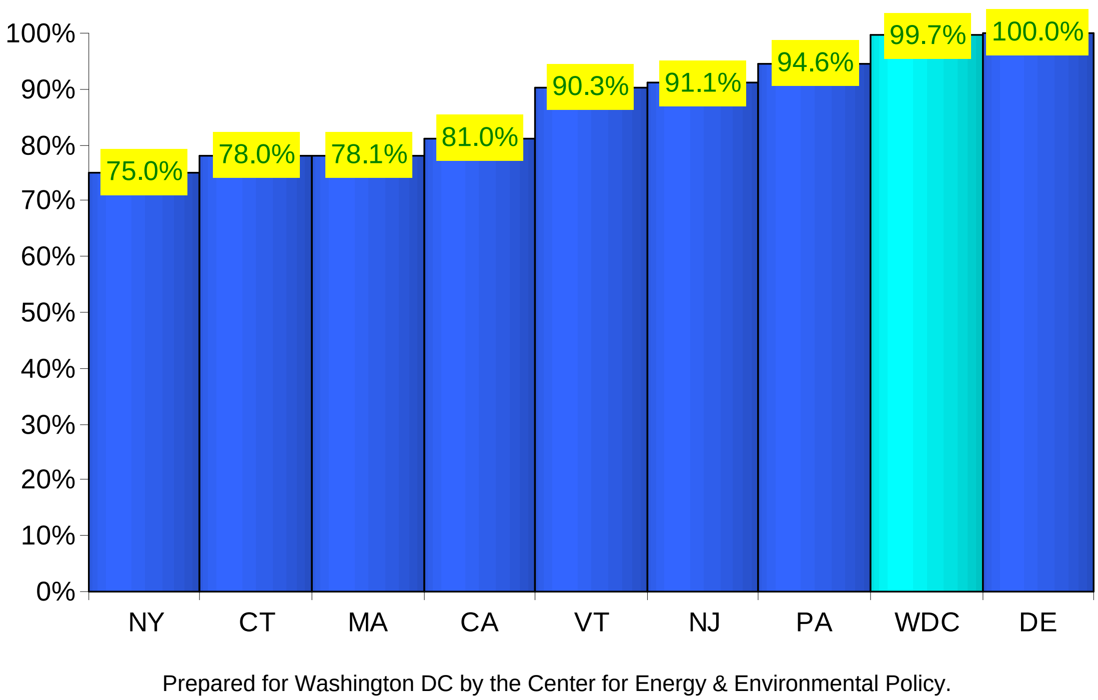

Figure 18: Comparison of Commercial/Public Building Sector Electricity Intensities (DE = 1.000)

Here again, the results offer important guidance for policy. The local economy of Washington, DC is overwhelming service-oriented, and its commercial/public building stock reflects this. It is common for this building stock to use a significant amount of energy on heating, cooling, lighting and motor loads. Well-designed programs to address these sources of electricity demand can pay important dividends in lowering the City's electricity intensity. Decisions regarding these end uses can involve equipment with lifetimes of 15 or more years. If efficiency is made a competitive option, a multi-year stream of benefits can be garnered. But if these decisions do not consider energy savings, the City will be saddled with the cost of lost opportunities. This point is even more germane regarding envelope quality, as most commercial/public buildings will stand for 60 or more years. Both the new construction market and the market for repairs and remodeling in this sector

[44] Compare versions (1) and (2) of the commercial/public building sector econometric model in Appendix 4. The stability of the rankings across the two variations of the model suggests it is statistically robust.

need to be high-priority targets for performance upgrades. A District SEU can target funds and programming to these high gain applications.

5.3. SEU Performance Potential for Washington DC – Setting Performance Targets

A detailed inventory of energy efficiency and distributed renewable energy opportunities is needed to properly asses the potential impact of an SEU initiative. But if typical measures widely used by the four jurisdictions discussed in Section II above are marshaled to address city building electricity and natural gas use, a preliminary estimate of impact can be obtained.

For this purpose, we assume the following:

- The District's GDP will continue to grow as it has for the past five years;
- Electricity and natural gas use associated with economic growth will continue to increase in the District as they have for the past five years, except for expectable technology improvements (which modestly reduce the rate of demand growth);[45]
- The District launches an SEU in 2008 with the aim of reducing residential and commercial/public building use by 30% by 2015;[46]
- By 2015, the District's SEU has reached a 33% participation rate for its buildings-focused programs; [47]
- The District's RPS, including its solar carveout, is implemented according to schedule and entirely offsets conventional electricity and natural gas use.

With these assumptions, and seven years of District GDP, electricity and natural gas use, and carbon emissions[48] data to establish tends, it is possible to project the potential energy and carbon impacts of a Washington, DC SEU.

The SEU can be anticipated to create real, measurable, and verifiable energy savings. Without the SEU or other significant programming in place, conventional electricity and natural gas use in the District is likely to grow by 32 trillion Btu through 2020. This represents a 1.4 times increase from the 2004 level of 72 trillion Btu. Through SEU programs, *the District will be able to reduce building use of conventional fuels by 11 trillion Btu, flattening the building sector's conventional energy use by 2012, despite continued economic growth of 2.5-3.5% per year*. In this respect, the SEU will have enabled the City to finance economic growth at 0% energy 'interest'.

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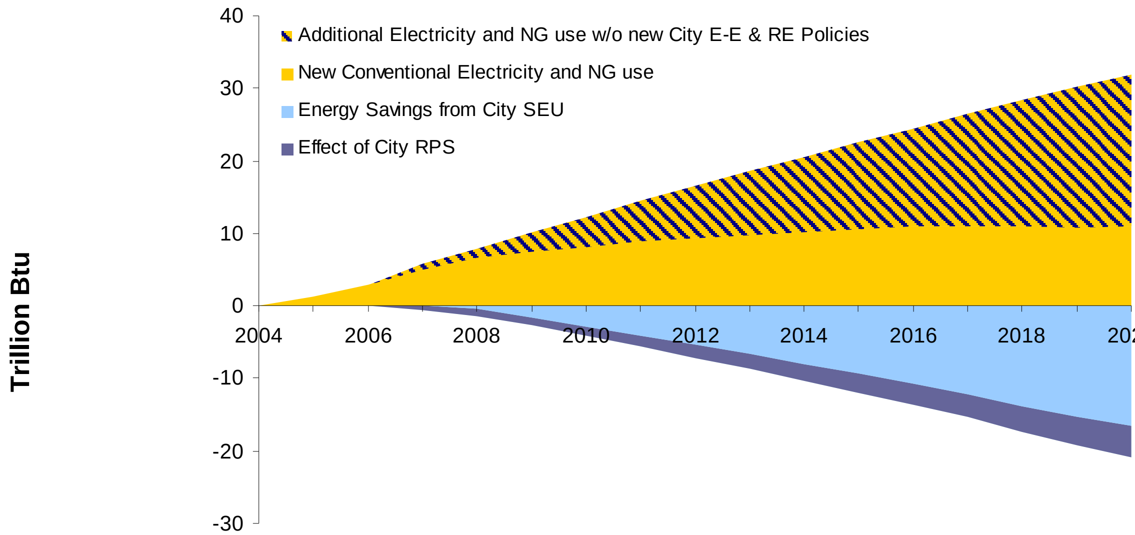
[45] Economists sometimes refer to this phenomenon as 'automatic energy efficiency improvements' because a measure of continuous technology change is considered endogenous to the modern economy. Estimates of the U.S. AEEI very but are typically in the range of 0.5-1.0% per year. See Hassol, S.J., Strachan, N.D., Dowlatabadi, H. 2002. Energy efficiency: a little goes a long way. In: Watts, R.G. (Ed.), *Innovative Energy Strategies for CO_2 Stabilization*. Cambridge University Press, Cambridge, pp. 87–121. A deduction for AEEI of 0.75% per year is made for the impact projections for Washington, DC.

[46] A 30% saving in building energy use by 2015 conforms with research conducted by CEEP on the programs of the 6 pioneer states investigated by the Delaware SEU Task Force. See the Task Force's Briefing Book, available at: http://www.seu-de.org/docs/SEU_Full_Report.pdf

[47] This participation rate may be conservative, if the experience of states like New York, Connecticut, Massachusetts, Vermont and California are replicated for seven years of programming.

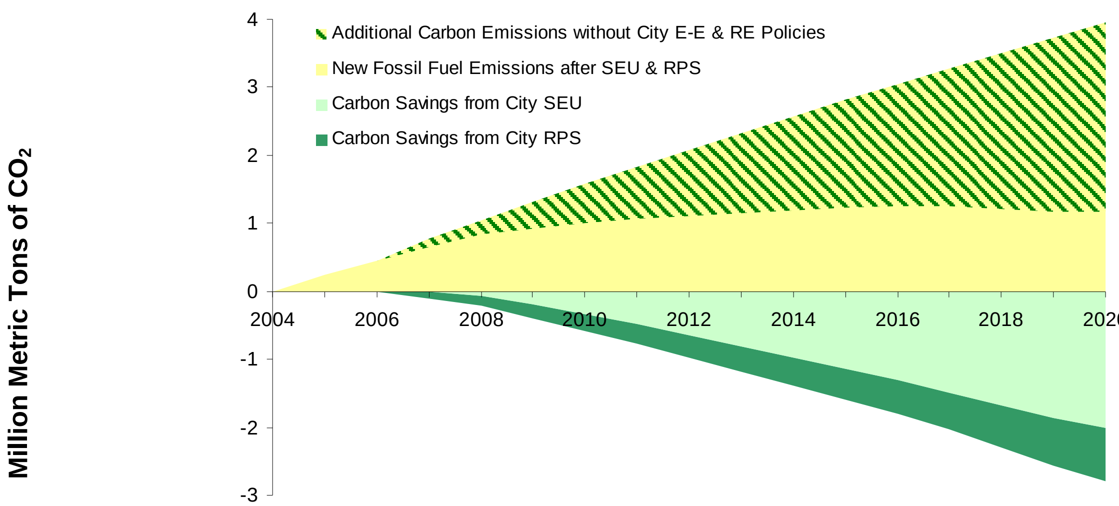
[48] Carbon emissions for District electricity use are based on the current PJM fuel mix.

CO_2 savings are greater because District emissions are growing more quickly than energy use.[49] An SEU can offset *2.8 million metric tons of CO_2 emissions by 2020*. This represents a 37% offset from the 2020 business-as-usual forecast of District emissions. By 2017, District CO2 emissions are falling yearly (see Figure 20). Again, this occurs while the District economy maintains healthy economic growth. The impact on the District's Carbon Footprint is significant by any measure. Importantly, it can be realized without tax or utility rate increases – a promise that few, if any, environmental or energy policy options can offer change on this scale.



Prepared for Washington DC by the Center for Energy & Environmental Policy.

Figure 19. Potential Energy Impacts of a Washington DC Sustainable Energy Utility Focused on Electricity and Natural Gas Consumption by Buildings



Prepared for Washington DC by the Center for Energy & Environmental Policy.

Figure 20. Potential Carbon Impacts of a Washington DC Sustainable Energy Utility Focused on Electricity and Natural Gas Consumption by Buildings

[49] This is due to the higher use of coal-based electric power as PJM annexes transmission operations in West Virginia and the Ohio Valley.

VI. MOVING FORWARD WITH AN SEU MODEL FOR THE DISTRICT OF COLUMBIA

Washington, DC provides a unique challenge and opportunity to develop a meaningful sustainable energy policy and program. We are very optimistic about the potential for the City to be a leader in local efforts to balance the goals of energy affordability, economic development and environmental sustainability. The decision by nine Members of the Council of the District of Columbia to co-sponsor legislation[50] to create a Sustainable Energy Utility is indicative of the will to lead in this field.

In support of the City's efforts, we offer below suggestions for building and sustaining leadership in this burgeoning area of innovative policy and program development.

6.1 Forming a Task Force

The DDOE may wish to consider formation of a Task Force initially to evaluate sustainable energy services potential by fuel and end use sector. Its purpose could evolve to assist the Department in examining policy issues, program needs and barriers, and implementation challenges on an ongoing basis.

The Task Force could include representatives of the Mayor's Office, Council Members, DDOE representatives, other public sector representatives, industry officials, community leaders and research experts. The District's unique role as home to prominent sustainable energy organizations and leaders in the country might be exploited by creating an Advisory Board to tap the reservoir of ideas and advice not often found elsewhere.

6.2 Creating a Research Plan

It is suggested that a detailed research plan be prepared in order to identify near-, medium-, and long-term targets and markets for sustainable energy development in the District. The residential and commercial building stock offer exceptional opportunities and special challenges to realize urban sustainability. The District is also blessed with a high quality building design community and a well-performing weatherization program. Linking all of the City's assets in a systematic way should be a focal question for the research plan.

In defining the parameters of a District Sustainable Energy Plan, specific attention should be given to all relevant fuels and associated technologies for energy delivery. One area of investigation might additionally involve an expansion of the Green Building Requirement program beyond its current limited target of new construction greater than 50,000 square feet. Another focus might be a High Efficiency Rowhouse Program that considers white roof technologies and solar hot water and electricity applications.

The key outcome of the research plan would be analytically based targets for efficiency gains, renewable energy utilization, and affordable energy development. Green employment and environmental sustainability goals can also be integrated into a recommended targets protocol.

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[50] The legislation, entitled "Clean and Affordable Energy Act of 2007," is authored by Council Member Mary Cheh (assisted by DDOE's Director and staff).

In order to receive a quality bond rating, the District's SEU proposal will need to demonstrate an attractive return on investment to potential bondholders. Projections of revenues based on shared energy savings renewable energy credits (RECs) will be an essential component of the research plan, along with an ability to show balanced use of trust funds to improve program and project performance.

In sum, a research plan can furnish the District with an analytically based set of achievable targets and strategic markets, a detailed map of SEU financeability, and a useful guide for present and future policy decision making.

6.3 Developing an Organizational Model that Learns from other Jurisdictions

This report has provided a detailed description of several organizational models for sustainable energy service delivery. Based on experience in pioneer jurisdictions, a diagram of an SEU model for the District is sketched (Figure 21). In this model the DDOE would implement and oversee a competitive process to appoint a Contract Administrator (CA). The CA would administer the SEU and supervise implementation contractors delivering the District's sustainable energy services. The effort to create a one-stop shop through the CA is vital in avoiding confusion and redundancy that might otherwise discourage participation. The CA would report to a Board composed of District policy authorities, experts and community leaders. An independent Fiscal Office would ensure proper monitoring and verification of all financial transactions.

Based on findings from the research plan and in consultation with other jurisdictions and experts in the District, a more detailed organizational model can be developed by the Task Force.

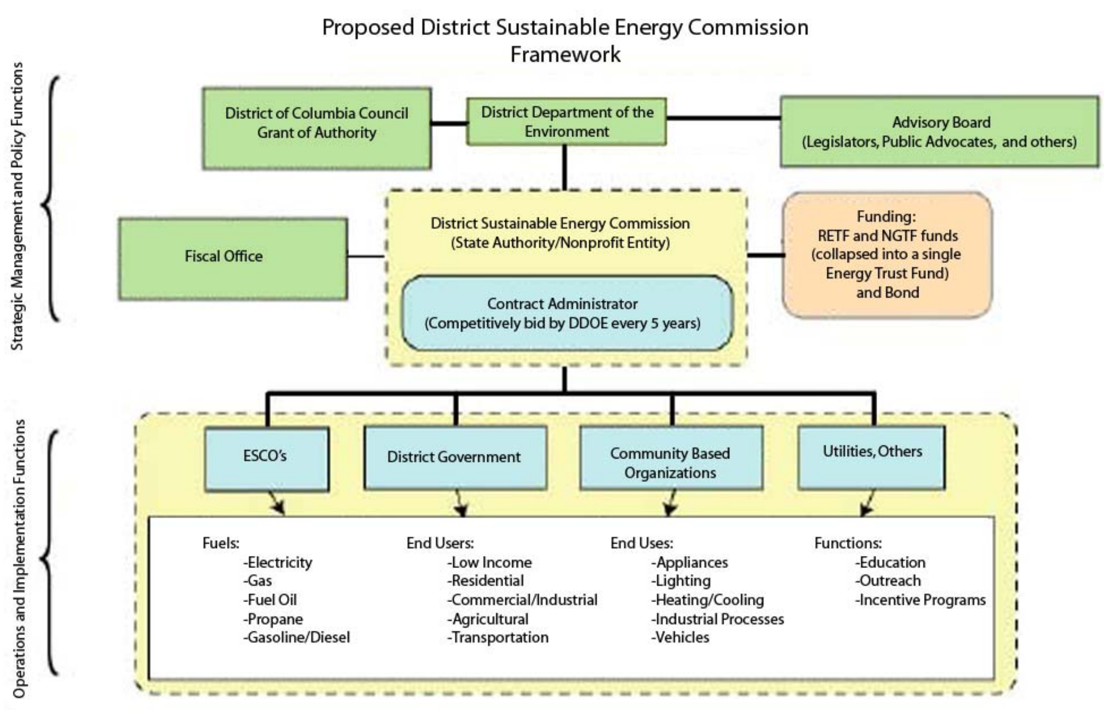

Figure 21. Proposed District Sustainable Energy Commission Framework

6.4 Defining a Policy Agenda

As the District moves forward with its SEU planning, additional policy priorities may be identified. For example, while reviewing the District's Net Metering Law and targets for renewable energy, it may be reasonable to suggest an increase in renewable energy system capacities for residential and commercial buildings. Revision of building codes and the possible adoption of an energy efficiency building standard with associated energy efficiency credits might merit attention by the Mayor's Office and Council.[51] A DDOE Task Force could assist District Government on an ongoing basis to assess and develop policy needs.

6.5 Harvesting Energy Innovation

As the national capitol, the District of Columbia is poised like no other local jurisdiction to provide national leadership in the quest for energy sustainability. As home to leading sustainable energy organizations, with its world-class building design community, and with one of the country's well-performing, community-based weatherization programs, the assets for leadership exist. Through recent initiatives creating an SEU and a Green Jobs program, the will and ability to put the District onto a path of urban innovation is evident. A timely opportunity awaits action for Washington, DC to harness the strengths of this city's communities, businesses and cultural tapestry, and become a model for local energy innovation.

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[51] For a detailed discussion of this option, please see the following: Hamrin, J., E. Vine and A. Sharick (2007). The Potential for Energy Savings Certificates (ESC) as a Major Tool in Greenhouse Gas Reduction Programs (Center for Resource Solutions, May). Available at http://www.resource-solutions.org/lib/librarypdfs/Draft_Report_ESC_V12_cleanFINAL_5-24-07.pdf; California Energy Commission (2007). Integrated Policy Report, (November), pg. 94-95. Available at: http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CTF.pdf; and California State Legislature (2007). Assembly Bill 1065 (amending Title 24). Available at: www.leginfo.ca.gov/pub/07-08/bill/asm/ab_1051-1100/ab_1065_bill_20070416_amended_asm_v98.pdf.

APPENDIX 1

Estimates of Annual Electricity Savings for Targeted Residential Appliances

Part a. Residential Energy Efficiency Potential - Targeted Appliance Turnover Estimates

	Appliance Type	Delaware Appliance Stock: Total % of households with 1 or more appliances[1]	Delaware Appliance Stock: Estimated Total No. of Appliances Based on No. of Delaware Households (assumes 1 per household)	Existing Appliance Sales Rate: Average National Replacement & New Sales Rate[1]	Existing Appliance Sales Rate: Estimated Delaware Sales for Replacement & New Sales	Existing Appliance Sales Rate: % of 2004 Sales that are Energy Star rated[2]	Existing Appliance Sales Rate: Targeted Energy Star Replacement rate (%)	Existing Appliance Sales Rate: Incremental Energy Star Replacement (no. of units)
Electricity	Refrigerators	100%	298,736	10%	30,551	30%	60%	9,165
	Clothes Washers	85%	253,926	10%	26,644	26%	50%	6,395
	Central AC w/o Heat Pump	51%	152,355	12%	18,187	33%	66%	6,002
	Central AC w/ Heat Pump	8%	23,899	17%	3,989	33%	66%	1,316
	Freezers	33%	98,583	7%	7,254	30%	66%	2,611
	Room AC	14%	41,823	32%	13,367	30%	66%	4,812
	Water Heaters - Electric	69%	206,128	11%	23,108	30%	66%	8,319

1. Based on EIA Residential Energy Consumption Survey, South Atlantic Region, 2001.
2. Based on U.S. DOE Energy Star and EIA.

Part b. Residential Energy Efficiency Potential - Targeted Appliance Turnover Estimates

	Appliance Type	Increase In Old Appliance Turnover: Approximate No. of Appliances > 10 years old (i.e. likely to be replaced)[3]	Increase In Old Appliance Turnover: Targeted Increase in Replacement Rate (%)	Increase In Old Appliance Turnover: Targeted Incremental Replacements, Units > 10 years old (no. of units)	Annual Energy Savings: Total Targeted Energy Star Sales per year	Annual Energy Savings: Average Annual Electricity Savings per unit (kWh) (difference between E-Star and >10yr-old appliance)[4]	Annual Energy Savings: Total Annual Energy Savings (kWh/yr)
Electricity	Refrigerators	86,633	13%	38,836	48,001	750	36,000,751
	Clothes Washers	50,785	13%	33,010	39,405	815	32,115,057
	Central AC w/o Heat Pump	39,612	13%	19,806	25,808	1,794	46,299,326
	Central AC w/ Heat Pump	6,214	13%	3,107	4,423	1,511	6,683,491
	Freezers	16,759	13%	12,816	15,427	609	9,395,091
	Room AC	8,365	13%	5,437	10,249	385	3,945,915
	Water Heaters - Electric	80,390	13%	26,797	35,116	375	13,168,340

3. Based on EIA Residential Energy Consumption Survey, South Atlantic Region, 2001.
4. Based on Database for Energy Efficiency Resources (DEER) California, EIA Buildings Energy Data Book 2005, Energy Star, U.S. DOE.

Prepared for the Delaware Sustainable Energy Utility Task Force by the Center for Energy & Environmental Policy.

APPENDIX 2

Estimated Revenues from a 25% Aggregation Fee Assessed by the SEU on its Distributed Renewable Energy Investments

	Year	Installed Capacity From Rebate Program (kW)	Cummulative Capacity From Rebate Program (kW)	Cummulative Electricity From Rebate Program (MWh)	REC Price ($/MWh)	REC Sales ($)	SEU Aggregation Fee	SEU REC Income ($)
PV RECs	2008	80	700	1,002.40	$200	$200,480	0.25	$50,120
	2009	178	878	1,257.51	$200	$251,502	0.25	$62,876
	2010	315	1,193	1,708.65	$200	$341,729	0.25	$85,432
	2011	2,127	3,320	4,754.28	$180	$855,770	0.25	$213,943
	2012	3,741	7,061	10,110.92	$170	$1,718,856	0.25	$429,714
	2013	7,617	14,678	21,018.78	$150	$3,152,816	0.25	$788,204
	2014	11,992	26,670	38,191.90	$125	$4,773,987	0.25	$1,193,497
	2015	16,683	43,354	62,082.24	$100	$6,208,224	0.25	$1,552,056
Sub-totals		42,734				$17,503,365		$4,375,841
	2016	20,778	64,131	91,836.00	$75	$6,887,700	0.25	$1,721,925
	2017	27,332	91,463	130,975.58	$50	$6,548,779	0.25	$1,637,195
	2018	39,679	131,143	187,796.12	$50	$9,389,806	0.25	$2,347,452
	2019	43,897	175,039	250,656.51	$25	$6,266,413	0.25	$1,566,603
Totals		174,419				$46,596,063		$11,649,016

	Year	Installed Capacity From Rebate Program - Non-PV Renewables (MW)	Cummulative Capacity From Rebate Program - Non-PV Renewables (MW)	Cummulative Electricity From Rebate Program (non-PV RE) (MWh)	REC Price ($/MWh)	REC Sales ($)	SEU Aggregation Fee	SEU REC Income ($)
Wind, Geothermal, Solar Thermal and Other RE RECs	2008	7	20	52,727.80	$35	$1,845,473	0.25	$461,368
	2009	14	34	89,840.13	$35	$3,144,404	0.25	$786,101
	2010	19	53	138,888.70	$35	$4,861,105	0.25	$1,215,276
	2011	22	75	196,320.08	$30	$5,889,603	0.25	$1,472,401
	2012	25	100	262,567.46	$30	$7,877,024	0.25	$1,969,256
	2013	28	128	336,881.62	$30	$10,106,449	0.25	$2,526,612
	2014	31	159	419,159.99	$25	$10,479,000	0.25	$2,619,750
	2015	34	194	509,357.59	$25	$12,733,940	0.25	$3,183,485
Sub-totals		181				$56,936,996		$14,234,249
	2016	38	231	607,964.26	$20	$12,159,285	0.25	$3,039,821
	2017	40	272	713,611.87	$15	$10,704,178	0.25	$2,676,044
	2018	51	323	848,383.90	$15	$12,725,759	0.25	$3,181,440
	2019	56	379	995,389.84	$10	$9,953,898	0.25	$2,488,475
Totals						$102,480,117		$25,620,029

Note: Installed capacity of PV systems is based on the proposed Solar Carveout to be submitted as an amendment to the State's current RPS policy. Installed capacity of non-PV renewable energy systems is based on the proposed upgrade of the RPS schedule, also to be submitted as an amendment to SB 161.

Prepared for the Delaware Sustainable Energy Utility Task Force by the Center for Energy & Environmental Policy.

APPENDIX 3

An SEU Prospectus with Tax Exempt Bonding

	Net SEU Revenues (before Debt Service)	SEU Bond Debt Service								Net SEU Revenue (after Debt Service & Bond Retirement)	SEU Bottom Line
Year	Balance of SEU Costs and Revenues	Tax Exempt Bond Floats		Annual Interest Cost for Bond 1 (Yield = 5.20%)	Annual Interest Cost for Bond 2 (Yield = 5.0%)	Annual Interest Cost for Bond 3 (Yield = 4.90%)	Annual Interest Cost for Bond 4 (Yield = 4.90%)	Bond Management	Debt Totals	SEU Balance + Bond Interest Cost + Bond Principal	Cumulative Cash Flow
2008	-$4,013,569	Bond 1: 5 yr Maturity Yield = 5.20%	$7,700,000	-$400,400				-154000	-$554,400	$3,132,031	$3,132,031
2009	-$2,483,161			-$400,400					-$400,400	-$2,883,561	$248,469
2010	$1,017,936	Bond 2: Yield = 5.00%	$0	-$400,400	$0			$0	-$400,400	$617,536	$866,006
2011	$390,910	Bond 3: Yield = 4.90%	$0	-$400,400	$0	$0		$0	-$400,400	-$9,490	$856,515
2012	$2,854,090	Bond 4: 8 yr Maturity Yield = 4.90%	$15,300,000	-$400,400	$0	$0	-$749,700	-$306,000	-$1,456,100	$8,997,990	$9,854,505
2013	-$1,354,313				$0	$0	-$749,700		-$749,700	-$2,104,013	$7,750,492
2014	-$3,104,557				$0	$0	-$749,700		-$749,700	-$3,854,257	$3,896,235
2015	-$2,830,012				$0	$0	-$749,700		-$749,700	-$3,579,712	$316,523
Sub-totals	-$9,522,677			-$2,002,000	$0	$0	-$2,998,800	-460000	-$5,460,800	$316,523	
2016	$3,001,262				$0	$0	-$749,700		-$749,700	$2,251,562	$2,568,084
2017	$3,089,776				$0	$0	-$749,700		-$749,700	$2,340,076	$4,908,161
2018	$5,120,989				$0	$0	-$749,700		-$749,700	$4,371,289	$9,279,450
2019	$10,232,470				$0	$0	-$749,700		-$749,700	-$5,817,230	$3,462,220
Totals	$11,921,820			-$2,002,000	$0	$0	-$5,997,600	-460000	-$8,459,600	$3,462,220	

All Bond Interest	-$7,999,600
Total Bond Float	$23,000,000

* Revenue Assumptions
$25 million in Sustainable Energy Special Purpose Bonds are authorized.
GEF mill rate is doubled.
Revenues from 33% Shared Savings Agreements for energy efficiency investments are received as projected.
REC revenues are received as projected based on declining price schedule.

Prepared for the Delaware Sustainable Energy Utility Task Force by the Center for Energy & Environmental Policy.

APPENDIX 4

Statistical Detail for the Residential Building Sector Electricity Intensity Model (1)

Method: Least Squares

Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Per Cap Income	0.487086	0.057430	8.481368	0.0000
Degree Days	0.139540	0.033956	4.109475	0.0002
D1 (CA)	5.346539	0.270242	19.78425	0.0000
D2 (NY)	5.402276	0.268234	20.14015	0.0000
D3 (WDC)	5.395861	0.288502	18.70302	0.0000
D4 (MA)	5.427055	0.272019	19.95104	0.0000
D5 (VT)	5.495553	0.274349	20.03125	0.0000
D6 (NJ)	5.516732	0.248895	22.16491	0.0000
D7 (CT)	5.547975	0.278038	19.95400	0.0000
D8 (PA)	5.647667	0.271700	20.78640	0.0000
D9 (DE)	5.831834	0.28068	20.77767	0.0000

R-squared	0.991048	Mean dependent var	8.294928
Adjusted R-squared	0.988415	S.D. dependent var	0.170838
S.E. of regression	0.018388	Durbin-Watson statistic	2.009148
Sum squared residuals	0.011496		

Statistical Detail for the Residential Building Sector Electricity Intensity Model (2)

Method: Least Squares

Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Res Elec Price	0.078056	0.076989	1.013859	0.3180
Per Cap Income	0.437763	0.075248	5.817586	0.0000
Degree Days	0.137189	0.034021	4.032524	0.0003
D1 (CA)	5.341899	0.270170	19.77236	0.0000
D2 (NY)	5.388909	0.268448	20.07431	0.0000
D3 (MA)	5.432376	0.271958	19.97508	0.0000
D4 (WDC)	5.440875	0.291782	18.64708	0.0000
D5 (VT)	5.501427	0.249250	22.07188	0.0000
D6 (NJ)	5.509510	0.274582	20.06510	0.0000
D7 (CT)	5.560375	0.278193	19.98746	0.0000
D8 (PA)	5.659220	0.271828	20.81915	0.0000
D9 (DE)	5.854997	0.281491	20.79991	0.0000

R-squared	0.991318	Mean dependent var	8.294928
Adjusted R-squared	0.988424	S.D. dependent var	0.170838
S.E. of regression	0.018381	Durbin-Watson statistic	2.018266
Sum squared residuals	0.011149		

Statistical Detail for the Commercial Building Sector Electricity Intensity Model (1)

Method: Least Squares

Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Per Emp Income	0.743660	0.186684	3.983527	0.0003
D1 (NY)	6.269318	0.716940	8.744545	0.0000
D2 (CT)	6.308302	0.714184	8.832874	0.0000
D3 (MA)	6.309708	0.706304	8.933417	0.0000
D4 (CA)	6.346675	0.692010	9.171362	0.0000
D5 (VT)	6.454711	0.634795	10.168180	0.0000
D6 (NJ)	6.464017	0.704721	9.172447	0.0000
D7 (PA)	6.501279	0.662251	9.816939	0.0000
D8 (WDC)	6.554436	0.742255	8.830443	0.0000
D9 (DE)	6.557099	0.687387	9.539163	0.0000

R-squared	0.922715	Mean dependent var	9.188222
Adjusted R-squared	0.902842	S.D. dependent var	0.153361
S.E. of regression	0.047803	Durbin-Watson statistic	1.337007
Sum squared residuals	0.079979		

Statistical Detail for the Commercial Building Sector Electricity Intensity Model (2)

Method: Least Squares

Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Com Elec Price	0.085223	0.151804	0.561402	0.5783
Per Emp Income	0.644261	0.230196	2.798753	0.0085
Degree Days	0.057961	0.088341	0.656105	0.5163
D1 (NY)	6.018946	0.867177	6.940852	0.0000
D2 (MA)	6.064707	0.864561	7.014781	0.0000
D3 (CT)	6.067818	0.880869	6.888448	0.0000
D4 (CA)	6.077730	0.857268	7.089646	0.0000
D5 (VT)	6.207991	0.775551	8.004618	0.0000
D6 (NJ)	6.225749	0.871498	7.143732	0.0000
D7 (PA)	6.240007	0.848584	7.353431	0.0000
D8 (DE)	6.304881	0.888913	7.092798	0.0000
D9 (WDC)	6.329626	0.929601	6.808970	0.0000

R-squared	0.924515	Mean dependent var	9.188222
Adjusted R-squared	0.899354	S.D. dependent var	0.153361
S.E. of regression	0.048653	Durbin-Watson statistic	1.284067
Sum squared residuals	0.078116		