Foundation for Renewable Energy & Environment

Policy Brief Series

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About the series:

The FREE Policy Brief Series offers a topic-by-topic discussion of issues relevant to the mission of FREE. A current focus is the Sustainable Energy Utility (SEU), a model of 21st century energy governance and service. Topics include: the SEU model throughout the U.S., how to initiate an SEU organization, innovative SEU clean energy financing, and international interest in the SEU model.

Intended to provide readers with a deeper understanding of the SEU model and its potential, the Policy Briefs examine of key ideas, successes, and challenges.

SEU Basic Characteristics:

- Conservation and renewable energy focus
- Pursuit of a New Economics based on energy savings and renewable resource benefits
- Participation by a diverse group of stakeholders while remaining independent
- Matched approaches to energy supply and actual energy needs
- Promotion of local and community-based governance
- Pooled financing to realize net-zero carbon and energy benefits
- Guaranteed money savings to support large scale green energy investments
- Conservation and renewables tailored to the needs of participants
- Structured incentives that support long-term sustainability (an "all hanging fruit" philosophy)

SUSTAINABLE ENERGY UTILITY (SEU)

Understanding the Basics

The Sustainable Energy Utility (SEU) was built to change the core relationships between energy, the economic sector, the environment and society. It use is intended to foster low-carbon development that is governed by the communities it serves.

Highlighted in this Policy Brief is a conservation-based policy which the first SEU carried out in 2011 in Delaware (U.S.). The SEU's transformative power is evident when the actual outcome of its policy is extrapolated nationally. If the U.S. adopted the financing strategy pioneered by the first SEU (see below for details), it would unlock a $25 billion clean energy investment market in the Municipality, University, Schools and Hospital (MUSH) sector alone. Using this market-tested strategy, the country could expect this transaction to result in 300,000 construction, project management, engineering and finance jobs. The avoided carbon dioxide emissions from a nationally equivalent investment in energy conservation measures in the MUSH building sector is estimated to be more than 225 million metric tons, or a reduction in annual commercial sector emissions of more than 5%. The SEU model would outperform the U.S. Government's Energy Service Performance Contract Program by a factor of 6 and save taxpayers $500 million. These estimates indicate the significant potential and promise of the SEU.

At the core of the SEU approach is the notion that we all *share responsibility* for creating a healthy environment and democratically governed energy system. The SEU builds on the idea of *participation by a diverse group of stakeholders* coming together to provide the energy needs of a community.

In order to match energy supply to the actual energy needs of a community, the SEU positions itself as a local, community-focused utility created to accelerate energy, water and materials savings and reliance on locally based renewable energy.

The SEU maintains a *local* focus. Rather than stockholders or regulators, an SEU engages individuals, businesses, and farms, in cities, counties, or regions, and answers directly to the community it seeks to serve. If it fails to attract participation, it fails to exist. The aim is to find ways to meet energy, water, and material needs economically without reliance on traditional carbon-intensive, fossil fuel resources. Although the SEU engages in close cooperation with a wide group of stakeholders, the SEU remains *independent*. It is not affiliated with any of the electric or gas utilities serving an area and it is not an arm of government. However, it remains accountable to the public.

Whereas conventional energy utilities are geared towards the sale of electricity through ever larger centralized energy production systems owned by

non-local companies, the SEU strategy recognizes the benefits of reductions in use and on-site renewable energy generation as a practical strategy to develop community- and livelihoods-based sustainability. As a non-profit utility for the 21st century, the SEU aims to directly provide energy and other *services*[1] - such as heat, cold, insulation, ventilation, water and materials conservation - to people rather than focusing on energy sales.

SEU economics functions on a basic principle of conservation, monetizing savings which cost less than paying the retail price for energy, water and materials as the source of its capital investments. The benefit of the conserved energy (either from direct savings or the use of renewable energy to lower use of conventional energy demand) can then be used to pay back initial investments made to realize the reductions. It avoids the practice of many governmental and regulatory programs currently in use which assess end users for funds that conventional utilities operate to meet sustainability goals. This 20th century model has largely failed, in part, because it relies on companies whose economic interest is to sell more power, water, etc. to meet such goals. This contradiction is a key reason for a persistent policy and market failure in the face of pressing societal and global needs for transformation.

The refocused approach of the SEU towards conservation and renewability offers a comprehensive alternative to conventional utilities and current policy. In light of contemporary concerns about environmental harms and risks associated with the modern energy regime and, given the problems of social inequality, insecurity, and economic volatility of that regime, the SEU movement seeks to return the power to communities to define their future sustainability.

The SEU and the New Energy Economy

An SEU can facilitate a new economy of more jobs and lower consumption. Sustainable energy investments create jobs. In the State of Delaware, with a single transaction, the Delaware SEU created nearly 980 jobs in construction, project engineering, and building management. An extrapolation of this strategy to a nationwide upgrade of the public sector could potentially put 300,000 Americans to work in a 21st century clean energy economy. The SEU can continuously organize investments over and over, creating the significant potential for the model to substantially change the energy economy. At the same time, an SEU keeps value in the local economy due to the employment of local contractors and its emphasis on local production of the equipment used to meet energy needs.

The SEU positions itself as a one-stop-destination for conservation and renewable energy, allowing everyone to interact with a single, public-minded organization, avoiding confusion and reducing administrative costs. In this way, communities can build customized programs to meet local needs rather than forcing a one-size-fits-all solution that too often characterizes the current energy economy. Another advantage, built into the DNA of the SEU, is increased reliance on distributed rather than centralized technology architectures. Such an approach insulates communities from energy price volatility which is common with fossil fuel energy sources.

The Delaware SEU

In response to concerns about the contribution of greenhouse gases to global climate change, the State of Delaware established a Climate Change Action Plan[2] in 2000 to raise awareness of the potential impacts of climate change, to identify cost-effective opportunities for reducing Delaware's greenhouse gas emissions, and to develop practical, analytically-based strategies to reduce emissions. The Plan set an aggressive goal of reducing emissions 15 – 25 % below year 2000 levels by 2020. Among the Plan's priorities were increased energy efficiency, a switch to low- or zero-carbon energy sources, the promotion of renewable energy, and the return of participation in community design of both energy use and emissions.

In parallel, the Delaware Energy Act of 2003 (Title 29, Subchapter II) created a "Green Energy Fund." Residents of the State were to pay an additional $0.000178 per kWh to fund energy efficiency and renewable energy projects and educational programs. In 2007, the amount was increased to $0.000356 per kWh. In 2010, the Green Energy Fund collected over $4,000,000.

In 2005, the Delaware legislature enacted a renewable portfolio standard (RPS) to ensure that a minimum of 10% of the electricity generated in the state was provided by renewable sources by the year 2019. The RPS was increased in 2007 to 25 % renewable by 2025, with a 3.5% carve-out for solar PV. The Center for Energy and Environmental Policy (CEEP) of the University of Delaware, its students and faculty, provided key research support and drafted legislation to realize these policies.

With this background, development of the SEU began in 2006. The Delaware General Assembly convened a bipartisan task force to research and recommend a best-practices course for sustainable energy in Delaware. This effort was spurred in part by the prospect of rising energy prices. The state government had reached the limit of its bonding capacity and legislators did not want to increase taxes.

The task force returned sweeping recommendations in its 2007 report "The Sustainable Energy Utility: A Delaware First."[3] Outlined in the report was an approach that would move away from utility administered efficiency and renewables programs to an independent, civil society-based management system. It proposed the formation of an independent, non-profit entity which would take charge of statewide efforts to shift direction in the energy sector with no new taxes and no new bureaucracy. Again, CEEP was the analytical force behind the initiative.

The Delaware SEU came into being in 2007 with the passage of State Senate Bill 18, written by Senator Harris B. McDowell III in coordination with Dr. John Byrne[4], the architect of the state's multi-dimensional clean energy policy framework.

The Delaware SEU is registered as a nonprofit, tax-exempt 501 (c)(3) entity funded from sustainable energy financing. The Delaware SEU completed its inaugural tax-exempt bond issue on the first of August 2011 - the first tax-exempt sustainable energy bond issue in the U.S. based on guarantees of monetized energy savings.

The $67.4 million par value energy efficiency bond was oversold within two hours of its offering. In fact, the serial bond issue generated premiums in excess of $5 million and sold at the low arbitrage yield of 3.7% over its 20 year debt service period. The rapidity with which investors subscribed to the bond awakened many to the transformative power of the SEU concept.

SEU Structure

By law, the Delaware SEU is governed by an Oversight Board, chaired by a member of the State Senate appointed by the body's President Pro Tempore. Senator McDowell[5], the author of the original legislation and seven additional supporting laws passed between 2008 and 2011, is the organization's first chair. In addition, the Board includes the Secretary of the Delaware Department of Natural Resources and Environmental Control (DNREC), the Delaware Public Advocate, seven members appointed by the Governor, and one member appointed by the Speaker of the House.

Competitive procurement processes are used to engage local contractors and equipment providers. This ensures that the SEU maximizes the participation of the community and its businesses in the programs it offers.

The SEU model designed at CEEP is a pioneer in the sustainability field using the expertise of several organizations to carve out its aims (see Figure 1):

- Implementers are businesses and organizations selected by the Agency to deliver services to Participants.

- Monitoring and Verification (M&V) is performed by outside parties under contract to the Oversight Board. The SEU is responsible for monitoring and verification of the energy savings and clean energy generation resulting from its efforts.

- A fiscal agent and financial trustee are third parties which manage the funds invested by the SEU.

- The Participants are any users of energy.

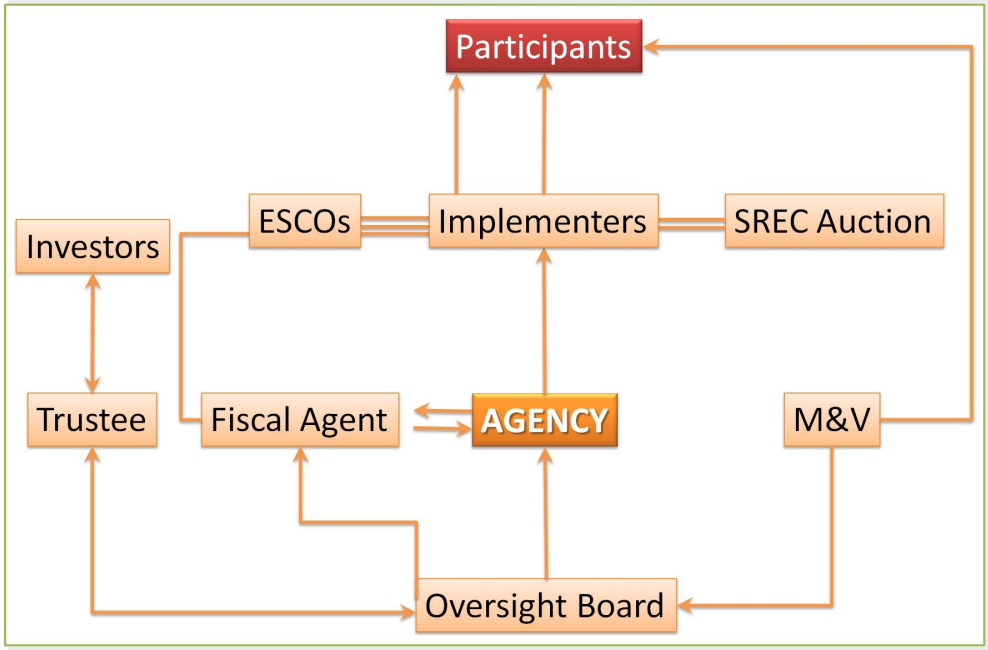
Funding Sources

The SEU can combine third party financing, federal incentives, sustainable energy funds, public benefit charges and monies available from philanthropic sources.

In Delaware, the SEU has the authority to issue tax exempt bonds to contribute additional financing: the SEU's bonds do not add to the State's burden. The Delaware SEU also serves as the administrator of 65 % of the State's share of the Regional Greenhouse Gas Initiative (RGGI) auction proceeds. Thus, the SEU can draw on a variety of funding sources to secure sufficient capital to invest in sustainable energy infrastructure and projects that lower energy use. Importantly, its funds are not dependent on taxes and exist independent from the State.

Being able to draw on many funding sources gives the SEU flexibility in the types of financial incentives it can offer. It can deliver assistance to low income families who would like to participate in programs but cannot afford a cost sharing approach. It can arrange cost sharing programs in which it covers the full incremental cost of sustainable energy equipment for those who are able to afford this approach.

Figure 1. Overview of the SEU Model Structure



SEU Results

While still in the early stages of development— its bond and solar market programs have only been in operation for about a year—the Delaware SEU has pioneered strategies which are generating substantial benefits for Delawareans in terms of energy savings, renewable energy development, CO_2 emission reductions, and cost savings. The profile of success depicted in Tables 1 and 2 furnishes an overview of these benefits.

Table 1 records the results to date of the Delaware SEU's energy conservation initiative—achieved through its sustainable energy bond and the rebate programs. It shows that, throughout the 20-year lifetime of the bond, the use of about 7.2 million MMBTU is avoided. At 217.8 MMBTU total energy consumption per household in 2010, this value roughly represents the total energy use of 33,300 Delawarean households.[6]

In terms of greenhouse gas emissions avoided, the sustainable energy bond lifetime savings are 661,687 metric tons of carbon dioxide (CO_2). In 2010, Delaware's energy-related non-

Table 1. Delaware SEU Savings Profile—Energy Efficiency

Lifetime savings	Sustainable Energy Bond [1]	Rebate Programs [2]
Avoided grid energy use (MMBTUs)[3]	7,253,592	1,139,157
Emissions avoided (metric tons of CO_2)[4]	661,687	122,646
Total capital costs[5]	$67,435,000	$17,295,143 [6]
Costs/MMBTU avoided [7]	$2.05	$3.34
Costs/ metric ton of CO_2 avoided [7]	$22.42	$31.02
Gross program bill savings [5]	$147,889,405 (guaranteed)	$5,179,935 (estimated)

[1] Savings data are sourced from Investment Grade Energy Audits.
[2] The Delaware SEU maintains several rebate programs. The programs, with the average rebate per participant in parentheses, are: Appliance Rebate ($68), Residential Lighting ($1.13), Home Performance with Energy Star ($497), Green for Green ($3,647), and Efficiency Plus Business ($1,909).
[3] Electricity savings have been converted to primary energy savings to reflect avoided grid energy use.
[4] The emission factor for the PJM Interconnection for 2012 (0.510 ton CO_2/MWh) has been used. To reflect changes in the fuel mix of the grid due to policy factors (such renewable energy portfolio standards) and market factors (such as the improving competitiveness of renewables), this emission factor is assumed to decrease by 1.9% per year (based on analysis of recent PJM data). A 7-year lifetime is used for the rebate programs and a 20-year lifetime is used for the sustainable energy bond.
[5] The SEU bond covered all capital, operating and maintenance, and transaction costs. An all-in cost for the August 1, 2011 Bond was $110 million, producing a net revenue stream of $38 million. Because rebate program costs cover only a portion of total capital and operating costs (e.g., recipients must pay the difference between the rebate and the device cost, and they must assume installation and maintenance cost themselves), it is not possible to report a net revenue stream with the accuracy of the Bond program. It is important to note that the SEU bond covers all capital costs – not simply the incremental cost of the efficiency improvement. By contrast, rebates cover only incremental costs of efficiency improvements.
[6] The program cost is $9,403,826, of which $3,381,993 was used to offer rebates. The rebates, however, only cover 30% of the total capital cost of the equipment. Participants must cover the remaining 70% of the capital cost. These costs are included in the total capital cost reported here.
[7] In contrast to the total capital costs—which reflect all costs associated with the equipment—the costs illustrated here are limited to the additional cost associated with the energy efficiency equipment as compared to a benchmark conventional energy unit. In this way, the costs illustrated here reflect the needed additional cost to go beyond 'business-as-usual' and to opt for the more efficient unit. Based on a review of the research literature and results from DOE-2 (a simulation software developed for the U.S. Department of Energy), it is assumed that, on average, the capital cost premium paid for a more efficient device is 22%. There is evidence that the premium in the residential sector is higher than in non-residential applications. However, statistical variation around sector estimates can be large. Therefore, a composite value is used.

Table 2. Delaware SEU Savings Profile—Solar Energy Programs

	Dover Sun Park[1]	2012 SREC Auction[2]
Avoided grid energy use (MMBTUs)[3]	111,332	669,332
Emissions avoided (metric tons of CO_2)[4]	16,334	84,125
Program costs [5]	7,309,132	27,343,093

[1] At 10 MWp, the Dover SUN Park is the largest public sector installation on the U.S. east coast. As per the contract between the SEU and Delmarva Power, the SEU purchases the 10,600 SRECs in year 1 and 2 and sells them back to Delmarva Power in year 4 and 5 of the five year program.
[2] The 2012 SREC program established a multi-tiered solicitation for long-term SRECs. Contracting with SRECTrade, the SEU awarded 20-year contracts to 166 PV systems at an estimated 7.7 MW of capacity.
[3] Electricity savings have been converted to primary energy savings to reflect avoided grid energy use. The total SRECs generated by the Dover SUN Park and the SREC Auction contain a 20% multiplier for in-state products. Here, this multiplier is subtracted. The Dover SUN Park displaces distribution (+3%) and the 2012 SREC Auction avoids both transmission and distribution losses (+7%). Additionally, it is expected that the PV panels will lose 0.5% per year of their rated power on average over 20 years and balance of system losses will average 5% over the 20-year period.
[4] The PJM emission factor for 2012 (0.510 ton CO_2/MWh) has been used. To reflect changes in the grid, this emission factor decreases by 1.9% per year.
[5] In the case of the Dover SUN Park transaction, program costs reflect the cost to purchase the SRECs throughout the program lifetime and payment of SEU fees. For the SREC Auction, program costs include the purchase of SRECs for 20 years as well as the costs to contract with SRECTrade and payment of SEU fees.

transportation CO_2 emissions were 7.2 million metric tons. Thus, the lifetime savings of the bond represent about 9.2% of the state's 2010 non-transportation emissions.[7] The Delaware SEU has been able to create 980 jobs in construction, project engineering, and building management. These substantial savings generate a net revenue premium of $38 million, empowering the state and participating universities to use funds once spent on energy waste for more productive uses such as new libraries, better services to Delawareans, etc.

The SEU rebate programs, throughout their lifetime, will realize energy savings of 1,139,157 MMBTU and emissions savings of about 122 thousand metric tons of CO_2. These energy savings are equivalent to the annual energy consumption of 5,230 households. Similarly, the emission savings represent 1.7% of the state's non-transportation emissions.

The Delaware SEU also plays a vital role in improving the competitiveness of solar power and the development of a local solar industry. As mentioned earlier, the Delaware SEU has the authority to be the "one-stop shop" for SREC trades statewide and to "bank" SRECs in order to maintain market stability. Use of this authority has had important effects on local renewable energy generation, as reported in Table 2.[8]

From its solar programs, the Delaware SEU has stimulated enough energy generation to power the annual electricity needs of nearly 3,600 households entirely by solar power and it has offset emissions comparable to 1.4% of the state's 2010 emissions. An additional impact is the scaling of the Delaware solar market to the point where its installed capacity ranks seventh among states in the U.S. on a per capita basis (at about 40 W_p/person). On a solar capacity per unit area basis, Delaware now rivals Germany in its installed capacity because of the successful use of market-based program development of the technology and industry.

In Short…

Positioning itself as a 21st century energy utility, the SEU model pursues a fundamental shift in energy governance built around local and community-based energy discourse. Based on a new economics of energy savings and renewable energy benefits, the SEU model matches energy supply to actual energy needs. Initial results of the Delaware SEU demonstrate the potential of the SEU model to offer a pathway towards a New Energy Economy.

Various aspects of the SEU model (e.g. potential funding structures, its evolution over time and space, etc.) will be highlighted in subsequent SEU policy briefs. This series will demonstrate the structured "all hanging fruit" philosophy of the SEU model that motivates and supports all participants in the energy landscape to pursue long-term sustainability.

Notes:

1. This is in marked contrast to the energy-as-commodity orientation popularized by conventional utilities. See Byrne, Martinez and Ruggero (2009) below.

2. This plan was written by the Center for Energy and Environmental Policy (CEEP) at the University of Delaware. For more information see: http://www.ceep.udel.edu/publications/energy/reports/energy_delaware_climate_change_action_plan/deccap.htm

3. This report is available at: http://freefutures.org/wp-content/uploads/2012/02/2007_DE-Senate_SEU-Task-Force_final-report5_final.pdf

4. Dr. Byrne is Chairman of the Foundation for Renewable Energy and Environment, and Director and Distinguished Professor of Energy and Climate Policy, Center for Energy and Environmental Policy, University of Delaware. He conceived the SEU model, including its Sustainable Energy Bond.

5. Senator McDowell authored the state's public advocate, RPS, green energy fund, energy performance contracting and SEU bills. Many of these pieces of legislative were drafted with the support of the faculty and students at CEEP at the University of Delaware. Senator McDowell continues to serve as chairman of the board as of spring 2013. See http://www.energizedelaware.org/index.cfm?fuseaction=content.faq&faqTypeID=12

6. To determine household energy consumption, EIA energy data and U.S. census data were used.

7. Data on energy-related emissions from the EIA were used.

8. No direct comparison can be made between the programs described in Tables 1 and Table 2 due to the substantially different role played by the SEU. The Delaware SEU's role in the sustainable energy bond is to attract the most efficient means to finance clean energy investment and addresses the full capital cost requirements to shift to clean energy (when, and only when, the guaranteed savings of these investments are equal to or greater than their costs). In contrast, the SEU's role in solar energy development is to create a stable market for the environmental attribute created by the technology's use, enabling load-serving utilities to acquire the attribute in the most cost-effective means possible. The one commonality is that all SEU programs in Tables 1 and 2 use market-mechanisms to attract investment.

About FREE

The Foundation for Renewable Energy and Environment (FREE) is a non-profit, international organization established to promote a better future based on energy, water and materials conservation, renewable energy use, environmental resilience, and sustainable livelihoods. Guided by experts and distinguished academics, FREE sponsors research, supports graduate education and consults with organizations on strategies to create new sustainability models, to advise policy makers and other societal leaders, and to provide outreach to communities seeking to transform energy-environment relations. Managing an active agenda of conferences, films, exhibitions, seminars, and publications, FREE works with cities, non-profits, governments, businesses, and academic institutions around the world on environment and renewable energy issues.

Founded in 2012, a unique feature of FREE is its ability to harness the creativity and wide band-width of expertise of an evolving network of experts active in over 40 countries. Many were educated in the first U.S. graduate program in the field of energy & environmental policy at CEEP (University of Delaware). These FREE Minds are a vital resource enabling the Foundation to address the pressing issues of our era with the sort of in-depth and diverse thinking they require.

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