



State Leadership in **Clean Energy** A W A R D S

New Solutions for Market Transformation

JUNE 2016





Contents

- 1 Introduction**
- 2 The 2016 Award Judges**
- 3 California Energy Commission**
New Solar Homes Partnership
- 5 Connecticut Green Bank**
CT Solar Lease 2 Commercial Program
- 7 Energy Trust of Oregon**
Irrigation Modernization Program
- 9 New Hampshire Public Utilities
Sustainable Energy Division**
Useful Thermal Renewable Energy
Certificate Program
- 11 NYSERDA**
NY-Sun
- 13 Rhode Island Office of Energy Resources**
System Reliability Procurement Solar
Distributed Generation Pilot Project
- 15 CESA Members**

Cover Images

Front cover:

(top) Temple B'Nai Jacob, Woodbridge, CT, Bullrock-Deutsche Eco (© Connecticut Green Bank)
(bottom left) Three Sisters Irrigation District in Sisters, OR (© Energy Trust of Oregon)
(bottom middle) Wide Awake Bakery PV panels, Trumansburg, NY (© Solar Schuyler)
(bottom right) Holderness School Biomass District Heating Boiler, Holderness, NH (© Holderness School)

Inside front cover: Residential PV project in North Kingstown, RI (© Newport Solar)

Inside back cover: PV System at Octagon Apartments, New York, NY (© NYSERDA)

Introduction

The *State Leadership in Clean Energy Awards* recognize exemplary programs that have accelerated the adoption of clean energy technologies and expanded clean energy markets. The programs selected for these awards have served as examples to be replicated by others and have helped to transform clean energy in the United States. The 2016 awardees further contribute to the outstanding portfolio of programs established by former winners.

This report presents case studies of the six recipients of the 2016 awards. As such, it showcases a few of the many innovative projects and programs implemented by members of the Clean Energy States Alliance (CESA).

CESA member organizations, most of which are state agencies, have been supporting clean energy technologies since the 1990s, and the results of their efforts can be seen across the country. Many CESA members have expanded their efforts beyond wind and solar grants to include sophisticated finance tools, multi-faceted clean energy programs, and geographically targeted deployment in order to bring the benefits of clean energy to a wide range of communities, industries, and income groups. Despite many financial, political, and technological challenges, these public servants are finding solutions to make clean energy the go-to option for communities, homes, businesses, public infrastructure, and financial markets.

State energy agencies and organizations from across the country submitted nominations for *State Leadership in Clean Energy* awards. A panel of distinguished, independent judges (whose bios are on the next page) reviewed the entries and scored them based on public benefits and results, cost effectiveness, leadership and innovation, and replicability.

This year's award winners represent many of the new ideas that are driving adoption of clean energy. They involve combining commercial property assessed clean energy (C-PACE) with power purchase agreements so that nonprofits can participate in clean energy expansion; combining water conservation with clean energy generation; implementing comprehensive programs to advance the solar industry in the East and in the West; and tapping into the power of distributed generation and geo-targeting to ease grid constraints.

The programs honored with the 2016 *State Leadership in Clean Energy* awards are diverse geographically, technologically, and in the size of their programs. But the two things they all have in common are their commitment to clean energy and their ability to get things done.

We applaud the efforts of the 2016 *State Leadership in Clean Energy Award* recipients, as well as the work of the other CESA-member programs that are not highlighted in this year's publication. The programs described in the following case studies are excellent examples of what's working today as well as outstanding models for future success in clean energy markets.

The 2016 Award Judges

The *State Leadership in Clean Energy Awards* are made possible by the generous donation of time and expertise by our panel of judges. These individuals have collectively an impressive wealth of knowledge and experience related to clean energy. We would like to express our sincere appreciation for their enthusiasm and participation in this process.



Todd Foley
Senior Vice President,
Policy & Government
Relations
American Council on
Renewable Energy (ACORE)

Todd Foley leads strategic integration of policy development, research, external communications and interaction with Federal and state government

and regulatory officials. He has over 25 years' experience in Federal and state policy, renewable energy market design, business development and sales. Prior to joining ACORE, he directed global and U.S. policy, communications and business development and profile sales for BP Solar. Prior to that, Mr. Foley directed U.S. environmental, government and regulatory affairs for BP America. He has served on the Board of Directors of the Solar Energy Industries Association (SEIA), the Solar Alliance, Solar Electric Power Association (SEPA) and the Texas Renewable Energy Industries Associations (TREIA).



Jenny Heeter
Senior Energy Analyst
National Renewable En-
ergy Laboratory

Jenny Heeter is a member of the Market and Policy Impact Analysis Group in the Strategic Energy Analysis Center. Ms. Heeter focuses her research on the mid-scale solar market, corporate investments in

renewable energy, renewable energy certificate markets, city clean energy policies, renewable portfolio standards, net metering policies and utility regulatory issues. She currently leads work focused on expanding solar at universities around the country. In her prior position at the Indiana Office of Utility Consumer Counselor, the ratepayer advocate in Indiana, she filed testimony on cases related to utility green pricing programs as well as energy efficiency proposals.



Brian F. Keane
President
SmartPower

Brian Keane is a leading voice on clean energy, energy efficiency, and the environment. As President of SmartPower, a Washington, DC-based marketing agency dedicated to promoting clean, renewable energy and energy efficiency, Keane has helped shape the energy debate in the United States. In 2015 and 2016, SmartPower was named

"The Best Non-Profit Marketing Firm in The United States". Mr. Keane is the author of *Green Is Good: Save Money, Make Money, and Help Your Community Profit from Clean Energy* (Lyons Press, 2012). He is a regular panelist on "White House Chronicle," a weekly public affairs television show that appears on over 200 PBS stations and Sirius/XM radio. Mr. Keane is a past-president of the American University Alumni Association and sits on the Board of Directors of the Vermont-based Clean Energy Group.



Heather Rhoads-Weaver
Founder and Principal Consultant
eFormative Options, LLC

Heather Rhoads-Weaver specializes in policy and market analysis, funding development, and stakeholder communications. She managed the development of the NIST-funded Sustainable Manufacturing, Advanced Research & Technology Wind Roadmap, the U.S. DOE/PNNL-funded Distributed Wind Policy Comparison Tool, and has led contracts with the

California Wind Energy Association, Minnesota Renewable Energy Society, and the Small Wind Certification Council. Ms. Rhoads-Weaver was selected to receive DWEA's 2014 Person of the Year Award, Windustry's 2013 Distinguished Service in Community Wind Award, and was named the Women of Wind Energy's 2012 Mentor of the Year. She has served as Secretary for Distributed Wind Energy Association Board of Directors and on the Board of Solar Washington.



Bill Ritter, Jr.
Founder and Director
Center for the New Energy Economy

Bill Ritter, Jr. is the founder and director of the Center for the New Energy Economy (CNEE) at Colorado State University. The Center works directly with governors, legislators, and regulators to create policies that will facilitate America's transition to a clean-energy economy. Mr. Ritter was elected as Colorado's 41st governor in 2006. During

his four-year term, he signed 57 new energy bills into law, including a 30% Renewable Portfolio Standard and a Clean Air Clean Jobs Act that replaced nearly a gigawatt of coal-fired generation with natural gas. Mr. Ritter is a member of the board of the directors of the Energy Foundation and the Advanced Energy Economy Institute. He served as Denver's district attorney from 1993 to January 2005.

Program Highlights

- ▶ The NSHP has nearly 21,000 PV systems installed and another 24,000 in development.
- ▶ As of January 2016, the program has installed or reserved funds for 141.8 MW of new solar capacity; and it has a 10-year goal of achieving an additional 360 MW of capacity.
- ▶ The California Building Industry Association, California Solar Energy Industries Association, and California Solar Energy Industries Association have credited the NSHP program with boosting the new home solar penetration rate from less than 1 percent to more than 20 percent.
- ▶ As of January 20, 2016, the program has paid \$19.5 million to support 6.4 MW of installed solar capacity on affordable housing projects.

California Energy Commission NEW SOLAR HOMES PARTNERSHIP

The California Energy Commission's New Solar Homes Partnership (NSHP) program is helping to make new homes in California environmentally friendly, while reducing energy bills. The program, a component of the comprehensive California Solar Initiative (CSI), provides financial incentives and other support to builders, developers, and homeowners to encourage the construction of new, energy-efficient solar homes. The NSHP, which was launched in 2007, has a 10-year goal of installing 360 megawatts (MW) of new residential solar photovoltaic (PV) capacity in California. It aims to have at least half of all new homes include solar by 2020. As of January 2016, the program has installed or reserved funds for 141.8 MW of solar capacity. It has already helped boost the new home solar penetration rate in the state from less than 1 percent to more than 20 percent.

Maximum Efficiency, Maximum Impact

The NSHP focuses on new home construction as a way to lower the upfront installation costs of solar energy systems by incorporating these systems seamlessly into the design of a building and installing the PV system while all the other construction activities of the home are underway. By focusing on new residential development, the program can produce significant benefits because builders can optimize the PV system design to maximize solar production and tailor the building's electrical and roofing construction to seamlessly accommodate a PV system. The NSHP requires that projects meet minimum energy efficiency levels, which maximizes the project's impacts: environmental benefits, market development, and cost savings for homeowners.

The NSHP's performance-based incentives are based on the expected annual generation of the PV system weighted by its time-of-use value to the utility system. This encourages high-quality installations with optimal designs. To avoid incentivizing oversized systems, NSHP incentives are limited to the first 7.5 kilowatts (kW) of a PV system. The NSHP also takes into account and offers higher incentives for qualified affordable housing projects and for installations on buildings that achieve higher levels of energy efficiency.

NSHP incentives decline over time as cumulative MW capacity targets are reached. By allowing performance-based incentives to decrease alongside declining solar hardware costs, the NSHP

Mutual Housing at Spring Lake in Woodland, the first certified zero net energy rental community in the nation
(Photo: California Energy Commission)





California Energy Commission

The California Energy Commission is California's primary energy policy and planning agency. Established in 1974, the Energy Commission is responsible for overseeing the following seven core responsibilities: advancing state energy policy, encouraging energy efficiency, certifying thermal power plants, investing in energy innovation, developing renewable energy, transforming transportation and preparing for energy emergencies.

For more information

<http://www.gosolarcalifornia.ca.gov/about/nshp.php>

Contact person

Payam Narvand
Supervisor, Customer
Programs Unit
Payam.Narvand@energy.ca.gov



Solar-standard community in El Dorado Hills (Photo: California Energy Commission)

maximizes the total number of incentivized solar systems and encourages the industry to rely less on incentives as solar costs fall and the market matures.

The Energy Commission has worked to administer the program efficiently and cost-effectively. The NSHP program may be one of the few solar rebate programs in California, if not the only one, that spends 100 percent of funds on solar system purchases and installation rather than subtracting 10 or 15 percent for administrative costs.

Market Development and Transformation

The NSHP program fosters a housing market in which builders routinely construct highly energy efficient homes and install solar energy systems as a standard feature. According to the California Building Industry Association, several major homebuilders began offering developments with solar as a standard feature in 2012, and “most, if not all . . . relied on NSHP incentive funding, which has provided key financial support in making a variety of business models work.” The program’s success has paved the way for cities, such as Lancaster and Sebastopol, to require solar on all new homes. The NSHP program has also made significant inroads toward expanding solar access for affordable housing. The program guidelines have multiple provisions that support that market sector, including offering higher per-watt incentives for qualifying affordable housing residential projects and incentivizing solar systems that offset common area electricity loads. Reducing energy costs for low-income households frees up income to be used on other basic needs such as food, transportation, and medical expenses. The California Housing Partnership cited the NSHP program as a catalyst in improving the affordability and sustainability of multifamily rental properties.

A Model for Other States

Though builders and developers in other states and regions may not face identical barriers to widespread solar integration, the NSHP offers numerous tools that could be used or replicated across the country. One example is the NSHP web tool, an online portal that allows the administrator, homeowners, homebuilders, and installers to have one location to upload application documents and monitor projects through the multiple stages of reservation and payment review. The web tool database allows the program administrator to easily compile and report on program activity that can be used for studies and assist in improving program design. Other replicable tools include the NSHP Guidebook, which lays out the eligibility requirements, rules, and process for claiming an incentive and is routinely revised to address various industry conditions. The NSHP Solar Advantage Value Estimator (SAVE) tool helps appraisers and realtors better understand and incorporate the value of solar energy systems as part of real property valuation.

Judges’ Comments

The NSHP program has been the leader in expanding the market for solar in new home construction and has made impressive strides in California. Its work to extend the benefits of solar to the affordable housing market is commendable for increasing solar access to renters.

Program Highlights

- ▶ The CT Green Bank's Solar Lease 2 program offers a new financing tool for commercial customers, municipalities and nonprofit organizations to go solar.
- ▶ By securing solar PPAs with C-PACE benefit assessment liens, private investors have confidence that the PPAs will be repaid.
- ▶ Under the Solar Lease 2 program, multiple megawatts of solar have already been deployed across 15 nonprofit projects in Connecticut, with no money down and PPA prices offered at less than the customer's traditional electricity rate.

Connecticut Green Bank CT SOLAR LEASE 2 (SL2) COMMERCIAL PROGRAM

With the CT Solar Lease (SL2) program, the Connecticut Green Bank (Green Bank) continues to develop innovative financing solutions to advance solar and other clean energy technologies. The CT SL2 program builds on the success of the original CT Solar Lease program, the nation's first residential PV financing program to combine ratepayer funds with private capital to leverage federal incentives. By expanding the Solar Lease program to include commercial and nonprofit projects that have traditionally been excluded from the solar financing market (along with serving more customary municipal credits), SL2 has further opened the door to distributed solar by pairing Connecticut's Commercial Property Assessed Clean Energy (C-PACE) financing mechanism with power purchase agreements (PPAs). The result has enabled the Green Bank to once again leverage ratepayer funds with significant private capital, in a scalable and replicable manner, in order to finance and deploy solar projects for "mid-market" commercial and nonprofit organizations that otherwise would not be able to make these projects happen.

Opening up a New Market Segment for Solar Finance

The principal financial barriers that prevent nonprofits from going solar include the lack of both a) upfront capital and b) tax equity appetite to monetize federal tax credits. The SL2 program uses the well-established solar tax equity fund model to provide low-cost, long-term power PPAs and leases to Connecticut nonprofit customers as well as municipalities and commercial customers. Within this widely adopted framework, however, what is unique about this fund is that the Green Bank received approval from both tax equity and debt investors to finance otherwise non-creditworthy projects by using C-PACE as a credit enhancement tool to secure customer PPAs. PPAs for nonprofits under this program enjoy an improved credit profile thanks to a C-PACE benefit assessment lien on each property, providing confidence to private investors that each PPA will be repaid. Through the use of the PACE + PPA structure under the SL2 program, solar adoption becomes viable for an entire class of customers who previously had no way to finance their projects.



The CT Solar Lease 2 Commercial program's JCC of Greater New Haven Solar Canopies (Photo: Connecticut Green Bank)



CT Green Bank

The Connecticut Green Bank was established by Connecticut's General Assembly on July 1, 2011 as a part of Public Act 11-80 to lead the green bank movement by accelerating private investment in clean energy deployment for Connecticut to achieve economic prosperity, create jobs, promote energy security and address climate change. As the nation's first state Green Bank, it leverages public and private funds to drive investment and scale-up clean energy deployment in Connecticut.

For more information

<http://www.ctgreenbank.com/programs/commercial-contractors>

Contact person

Benjamin Healey
Director,
Clean Energy Finance
benjamin.healey@ctgreenbank.com



The CT Solar Lease 2 Commercial program's JCC of Greater New Haven Solar Canopies (Photo: Connecticut Green Bank)

Establishing a New Investment Model for Nonprofits

As the first nonprofit to utilize the SL2 program, the Jewish Community Center of Greater New Haven (JCC) has paved the way for other nonprofit organizations to go solar. The JCC project involved the installation of 755 kW of solar panels over three carports in their parking lot to provide a cleaner, cheaper, and more reliable source of energy. Using the Green Bank's C-PACE-secured PPA structure, the project required no money down from the JCC and provided immediate cost savings when completed. The build cost for the JCC Solar Canopy Project's was \$3.12/W (or approximately \$2.35 million in total), and the project benefited from a utility "ZREC" contract (a fixed-price, 15-year REC offtake contract) as well, offering \$94.95 per megawatt-hour generated by the solar. All in, then, the JCC is now paying a discounted rate for electricity under a 20-year PPA, with a starting price of \$0.102/ kWh (escalating at 1.5% annually), leading to an effective monthly rate of \$7,568.00 (or nearly \$5 million in lifetime project revenues and tax benefits realized for the Green Bank and its investors). The JCC is also expected to save more than \$20,000 on its electricity bills every year. The JCC project represents the first nonprofit in the country to successfully utilize a PACE + PPA approach to financing a solar project.

Lessons Learned

While third-party ownership structures are not new to the solar market, the unique financing structure of securing a PPA via a C-PACE benefit assessment lien made the JCC Solar Canopy project financing possible for a nonprofit organization. From the investor point of view, PACE PPA payments are a senior benefit assessment lien on the property, and in the event of a default, the remedies are much stronger compared to a typical PPA. There were a number of achievements in leadership and innovation in creating this program. The first was getting the SL2 program's investors comfortable with the C-PACE mechanism as a means to securing investments into traditionally non-investment grade credits. The second was establishing the initial set of documentation (available upon request) to fully capture the entire financing structure. Finally, the Green Bank had to create an outreach and marketing strategy to onboard local solar developers who could not only understand and deliver the financing offering to customers, but also generate growth for the program to help it achieve scale. Some of these challenges, and the Green Bank's approach to overcoming them, are further discussed here: <http://www.pacenation.us/pace-talk-pace-power-purchase-agreements-ppa-is-a-game-changer-for-connecticut-and-beyond>.

The JCC project and the SL2 program under which it was financed can be replicated across the country, particularly in states with PACE programs that are already established or are currently in development. In fact, significant market participants are now looking to do just that: <http://www.pacenation.us/pace-talk-renew-financial-solar-city>.

Judges' Comments

The Green Bank's Solar Lease 2 program tackles solar financing in a market segment that is often overlooked. It successfully leverages limited state resources with private investors to go where the market won't go and demonstrates commercial viability for financing new solar customers. Applying C-PACE to nonprofits is difficult to do; the Green Bank has developed creative third-party solar financing for a new market segment.

Program Highlights

- ▶ Replacing open canals with pipes saves water and reduces the need for farms to use energy to pump water. It also creates opportunities for new hydropower projects.
- ▶ Twelve Oregon irrigation districts are currently undertaking assessments identifying the renewable energy, energy efficiency, agricultural, water, environmental, and economic benefits associated with modernization and characterizing project implementation approaches.
- ▶ The program is producing tools, methodologies, and process guides that can be used by irrigation districts and other organizations across the western U.S.



Energy Trust of Oregon IRRIGATION MODERNIZATION PROGRAM

Energy Trust of Oregon, working with the nonprofit Farmers Conservation Alliance (FCA), has developed a coordinated and comprehensive program to help irrigation districts and the farmers they serve to develop modern irrigation systems. The resulting systems will reduce energy use and operating costs; generate income from renewable energy production; increase agricultural production, quality, and diversity; reduce water use; and enhance environmental conditions. Twelve Oregon irrigation districts are currently undertaking assessments of the benefits they could achieve through modernization. This program reduces the cost and time required for project planning and implementation, addresses key regulatory and institutional barriers, leverages funding, and demonstrates how modern agricultural water management can mitigate the impacts of long-term drought.

The Need for Modernization

Oregon has more than 6,500 farms covering over 1,200 square miles of land. These farms typically receive irrigation water delivered via open canals owned by irrigation districts. The canals transport more than 480 billion gallons of water annually, but the aging, open systems are deteriorating; many are over 100 years old and are inherently inefficient. Because of seepage and evaporation, 20 to 50 percent of the water in a canal never makes it to a farm. Modernization is desperately needed. Modernizing an irrigation system starts by replacing open canals with pipes, conserving the water previously lost to seepage and evaporation. Gravity pressurizes the water delivered through the pipes, allowing irrigators to remove water pumps, thereby saving energy and related costs. In places where there is excess water pressure in the delivery system, electricity generation from hydropower can be produced. However, the expense of modernization, limited public awareness, and a lack of entities to coordinate modern infrastructure development meant that only three of Oregon's approximately 200 irrigation districts had modernized before the start of the Energy Trust program.



Marc Thalacker stands in front of the Three Sisters Irrigation District's new 700-kilowatt hydropower turbine, powered by pressurized irrigation water. Installation of the pressurized pipe enabled the savings of more than 20 cubic feet per second of water during the irrigation season. The power plant will generate more than 3 million kilowatt hours annually, on average. (Photo: Energy Trust of Oregon)



Energy Trust of Oregon

Energy Trust of Oregon is an independent nonprofit organization serving 1.5 million customers of four investor-owned utilities. Energy Trust invests in cost-effective energy efficiency, helps pay the above-market costs of renewable energy resources and transforms markets to higher efficiency products and services. Since 2002, Energy Trust has provided cash incentives, services and information to help households, commercial businesses, industries, and public buildings save energy and generate renewable power at more than half a million locations.

For more information:

<http://irrigationmodernization.fcasolutions.org>

Contact person

Jed Jorgensen
Renewable Energy
Program Manager
jed.jorgensen@energytrust.org

Developing a Coordinated Approach

Over the past decade, Energy Trust engaged with a few irrigation districts on hydropower projects, most notably as a major funder of a 700-kilowatt hydropower turbine for the Three Sisters Irrigation District. That turbine, which produces 3.1 million kilowatt-hours annually, has helped defray the costs of an ambitious modernization program that piped 50 miles of the district's 63 miles of canals. Among the many results of modernization, pressurized water is now delivered to 75 farms, allowing irrigation pumps to be removed, saving five million kilowatt-hours annually. In addition, 9,000 gallons of water per minute remains in Whychus Creek, the district's water source, to benefit steelhead listed as threatened under the Endangered Species Act.

Through work with Three Sisters and other districts, Energy Trust recognized an opportunity. If more districts were able to move forward with modernization, Energy Trust could support more hydropower projects generating clean energy. In turn, financial support from Energy Trust would allow more parts of the state to achieve the many interrelated benefits of modernization. To tackle the planning associated with a coordinated, comprehensive approach, Energy Trust contracted with FCA, whose mission is to develop resource solutions for rural communities. With funding and staff support from Energy Trust, FCA created a methodology for developing individual irrigation district modernization strategies and built a large coalition of public and private sector partners. By the end of 2015, less than a year after starting, the program had signed up participation by 12 irrigation districts, including all eight districts in the Deschutes River Basin, one of Oregon's most heavily irrigated areas.

Assessments of specific modernization benefits are now underway in all 12 districts. When completed by the end of 2016, the assessments will identify renewable energy, energy efficiency, agricultural, water, environmental, and economic benefits associated with modernization and lay out implementation options. After a district's board selects a preferred approach, permitting and financing for projects will begin, followed by contracting and construction.

Benefits and Costs

The benefits associated with the initial 12 irrigation districts are expected to be 10-20 times greater than those seen at Three Sisters, and they will include installation of up to 10 megawatts of hydropower. Energy Trust is investing over \$600,000 to help FCA design, build, and implement the program. Energy Trust has also committed to spend \$1.3 million on the assessments at the 12 irrigation districts. That funding is more than matched by \$1.8 million from the U.S. Bureau of Reclamation, the Oregon Water Resources Department, the USDA's Natural Resources Conservation Service, the Freshwater Trust, the Nez Perce Tribe, the irrigation districts themselves, and other watershed partners. As more irrigation districts participate in the program, Energy Trust expects to commit up to \$200,000 per irrigation district for assessment studies. Additional funds will help the districts move into project implementation.

Spreading the Approach

Energy Trust and FCA designed the Irrigation Modernization Program with replicability in mind, because other states in the water-constrained western U.S. also have need for irrigation modernization. The Oregon program is producing open-source tools, methodologies, and process guides for irrigation districts and other organizations involved in modernization planning and implementation. Among the many resources that Energy Trust and FCA are making available are a model and template for creating a modernization plan at an irrigation district; tools for evaluating irrigation district organizational capacity, as well as for assessing economic, energy, water-saving, and agricultural benefits; a guide for developing hydroelectric capacity within an irrigation system; and guides for community and stakeholder outreach.

Judges' Comments

This well-conceived program is tackling an important issue in Oregon and the rest of the West. Its coordinated approach allows it to achieve not just important energy benefits, but other environmental and educational benefits as well. It is good to see a program focused on the needs of rural communities.

Program Highlights

- ▶ The New Hampshire T-REC program has certified 18 thermal facilities with a total capacity of more than 36 MMBTU/hr from the installation of biomass and geothermal technologies.
- ▶ Over 10 megawatts-equivalent of renewable thermal energy capacity have been added to New Hampshire's RPS since the program began in 2012.
- ▶ The NH PUC Sustainable Energy Division has provided over \$2.2 million in grants to 12 projects that will develop thermal alternatives and create T-RECs with a total investment of over \$11.3 million.

New Hampshire Public Utilities Commission—Sustainable Energy Division

USEFUL THERMAL RENEWABLE ENERGY CERTIFICATE (T-REC) PROGRAM

In 2012, New Hampshire became the first and only state to add a carve-out for renewable thermal technologies to its renewable portfolio standard (RPS). This carve-out requires electricity providers to support a minimum amount of renewable thermal energy each year that is produced by eligible biomass, solar thermal, and geothermal technologies. Since this law passed in 2012, the New Hampshire Public Utilities Commission Sustainable Energy Division developed rules to govern the metering, monitoring, and quantification of thermal renewable energy credits (T-RECs). New Hampshire's T-REC program has provided substantial economic and environmental benefits for the state, and serves as a model that other states can use to support a wide range of clean energy thermal technologies.

A First-in-the-Nation Program to Promote Heat from Renewables

An RPS is a state target for renewable energy generation, generally focused on electricity. Even though many states have come to recognize that renewable thermal heat has many of the same benefits as electricity-generating renewable technologies, few state programs include thermal technologies in their RPS.

With New Hampshire's cold winter climate, access to clean, reliable, and affordable heating systems is a concern for the state's residents and policymakers. Currently, most of the estimated \$6 billion that New Hampshire spends annually on fossil fuels leaves the state. New Hampshire's T-REC program capitalizes on locally produced energy resources, keeping financial resources in



Androscoggin Valley Hospital
Biomass Boiler and Emissions
Reduction System (Photo:
Androscoggin Valley Hospital)



New Hampshire Public Utilities Commission Sustainable Energy Division

The New Hampshire Public Utilities Commission is vested with general jurisdiction over electric, telecommunications, natural gas, water, and sewer utilities. The Sustainable Energy Division was created in 2008 to assist the Commission in implementing specific state legislative initiatives focused on promoting renewable energy and energy efficiency and to advance the goals of energy sustainability, affordability and security.

For more information:

<https://www.puc.nh.gov/Sustainable%20Energy/SustainableEnergy.htm>

Contact person

Karen Cramton
Director, Sustainable
Energy Division
karen.cramton@puc.nh.gov

state. The program requires electricity providers to secure renewable thermal generation equivalent to 1.3 percent of electricity sales in 2016, increasing gradually to 2 percent in 2023. This represents the first time a state has set a target within its RPS for thermal output. The useful thermal energy generated must be delivered in New Hampshire.



The Geothermal Distribution Room at 233 Vaughan Street, in Portsmouth, New Hampshire (Photo: Anthony Callendrello, NEO Geothermal)

280,000 gallons of number-two fuel oil over the past two years with 7,043 tons of wood chips purchased through a local distributor. Since biomass facilities generally source wood products from New Hampshire's North Country, an area that is heavily dependent on the forest product industry, the T-REC program supports local jobs in forestry, logging, pellet manufacturing, and transportation industries.

The environmental benefits of the T-REC program are substantial. Renewable thermal technologies are often more efficient than conventional heating and cooling systems, and biomass technologies are held to more stringent emissions criteria than would otherwise be required. In addition, these thermal technologies typically replace older, oil-burning technologies, which results in overall emission reductions (greenhouse gas, nitrogen oxide, sulfur dioxide, and particulate matter).

A Model for the Country

Incorporating renewable thermal into RPS programs presents a challenge, because RPSs were originally designed to measure electrical output. Some states allow some renewable thermal technologies to be eligible for their RPS, and many states offer other support for this developing market. However, New Hampshire is the first state to take on the challenge of developing from scratch a program with metering requirements, emissions qualifications, and defined rules; and its T-REC program is the most comprehensive initiative to support renewable thermal technologies in the country.

States across the country are looking to New Hampshire as a model for supporting renewable thermal technologies. This program can serve as a template for other states to adapt for use in their RPS or incentive programs. The metering standards could be duplicated, as could the framework of the rules. Massachusetts, for instance, has monitored the development of the New Hampshire T-REC program and looked to it as it develops a thermal standard. Other states have asked for assistance and feedback when considering the addition of useful thermal energy in their RPS.

Judges' Comments

New Hampshire has done a lot of technical work to develop this pioneering program, its structure and rules. Though carve-outs have been done before, a thermal carve-out is new. The program has shown significant impact, and its success can be replicated.

Local Resources, Local Benefits

The T-REC program expands New Hampshire's economy by supporting the renewable thermal industry and by developing its work force. The T-REC program has benefitted the geothermal, solar thermal, and biomass industries by providing an additional revenue stream to make these technologies more cost-effective. A typical large commercial facility generates approximately 2,500-6,000 T-RECs (measured in MWh equivalent).

The economic benefits of the T-REC market go beyond the renewable energy sector. Androscoggin Valley Hospital, for example, displaced approximately

Program Highlights

- By combining incentives with soft cost reduction, customer aggregation, targeted financing (especially for the LMI market), and training for stakeholders, NY-Sun is a comprehensive initiative to develop a sustainable and subsidy-free solar industry in New York State.
- Growth in the New York solar market significantly outpaced national growth in 2014 and 2015. The total number of solar installations in New York State increased by 62 percent in 2015.
- With 438 solar contractors participating in NY-Sun, projects currently in the pipeline will more than double the total amount of New York's current solar capacity.

New York State Energy Research and Development Authority (NYSERDA)

NY-Sun

NY-Sun is a bold initiative that is driving New York's solar industry and building momentum toward a sustainable, subsidy-free market by 2023. Through a comprehensive approach that offers incentives, reduces industry barriers, and addresses soft costs, NY-Sun has helped lead to a dramatic uptake in solar capacity, while reducing costs. More than 18,000 solar projects were installed across New York in 2015, increasing the State's solar capacity by nearly 202 megawatts (MW) to 568 MW (see Table 1). Looking forward, projects already in the initiative's pipeline will more than double the total amount of current capacity. NY-Sun aims to install 3 gigawatts of solar by 2023, while building a self-sustaining solar industry.

A Multi-Faceted Approach

NY-Sun is a comprehensive initiative established by Governor Andrew M. Cuomo in 2012 to develop a sustainable and subsidy-free solar industry in New York State. It consists of numerous components administered by the New York State Energy Research and Development Authority (NYSERDA), in collaboration with the New York Power Authority (NYPA) and the Long Island Power Authority (LIPA). The components of NY-Sun include a photovoltaic (PV) incentive initiative, consumer education, a community solar joint purchasing initiative, an initiative to add solar to schools (K-Solar), a program to improve access to PV by low- and moderate-income (LMI) households, a Shared Solar initiative that enables residences to buy into a solar project, solar workforce trainings, and soft cost reductions associated with customer acquisition and installation. In 2014, NY-Sun was expanded into a \$1 billion initiative featuring the "Megawatt Block" incentive structure, which adjusts incentive rates based on market activity in each sector and geographic region. NY-Sun stands apart from other initiatives in that it is not just an incentive initiative, but rather a multi-faceted roadmap for creating a self-sustaining solar industry.



Linear Lighting,
Long Island City,
NY (Photo:
Linear Lighting)



NYSERDA

The New York State Energy Research and Development Authority (NYSERDA), a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and funding to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

For more information:

<http://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun>

Contact person

David Sandbank
Director, NY-Sun
david.sandbank@nyserda.ny.gov

TABLE 1: Total quantitative measures for the energy and environmental benefits of PV systems installed to date in NYS.

	MW Installed	MWH Generation (Annual Equivalent)	Tons of SO ₂ Offset (Annual Equivalent)	Tons of NO _x Offset (Annual Equivalent)	Tons of CO ₂ Offset (Annual Equivalent)
2002–2013 (Pre Megawatt Block)	202.98	238,266	105	88	77,458
2014–Q12016 (Post Megawatt Block Launch)	365.02	428,475	189	159	133,898
Total NY State	568.00	666,741	293	247	208,357

Declining Block Incentives

The design of the Megawatt Block incentive structure reduces the available incentives by set increments as the solar market reaches pre-determined capacity targets. This structure allows solar customers to clearly see available incentives, and it gives the solar industry the transparency and certainty needed to forecast project economics and to attract investment. Real-time information on incentive levels and block capacity is available online. The program design divides the state by region and by market sector, allowing different parts of the market to accelerate over time at their own pace. As incentives decline, NY-Sun has more impact per dollar spent. In 2014, NY-Sun awarded more than \$95 million in solar incentives, and had 121 MW of PV installed (effectively \$0.79/watt). Last year, it awarded more than \$125 million in incentives and saw 202 MW of PV installations (effectively \$0.62/watt).

Solar Accessible to All

Affordable Solar, a component of NY-Sun launched in 2015, expands access to solar energy to LMI households. It doubles the per-watt incentive provided by NY-Sun for solar on owner-occupied residences of LMI households. NYSERDA also launched a financing pilot program using low-interest Green Jobs-Green NY financing to prepay solar leases for LMI solar customers. NY-Sun support for LMI customers participating in Shared Solar projects will be introduced in 2016, which will enable residents to buy into or purchase shares of solar projects so they can receive bill savings without putting solar on their roofs.

Soft Cost Strategies

NY-Sun is reducing soft costs in a variety of ways, including promoting customer aggregation, training, and streamlining. A statewide Solarize program helps homes and businesses use group purchasing to secure low prices and simplify the contracting process through aggregated demand. The K-Solar initiative provides technical assistance and an aggregated solar procurement process to public schools throughout the State. As with other aspects of NY-Sun, K-Solar relies on a high level of collaboration across New York State agencies. It was implemented in partnership with NYPA and the State Education Department.

NY-Sun has given considerable attention to municipal governments, because New York is a “home rule” state that relies on municipal governments to implement solar-friendly building, zoning, and taxation policies. NY-Sun’s PV Trainers Network provides technical training, general education, and tools to local officials involved in policymaking, purchasing decisions/negotiations, permitting, system inspections, and emergency response. In its first year, the network completed 100 trainings, reaching over 3,000 local officials. NY-Sun has also streamlined its internal processes and program requirements to eliminate unnecessary documents, reduce unnecessary document reviews, and expedite the process through which incentives are awarded to projects.

Judges’ Comments

This is a well-rounded initiative to increase solar capacity while driving down solar costs. It is taking a long-term view of the solar market and has put in place many individual components that are collectively having a significant impact.

Program Highlights

- ▶ The System Reliability Procurement Solar Distributed Generation Pilot Project demonstrated how distributed solar PV can provide value to RI's electric grid.
- ▶ National Grid estimates that the project will contribute 362 kW of projected peak load reduction, demonstrating a viable "non-wires alternative" in distribution system planning, and potentially deferring a new substation feeder by an estimated two to four years.
- ▶ The project was a constructive collaboration between a utility, state agencies, and key energy stakeholders to advance knowledge of solar distributed generation through a real-world demonstration of its strategic integration with the electric grid.

Rhode Island Office of Energy Resources

SYSTEM RELIABILITY PROCUREMENT SOLAR DISTRIBUTED GENERATION PILOT PROJECT

This pilot project, developed by the Rhode Island Office of Energy Resources (RI OER), explored how distributed PV could provide value to Rhode Island's electric grid. The project sought to better understand the costs and benefits of solar distributed generation and its ability to reduce peak loads on the electric distribution system. It successfully mobilized the local community to adopt solar PV, exceeded goals for solar deployment, helped to defer traditional utility capital investments, and provided important lessons for the consideration of "non-wires alternatives" in distribution system planning. Preliminary estimates indicate that solar resources that were geo-targeted by the project could provide enough peak load reduction to defer a new substation feeder—estimated to cost \$2.93 million—by two to four years.

Using Distributed Generation to Address Electric Load Constraints

For several years, National Grid, Rhode Island's major electric utility, used an initiative called DemandLink™ to geo-target customer adoption of energy efficiency and demand response to address a localized electric load constraint during late summer afternoons in the towns of Tiverton and Little Compton. In order to understand how solar might also help contribute to meeting the distribution need, RI OER proposed using an additional non-wires alternative: geo-targeted solar PV deployment. The System Reliability Procurement Solar Distributed Generation (SRP DG) Pilot Project aimed to use solar adoption to help defer the construction of a new substation feeder in the Tiverton-Little Compton area. It employed two key solar-adoption strategies: (1) an open solicitation for competitive proposals from solar developers and (2) a locally based Solarize campaign.

Solar Solicitation

RI OER designed the pilot project's solar solicitation to fully integrate with and complement the state's Renewable Energy Growth (REG) Program, which helps Rhode Island customers develop and benefit from renewable energy projects by using fixed-price, long-term, performance-based



U.S. Senator Sheldon Whitehouse speaks at the Solarize Tiverton and Solarize Little Compton kickoff event (Photo: Rhode Island Office of Energy Resources)



Solar installation at the Black Goose Cafe in Tiverton, RI (Photo: Rhode Island Office of Energy Resources)



Rhode Island Office of Energy Resources

The Office of Energy Resources (OER) is Rhode Island's lead state agency on energy policy and programs. The mission of OER is to lead Rhode Island to a secure, cost-effective, and sustainable energy future. OER works closely with private and public stakeholders to increase the reliability and security of our energy supply, reduce energy costs and mitigate price volatility, and improve environmental quality. By developing and implementing smart energy policies—such as those that promote energy efficiency and renewable energy—OER helps advance Rhode Island as a national leader in the new clean energy economy.

For more information:

www.energy.ri.gov/reliability

Contact person

Danny Musher
Chief Program Development
Rhode Island Office
of Energy Resources
danny.musher@energy.ri.gov

incentives. RI OER offered a competitive grant opportunity to REG Program participants based on the incremental costs that might be incurred to maximize a solar installation's benefit to the distribution system. One developer submitted a proposal for a single-axis tracking system. The solar tracking system design helps maximize value to the distribution grid by providing increased electric generation during the late afternoon load peak when the area's load constraint is most acute.



The Solarize initiatives engaged a wide array of local community members—even dogs got excited about solar! (Photo: SmartPower)

Solarize with a Twist

Solarize initiatives use community engagement techniques and competitive tiered pricing to promote targeted adoption of solar while driving down costs for all participants by leveraging economies of scale. The Solarize Rhode Island component of the SRP DG project brought together multiple collaborators, including the Renewable Energy Fund at Commerce RI, SmartPower, a non-profit marketing company, and RI OER. RI OER added a new twist to the traditional Solarize tiered pricing model for the Tiverton and Little Compton campaigns: a sliding-scale of incentives for westward-facing solar projects,

which were based on the solar project's incremental value to the distribution system during the local summer peak periods. Recognizing that solar panels facing west and southwest would generate electricity during the critical time of peak demand when the value to the grid is highest, the Solarize campaigns in Tiverton and Little Compton offered extra monetary incentives to homeowners who oriented their solar systems westward, to offset their lower overall solar production. Sixty-seven Rhode Island customers signed contracts for solar during the course of the Tiverton and Little Compton Solarize campaigns. Many received the added incentive for westward-facing solar installations.

Leadership, Lessons, and Legacy

The RI OER's SRP DG project represents a successful geo-targeted effort to promote customer adoption of solar. Collectively, the project enrolled 735 kW of solar DG, exceeding its original goal of 520 kW. Not only did the project result in substantial new installed solar capacity, but it also achieved cost savings for residents of Tiverton and Little Compton, as well as for statewide rate-payers. The addition of solar is anticipated to contribute to the deferral of a proposed new substation feeder. National Grid estimates that the solar enrolled through the project will contribute 362 kW of projected peak load reduction. Beyond the immediate savings and increased solar penetration achieved, the project offers a real-world demonstration of the strategic integration of distributed solar deployment with electric distribution planning. The project provides an example of a successful partnership between a state energy office and an electric distribution company, and the use of geo-targeted solar as a viable "non-wires solution" to address localized electric load constraints. It provides a replicable model that other states can use to strengthen cooperative planning with utilities on distributed generation.

Judges' Comments

This project demonstrates the successful use of geo-targeting for solar resources and non-wires solutions for grid constraints. The data analysis by RI OER will inform other states about how distributed generation can benefit the local utility and the grid.

CESA MEMBERS

CESA Core Members

Alaska Energy Authority (AEA)
California Energy Commission (CEC)
Connecticut Green Bank
Department of Energy & Environment (DoEE) — D.C.
Energy Trust of Oregon
Illinois Power Agency
Massachusetts Clean Energy Center (MassCEC)
New Hampshire Public Utilities Commission —
Sustainable Energy Division
New Jersey Board of Public Utilities — New Jersey Clean
Energy Program
New Mexico State Energy Office —
Energy Conservation and Management Division
New York State Energy Research & Development
Authority (NYSERDA)
Rhode Island Office of Energy Resources
Sacramento Municipal Utility District (SMUD)
Vermont Public Service Department —
Clean Energy Development Fund
Washington Department of Commerce
Xcel Energy — Renewable Development Fund (Minnesota)

CESA Affiliate Members

Alaska Center for Energy and Power (ACEP)
Connecticut Department of Energy and Environmental
Protection (CTDEEP)
Massachusetts Department of Energy Resources
(MassDOER)
Massachusetts Department of Environmental Protection
(MassDEP)
Minnesota Department of Commerce
New Hampshire Department of Environmental Services
New Hampshire Office of Energy and Planning
Oregon Department of Energy
Prairie Island Indian Community
Rhode Island Commerce Corporation (Commerce RI)



Clean Energy States Alliance

50 State Street, Suite 1
Montpelier, VT 05602
802.223.2554

cesa@cleanegroup.org
www.cesa.org

Clean Energy States Alliance (CESA) is a national, non-profit coalition of public agencies and organizations working together to advance clean energy. CESA members—mostly state agencies—include many of the most innovative, successful, and influential public funders of clean energy initiatives in the country.

CESA works with state leaders, federal agencies, industry representatives, and other stakeholders to develop and promote clean energy technologies and markets. It supports effective state and local policies, programs, and innovation in the clean energy sector, with an emphasis on renewable energy, power generation, financing strategies, and economic development. CESA facilitates information sharing, provides technical assistance, coordinates multi-state collaborative projects, and communicates the views and achievements of its members.

© 2016 Clean Energy States Alliance

