

# State Leadership in Clean Energy

## Seven Exemplary Programs



October 2012



California Energy Commission –  
University of California, San Diego  
Microgrid

Fuel cell for heat and power:  
A 2.8 MW fuel cell generates  
electricity from biogas. Waste heat  
feeds a thermal storage system.

© University of California, San Diego

## Contents

- 1 Introduction**
- 3 California Energy Commission**  
University of California, San Diego Microgrid
- 5 California Energy Commission**  
Synchrophasor Research and Development Program
- 7 Clean Energy Finance and Investment Authority**  
CT Solar Lease Program
- 9 Massachusetts Clean Energy Energy Center**  
Commonwealth Solar Hot Water Pilot Program
- 11 New Hampshire Public Utilities Commission**  
Residential Wood-Pellet Boiler Rebate Program
- 13 New York State Energy and Research and Development Authority**  
Clean Energy Business Incubator Program
- 15 New York State Energy and Research and Development Authority**  
On-Site Wind Market Development Program
- 17 The 2012 SLICE Award Judges**

## Introduction

**The State Leadership in Clean Energy (SLICE) Awards recognize outstanding state and municipal programs that have accelerated adoption of clean energy technologies and strengthened clean energy markets.**

Since the 1990s, states across the U.S. have implemented policy initiatives that have made clean energy technologies an increasing part of the nation's energy system and landscape—a visible reality in neighborhoods, on rooftops, at businesses, along highways, and in many other locations. State and municipal clean energy funds have been some of the most important entities to advance clean energy deployment. Clean Energy States Alliance (CESA) and its clean energy fund members are at the center of this state clean energy activity. States are driving renewable energy markets. They are pioneering new investment models, fostering research and development, and embracing innovative new technology commercialization strategies.

The policies and programs that CESA members are implementing have significantly increased public and private investment in renewable energy deployment. Since 1998, the clean energy funds and agencies that comprise the membership of CESA have invested more than \$3.4 billion in renewable energy projects and leveraged an additional \$12.5 billion. In 2011 alone, these organizations supported nearly 33,000 clean energy projects across the country.

CESA was formed in 2002 to assist state and other sub-federal efforts related to renewable energy technologies and markets. Over the past ten years, the 27 state, quasi-state, and municipal agencies that have been members of CESA have combined their efforts to develop more effective strategies and joint initiatives.<sup>1</sup> CESA facilitates multi-state collaborations, real-time learning, and strategic public-private partnerships. Put simply, CESA is dedicated to supporting state leadership, activities, and innovation in the clean energy sector.

### **The State Leadership in Clean Energy Awards**

CESA established the SLICE Awards in 2008 to provide greater recognition and visibility for exemplary state programs. By identifying and publicizing excellent programs, the SLICE Awards help states learn from each other and encourage the spread of worthy program models.

Programs are nominated for SLICE Awards by state funds and agencies from across the country. The nominated programs are reviewed by a team of independent judges, who select the best programs for recognition. The winning entries exemplify the ground-breaking work being done by states in the arena of clean energy development and deployment.

For the 2012 SLICE Awards, the six judges selected seven winners from among the nominated programs. This year's winners are:

- **California Energy Commission (CEC):** *Enabling Renewable Energy, Energy Storage, Demand Response, and Energy Efficiency with a Community-Based Controller-Optimizer at the University of California, San Diego Microgrid.* With \$2.4 million from the CEC Public Interest Energy Research (PIER) program and support from other state and federal sources, the University of California, San Diego (UCSD) Microgrid has integrated a diverse set of distributed energy technologies into an effective microgrid that has sharply reduced the university's energy costs, while providing valuable services to the larger utility grid and helping the state meet its energy and environmental goals.
- **California Energy Commission (CEC):** *Synchrophasor Research and Development Program.* The CEC PIER program significantly improved the ability of the California Independent System Operator (CAISO) to manage the regional electricity grid by supporting development of the Real Time Dynamics Monitoring System, which provides grid system operators with better, more complete and instantaneous information about grid operations. This improves

<sup>1</sup> Current and former members of CESA include: The Alaska Energy Authority; Arizona Department of Commerce – Energy Office; California Energy Commission; Colorado Governor's Energy Office; Connecticut Clean Energy Fund (now CEFA); District Department of the Environment, Energy Administration; Energy Trust of Oregon; Illinois Clean Energy Community Foundation; Long Island Power Authority; Maryland Energy Administration; Massachusetts Clean Energy Center; Metropolitan Edison Company – Sustainable Energy Fund of The Berks County Community Foundation (PA); New Hampshire Public Utilities – Sustainable Energy Division; New Jersey BPU – Clean Energy Program; New Mexico Energy Conservation and Management Division; New York State Energy Research and Development Authority; Ohio Department of Development – Office of Energy; PA Electric Company – Sustainable Energy Fund of the Community Foundation of the Alleghenies; Rhode Island Renewable Energy Fund; Puerto Rico Energy Affairs Administration; Sacramento Municipal Utility District; Sustainable Energy Fund of Central Eastern Pennsylvania; TRF-Sustainable Development Fund (PA); Vermont Clean Energy Development Fund; West Penn Power Sustainable Energy Fund; Wisconsin Focus on Energy, Xcel Energy Renewable Development Fund (MN).

grid reliability, reduces the chances and impacts of outages, and makes it easier to incorporate intermittent renewable energy sources into the transmission and distribution system.

- **Clean Energy Finance and Investment Authority (CEFIA):** *CT Solar Lease Program.* The CT Solar Lease Program, the first residential solar lease financing program in the nation supported by a public organization, was developed at a time when private solar lease financing was not yet available. The program has provided loans for 845 solar PV systems totaling 6.2 MW, while helping to pioneer and popularize the concept of third-party financing for residential solar. In addition, CEFIA's program brought U.S. Bancorp into the solar financing market; it subsequently became the single largest tax equity player in the residential solar PV market. CEFIA is also making valuable data from its solar lease program publicly available so that it can inform the design of future residential solar programs.
- **Massachusetts Clean Energy Center (MassCEC):** *Commonwealth Solar Hot Water Pilot Program.* This program awarded rebates to 320 residential, multi-family and commercial-scale construction projects, and funded feasibility studies for 38 commercial-scale projects. It supported residential systems serving domestic hot water or space heating loads, and commercial systems serving those functions as well as process and pool heating loads. MassCEC used information collected through the pilot program to develop a full-scale, long-term program, which launched in July 2012.
- **New Hampshire Public Utilities Commission:** *Residential Wood-Pellet Boiler Rebate Program.* This first-in-the-nation rebate program for residential bulk-delivery wood-pellet furnaces and boilers was a joint effort of the state's Public Utilities Commission and Office of Energy and Planning. It was designed to stimulate a new market for whole-house wood-pellet heating systems and, as importantly, to bolster the infrastructure for bulk delivery of wood pellets. With an initial budget of \$500,000, the program subsidized installation of 100 whole-house biomass heating systems, which almost always substituted for fuel oil systems. Approximately 30 installers participated in the program.

- **New York State Energy Research and Development Authority (NYSERDA):** *Clean Energy Incubator Program (CEBI).* NYSEDA's CEBI program aims to create a robust, long-lasting capacity for cleantech business mentoring and support. The program supports six incubators that collectively offer a portfolio of technical and business services designed to transform commercially promising clean energy technologies into scalable businesses that can attract additional investment.
- **New York State Energy Research and Development Authority (NYSERDA):** *On-Site Wind Market Development Program.* In 2003, NYSEDA implemented a standardized approach to providing incentives for the installation of behind-the-meter wind turbines (those up to 2 MW nameplate capacity). Each subsequent solicitation has incorporated program modifications based on experience and changes in the marketplace. The current round of the program has \$13,800,000 available through December 31, 2015. NYSEDA's small wind program has prompted manufacturers and installers to meet performance and safety criteria, playing a central role in the development of wind turbine installer training and certification programs, turbine eligibility criteria, and performance modeling software. These pioneering efforts have influenced and benefitted other states that support behind-the-meter wind installations.

These seven programs were judged exemplary on the basis of their public benefits, leadership and innovation, cost effectiveness, and replicability. They represent outstanding state efforts to overcome the barriers to greater clean energy use. The judges were impressed by the creative thinking, new ideas, and bold innovations that are embodied in the winning programs.

CESA is proud to honor these seven state programs and will present the SLICE Awards at its 2012 Fall Membership meeting in October. Although these programs reflect well the range of activities being undertaken by CESA members, there are dozens of other excellent programs that CESA members are carrying out to advance their states' and cities' goals towards a clean energy future. We at CESA admire our members' dedication, commitment, and resourcefulness. Full descriptions of the winning programs follow, along with short bios of our distinguished judges. CESA will offer several webinars on the winning programs this fall.

**More information on upcoming webinars and on past SLICE Award winners may be found on the CESA website, at <http://www.cleanenergystates.org>.**

## Program Highlights

- ▶ Funding from the California Energy Commission has provided \$2.4 million in support to UCSD's Microgrid.
- ▶ The UCSD Microgrid operates low-carbon, self-generation serving 92% of the campus' electricity load and 95% of its heating and cooling loads.
- ▶ The UCSD microgrid control system integrates and manages a wide-range of systems in real-time based on pre-defined operation priorities, including a 2.8 MW fuel cell, 1.2 MW of photovoltaics, 27 kW of concentrating photovoltaics, a 30 kW-hour photovoltaic-integrated storage system, 5 electric vehicles, 4 re-purposed electric vehicle batteries, a 27 MW combined-heat-and-power plant, and a 3.8 million gallon thermal storage system.



## California Energy Commission UNIVERSITY OF CALIFORNIA, SAN DIEGO MICROGRID

The California Energy Commission's Public Interest Energy Research (PIER) program is the state's premier energy RD&D program, advancing science and technology in the fields of energy efficiency, renewable energy, advanced electricity technologies, energy-related environmental protection, transmission and distribution, and transportation technologies. With \$2.4 million from the PIER program and support from other state and federal sources, the University of California, San Diego (UCSD) Microgrid has integrated a diverse set of distributed energy technologies into an effective microgrid that has sharply reduced the university's energy costs, while providing valuable services to the larger utility grid and helping the state meet its energy and environmental goals.

### The Benefits of Microgrids

A microgrid is a smaller-scale version of the traditional power grid. It consists of distributed energy resources, with renewable or other generation, that are integrated together as a single power generation source that can operate independently from, but still remain tied to, the main utility power grid. Microgrids represent an energy infrastructure model that can help achieve energy independence, mission assurance, and environmental sustainability. Microgrids have the potential to help California achieve several of its important energy policies and goals, including increasing renewable electricity generation to 33% by 2020, reducing carbon dioxide emissions, and accelerating the adoption of clean energy technologies.

The UCSD Microgrid self-generates 92% of its own annual electricity load and 95% of its heating and cooling load. By operating as a microgrid, the UCSD facility can manage a



Solar panels provide shade for parked cars and will eventually serve to charge electric vehicles.

© University of California, San Diego ©2008

variety of energy resources as an integrated system, expand the amount of renewable energy in the system, as well as accept and implement new and creative energy efficiency measures. It can also provide time-critical services, such as demand response, that assist the larger utility grid and bring in revenue to the university.

### Cost Effectiveness

Because UCSD conducts approximately \$1 billion per year in research, houses a national supercomputer center, and manages two patient care facilities, it needs mission-critical, low-cost, secure, reliable, and quality power. Using the micro-grid configuration, UCSD has proven it can reduce consumption from the utility grid for its 13 million square feet of buildings from 11 MW to 2 MW (an 80% reduction) within a two-hour period without impacting any critical loads. Energy is the university's second largest budgetary item. It now saves more than \$800,000 per month by providing for the vast majority of its own electricity, heating, and cooling needs. The high-speed integrated management of the microgrid allows the UCSD operator to address critical energy issues such as excess generation, renewable supply load balancing, and power outages.

The PIER program's \$2.4 million in support to the UCSD Microgrid has enabled: (1) the microgrid master controller to be capable of hourly re-optimization based upon dynamic market price signals; (2) the microgrid to be a live test bed for some of the most innovative and important technologies on the energy market today; and (3) the project to become the flagship microgrid in both California and the nation.

UCSD leveraged PIER funds by obtaining additional project co-funding through San Diego Gas & Electric, the US Department of Energy, the United States Treasury's Clean Renewable Energy Bonds, the California Public Utility Commission's Self-Generation Incentive Program, the California Solar Initiative, and the Statewide Energy Partnership.

### Leadership and Innovation

The microgrid serves as a "lab to market" living laboratory for numerous innovative grid-integrated demonstration projects from the global private sector. Because UCSD is a self-regulated entity, the private sector gains a substantial reduction in commercializing the products used in this project because UCSD is able to rapidly install and evaluate these new clean energy technologies. UCSD has been the launching pad to bring new renewable energy technology manufacturing capability to California.

The UCSD Microgrid provides insight into how the future California smart grid can operate with higher penetrations of renewable resources, integrate more distributed energy resources, and achieve higher levels of energy efficiency (including demand response) into a smooth operating electrical system. Understanding how and when microgrids draw from and sell back to the grid is essential for an evolving energy paradigm. By working with the California Energy Commission and other partners, the UCSD microgrid has become a superior advanced-knowledge transfer system that can educate others about the value of an integrated and functioning microgrid for years to come.

### Judges' Comments

*This program is a solid example of what could and should be done at a public university around RD&D and implementation of renewable energy technology; it demonstrates how renewable energy technologies can be used and provides valuable insights on how to advance the concept. We need advanced thinking and leadership like this to advance new technologies and gain valuable experience and learning.*



### About the California Energy Commission

The California Energy Commission is the state's primary energy policy and planning agency. It was created by the Legislature in 1974; its responsibilities include forecasting future energy needs, licensing thermal power plants, promoting energy efficiency, supporting the renewable energy market, administering the American Reinvestment and Recovery Act funding through the state energy program, and more. Within the last two years, the most important development in California's energy policy has been two landmark pieces of legislation for energy policy that focus on climate change and transportation.

### For more information:

California Energy Commission  
1516 Ninth Street  
Sacramento, CA 95814

### Contact person

Consuelo Sichon  
Senior Electrical Engineer  
(916) 327-2222  
Consuelo.Sichon@energy.ca.gov

Program Highlights

- ▶ The California Energy Commission's PIER program funded the Real Time Dynamics Monitoring System software that allows operators of the electricity grid to have better, more complete and instantaneous information, improves operations, and allows operators to visualize system status in real time.
- ▶ According to research completed by the PIER program benefits team, better control of the electrical grid has the potential to avoid outage costs by 2020 that are conservatively estimated to range from \$210–\$360 million annually.
- ▶ The synchrophasor research and development program initiated by the CAISO and supported by the PIER Program has been replicated by the US Department of Energy in its national synchrophasor program.



## California Energy Commission SYNCHROPHASOR RESEARCH AND DEVELOPMENT PROGRAM

The California Energy Commission's Public Interest Energy Research (PIER) Program significantly improved the ability of the California Independent System Operator (CAISO) to manage the regional electricity grid through funding the synchrophasor research and development program. The Real Time Dynamics Monitoring System developed provides grid system operators with better, more complete, and instantaneous information about grid operations, improves grid reliability, reduces the chances and impacts of outages, and makes it easier to incorporate intermittent renewable energy sources into the transmission system.

### The Need for Reliable Information to Manage the Grid

Operators of regional electricity grids face new challenges because of the increasing penetration of renewable energy and distributed generation, addition of electric vehicles to the grid, and difficulty in obtaining permits and funding to install transmission lines to address growing congestion problems.

PIER, the state's premier energy RD&D program, has been helping the California Independent System Operator (CAISO) to address these challenges. Over the past decade, PIER provided the CAISO synchrophasor program with \$11.4 million in research and development funding. CAISO also leveraged funds from other sources such as the US Department of Energy.

CAISO was an early leader in realizing the potential of using synchrophasor technology and in developing the first industry prototypes of a dynamic system that takes the high-resolution synchrophasor data and converts it into useful, real-time information that can be used by system operators to manage the electric grid. A phasor measurement unit (PMU) or synchrophasor is a device that measures the electrical waves on an electricity grid, using a common time source for synchronization. Time synchronization allows



The CAISO control room utilizes synchrophasor data to manage the electric grid.  
Source: CAISO

synchronized real-time measurements of multiple remote measurement points on the grid. The synchrophasor data, when properly used, provides CAISO operators more accurate system status information, allows the operator to better control the grid in real-time, and increases overall system reliability.

CAISO's involvement with synchrophasor technology began a decade ago when it began working with Electric Power Group to move the technology from an experimental setup into the control room. The Real Time Dynamic Monitoring System software, developed with funding from PIER, compiles high quality electrical system information from synchrophasors and allows CAISO operators to visualize the system status in real-time, transitioning from a system that updates data every few seconds to a system that updates data 10 to 30 times a second. Not only do synchrophasors provide a much more accurate status of the electric grid system to the grid operators, but software can be enabled to provide automatic feedback and system correction when disturbances are detected.

This improved technology is especially valuable for renewable energy technologies, such as solar and wind, which are intermittent and highly variable. Synchrophasors installed alongside renewable generation sources can provide instantaneous data to the system operator. Such data aids in acquiring generation resources that can be ramped up or down to meet energy balance requirements, and smoothes the variability of renewable resources. By enabling CAISO operators to control the grid with greater precision, transmission capacity has been increased, and the critical information being provided to the grid operator is available faster and with more detail.

### **Cost-Effectiveness**

Although the cost of developing and implementing synchrophasors has been considerable, so are the benefits of the grid operator being able to more effectively manage the grid and avoid potential disturbances or outages. According to research completed by the PIER Program benefits team, better control of the electrical grid by 2020 has the potential to avoid outage costs that are conservatively estimated to range from \$210–\$360 million annually. The greatest benefits accrue to small businesses and manufacturers who face the highest costs for each kilowatt-hour not delivered due to power interruptions. California ratepayers are also expected to save \$90 million annually by 2020 through lower electricity costs associated with increased transmission capacity that implementing synchrophasor technology will provide.

### **Leadership and Innovation**

The synchrophasor research and development program supported by PIER has already been replicated by US Department of Energy in its national synchrophasor program. The lessons learned from the CAISO implementation of synchrophasors will allow the grid operators in other regions across the country to rapidly implement these solutions. Further adoption of synchrophasor technologies by other states and jurisdictions will allow the nation to erect the smart grid sought by so many, and will validate the impact of this leadership role played by the CAISO and the PIER program to bring synchrophasor technology to the grid operation control room.

### **Judges' Comments**

*This technology addresses a major barrier to increased use of renewable energy—the Grid. Putting synchrophasor technology online in California and documenting its results has helped the region and the country to use the grid better and more efficiently, and has served as a stepping stone to a smart grid. The Synchrophasor Program has added significant capabilities to the general operation of the grid and the lessons from this program have advanced the ability to maintain grid reliability nationwide.*



### **About the California Energy Commission**

The California Energy Commission is the state's primary energy policy and planning agency. It was created by the Legislature in 1974; its responsibilities include forecasting future energy needs, licensing thermal power plants, promoting energy efficiency, supporting the renewable energy market, administering the American Reinvestment and Recovery Act funding through the state energy program, and more. Within the last two years, the most important development in California's energy policy has been two landmark pieces of legislation for energy policy that focus on climate change and transportation.

### **For more information:**

California Energy Commission  
1516 Ninth Street  
Sacramento, CA 95814

### **Contact person**

Jamie Patterson  
Senior Electrical Engineer  
(916) 327-2342  
[Jamie.Patterson@energy.ca.gov](mailto:Jamie.Patterson@energy.ca.gov)

## Program Highlights

- ▶ The CT Solar Lease Program helped pioneer the concept of solar leasing and was the first residential solar lease financing program supported through a public-private partnership.
- ▶ The program served as one of U.S. Bancorp's first tax equity investments in the solar market. Since that time, U.S. Bancorp has become one of the nation's largest tax equity providers for residential solar.
- ▶ As a public entity involved in the solar lease market, CEFIA has collected and disseminated information on its experiences with solar leasing, thereby providing valuable information for private sector players and government agencies involved with residential solar programs in other states.



**CLEAN ENERGY**  
FINANCE AND INVESTMENT AUTHORITY

# Clean Energy Finance and Investment Authority

## CT SOLAR LEASE PROGRAM

**The CT Solar Lease Program was the first residential solar lease financing program in the nation to be financed through a public-private partnership. Its guiding mission was to make it possible for homeowners to install solar electricity systems without having to make the large up-front payments that had proved prohibitive for middle-income homeowners. The CT Solar Lease Program helped pioneer and popularize the concept of third-party financing for residential solar PV systems. To date, this particular program has provided loans for 845 systems totaling 6.2 MW of solar capacity.**

### The Financing Barrier to Solar Installations

Homeowners who want to install a solar photovoltaic (PV) system have historically faced the hurdle of coming up with the money to purchase the system. Even if the system will ultimately save money over time, the initial purchase price can be a daunting barrier. For that reason, in the mid-2000s, several private and public parties began exploring creative financing options to reduce the need for a large up-front payment on the part of the homeowner. The Connecticut Clean Energy Fund, the predecessor agency of the Clean Energy Finance and Investment Authority (CEFIA), in partnership with several private sector entities, developed solar lease programs that would provide homeowners with a low-cost alternative. This and similar programs have collectively transformed the residential solar market as most installations across the country now include third-party financing.

### How the Program Works

When the CT Solar Lease Program was launched in 2008, the installed cost of residential PV was just over \$8.70 per watt. The Connecticut Clean Energy Fund provided a rebate covering nearly 50% of the installed cost leaving \$4.35 per watt remaining. The Fund worked with



Connecticut Solar Leasing, LLC (a non-bank subsidiary of U.S. Bancorp), AFC First Financial Corporation (AFC First), and Gemstone Lease Management, LLC (Gemstone) to design a residential solar lease program that would finance the remaining installed cost.

Under the program, CT Solar Leasing offers a zero down-payment lease with a 15-year initial term. Lease payments are fixed for that term and paid monthly. After the 15 years, the homeowner can extend the lease for an additional five years at a reduced rate, purchase the system, or have it removed.

To qualify for a lease, homeowners need a FICO score of at least 620 and their maximum family income can be no more than 200 percent of the state's median family income.

### CT Solar Lease Customer Statistics

Variable	Mean	Range	Sample Size
Primary Applicant Age	50 years	23 to 90 years	845
Household Income	\$97,290	\$3,694 to \$234,472	839
Applicant's FICO Credit Score	769 pts	620 to 850 pts	838
Co-Applicant's FICO Credit Score	772 pts	594 to 850 pts	565
Debt to Income Ratio	31.5%	1.0 to 53.6	845
System Size	7.40 kW	1.80 to 12.30 kW	845

Solar incentives in Connecticut have evolved over time. As PV hardware and installation costs declined rapidly after 2008, Connecticut reduced rebate levels. CEFIA is now working on modifying the solar lease program so that it will work without a subsidy and to attract additional debt financing into the capital structure.

### Spreading the Solar Lease Model

In 2007 Connecticut began looking for ways to make solar power available to households with moderate income levels. CEFIA, Gemstone and AFC First, developed the concept of a solar lease program, which was financed and owned by CT Solar Leasing, LLC, a non-bank subsidiary of U.S. Bancorp that provided tax equity financing in support of the solar installations. When Connecticut began developing the solar lease program, few such institutions had considered such investment in the residential solar market. Since that initial partnership, U.S. Bancorp has become not only a committed supporter of renewable energy developments broadly, but a market leader in the financing of residential solar PV.

Although solar leasing outside Connecticut is normally handled entirely by the private sector, the Connecticut program is nevertheless important to those states seeking to move towards a market that relies less and less on subsidies and rebates. Private companies are understandably reluctant to share data on their leasing experiences, but the CT Solar Lease Program, as a public-private partnership, views information sharing as part of its mission. For example, to help the National Renewable Energy Laboratory analyze customers' experiences with solar leasing, CEFIA has shared non-personal data on its solar lease customers, along with information on late payments, defaults, assignments, and impacts on home sales. The resulting analysis, which will come out in the next few months, should help the financial community and state agencies across the country better understand the solar leasing market and will likely inform the design of future solar programs.

### Judges Comments

*The CT Solar Lease Program was creative in tackling one of the most important barriers to widespread adoption of solar energy by homeowners. It has stimulated financial institutions to enter the residential solar financing market in Connecticut and elsewhere.*

State Leadership in Clean Energy Award Winner • 2012  
CLEAN ENERGY STATES ALLIANCE



**CLEAN ENERGY**  
FINANCE AND INVESTMENT AUTHORITY

### About the Clean Energy Finance and Investment Authority

CEFIA was created by the Connecticut General Assembly in 2011. It is the successor organization to the Connecticut Clean Energy Fund. CEFIA's mission is to promote, develop and invest in clean energy and energy efficiency projects in order to strengthen Connecticut's economy, protect community health, improve the environment, and promote a secure energy supply for the state. CEFIA is governed by an 11-member board of directors appointed by the governor and the leadership of the State Legislature. As the nation's first full-scale clean energy finance authority, CEFIA will leverage public and private funds to drive investment and scale up clean energy deployment in Connecticut.

### For more information:

Clean Energy Finance and Investment Authority  
868 Brook Street  
Rocky Hill, CT 07067  
[www.ctcleanenergy.com](http://www.ctcleanenergy.com)

### Contact person

Dale Hedman  
Director of Renewable Energy Development  
(860) 257-2331  
[Dale.Hedman@ctcleanenergy.com](mailto:Dale.Hedman@ctcleanenergy.com)

Program Highlights

- ▶ Funding for commercial-scale feasibility studies helped to standardize the methodology for site assessment, increase installer expertise, provide stakeholders with complete information on which to base siting and investment decisions, and increase the ultimate performance of the solar hot water projects.
- ▶ The CSHW Pilot program is replicable nationwide; several states have already consulted with MassCEC about the performance monitoring program to gain guidance on technical requirements, cost considerations, and implementation issues.
- ▶ Data from metered systems will be shared following validation and analysis, in an effort to advance the solar thermal industry as a whole.

## Massachusetts Clean Energy Center COMMONWEALTH SOLAR HOT WATER PILOT PROGRAM

The Massachusetts Clean Energy Center (MassCEC) designed its Commonwealth Solar Hot Water (CSHW) Pilot Program to encourage solar hot water installations at residential, multi-family, and commercial-scale buildings in Massachusetts. The program ran from February 2011 through June 2012, during which time it awarded rebates to 320 residential and commercial-scale construction projects, as well as funded feasibility studies for 38 commercial-scale projects. The program supported residential systems serving domestic hot water or space heating loads, and commercial systems serving those functions as well as process and pool heating loads. Systems could supplement any fuel type. MassCEC has utilized information collected through the pilot program to develop a full-scale, long-term program, which launched in July 2012.

### Addressing Barriers to Solar Hot Water

More than one third of total US energy consumption stems from thermal uses. Renewable thermal technologies, like solar hot water (SHW), present significant opportunities for job creation, economic development, reduction of greenhouse gas emissions, and improved energy security—all key goals of MassCEC. While MassCEC had previously focused on supporting electricity producing renewable technologies, the CSHW Pilot Program represented a first step towards incentivizing cost-effective renewable thermal technologies.

Studies on the adoption of solar thermal technology indicate two primary barriers: 1) lack of awareness of the technology and its associated economic and environmental benefits, and 2) large upfront capital costs. The CSHW Pilot Program directly addressed these two challenges by providing 1) marketing, education and training for the public and building and plumbing inspectors and 2) financial assistance in the form of feasibility study grants for commercial systems and construction rebates for residential and commercial systems to help ease the substantial upfront capital investment.



Multi-family flat plate solar domestic water heating system in Beverly, Massachusetts.



## Accomplishing a Lot with a Little

Within a program budget of \$2 million, the CSHW pilot program has accomplished a lot: hundreds of SHW systems have been installed, dozens of contractors and inspectors have been trained, and many important performance monitoring lessons have been learned. In this multi-faceted program, \$900,000 was awarded in the form of rebates. Because the average construction rebate covered about 15% of total installed costs, MassCEC leveraged more than \$3.2 million in total project investments. MassCEC's administrative costs were less than 15% of the total program budget. On a levelized cost of energy basis, installed costs for solar hot water equate to about \$0.09/kWh, making it one of the most cost-effective renewable energy technologies in MassCEC's portfolio.

A distinguishing feature of the CSHW Pilot Program was its performance monitoring program, which collected performance data for at least 12 months on a large subset of the solar hot water residential and commercial systems funded through the program. Participation in the monitoring program was voluntary for residential installations, but all commercial entities were required to participate. The program provided additional funding to system owners to cover the costs of installing metering equipment.

The data collected through this program will form a basis for educating future customers on the expected performance of the technology in this region; equally important, it will significantly contribute to the development of performance-based incentives and third-party ownership models for solar hot water systems, by standardizing the design of monitoring systems and data collection. MassCEC plans to use the performance data collected to create case studies and other educational materials in an effort to showcase actual performance of solar hot water systems in Massachusetts. The goal will be to use concrete, quantitative results to generate positive public awareness about the economic and environmental benefits of appropriate SHW applications. Additionally, through troubleshooting the installed systems and validating the performance data, Massachusetts is leading the way in understanding design, installation, and other common issues associated with monitoring SHW projects. Through this work, Massachusetts aims to standardize the monitoring of SHW systems, encouraging the development of third-party financing and production-based incentive programs.

### Judges' Comments

*This targeted program had all the right components. It laid out and executed a game plan to address a technology that is trying to find its place.*



Residential evacuated tube solar domestic water and space heating system on Martha's Vineyard, Massachusetts.



### About the Massachusetts Clean Energy Center

Massachusetts is leading the way in innovative and comprehensive energy reform that will make clean energy a centerpiece of the Commonwealth's economic future. The Green Jobs Act of 2008 created the Massachusetts Clean Energy Center (MassCEC) to accelerate job growth and economic development in the state's clean energy industry. This new quasi-public agency serves as a clearinghouse and support center for the clean energy sector, making direct investments in new and existing companies, providing assistance to enable companies to access capital and other vital resources for growth, and promoting training programs to build a strong clean energy workforce that capitalizes on the job opportunities created by a vital new industry.

### For more information:

Massachusetts Clean Energy Center  
55 Summer Street, 9th Floor  
Boston, MA 02110  
[www.masscec.com](http://www.masscec.com)

### Contact person

Christie Howe  
Project Manager  
(617) 315- 9318  
[CHowe@masscec.com](mailto:CHowe@masscec.com)

State Leadership in Clean Energy Award Winner • 2012  
CLEAN ENERGY STATES ALLIANCE

Program Highlights

- ▶ This program is highly replicable; program administrators have received inquiries from other states and Canadian provinces interested in developing similar programs.
- ▶ Project rebates are 30% of system cost including labor, with a cap of \$6,000, meaning that outside financial leverage is more than 2:1, and in some cases significantly more.
- ▶ The success of this program helped provide a catalyst for policy improvements to New Hampshire's renewable portfolio standard (RPS).



## New Hampshire Public Utilities Commission

### RESIDENTIAL WOOD-PELLET BOILER REBATE PROGRAM

In April 2010, New Hampshire established a first-in-the-nation rebate program for residential, bulk-delivery, wood-pellet furnaces and boilers. A joint effort of the state's Public Utilities Commission (PUC) and Office of Energy and Planning (OEP), the program was designed to stimulate a new market for whole-house, wood pellet heating systems and, as importantly, to bolster the infrastructure for bulk delivery of wood pellets. With an initial budget of \$500,000, the program subsidized installation of 100 whole-house biomass heating systems, which almost always substituted for fuel oil systems. Approximately 30 installers participated in the program.

#### Displacing Fuel Oil

More than 60% of New Hampshire homes are heated with fuel oil, propane, or kerosene. Natural gas is only available in limited urban areas, and at the time of this program's inception, the New Hampshire wood pellet industry primarily produced bagged wood pellets for use in small stoves. At that time, only a handful of residential wood-pellet systems used bulk-delivery storage and conveyance in New Hampshire, meaning that the five pneumatic wood-pellet bulk-delivery trucks that existed in the state overwhelmingly sat idle. With this as a starting point, the program's challenge was to break through a chicken-and-egg barrier: consumers will not invest in innovative systems if they are unsure of the maturity of the fuel delivery infrastructure, while fuel supply chains will not mature in the absence of sufficient demand.

To overcome this challenge, program designers involved pellet delivery firms in discussions from the outset. They learned that existing fuel suppliers could service the entire state so long as customers used three-ton bulk delivery bins, which would ensure that



A typical storage bin and wood-pellet boiler. A bin is usually about 6' X 6', about the size of an old coal bin.

fuel deliveries were of sufficient size to be worthwhile for suppliers. The program adopted the three-ton bin as a requirement, with the result that customers were assured of the reliability of fuel supplies regardless of their location within New Hampshire. This validated wood pellets as a primary heating fuel for consumers, policymakers, energy delivery companies, and entrepreneurs. Additionally, it increased the credibility of wood pellet fuel and whole-house, wood pellet heating systems with insurance companies, lenders, appraisers, and real estate professionals. As a result of this program and in less than a year, New Hampshire experienced a market transformation. System manufacturers have retooled their products to meet the program's storage, conveyance, efficiency, and emissions requirements, and dozens of installers have been trained.

Before the launch of this program, the NH PUC offered rebates solely for residential small wind and photovoltaic systems, and the state's RPS provided renewable energy credits almost exclusively for renewable electricity generation. Incentivizing wood-pellet central heating systems advanced the state's desire to also support thermal renewable energy, culminating with a renewable thermal carve-out recently added to the state's RPS.

### Renewable Energy for Impoverished Communities

A public-private collaboration supported clustered "neighborhood" installations in the economically struggling community of Berlin. Through the Model Neighborhood Project, participating homeowners had most project costs paid for, with the result that they enjoyed immediate economic benefits due to lower heating costs. The Model Neighborhood Project also benefited the wood pellet industry by providing a stable, geographically clustered consumer base in the northern part of the state.

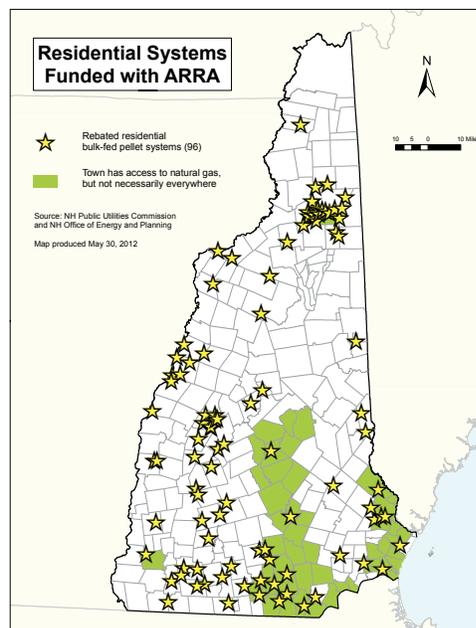
### Persistence Pays Off

Although central wood pellet heating systems are very popular in Europe, this technology has not penetrated the market in the United States. As such, this program was considered risky but with significant potential. Incentive programs are meant to spur innovation, and this program addressed a significant consumer need for renewable, local, less expensive, and safer/cleaner heating fuel for homeowners. With approval by the US Department of Energy to target this market and sector and by maximizing a limited funding opportunity (the program was funded with State Energy Program funds from the American Recovery and Reinvestment Act), OEP, PUC, and the industry patiently pushed for the market to transform. Despite a slow start, the two-year program ended with a waiting list. The New Hampshire PUC is now seeking to continue funding the program for another cycle.

### Judges Comments

*This program did a lot with a small budget. It put stranded assets (pellet delivery trucks) to work and developed a market. New Hampshire demonstrated leadership in finding a clever way to solve a problem.*

Residential wood-pellet boiler systems have been installed throughout the state.



**The Sustainable Energy Division (SED)** was created in 2008 to assist the NH Public Utilities Commission in implementing specific state legislative initiatives focused on promoting renewable energy and energy efficiency and on advancing the goals of energy sustainability, affordability and security. The Division administers two clean energy funds, implements the state's renewable electricity portfolio standard law, and manages the statewide energy code program for residential and commercial buildings. Currently the SED manages three residential rebate programs (Solar Photovoltaic & Wind Turbine, Solar Water Heating, and Wood-Pellet Boilers). SED also manages a Commercial & Industrial Solar Incentive Program and issues an annual RFP for commercial and industrial renewable energy projects.

### For more information:

NH Public Utilities Commission  
21 South Fruit Street  
Suite 10  
Concord, NH 03301-2429

### Contact person

Barbara Bernstein  
Sustainable Energy Analyst  
(603) 271-6011  
[Barbara.bernstein@puc.nh.gov](mailto:Barbara.bernstein@puc.nh.gov)

## Program Highlights

- ▶ NYSERDA's Clean Energy Business Incubator program seeks to create a long-lasting capacity for cleantech business mentoring and support.
- ▶ NYSERDA investment of \$5.3 million has enabled 94 client companies at the incubators to attract over \$74 million from private investors, another \$20 million in federal grants, and create over 190 new jobs since joining the incubator program.
- ▶ New York and its citizens benefit from the introduction of new technologies and the economic development that comes from commercializing those technologies by strong new businesses.

## NYSERDA

### CLEAN ENERGY BUSINESS INCUBATOR PROGRAM

**Start-up businesses can be an important vehicle for job creation, innovation, and economic growth, but entrepreneurs face significant challenges in transforming a commercial opportunity into a viable business. NYSERDA's Clean Energy Business Incubator (CEBI) program aims to create a robust, long-lasting capacity for cleantech business mentoring and support. The program is supporting six incubators that collectively offer a portfolio of technical and business services designed to transform commercially promising clean energy technologies into scalable businesses that can attract additional investment.**

#### **NYSERDA's Investment in Innovation**

NYSERDA created the CEBI program in 2009 and has four-year performance-based contracts (\$1.5 million each) with six clean energy business incubators. The program provides guidance and technical assistance to early-stage companies to help them develop and commercialize clean energy technologies. Among the services offered through the six participating incubators are technical assistance, mentorship and entrepreneurial development, opportunity assessment, business planning, marketing and business development support, legal and financial planning support, networking and introductions to investors, strategic partners, and key hires.

The program targets an important weakness in the process of bringing new technology to market. By working with experienced business incubators that add a strong cleantech focus, start-up companies are able to receive critical mentoring and support as they bring their technology to market. This increases the likelihood that the business will succeed and accelerates the availability of clean energy technologies.



With a few workstations and a lot of business support, startups like Sollega, a manufacturer of PV racking systems, can begin to thrive in NYSERDA's clean energy business incubators.



**About NYSERDA**

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 their reliance on fossil fuels. NYSERDA professionals work to protect our environment and create clean energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York since 1975.

**For more information:**

NYSERDA  
17 Columbia Circle  
Albany, NY 12203

**Contact person**

Michael Shimazu  
Senior Project Manager  
Innovation and Business  
Development  
518-862-1090 ext. 3478  
mhs@nyserdera.org

**Judges' Comments**

*The Clean Energy Business Incubator Program provided support for a wide variety of new clean energy products and greatly leveraged NYSERDA funding resulting in numerous new clean energy products entering the market. The program can be easily replicated by any state or region wishing to encourage entrepreneurial enterprise in virtually any area of technology.*

NYSERDA funding of the CEBI incubators will eventually total \$9 million. Each incubator is required to develop a sustainability plan to demonstrate its ability to continue supporting start-up cleantech companies beyond the availability of NYSERDA funding. The incubators are geographically dispersed around the state: iCLEAN at the College of Nano-scale Science and Engineering in Albany; Clean Energy Business Incubation Program (CEBIP) at the Long Island High Technology Incubator in Stony Brook; NYC Accelerator for a Clean and Renewable Economy (NYC-ACRE) at Polytechnic Institute of New York University in New York City; Clean Energy Incubator at the Rochester Institute of Technology; The Clean-Tech Center at The Tech Garden in Syracuse; Directed Energy at the University at Buffalo. To learn more about them, see <http://www.nyserdera.ny.gov/en/Innovation-and-Business-Development/Ways-NYSERDA-Supports-Growth-Essentials.aspx>.

As of June 2012, after three years of operation and a NYSERDA investment of \$5.3 million, the incubators have served 94 client companies, which have been able to attract more than \$74 million in private capital investments and secure nearly \$20 million more in federal grants, and have created 193 jobs since joining the incubator programs.

The ultimate benefits of the program are the introduction of new technologies and the economic development that comes from building strong new businesses to commercializing those technologies. For example, NYC-ACRE has graduated 22 companies from the incubator in the last three years.

NYSERDA expects each incubator to become a hub for other business innovation activities. By helping young companies plant roots in New York, the incubators will increase the likelihood that the companies will stay in the state as they grow. NYSERDA believes that the visible success of the businesses aided by the incubators will encourage further innovation and entrepreneurship in the clean energy sector.

A unique element of this program is that two-thirds of the funding provided to each incubator is directly tied to client success. Incubators are paid by NYSERDA as their clients complete business plans, formulate financial plans, introduce new products, raise private capital, and achieve revenue milestones on the way to viability. To earn these payments, the six incubators must offer a portfolio of technical and business services designed to transform a commercially promising clean energy technology into a scalable business that can attract enough investment to enter a market.

**Opportunities for New York**

For New York to realize the opportunities and benefits of innovation in the clean energy market there will need to be increased emphasis on the creation of a more entrepreneurial environment; increase of early-stage capital for technology startups; encouragement of networking and connection among innovation actors; and promotion of an innovation-friendly legal and regulatory environment. The NYSERDA CEBI program demonstrates a results-oriented model to foster clean technology innovation and new product development in New York State and provides valuable assistance to business startups that will increase their chances of success.

	<b>NYSERDA Funding</b>	<b>New Clients</b>	<b>Private Capital Raised</b>	<b>Non-State Gov't Funds Received</b>	<b>New Products</b>	<b>Jobs Created</b>
2009-1Q11	\$2,700,000	64	\$22,400,000	\$6,800,000	26	94
2Q11	\$732,000	3	\$13,299,000	\$3,766,000	4	20
3Q11	\$437,500	10	\$5,263,000	\$1,187,000	3	18
4Q11	\$520,000	1	\$7,169,000	\$2,424,364	3	18
1Q12	\$492,500	2	\$15,496,400	\$3,365,000	1	19
2Q12	\$476,500	14	\$10,435,000	\$2,352,000	10	24
<b>TOTAL 3 Years</b>	<b>\$5,358,500</b>	<b>94</b>	<b>\$74,062,400</b>	<b>\$19,894,398</b>	<b>48</b>	<b>193</b>

Program Highlights

- ▶ To ensure turbine quality and performance, the program relies on pre-qualified eligible installers installing pre-qualified eligible turbines, following performance modeling of the specific turbine at a specific site and height.
- ▶ The program has been continuously improved, and is one of the first in the US to base incentives on predicted performance instead of installed capacity.
- ▶ NYSERDA has supported firms and organizations devoted to installer training and certification, turbine testing and certification, and product development and analysis.
- ▶ Knowing the predicted performance, the small turbine owner can compare what was predicted with actual performance and provide feedback on the overall value of the program.

## NYSERDA

### ON-SITE WIND MARKET DEVELOPMENT PROGRAM

In 2003, NYSERDA implemented a standardized approach to provide incentives for the installation of behind-the-meter wind turbines (those up to 2 MW nameplate capacity). Each solicitation had a sunset date to allow program modifications based on experience and changes in the marketplace. The program was revised for the third time on October 1, 2010 and this program was in place until December 31, 2011. During that round, the program provided funding for 73 installations that are expected to generate 4,232,000 kWh annually. NYSERDA contributed \$4,243,000 towards these projects, which leveraged an additional \$8,000,000 in direct construction investments. The fourth and current round has \$13,800,000 available through December 31, 2015.

#### A Multifaceted Program

To ensure quality and reliability for customers, NYSERDA's incentive program offers funds only when a pre-qualified eligible turbine is installed by a pre-qualified eligible installer. The incentive is based on modeled performance. NYSERDA's small wind program has supported manufacturers and installers to meet these criteria, playing a central role in the development of wind turbine installer training and certification programs, turbine eligibility criteria, and performance modeling software. NYSERDA's pioneering efforts have influenced and benefitted other states that support behind-the-meter wind installations.



Rogues' Roost Country Club in Bridgeport, NY, operates a 10 kW wind turbine as part of its green community initiative.



Ledge Farm in Bascom, NY, operates a 50 kW turbine that generates almost all of the farm's electricity.

To establish and grow the list of pre-qualified eligible installers, NYSERDA offered early assistance to the North American Board of Certified Energy Practitioners (NABCEP), and has assisted community colleges within the state to develop and offer courses in wind site assessments, small wind energy workshops, and small wind installer training. To achieve qualification, installers must either attend an in-depth wind-related course, such as the one provided by the community colleges, or become a NABCEP Certified Small Wind Installer.

To develop policies and procedures necessary to pre-qualify eligible turbines, NYSERDA supported the Small Wind Certification Council (SWCC) and helped Intertek, a product testing laboratory, to build and operate an open-air test site for small wind turbines in Otisco, NY. Effective September 30, 2012, the NYSERDA incentive program will require small turbines to be certified to the American Wind Energy Association (AWEA) 9.1 Standard for performance and safety, and SWCC and Intertek are the only two organizations accredited to certify to that standard. In addition, NYSERDA funding is supporting Intertek to partner with Clarkson University, AWS TruePower of Albany, Rochester Institute of Technology, Alfred State College, and Binghamton University. Together, the project partners will create the Center for Evaluation of Clean Energy Technology (CeCeT), an organization that will provide product development and analysis expertise to client manufacturers, helping to increase product performance and reliability.

To enable modeling of turbine performance at specific sites and heights, NYSERDA contracted with AWS Truepower to develop the “New York State Small windExplorer” (<http://nyswe.awstruepower.com>), a wind resource assessment tool. Wind Analytics, a Brooklyn-based company, was awarded NYSERDA funding to develop an accurate yet affordable wind resource assessment tool for small wind turbines. NYSERDA is also in the process of requesting proposals to competitively select a wind resource assessment tool that the incentive program will use for the next three years. In addition, NYSERDA is also a charter member and jump-start funder of the Interstate Turbine Advisory Council (ITAC), established through the Clean Energy States Alliance, to create a multi-state unified list of small turbines that meet stringent performance requirements. (See [www.cleanenergystates.org/projects/ITAC](http://www.cleanenergystates.org/projects/ITAC) for more information.)

### **Continuous Improvements**

NYSERDA's on-site wind program has been continually adapted and improved. In the first round, incentives were based on a percentage of the installation cost; the second round incentives were based on turbine capacity (kW) with an adder for tower height, and sites were required to have a minimum average annual wind speed of 10 mph. The third round was one of the first wind programs in the US to base the incentive on predicted performance instead of installed capacity. The use of a single estimating tool allowed for consistency across multiple installers.

In addition, NYSERDA has routinely solicited feedback from the marketplace in search of further opportunities to improve the program. In early 2011, stakeholders highlighted the significance of available opportunities in the mid-size, community-wind scale market in New York State. This inspired NYSERDA to successfully advocate that the New York State Public Service Commission increase the program cap from 600 kW to 2 MW.

### **Judges' Comments**

*A focal point of this program is the training aspect—getting people trained, having standards, testing the units, and developing an assessment tool. This is a holistic approach and it seems well balanced. NYSERDA has been learning and evolving the program to take care of problems. It really helped to raise the standard for small wind installations.*



### **About NYSERDA**

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 their reliance on fossil fuels. NYSERDA professionals work to protect our environment and create clean energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York since 1975.

### **For more information:**

NYSERDA  
17 Columbia Circle  
Albany, NY 12203

### **Contact person**

Mark Mayhew  
Project Manager  
518-862-1090 ext. 3319  
[msm@nyszerda.org](mailto:msm@nyszerda.org)

# The 2012 SLICE Award Judges

**The CESA State Leadership in Clean Energy Awards are made possible by the generous donation of time and expertise of the SLICE Award judges. These individuals represent federal agencies, national associations, and non-government organizations. They collectively represent an impressive wealth of expertise and experience related to clean energy. We would like to express our sincere thanks for their participation and enthusiasm.**

## **Glen Andersen**

Glen Andersen is director of the National Conference of State Legislatures Energy Program, which provides outreach and policy analysis for state legislators on a wide range of energy issues, including fossil fuels, nuclear energy, renewable energy and energy efficiency. Glen has worked for more than 10 years assisting state legislators in their efforts to create effective energy policy and has testified before numerous state legislative committees on a variety of energy policy topics. He has authored many articles and publications on renewable energy, energy efficiency and climate change. Glen received his Master's of Science degree in environmental health from the University of Michigan and his bachelor's degree from the University of Minnesota.

## **Rusty Haynes**

Rusty Haynes has managed the Database for State Incentives for Renewables and Efficiency (DSIRE) project since 2007. In addition to coordinating and overseeing the project's research, tasks and budget, he participates in conferences and on committees and boards; leads policy research in New Hampshire and Rhode Island; and collaborates with the federal government, businesses and other organizations to improve and expand DSIRE and its resources. Rusty is currently working with the National Renewable Energy Laboratory and the Indian federal government to help create an Indian version of DSIRE. He has worked on all aspects of the DSIRE project since joining the N.C. Solar Center at N.C. State University in 2001. Rusty received an M.A. from UNC-Chapel Hill and a B.A. from the University of Georgia, where he graduated summa cum laude.

## **Carrie Cullen Hitt**

Carrie Cullen Hitt serves as Vice President of State Affairs for Solar Energy Industries Association (SEIA), and is a member of the advisory councils of the Interstate Renewable Energy Council (IREC) and the North Carolina Sustainable Energy Association (NCSEA). She previously served as President of the Solar Alliance and Vice President of Renewable Products for Constellation Energy. In this role, she developed programs and capabilities to help customers manage their business impact on the environment through greenhouse gas reducing activities, including purchasing renewable power. She also served as Vice President of Government and Regulatory Affairs for Constellation Energy from 2002-2007. From 1999-2001, she worked at Green Mountain Energy Resources as Director of Regional Business Development. She has also held energy related positions at the Massachusetts Legislature and Harvard University. Carrie holds an undergraduate degree from Clark University and an MA from the School of Advanced International Studies of Johns Hopkins University.

## **Steve Lindenberg**

Steve Lindenberg serves as a Senior Advisor to the Deputy Assistant Secretary of Renewable Energy at the U.S. Department of Energy. In that position he is responsible for coordinating efforts to expand deployment of wind, solar, water, geothermal, hydrogen and biomass energy resources across the nation, through collaboration within the Energy Efficiency and Renewable Energy offices and across the Department of Energy from Policy to Electricity Delivery and Energy Reliability. Steve also works with other federal agencies where their missions either support or constrain renewable market expansion. He is responsible for working with communities having high energy costs to help inform decision-makers on renewable and efficiency opportunities and to expand adoption of DOE developed technologies. He has directed environmental compliance and business line research and development in the electric utility industry for more than thirty years. Steve was previously employed with the National Rural Electric Cooperative Association, the *Electric Power Research Institute* and Cooperative Power Association.

## **Susan Sloan**

Susan Williams Sloan is Director of State Relations at the American Wind Energy Association (AWEA). She leads a team working on state policy issues including market development, taxes, siting, transmission, distributed and community wind. The State Relations team works with AWEA member companies and nine Regional Partner organizations covering 40 states across the country, in legislative and regulatory affairs. Susan promotes state and federal policies, educates policy makers and allied organizations about the wind industry, and addresses issues related to social acceptance and support of wind energy. Prior to joining AWEA, Susan worked for wind and solar interests, promoting renewable energy policies in Austin and to the Texas legislature; these efforts helped convince the Austin City Council to adopt significant climate goals, and the Texas legislature to establish Competitive Renewable Energy Zones (CREZ). Susan has also worked for elected officials in Texas, and for cable and broadcast media interests Texas and Hong Kong. She holds a B.A. from Austin College.

## **Robert Thresher**

Bob Thresher joined NREL in 1984 and has provided leadership for the growth and development of wind energy and the formation of the National Wind Technology Center, where he is an NREL Research Fellow. He has published extensively and is recognized internationally as one of the leading experts in research, development and commercialization of wind technologies. Bob has received an Honorary Doctor of Engineering from University of Glasgow in 2009, the Pioneer Award from the World Renewable Energy Network at the World Renewable Energy Congress VIII in 2004, a Lifetime Achievement Award from AWEA in 2001, recognition as 1997 Person of the Year by AWEA, and was inducted into the Academy of Mechanical Engineering and Engineering Mechanics at Michigan Technological University in 1996. He holds a Ph.D. in Mechanical Engineering from Colorado State University, an M.S. in Mechanical Engineering from Michigan Tech University, and a B.S. in Mechanical Engineering from Michigan Tech University.

# State Leadership in Clean Energy



## About CESA

Clean Energy States Alliance (CESA) is a national nonprofit organization that works with state leaders, federal agencies, industry players, and other stakeholders to promote renewable energy and energy efficiency. CESA's mission is to support state and sub-federal leadership, policies, and innovation in the clean energy sector.

At CESA's core is a national network of public agencies that are individually and collectively working to advance clean energy. Most of CESA's members are state agencies, but there are also independent nonprofits and municipal utilities. These organizations administer funds for clean energy deployment, business expansion, and research and development. CESA members include many of the most innovative, successful, and influential public clean energy funders in the country.

## CESA Strategies

CESA works to advance programs and policies that effectively address financing challenges, drive technological innovation, grow green jobs and industry development, and raise public support and demand for clean energy. Among its many activities, CESA:

- provides up-to-date information about clean energy programs and developments to its members and other audiences.
- creates forums for the exchange of information and best practices among state policymakers and other clean energy stakeholders.
- pursues numerous multi-state initiatives and projects designed to improve the overall effectiveness of individual programs, as well as to advance the interests of clean energy programs as a whole.
- frames and addresses key issues facing clean energy market development by working with federal agencies, regulators, and industry participants.
- provides technical support to its members (and to non-members, by request), assisting with program development and assessment.
- represents the interests of state and municipal clean energy programs in federal and industry forums.



Clean Energy States Alliance  
50 State Street, Suite 1  
Montpelier, VT 05602  
802-223-2554  
[cesa@cleanegroup.org](mailto:cesa@cleanegroup.org)