



Berkeley Lab and the Clean Energy States Alliance

CASE STUDIES OF STATE SUPPORT FOR RENEWABLE ENERGY

A Survey of State Clean Energy Fund Support for Research and Development Projects

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INTRODUCTION

State clean energy funds have typically focused their financial support on renewable energy deployment and commercialization efforts. A number of funds, however, have also supported earlier stage technology research and development (R&D) activities. This survey reviews efforts by CESA-member clean energy funds to support research and development of new clean energy technologies (principally renewable energy sources, but also fuel cells), including related energy storage mechanisms. Programs offered by non-CESA-member funds fall outside the scope of this survey. We note in advance that the demarcation between R&D and deployment/commercialization is not always clear. For the purposes of this summary, however, we place the greatest emphasis on those activities clearly falling within the R&D

category, and we do not exhaustively review support for demonstration projects or paper research studies, though we acknowledge that such efforts often do include an R&D component.

To date, ten funds – the California Energy Commission, the Connecticut Clean Energy Fund, the Illinois Clean Energy Community Foundation, the Massachusetts Renewable Energy Trust, the Xcel Energy Renewable Development Fund, the New Jersey Clean Energy Program, the Long Island Power Authority, the Rhode Island Renewable Energy Fund, the New York State Energy Research and Development Authority, and the Wisconsin Focus on Energy program – have offered support to research and development of new clean energy technologies. Below we review the efforts of these funds, starting with the

three funds that have arguably been the most aggressive in pursuing R&D activities so far: the California Energy Commission, the Xcel Energy Renewable Development Fund,

and the New York State Energy Research and Development Authority.

CASE STUDY DETAILS

California Energy Commission (CEC)

The CEC offers support to a wide range of research and development projects through its Public Interest Energy Research (PIER) Program, arguably the most comprehensive R&D initiative of any state clean energy fund. The PIER Program aims to provide environmental and economic benefits to California ratepayers by funding energy R&D projects that might not receive adequate support under traditional competitive or regulated energy markets. In recent years, approximately \$62 million has been collected annually from California electricity ratepayers and awarded through the PIER Program to promising public interest energy R&D projects in a number of program areas:

- Energy Innovations Small Grants
- Residential and Non-Residential Buildings End-Use Energy
- Industrial/Agricultural/Water End-Use Energy Efficiency
- Renewable Energy Technologies
- Environmentally-Preferred Advanced Generation
- Energy-Related Environmental Research
- Energy Systems Integration

Most of these program areas were launched in 1996, with initial solicitations offered in 1997 and 1998. To date, a total of over \$400 million has been appropriated to the PIER program, from which support has been

provided to projects in roughly similar amounts between the various program areas. The CEC has spent much of these funds on research and development projects, while a portion has also been directed at demonstration projects. Below we provide more detail on a number of the program areas listed above.

Renewable Energy Technologies

The Renewable Energy Technologies (RET) PIER component offers support for research and development into a wide range of renewable energy projects. Both traditional renewable energy applications and those utilizing a combination of renewable and fossil fuel sources are eligible for support. RET seeks to lower renewable energy capital and operating costs, improve conversion efficiency, reliability and power quality, and develop environmentally preferable ways of producing energy from waste products.

To date, the CEC has awarded over \$60 million to over 130 projects under the RET. Early solicitations from RET were generally technology-neutral, while more recent solicitations have included a mixture of technology-neutral solicitations and others targeting support at specific technologies (e.g., geothermal, wind, biogas, and biomass). Approximately half of the financial support provided by RET to date has been awarded through solicitations targeted at specific technologies.

Through the RET, the CEC has also provided support to both the California Wind Energy Collaborative and the California Biomass Collaborative. Both of these partnership efforts, which bring together participants from government, industry, higher education and elsewhere, exist to further research and development, along with demonstration, training and other activities, to promote the use of wind and biomass energy in California, respectively.

Finally, through municipal utility and other organizations, the RET has funded multifaceted research collaborations organized and administered by third parties totaling over \$30 million.

Energy Innovations Small Grants

The PIER program provides modest support for promising new energy research projects through its Energy Innovations Small Grant (EISG) Program. This program provides up to \$75,000 to small businesses, non-profits, individuals and academic institutions to conduct research on the feasibility of innovative energy concepts. Research projects must address a California energy problem and provide a potential benefit to California electric ratepayers, and must target one of the other PIER program areas listed above.

The CEC releases up to four solicitations per year from EISG, which receives approximately \$2.4 million of the \$62 million annual PIER program budget. Each project is eligible for a grant of up to \$75,000. A few examples of supported projects involving clean energy supply technologies appear in the table shown on the following page.

Energy Systems Integration

Another PIER initiative, the Energy Systems Integration (ESI) program, supports R&D

activities related to improving the reliability and efficiency of the electricity transmission and distribution grid in California. Support from ESI is generally directed at integrating technologies developed under other components of the PIER program into the state's electrical system. Projects eligible for support include those that integrate renewable energy, advanced generation, energy efficiency, and/or technologies aimed at reducing environmental damage. ESI has provided support to several research studies on the integration of distributed energy resources in the state.

The Environmentally Preferred Advanced Generation

The Environmentally Preferred Advanced Generation (EPAG) PIER component aims to speed the use of non-renewable distributed generation technologies in California. While support for renewable energy projects falls to other PIER components, EPAG does offer support to microturbines and fuel cells, which might utilize renewable fuel sources in their eventual application. EPAG released one funding solicitation targeted to fuel cells, microturbines, hybrid systems, and related technologies in early 2001, and funded several projects as a result.

Other Elements

Other components of the PIER Program provide support for R&D projects targeted at increasing energy efficiency and decreasing negative environmental effects of electricity production. These include the Residential and Non-Residential Buildings End-Use Energy program, the Industrial-Agricultural-Water End-Use Energy Efficiency program and the Energy-Related Environmental Research program. In addition, PIER offers support for a variety of demonstration projects, including via a recent solicitation for low-wind speed wind power systems.

Project Title	PIER Area	Organization	Grant Amount
Development of Low-Cost High-Efficiency Heterojunction Organic Solar Cell Using Inkjet and Screen Printing Techniques	Renewable Energy Technologies	University of Arizona	\$75,000
Flywheel System for Bulk Energy Storage	Energy Systems Integration	Cobalt Energy	\$75,000
Application of Stochastic Filtering and Control Methodology to the Optimization of Wind Turbine Control Design	Renewable Energy Technologies	University of California, Los Angeles	\$74,993
Construction and Testing of a High-Efficiency Solar Water Still	Industrial/Agricultural/Water End-Use Energy Efficiency	The Starburst Foundation	\$74,998
Nanostructured Electrodes For PEM Fuel Cells	Environmentally Preferred Advanced Generation	University of California, Riverside	\$75,000
A Novel Integrated Doubly-Fed Electric Alternator/Active Filter (IDEA) for Wind Power Applications	Renewable Energy	Texas A&M University	\$75,000

PIER has also provided support to research, development and demonstration of a variety of energy storage technologies, including thermal and flywheel energy storage systems.

Looking toward the future, representatives of PIER's Buildings Energy Efficiency Program and Renewable Energy Technology Program held a workshop in July 2004 to encourage public input on a forthcoming solicitation planned to support research and market needs in the area of Zero Energy New Homes. The solicitation will be intended to stimulate the development of new home designs, improving overall energy performance, reducing peak demand, and lowering homeowner costs. Energy efficiency and customer-sited solar technologies are both expected to play major roles in this initiative.

Finally, separate from the PIER Program, the CEC also offers support for geothermal research and development projects, as well as commercialization and demonstration

projects, through its Geothermal Program. This program, which seeks to develop a portfolio of near and long-term R&D projects, typically offers qualified applicants grants or loans. A total of 19 projects received over a combined \$20 million from four Geothermal Program solicitations released between 1999 and 2003. To date the program has cost-shared in partnerships with over 160 public and private entities. R&D projects that have been supported have typically been aimed at reducing the life-cycle cost of geothermal electricity generation and the uncertainty and cost of enhancing geothermal reservoir systems.

New York State Energy Research and Development Authority (NYSERDA)

NYSERDA has a long-standing, well-known, diverse program of clean energy R&D. NYSERDA's R&D activities are organized into five primary areas:

- energy resources,

- transportation and power systems,
- environmental,
- industry, and
- buildings.

NYSERDA's primary strategy for implementing its R&D program is to identify and select worthy research projects through a competitive solicitation process, and then provide funding and technical assistance to make those projects successful. NYSERDA has specifically offered support for renewable energy and hydrogen fuel cells through a number of separate solicitations. A non-comprehensive summary of some of NYSERDA's recent efforts is provided below.

In conjunction with the Long Island Power Authority and the New York Power Authority, in 2004 NYSERDA has offered support to hydrogen-related R&D projects through the New York State Hydrogen Roadmap, Outreach and Research program opportunity notice (PON 829). Project developers could submit proposals under three different categories in response to this solicitation, including Category C – Targeted R&D in the Areas of Hydrogen Production, Storage and Distribution. Proposals submitted in this category could involve R&D into hydrogen production, storage, distribution, or utilization. Each proposal could seek up to \$100,000 in support, out of a total of \$750,000 available through this PON. All R&D projects would have to include at least 50% cost-sharing from the project owner/developer.

Under the 2003 Renewable Energy Technology Options Program (PON 737), NYSERDA offered to support the development of new renewable energy projects, along with their demonstration, commercialization, and improvement. Funding was offered in two stages, the first

for concept development and the second for further development of a smaller number of projects. A total of \$600,000 was made available for Stage 1 projects, at a maximum of \$40,000 per project. An additional \$1,950,000 was offered for Stage 2 projects, at a maximum of \$250,000 each. Cost-sharing of at least 50% was required in both stages.

NYSERDA also provided for R&D and demonstration of alternative fuels in 2002 under PON 732 – Alternative Fuels Power Generation and Energy Storage. \$2 million in funding was available under this PON to projects developing and demonstrating alternative fuel systems (up to \$500,000 per project), innovative energy storage technologies (up to \$1 million per project), or feasibility studies of both (up to \$100,000 million per project). To be eligible, projects had to include a New York State manufacturer, utility, R&D firm, consulting firm, and/or demonstration site, and had to include at least 50% cost-sharing. NYSERDA has also provided funding for demonstration projects through PON 616 – Alternative Fuels Power Generation and Energy Storage, in 2001.

Under the 2002 PON 701, “Combined Heat & Power and Renewable Generation Technical Assistance,” and again in 2004 under PON 795 of the same name, NYSERDA also offered support for studies of the site-specific technical and economic feasibility of installing electricity generation capacity fueled by select renewable resources. Through these solicitations, NYSERDA offered to cost-share up to \$50,000 of the cost of selected technical assistance studies. In each case, up to \$500,000 was available under these solicitations. Under PON 701, NYSERDA also offered to reimburse up to 100% of the study cost, up to \$100,000, if the participant

later implemented study recommendations. Finally, under the recent PON 800, NYSERDA funded a number of DG/CHP product development and product development feasibility studies, several of which relate to renewable energy and hydrogen fuel cells.

Finally, it deserves note that NYSERDA has been especially active in supporting biomass-based R&D efforts, including support for a short-rotation willow cropping project, support for agricultural biogas and wastewater treatment digestion systems, and support for efforts to develop biodiesel production capability in New York, as well as work with other biomass-based products. On a going forward basis, NYSERDA plans to refocus some of its efforts on new product development in the renewable energy sector, with four initiatives being proposed: (1) entrepreneurial networks for renewable energy technology, (2) renewable energy technology options program, (3) business partnerships, and (4) manufacturing incentives.

Xcel Energy Renewable Development Fund (XERDF)

XERDF has released two solicitations offering support for both renewable energy deployment projects and clean energy R&D. XERDF released its first RFP in mid-2001, resulting in 19 projects receiving nearly \$16 million in funding. Among these were 11 R&D projects, featuring solar, wind, hydro, and biomass energy sources. The following text, taken directly from XERDF's website, describes each of these projects, which in aggregate received \$6.3 million in grants:

- **Sebesta Blomberg & Associates, Inc.**, to study the feasibility of producing electricity

from spent distiller grains used in the production of ethanol.

- **Energy Performance Systems, Inc.**, to explore the possibility of burning whole trees and waste wood to generate electricity.
- **University of North Dakota**, to 1) study an idea of burning biomass materials with coal, 2) study ways to reduce emissions from that process, and 3) to research biomass gasification (three projects).
- **National Renewable Energy Laboratory**, to research a new way of removing contaminants from the end product of biomass gasification processes.
- **D.H. Blattner & Sons**, to develop a system to erect wind turbine generators without the use of large cranes, as is current practice.
- **Colorado School of Mines**, to develop improved fuel-cell prototypes.
- **National Renewable Energy Laboratory**, to research new, lower cost solar photovoltaic power cells.
- **Global Energy Concepts**, to develop improved controls for wind turbines.
- **The University of Minnesota**, to study better ways to store power from wind turbines.

Near the end of 2003, XERDF released a second RFP, again requesting proposals from both energy production and R&D projects. XERDF planned to provide approximately 40% of the \$25 million in this funding cycle to R&D projects. Developers of R&D projects could apply for grants of up to \$1 million. The objective of this category of funding was to bring technologies toward the point of commercial introduction, and both early and advanced stage projects were eligible to apply. Preference was given to Minnesota research institutions, but all U.S. firms were eligible to apply. Proposed recipients for these R&D funds were announced in mid-2004, total nearly \$13 million, and cover biomass, solar, and wind technologies:

- **Rural Advantage/Blue Earth River Basis Initiative**, Luverne, Minn., to determine the

feasibility of commercially growing miscanthus, a large perennial grass native to Southeast Asia, and converting it to energy in Minnesota, \$318,800.

- **Production Specialties**, Norman, Okla., and Minnesota, to develop a hydrogen sulfide removal technology for biogas, \$228,735.
- **Gas Technology Institute**, Des Plaines, Ill., and Coleraine, Minn., to develop clean, highly effective and low-cost hydrogen production from the biomass gasification process, \$861,860.
- **Center for Energy and the Environment**, Minneapolis-St. Paul, Minn., to create for communities a framework to determine the feasibility of regional biomass generated-electricity and develop cost-effective projects that use local biomass resources, \$397,500.
- **University of Minnesota and RMT Inc.**, to determine the economic feasibility of generating renewable biomass-based electric power at dry-mill ethanol plants, \$858,363.
- **University of Florida and American Crystal Sugar**, East Grand Forks, Minn., to research the conversion of biomass into energy and compost through sequential batch anaerobic composting, \$999,995. This project was sponsored by the Prairie Island Indian Community.
- **Coaltec Energy USA**, Allendale, Mich., to utilize a poultry waste product as fuel to supply a solid-fuel, fixed-bed gasification testing facility, \$450,000.
- **Energy Performance Systems**, Maple Grove, Minn., and Southern Minnesota, to improve the efficiency of planting, tending and harvesting farm-grown trees so that biomass electric power generation can compete with fossil fuel systems, \$957,929.
- **National Renewable Energy Laboratory**, Golden, Colo., and University of Minnesota, to develop a solar cell that would be significantly cheaper to produce than current wafer-based silicon solar cells, \$1 million.
- **InterPhases Research**, Thousand Oaks, Calif., to discover a feasible process to develop a flexible photovoltaic cell for cost-effective electricity generation, \$1 million.
- **National Renewable Energy Laboratory**, Golden, Colo., and University of Minnesota,

to research development of organic semiconductor-based “plastic solar cells” that would reduce the high cost of photovoltaic module manufacturing, \$1 million.

- **University of Minnesota**, Minneapolis and Marshall, Minn., to determine if biomass-derived oils can be effectively used in turbo-generators, electrical generators also known as combustion turbines, \$299,284.
- **Iowa State University**, Nevada, Iowa, to develop a biomass-fueled engine for combined heat and power production, \$405,000.
- **Energy Conversion Devices**, Rochester Hills, Mich., to research a new method for production of hydrogen and bioethanol/biomethanol, \$900,000.
- **Global Energy Concepts**, Kirkland, Wash., and St. Paul, Minn., to analyze and develop advanced methods for reducing uncertainty in wind power project estimates, \$370,000.
- **WindLogics**, Southern and Southwestern Minnesota, build and demonstrate a utility-scale wind energy forecasting system, \$997,000.
- **Clipper Windpower**, Jackson County, Minn., to advance the application of a new wind turbine to perform in lower wind conditions than possible with current technology, \$1 million.
- **Agricultural Utilization Research Institute**, Southwest and West Central Minnesota, to conduct an economic study of environmentally friendly co-generation utilizing renewable energy, \$760,000.

Connecticut Clean Energy Fund (CCEF)

Connecticut Innovations, which manages the Connecticut Clean Energy Fund (CCEF), sponsors the annual Yankee Ingenuity Technology Competition (“Competition”), which seeks to support “royalty-based, market-driven funding for applied high technology research and development that leads to marketable products or processes

with high potential to contribute to long-term, sustainable economic growth in Connecticut.” The Competition offers awards of up to \$300,000 to collaborations between Connecticut universities and businesses. Each proposal to the Competition should describe an innovative, collaborative, high-tech research and development project that will generate a royalty stream or other investment return to the college or university partner. Large companies (>50 employees) must contribute at least half of project costs, with at least half of this provided as cash. Smaller companies face no strict cost-sharing criteria, but 25% of their contribution must be in the form of cash.

In 2004, the Yankee Ingenuity Technology Competition focused on clean energy technologies and was funded by the Connecticut Clean Energy Fund. Both \$300,000 winners for 2004 focused on fuel cell technology, with one seeking to develop new improved sealants and adhesives for proton exchange membrane fuel cells, while the other is developing a methanol micro-reformer fuel cell system for high-end, portable, consumer electronics. In both cases, the University of Connecticut was the partnering university.

CCEF has also entered into a partnership with Connecticut industry and the University of Connecticut’s School of Engineering to establish the Connecticut Global Fuel Cell Center. Advancing research and commercialization of fuel cells, which may utilize renewable energy fuel sources, is a major goal of this partnership.¹

¹ CCEF has also issued two Fuel Cell Initiative solicitations, which offer support for fuel cell demonstration projects. These solicitations do not, however, support product research or design.

Finally, CCEF is willing to consider providing support for R&D activities across any major clean energy technology. CCEF enjoys a great deal of flexibility in how it can spend its funds, including grants, direct or equity investments, debt, and support for education efforts, and is thus able to support viable unsolicited R&D projects through a variety of funding mechanisms. As one example, CCEF has supported Energetech, an early-stage wave power company seeking to commercialize and demonstrate a wave power technology.

Illinois Clean Energy Community Foundation (ICECF)

While ICECF will generally not provide funding for technology research and development, it did provide a grant of \$44,276 to the Illinois State Geological Survey in 2001 for production and combustion testing of biomass-coal fuels.

Massachusetts Renewable Energy Trust (MRET)

The Massachusetts Technology Collaborative (MTC), administrator of MRET, wishes to promote cooperative research and development efforts related to renewable energy technologies. According to the “Detailed Plan of the Massachusetts Renewable Energy Trust Fund,” released in Fall 2000, MTC will support R&D collaborations between research universities and businesses in Massachusetts. MTC’s R&D efforts to date have included:

Industry Support Program

MTC has formed a partnership with Commons Capital, a Massachusetts-based venture capital management company, to manage the \$15 million Green Energy Fund,

which will invest equity venture capital in Massachusetts-based renewable energy companies. The Green Energy Fund seeks to attract new investment from financial and strategic investors to leverage additional private funds for clean energy companies and entrepreneurs across the state. While clearly not a direct R&D program, this program is intended to help companies commercialize and sell emerging renewable energy technologies, and therefore indirectly contains an element of R&D.

In addition, under the Sustainable Energy Economic Development (SEED) Initiative, MRET is seeking to invest in companies that have a key technology that has not yet demonstrated commercial viability to an extent sufficient to attract venture capital. SEED provides capital on reasonable terms for companies undergoing new product development at the critical stage between R&D and the marketplace. Eligible companies have to be Massachusetts-based and provide products or services related to energy from biomass, fuel cells, solar photovoltaic, solar thermal electric, wave, tides, hydropower, and wind. Awards range from \$50,000 to \$500,000. In September 2004 the first 8 awards under this program were announced, totaling \$1.6 million, and going to fuel cell, solar, wind, and biomass technologies.

So far, MRET's Industry Support program has also invested in Acumentrics, Evergreen Solar, Konarka Technologies, Mass Energy Consumers Alliance, New Energy Capital, and Nuvera Fuel Cells.

Emerging Technology Demonstration

This 2003 open solicitation was for organizations interested in demonstrating an emerging renewable energy technology. To qualify, the emerging technology must have undergone rigorous, peer-reviewed research

and development but not yet be commercially available for use; as such, the solicitation was primarily for demonstration project, not R&D. MTC was particularly interested in supporting technologies that have broad applicability in Massachusetts and New England. Grants of up to \$500,000 were awarded to four companies (~\$2 million) in 2003, including:

- **Biomass Energy Resource Center** will demonstrate a combined heat and power biomass gasification system at Heyes Forest Products, a saw mill and dry kiln facility in Orange, Massachusetts.
- **Renewable Oil International, LLC** will scale up, construct and demonstrate a 10-dry-tons-per-day Advanced Fast Pyrolysis Biorefinery Plant at Berkshire Hardwoods in Chesterfield, Massachusetts.
- **Energetech America, LLC** will install a 500 kW ocean wave demonstration facility in the Point Judith Harbor of Refuge, in Narragansett, Rhode Island.
- **Verdant Power, LLC** is working with GCK Technology, Inc. to demonstrate the Gorlov Helical Water Turbines (developed by Dr. Alexander Gorlov of Northeastern University) in the Merrimack River in Amesbury, Massachusetts.

Offshore Wind Energy Collaborative

In collaboration with the U.S. Department of Energy and GE Global Research, MRET is supporting the development of an offshore wind energy collaborative (OWEC). This new collaborative, as currently envisioned, would seek to better understand the policy, engineering, regulatory, and environmental issues associated with offshore wind development. A component of OWEC will be technology R&D efforts, especially targeted at deeper offshore wind technology, and several pilot R&D projects are already under development. OWEC is still in the early development phase, however, and is currently seeking to contract with a firm to

develop a strategic plan for the collaborative.

New Jersey Clean Energy Program (NJCEP)

The New Jersey Board of Public Utilities (BPU), administrator of the New Jersey Clean Energy Program, issued a RFP in January 2003 offering support to clean energy research projects, along with other business development, demonstration and commercialization projects. The RFP, funded at a total of \$2.7 million, offered grants ranging from \$25,000 to \$500,000 per project per year. To be eligible, applicants had to demonstrate that their proposed projects would develop renewable energy business in New Jersey.

Ultimately, 10 companies received awards under this program, ranging from \$50,000 to \$500,000. Those projects that include an R&D component include:

- *Advanced Power Associates Corp.* Awarded \$119,000 to develop a power conditioner that will allow solar electric and wind power to be used in electrolyzers for the generation of hydrogen.
- *Energy Photovoltaics, Inc.* Awarded \$500,000 for the commercialization of thin film solar electric panels including improvements in product performance, reduction in product cost, enhanced product certification, and marketing.
- *Ocean Power Technologies, Inc.* Awarded \$499,486 for the demonstration and commercialization of a “powerbuoy,” a wave powered generating technology.
- *Reaction Sciences, Inc.* Awarded \$297,660 for the development of thermochemical hydrogen technology and the demonstration of the technology in a pilot scale solid oxide fuel cell.
- *Resource Control Corp.* Awarded \$225,000 for the demonstration and commercialization of an integrated system that produces

hydrogen from photovoltaic panels, onsite hydrogen storage and fuel cell integration.

- *Sun Farm Ventures, Inc.* Awarded \$50,000 to develop a first generation monitoring infrastructure based on fixed wireless technology.
- *World Water Corp.* Awarded \$300,234 to develop, test and commercialize a converter that is tied to solar electric panels that will allow for efficient motor and grid interactive qualities.

Long Island Power Authority Clean Energy Initiative (LIPACEI)

LIPACEI’s Clean Energy Research, Development and Demonstration (RD&D) Program relies on in-house expertise to advance a range of clean energy technologies. While the emphasis of this program has been very much on the demonstration of new renewable energy technologies rather than on technology research and development activities, LIPACEI has supported a few R&D projects.

In 2001, for example, LIPACEI launched its “Long Island Fuel Cell Farm R&D Project,” the focal point of which is a “fuel cell farm” located at the West Babylon substation, where LIPA connected 75 Plug Power fuel cells to its electric grid. This project was the first grid connection of fuel cells of this size in the world, and was intended to begin identifying and developing the measures and systems needed to facilitate the eventual use of fuel cells operating in parallel with, and contributing to the overall reliability and performance of, LIPA’s electrical grid system. In 2003 LIPA decommissioned 55 of the original 75 units and installed 25 new units that incorporate design improvements that allow for longer stack-life, higher efficiency, and reduced emissions and maintenance. Currently, 45 units are

feeding electricity directly into the local distribution grid.

LIPACEI has also provided support in two phases to an advanced direct exchange geothermal technology project at Hofstra University and the Nassau County Sands Point Reserve. This research study will provide performance data on several new containment designs developed by Energy Research Group, Inc. Finally, LIPACEI has been evaluating wave power through a feasibility study conducted by Giannotti Associates.

Rhode Island Renewable Energy Fund (RIREF)

Though RIREF does not emphasize R&D activities, along with CCEF and MRET, RIREF is helping to support a 500 kW wave demonstration project at Point Judith Harbor, Rhode Island.

Wisconsin Focus on Energy (WFE)

WFE offers assistance in the form of grants to applied renewable energy technology research and development projects with the

potential to improve market conditions for renewable energy systems and services. Emphasis is placed on projects aimed at near-term (five years or less) commercialization in Wisconsin. These grants typically range from \$50,000-\$100,000. Project developers are required to contribute at least 50 percent of associated costs. Projects receiving support must meet at least one of the following objectives:

- Create innovative renewable energy products and services
- Enhance renewable energy product reliability
- Reduce the costs of renewable energy products and services
- Accurately assess Wisconsin's renewable energy resources
- Provide renewable energy distributed benefits

The table below contains a non-comprehensive set of examples of funded projects, not all of which are strictly fundamental R&D.

Project Title	Project Description	Organization	Grant Amount
Development of a Zero-Net-Energy Building and Renewable Energy Technology Design Tool	Development of a freely distributable software tool to aid Wisconsin architects and engineers in the design of zero-net-energy buildings with a focus on the assessment of active solar thermal, passive solar, wind, photovoltaic, and fuel cell potential.	Thermal Energy System Specialists	\$26,000
Sonication Technology to Increase Biogas Generation	R&D into the application of an ultrasound technology called "sonication" to advance biogas energy generation	Bioenergy & Environmental, LLC	\$45,000
Municipal Anaerobic Digesters as Regional Energy Facilities	Study of the appropriate operating conditions for and a full-scale demonstration of municipal anaerobic digesters	Marquette University	\$48,529
Wind Resource Evaluation	Enhance the state's knowledge about the wind resource in Wisconsin through the installation of multiple tall-tower wind speed monitoring stations, and subsequent data collection, analysis and publication/distribution of the wind data	Seventh Generation Energy Systems, Ltd.	\$49,786
Use Existing Wind Data and Offshore Sampling Measurements to Improve the Characterization of the Offshore Wind Resource in Five Counties of S.E. Wisconsin	1) Put existing shoreline and offshore NOAA wind data for S. Lake Michigan, collected by NDBC and GLERL, into more usable format; 2) Make above data available to public through the WI Dept. of Administration; 3) Make sampling measurements from a boat within 5 miles of shore; and 4) Estimate wind resources, using NOAA and sampling data, in promising areas more than 3 miles from shore from Sheboygan to Kenosha Counties.	Superior Safety and Environmental Services, Inc.	\$29,200

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ABOUT THIS CASE STUDY SERIES

A number of U.S. states have recently established clean energy funds to support renewable and clean forms of electricity production. This represents a new trend towards aggressive state support for clean energy, but few efforts have been made to report and share the early experiences of these funds.

This paper is part of a series of clean energy fund case studies prepared by Lawrence Berkeley National Laboratory and the Clean Energy States Alliance. The primary purpose of this case study series is to report on the innovative programs and administrative practices of state (and some international) clean energy funds, to highlight additional sources of information, and to identify contacts. Our hope is that these brief case studies will be useful for clean energy funds and other stakeholders that are interested in learning about the pioneering renewable energy efforts of newly established clean energy funds.

For copies of all of the completed case studies, see:

<http://eetd.lbl.gov/ea/ems/cases/> or <http://www.cleanenergystates.org/>

ABOUT THE CLEAN ENERGY STATES ALLIANCE

The Clean Energy States Alliance (CESA) is a non-profit initiative funded by members and foundations to support the state clean energy funds. CESA collects and disseminates information and analysis, conducts original research, and helps to coordinate activities of the state funds. The main purpose of CESA is to help states increase the quality and quantity of clean energy investments and to expand the clean energy market. The Clean Energy Group manages CESA, while Berkeley Lab provides CESA with analytic support.

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