Public Abstract

Facilitating the Market Integration of Distributed Energy Resources (DER)

***Project Objectives*:** To demonstrate more creative and effective ways to integrate DER systems within larger electricity markets through collaborative stakeholder actions and to design and implement successful DER pilot programs, evaluate their impacts, and disseminate their results.

***Project Approach, Scope and Methodology*:** The overall project approach is to leverage STAC funding by building and expanding upon the existing 2003 Electricity Innovation Institute (E2I) DER Public-Private Partnership Program. The goal of the E2I DER Partnership is to advance the market integration of DER systems within the electricity enterprise. The DER Program Team will use a framework for collaborative pilot programs now being developed by E2I in 2003 to put such programs into practice in two states in 2004 and 2005. These programs will pioneer innovative market incentives benefiting multiple stakeholders; reduce barriers perpetuated by more adversarial approaches; and encourage cooperative efforts to install DER that adds value to conventional U.S. electricity systems. The Team will monitor and evaluate pilot program processes and progress and will present the results to leading DER stakeholder organizations throughout the U.S.

***Benefits of the Project**:* This project will advance the integration of DER systems from niche applications detached from larger electricity markets, to more widespread deployment of significantly greater value to customers, grid operators, planners, and 21st Century electricity markets. The project will also enable stakeholders to capture, and equitably allocate DER monetary benefits.

Timeframe of the Project: A two-year period of performance from an assumed start date of January 1, 2004

Project Budget (i.e., estimated costs) and funding organizations with funding share: The total estimated project cost is $1,018,922. The total applicant cost share is $560,446 thus providing a 55% applicant cost share.

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Public Abstract
A Multi-State Survey and Assessment of Critical Facilities for Fuel Cell and Other Clean Distributed Energy Resource Opportunities

Prime Participant: Connecticut Innovations, Incorporated (a state-chartered institution), Acting on Behalf of the Connecticut Clean Energy Fund

Other Participants:
California Energy Commission, Massachusetts Renewable Energy Trust, New York State Energy Research and Development Authority, the Clean Energy States Alliance

Objectives:
The objectives of this project are to (1) Gather data about the emergency and back-up power systems at critical facilities throughout the five participating states; (2) Assess and prioritize critical facilities for clean distributed energy resource opportunities; and (3) Prepare a strategy of joint funding for deploying clean distributed energy resource systems at these facilities.

Tasks:
Task 1: Finalize the List of Participating States and Select the Contractor
Task 2: Introduction to Clean Distributed Energy Resource Options for Critical Facilities
Task 3: Survey of Critical Operations Facilities in the Participating States
Task 4: Reports on Critical Operations Facilities in the Participating States
Task 5: Project Final Report

Deliverables:
• *Introduction to Clean Distributed Energy Resource Options for Critical Facilities* – document and website.
• *Reports on Critical Operations Facilities in the Participating States.*
• *Project Final Report- A Plan for Funding and Deploying DistributedEnergy Resources at Critical Facilities*

STAC Request and Budget:
The STAC request is $150,000. The total budget of this project is $338,125. The shared match is $188,125 (55.6% of the total project budget). The match is provided by four participating state clean energy funds and by the Clean Energy States Alliance, a nonprofit organization. The match is both cash ($160,000) and in-kind labor ($28,125).

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Public Abstract
5 kW Regenerative Fuel Cell System for a Back-up Power/Peak Shaving Application Located in Ohio

"We foresee a world of cleaner, smaller and more efficient units of power generation. We foresee more individual choice, more competition, and a closer approximation of a true market for energy in America. And we foresee increased reliability, increased supply, and lower prices." *-Energy Secretary Spencer Abraham, speaking about the National Energy Plan, July 26, 2001*

Distributed Energy Resources (DER) is the solution to the National Energy Plan. Several powerful and independent forces are combining to create an exceptionally large and rapidly expanding market for Distributed Generation (DG). Proton Energy Systems, Inc. (PROTON) is positioning its technology and products to take full advantage of this significant and growing trend. There is broad consensus that the DG market has exceptionally strong growth potential and that DG will capture an increasingly large percentage of the overall worldwide energy generation market. Several of the primary forces that will drive the demand for DG are: *1) Relief of transmission and distribution constraints; 2) Need for increased quantity and quality of power; 3) Demand for peak shaving; 4) Minimizing the environmental effects of power generation.*

Connecticut Innovations, Incorporated (CI), acting on behalf of the Connecticut Clean Energy Fund (CCEF), along with its partners the Ohio Department of Development (ODOD), PROTON and Marconi Corporation, propose to demonstrate and evaluate the operation of a 5 kW UNIGEN® Regenerative Fuel Cell (RFC) Backup Power System at host telecommunications sites in the state of Ohio (OH) and the state of Connecticut (CT). The UNIGEN® RFC Backup Power System will be designed and built by PROTON and the Outside Plant and Power Division of Marconi. This program couples PROTON's Backup Power technology with Marconi's product leadership in the field of outside enclosure design and power supply design for the telecommunications industry. The proposed STAC program supplements and extends a planned CCEF program with Marconi and Proton for Connecticut to now include an additional hardware installation in Ohio. Further, this combined program allows for additional engineering design refinements beyond what is feasible under a single program.

Objectives for this project are to fabricate a UNIGEN® RFC system and to test the system at two outdoor telecommunications sites. The design, fabrication, and testing of a system for this purpose provides a real world test of the technology and its path to commercialization. The benefits of this program are increased hydrogen education; creation of opportunities for reductions in the installed, operating and maintenance costs; and increased resolution of the barriers to market entry.

The costs and schedule included herein covers those items associated with this proposal (the Ohio site installation and design activities in CT and OH) and does not cover details of the separate CCEF program in CT. The proposed schedule is 36 months in duration with a budget of $1,329,400. CI, acting on behalf of the CCEF, is requesting $482,000 in STAC funding over the 36-month duration of the project. The participating parties will provide additional resources that result in a total cost sharing of 64% on a total program cost basis. The program includes a 20-month operation demonstration at a selected Ohio telecommunications site.

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Public Abstract
Advanced Converter Designs for Fuel-Cell and Photovoltaic Residential Power Systems

Economical and environmental factors are severely limiting our ability to generate and transmit power. We cannot always depend on foreign energy sources such as oil; neither can we continue polluting our environment during power generation processes. The main objective of our research is to develop a safe, durable, reliable, efficient and affordable alternate energy system based on photovoltaic and fuel cells. The University of Central Florida and the University of Illinois at Chicago are teaming up to carry on this project, which requires an estimated $709,323, for a period of three years. The project entitled "***Advanced Converter Designs for Fuel-cell and Photovoltaic Residential Power Systems***", sponsored by NASEO/DOE will see the use of the latest digital control technology in concurrence with advanced power electronics innovations to achieve high power-conversion efficiency at significantly low cost.

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Public Abstract
Tools To Evaluate DER As A Business Option For Electric Utilities

Objectives: Develop and field test an acceptable methodology and corresponding business case that includes the means to evaluate the use of DER technologies (DG/CHP) as an alternative approach to provide increased demand while benefiting the distribution systems. For instance, utilize DER as an alternative to upgrading existing or building new distribution lines, or improving the reliability of existing distribution systems. Transfer the methodology to other electric utilities through the outreach efforts of the State Energy Offices.
Timeframe: It is intended that the total project will be an 18 month effort
Benefits: Provide the electric utilities in the Midwest a means of evaluating DER technologies as part of their operational business case. This capability is not widely available today nor are most utilities able to bear the cost of independently developing the evaluation techniques. Utilization of DER technologies as an alternative approach to distribution line upgrades, deferred maintenance, and increased reliability can reduce overall operating costs for their distribution system.
Sponsoring Organizations:
• Midwest State Energy Offices (Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin)
• Midwest Electric Utilities (AEP, DTE, , NiSource, We Energy)
• University Of Illinois at Chicago Energy Resources Center(UIC/ERC), Gas Technology Institute (GTI), Power Equipment Associates (PEA).

This project will be executed through the partnership of the sponsoring organizations that presently have active DER programs. The "Team" will interact directly with the US DOE's Chicago Regional Office throughout the project. The prime contractor for this effort will be the UIC/ERC, which houses the Midwest CHP Application Center. The UIC/ERC will have overall management responsibility for the execution of the contract SOW, issuing subcontracts to the Team members as appropriate to carry out specific aspects of the project effort.
Methodology: The project will:

- Work with the electric utility partners to modify existing or develop new methods and tools to evaluate DER technologies as an option in their present business operations.
- Work with the electric utility partners to install and test DER technologies within their distribution network to test and monitor their performance
- Work with the State Energy Offices to transfer the approaches, protocols and analytic tools to other electric utilities within their State.

Budget: Total project cost: $1,240,951 (DOE Share at $505,951 – 40%).
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Public Abstract
Developing a Framework for Community Wind Projects in the Upper Midwest

The project will conduct feasibility studies and develop business models in Wisconsin and Michigan that would facilitate Community Wind development projects. Community Wind projects allow investment and participation opportunities for smaller investors in the development of larger "utility-scale" turbines. Given ongoing Community Wind projects in Minnesota already, this project will expand the Community Wind concept to encompass three state in the Upper Midwest, forming a regional base with possible future synergies.

In Wisconsin, the project will further develop the business model already formulated and construct a business plan for a specific turbine installation and the Limited Liability Corporation that would provide the financial vehicle for small investors. The objectives in the state of Michigan will be to conduct a feasibility study of the concept given that state's wind resources and regulatory and business framework and to adapt the business model created in Wisconsin.

The intended benefits of Community Wind projects are to facilitate rural economic development, to provide investment opportunities and to promote further utilization of wind power by broadening community support and providing capital.

The project will be conducted over a year's period. Total budget for the project will be $70,900, with $39,000 provided through cost-sharing.

The project is led by the Wisconsin Department of Administration with partnership by the Michigan Department of Consumer and Industry Services, Energy Office. Also participating in the project as subcontractors will be MSB Energy Associates of Middleton, Wisconsin, and Cooperative Development Services of Madison, Wisconsin.

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Public Abstract
Distributed Energy Resources Development for Montana and Idaho

Idaho and Montana's goals are to be leaders in distributed energy resource production. Several investor-owned and cooperative utilities in both states have recently enacted distributed energy/net metering tariffs. The programs are in varying stages of development. A cost share program will jump start the demand for and peak the interest for distributed energy systems among consumers. Idaho and Montana energy staff will assist consumers, vendors and utility staff in developing a smooth process. Improving the efficiency of the process will ultimately result in increased acceptance and greater numbers of systems installed.

The 2 year, $320,000 project will assist Montana and Idaho purchasers of photovoltaic electric systems with $225,000 of cost sharing funds. The estimated 75 systems will have approximately 75 kilowatts of renewable energy generating capacity and are expected to generate 3.3 million kilowatt hours over their 30-year life span. The project is highly leveraged with over one half million dollars. Developing a distributed energy resource will reduce the demand for, and delay the costly expansion of, transmission lines and new, centralized, fossil fuel, power plants.

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Public Abstract

The National Energy Policy released by the Department of Energy (DOE) in 2001 recognized that a broader implementation of distributed generation (DG) technologies could lead to numerous efficiency benefits nationwide. These benefits include reduced transmission and distribution line losses, an improved ability to use waste heat in combined heat and power applications (thereby displacing existing natural gas or electricity loads), and an increased ability to match generation to actual customer loads. DG would also serve to increase electric power system reliability.
In the face of these benefits and market interest, distributed generation implementation has been slow. A key factor contributing to slow market implementation is the lack of accurate, unbiased performance information on DG technologies. Because many of these technologies are just becoming commercial, such information is crucial to users seeking to benefit from DG systems. Without standardized testing and reporting protocols, data comparisons are unreliable, inhibiting the implementation of DG technology and high efficiency integrated DG systems in combined heat and power (CHP) applications.

The DGC (Distributed Generation Collaborative) is a set of state and national organizations, led by the Energy Center of Wisconsin and joined by the California Energy Commission, the Connecticut Innovations Inc., the National Renewable Energy Laboratory, the New York State Energy Research and Development Authority, and the University of Illinois-Chicago. The goal is to overcome the information-based barriers to the utilization of DG by establishing national protocols and provide data developed under the protocols. A 36-month effort is proposed at a funding level of $4 million, with $3 million in state funds and $1 million in DOE funds. This project extends and completes ongoing collaborative work to make advances in three areas. It would:
• Develop laboratory-testing, field-testing, and case study protocols for fuel cells
• Support full development and the ongoing operation of the Internet-accessible database at NREL
• Collect data for a set of fuel cell installations as well as additional micro-turbine, reciprocating engine, and small turbine sites. These sites include commercial buildings and will be linked where possible to DOE Buildings R&D efforts.

The proposed project builds upon a current effort that is developing national protocols for micro-turbines, reciprocating engines, and small turbines. The current effort includes lab and field testing under the protocol, and establishing the initial structure of a database to house the data from approximately 40 early field sites across the country. The DOE funded (DE-FC36-02GO12017) this jointly sponsored collaboration with ASERTTI. This proposal to STAC expands the DG technologies to fuel cells. The inclusion of fuel cells in the DG protocols is necessary to support the nation's ambitious goals in moving to a hydrogen-based energy system. The full database development and ongoing support is essential to serve the DG market place with an increasingly populated database over time. Such a database will provide critically needed information to end users and developers in such areas as electrical and thermal energy production, emissions, capital and operating costs, power quality, system reliability, and other critical parameters.

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Public Abstract
Field Demonstration and Market Application of Distributed Energy Generation with the Mercury 50

The California Energy Commission (CEC) and Clemson University (a State Chartered Institution) are proposing a program in response to the State Technologies Advancement Collaborative Solicitation (03-STAC-1). The program focuses on a 4,000-hour field evaluation of the 4.6 MW Mercury 50, a high-performance (38.5% electrical efficiency), single digit-NOx (without exhaust gas cleanup) gas turbine developed and manufactured by Solar Turbines Incorporated (Solar). Target market applications include energy efficient and environmentally friendly Distributed Energy Resources (DER) systems in electric utilities, as well as industrial and commercial Combined Heating and Power (CHP), Combined Cooling, Heating and Power (CCHP), and Distributed Generation (DG). The CEC/Clemson project team includes members of the National Association of State Energy Officials (NASEO), the Energy Center of Wisconsin (ECW, a participant on an industrial protocol project of the Association of State Energy Research and Technology Transfer Institutions [ASERTTI]), the Electric Power Research Institute (EPRI), and Solar.

An initial DOE sponsored market assessment showed strong CHP and DG application potential for the Mercury 50 in industries associated with manufacture or production of food, transportation equipment, chemicals, rubber and plastics, textiles, lumber and wood, primary metals, industrial machinery, fabricated metal, and electronics. Commercial CCHP and DG is promising for applications in health services, food stores, hotels and lodging, and educational institutions. Total technical potential in the U.S. has been estimated at 65 GW, 28 GW of which is in environmentally constrained areas. The economic benefits are very significant to the enduser with payback scenarios for continuous duty targeted applications being 1.6–2.5 years.

A Project Advisory Committee representing the CEC, Clemson, ASERTII, EPRI, and State Energy Offices in Ohio, Nevada, and South Carolina will take advantage of the lessons learned from the field evaluation experience to accelerate the replication of the Mercury 50 technology across the U.S. The DOE DER office will be invited to participate on the Advisory Committee to provide the continuity with the ATS program. A performance database for the Mercury 50 will be established by Clemson University in support of an ongoing nationwide protocol study for distributed generation units under the auspices of ASERTTI. Issues critical for distributed generation with the Mercury 50 such as interconnects to the grid, and economics of generation versus conventional centralized generation will be evaluated under the program.

The total project cost is estimated at $4,251,540. $680,400 is requested from NASEO, and $3,571,140 is to be contributed by the team. This represents an 84% cost share, which exceeds the 55% requirement for the solicitation. The proposed project is estimated to require 24 months to complete.

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