

INTELLIGENT GRID SOLUTIONS

Intent to submit a Proposal for FY 2011 Ohio Third Frontier Advanced Energy Program Grant

Date: September 7, 2010
Lead Applicant: Intelligent Grid Solutions, LLC
Address: 3340 West Market Street, Akron, OH 44333
Contact Person: Jeffrey Schumacher
Phone: 877-889-4743
Email: jschumacher@gridsrus.com
Project Title: Energy Efficiency gained through Home Energy Management
Funds Requested: \$1,000,000
Collaborators: FirstEnergy Solutions, First Communications, Cisco Systems
Non Profit Collaborator: To Be Determined (currently in discussions with an institution of higher education)

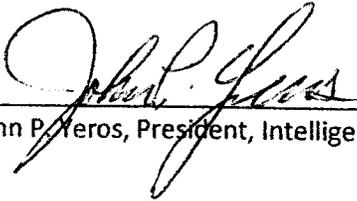
Project Background: Today many utilities face the ongoing challenge of meeting increasing peak demands for electricity. To meet growing needs and expectations, utilities are engineering demand response and alternative energy programs that allow energy consumers to manage daily consumption through intelligent control of various in-home devices, and to integrate alternative energy sources into daily utility operations. These programs increase the probability that users can maintain cost effective, comfortable, automated home environments while helping utilities reduce peak loads on the electrical grid and associated energy costs.

Summary of Project: Intelligent Grid Solutions (IGS) and its collaborators will develop a portfolio of Home Energy Management (HEM) solutions that will enable utility customers to manage home energy consumption through intelligent control of in-home devices, and to integrate alternative energy sources into utility operations. IGS will develop a tiered product offering, with each tier designed to match the appropriate vendor product set to particular customer requirements for intelligent and cost effective management of energy usage in homes and/or businesses. Each tier will address a particular category of customers based on their energy needs, energy savings potential, alternative energy involvement and appropriate level of investment in the HEM solution. After a successful development effort, including the identification of customer requirements and acceptance criteria, the IGS HEM portfolio will be launched in a limited residential/commercial deployment within FirstEnergy Solution's Ohio customer base.

Access to the HEM system and utility demand response programs will be accomplished via an intuitive portal. The system will provide real time energy usage to the customer via devices including, but not limited to, an in-home display and smart thermostat. These components include a Programmable Control Thermostat (PCT), a Portable In-Home Display Unit (IHD) and Controllable Power Switches (CPS), all of which will be integrated into a Home Area Network management platform. The intuitive home energy portal displays critical statistics about the home energy profile, real time energy usage, alternative energy capability and utility pricing signals/messages. This will be the first time this type of information is provided in real-time to an end-user of electricity, allowing the user to make informed decisions concerning their own personalized energy usage. This approach maximizes the benefit-cost ratio for the customer groups and contributes positively to the Ohio economy by providing employment, reducing energy costs, and positioning Ohio as a leader in the implementation of green energy technologies.

Our Collaborators: IGS will develop and market the IGS portfolio of HEM solutions for Ohio with approximately 1 million potential FirstEnergy Solutions customers as the primary focus. This strategy leverages relationships between IGS and FirstEnergy Solutions, First Communications, Cisco Systems, the non-profit collaborator (TBD) and other potential industry partners. IGS will utilize key Ohio-based infrastructures and services provided by First Communications that include fiber assets, back office systems, data centers and call center support. The non-profit collaborator will provide a complete test facility where all the various components will be integrated and thoroughly tested. Throughout the life cycle of the HEM development, IGS will assume a collaborative, team-oriented posture in everything IGS does to facilitate comprehensive progress throughout the state of Ohio. After successfully developing and demonstrating its HEM solutions for FirstEnergy Solutions customers, IGS will pursue additional utility clients and work to extend its reach and influence into other geographic areas.

Overall, we are very confident that successful development of IGS's HEM solutions will bring significant benefits to Ohio, including lower energy costs, a more efficient electrical grid, and the integration of advanced energy technologies into the Ohio electrical grid which will promote new business, new jobs, and decreased energy costs for Ohio consumers.

A handwritten signature in black ink, appearing to read "John P. Yeros". The signature is written in a cursive style with a large initial "J".

John P. Yeros, President, Intelligent Grid Solutions

OTFAEP 11-332

Heliotronic Energy System, LLC
490 E. Sharon Rd
Glendale, OH 45246
Atten: Dr. Carlo Montemagno

Ohio Department of Development, Technology and Innovation Division
Attention: Ohio Third Frontier Advanced Energy Program
77 South High Street, 25th Floor
Columbus, OH 43215

RE: Letter of Intent for OTFAEP 2011

Dear Sir,

Heliotronic Energy Systems is pleased to submit this Letter of Intent to submit a proposal in response to the Ohio Third Frontier Advanced Energy Program Fiscal Year 2011 Requests for Proposals, OTFAEP 2011.

Lead Applicant: Heliotronic Energy Systems, LLC
490 E. Sharon Rd, Glendale, OH 45246

Administrative Contact: Richard Harrison
RHarrison@fivestates.com (310) 795-7180

Technical Contact: Dr. Carlo Montemagno
carlo.montemagno@uc.edu (513) 702-2911

Project Title: Abiotic/Biotic Production of Environmentally Sustainable and Economically Competitive Biofuels

Estimated Grant Funds to be Requested:	Third Frontier	\$1,000,000
	Wright Capital Funds	\$1,000,000

Collaborators: College of Engineering and Applied Science
University of Cincinnati
801 Engineering Research Center
P.O. Box 210018
Cincinnati, OH 45221-0018

Description: We have engineered and are commercializing a carbon fixation/energy production platform using a novel nanoengineered system that is composed of a unique molecular assembly of stable proteins that mimic the natural photosynthetic process with unparalleled efficiency. This energy production system as currently demonstrated is almost twice as efficient as the best plant or biomass production method to date. Furthermore, the process is inexpensive; at the current state of development the liquid fuel is produced at a cost of \$2.44 per gallon of gasoline equivalent. With further development this technology has the potential of producing fuel at a cost of less than 75 cents per gallon of gasoline equivalent. The capital plant costs have an estimated payback of approximately one year. Fully implemented on 2% of the US non-arable land area, this technology would produce enough combustible fuel to replace current gasoline consumption. With the potential to meet domestic oil needs and capture 50.8 million metric tons of CO₂ per year in the process, a relatively small scale implementation of our technology would establish a new industry for the State of Ohio that facilitates both energy and economic security for the country and reduces greenhouse gas emissions.

Heliotronic Energy Systems looks forward to participating in this program to promote technology-based economic development within Ohio.

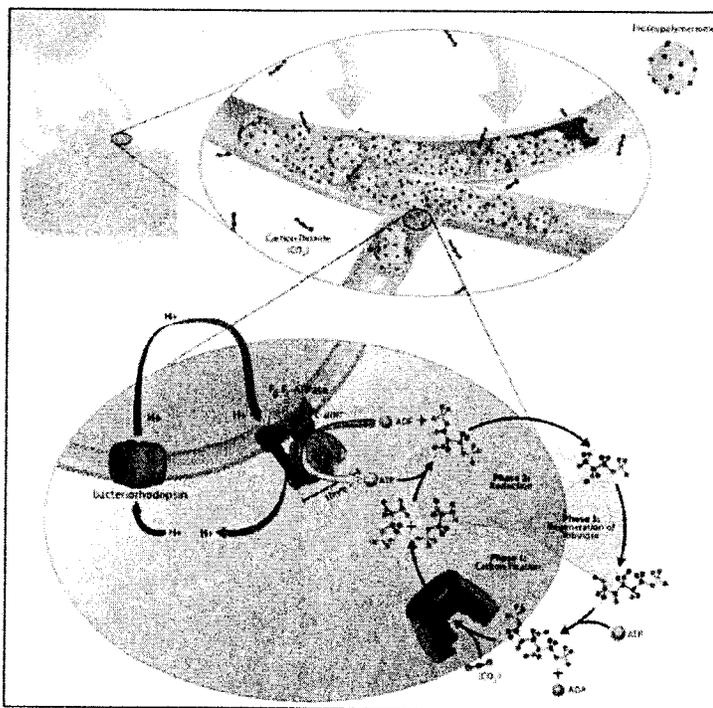
Sincerely,
Richard Harrison, CEO
Heliotronic Energy Systems, LLC

Attachment

Abiotic/Biotic Production of Environmentally Sustainable and Economically Competitive Biofuels

Heliotronic Energy Systems, LLC

We have engineered and are commercializing a carbon fixation/energy production platform using a novel nanoengineered system that is composed of a unique molecular assembly of stable proteins that mimic the natural photosynthetic process with unparalleled efficiency. This energy production system as currently demonstrated is almost twice as efficient as the best plant or biomass production method to date. Furthermore, the process is inexpensive; at the current state of development the liquid fuel is produced at a cost of \$2.44 per gallon of gasoline equivalent. With further development this technology has the potential of producing fuel at a cost of less than 75 cents per gallon of gasoline equivalent. The capital plant costs have an estimated payback of approximately one year. Fully implemented on 2% of the US non-arable land area, this technology would produce enough combustible fuel to replace current gasoline consumption. With the potential to meet domestic oil needs and capture 50.8 million metric tons of CO₂ per year in the process, a relatively small scale implementation of our technology would establish a new industry for the State of Ohio that facilitates both energy and economic security for the country and reduces greenhouse gas emissions.



This novel technology is founded on two innovations, functional bubble architecture and biofunctional polymersomes. This simple energy production system uses 70 nm sized biosolar polymer vesicles integrated and packaged within a bioprotective foam. Solar energy is converted into chemical energy which in turn powers an enzyme reaction to capture carbon from CO₂. The captured carbon molecules are then rearranged resulting in the formation of hydrocarbons, i.e. biofuel. The enzyme-infused bubble architecture represents a novel artificial photosynthetic carbon fixation pathway that converts in excess of 90% of the captured light into fuel. This proposal is directed at translating the lab scale technology into a pilot-scale demonstration facility.



GREAT LAKES
ENERGY
INSTITUTE

10900 Euclid Avenue, Olin 305
Cleveland, Ohio 44106-7074
(216) 368-0748
energy.case.edu

September 10, 2010

Dear Ohio Department of Development,

Please accept this Letter of Intent (LOI) from Case Western Reserve University (CWRU) for our 2011 Advanced Energy Program proposal.

Lead Applicant's Name:	Case Western Reserve University
Address:	Great Lakes Energy Institute (GLEI) at CWRU 10900 Euclid Avenue, Olin 305 Cleveland, Ohio 44106-7074
Telephone:	(216) 368-2923 (Dr. Zeng)
Contact Person:	Dr. Xiangwu (David) Zeng
Contact Email:	xxz16@case.edu
Proposed Project Title:	Development of Systems for Offshore Wind Turbine Foundations
Estimated Grant Funds to be Requested:	\$2 million (\$1M AEP R&D / \$1M WCF)
Known Collaborators:	The Great Lakes Construction Company (TGLCC) and others to be determined

Project Summary

Offshore wind power presents one of Ohio's greatest opportunities for leadership in the alternative energy sector. The hub of this opportunity is Lake Erie: its shallow depth and excellent wind quality provide a safe and reliable test bed for offshore elements of the national wind energy goal: 20% energy from wind power by 2030 (U.S. Department of Energy). Current efforts intend to develop a pilot project of 20 MW (5 turbines) in Lake Erie by 2012. Follow-on development targets 1000MW by 2030 (potentially hundreds of turbines). Both projects bring with them significant regional economic growth and job creation. Recently, this economic impact has been estimated at up to 8000 jobs and \$7.8 billion in wages over the next 20 years.

To accelerate Ohio's claim on this opportunity, this project, with Ohio Third Frontier support, will develop the critical engineering, design, and deployment capabilities for one of the most expensive components effecting offshore siting: turbine foundations. Lake Erie presents unique challenges to foundation design, manufacturing, and installation. Example challenges include untested soil composition and floating ice conditions, which can be more challenging to marine structures than in any of the other Great Lakes.

Specifically, this proposal team will develop and install a commercial prototype offshore turbine foundation and tower. Numerous testing and measurement equipment will be installed with the test foundation, which will be located very near the proposed site of initial wind turbine development near Cleveland. This offshore foundation will be the first of its kind in Lake Erie, the Great Lakes, and the U.S.

In addition to developing specialized expertise and test facilities, this offshore platform will enable valuable data to be obtained. This data includes soil characteristics of the lake floor, forces on the tower and foundation from water and ice, meteorological and environmental data, impact on freshwater wildlife near the proposed commercial demonstration site, and the prototype foundation performance. Such information will be essential for ensuring the safety and economy of the foundation designs of future turbines, allowing them to become economically competitive and to encourage a local



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industry to begin manufacturing and deploying them. Practical experience with constructing and installing the first Great Lakes offshore wind foundation will also be gained by the project team, positioning them well to serve not only the first 20MW project, but also subsequent projects in the Great Lakes.

The partners in this team include Cleveland-based Case Western Reserve University (CWRU) and The Great Lakes Construction Company (TGLCC) of Hinckley, Ohio. Case Western Reserve is one of the nation's leading independent research universities, ranking in the top 50 of all national colleges and earning \$345 million in annual sponsored research. The Great Lakes Construction Company is a 100% employee-owned civil construction company, which concentrates its projects in the Great Lakes region, with a predominate focus in Northeast Ohio.

Case Western Reserve currently pursues multiple research & development projects intended to enable the transition to sustainable energy, including multiple wind power projects. Among these are specific commercially-focused endeavors intended to help Ohio businesses claim major portions of the local wind energy supply chain. Likewise, TGLCC has adapted its wide range of services for the growing Ohio wind market.

Together, along with its other partners, this proposal team has the expertise, infrastructure, and access to fabricate, install, test, and validate the design and performance of offshore wind turbine foundations in Lake Erie. Within this same team is the capability to transition these pieces into the commercial products and services, captured investment, and quality green collar jobs needed to develop the industry for Great Lakes wind in Ohio.

Sincerely,

Dr. Xiangwu (David) Zeng
Case Western Reserve University

September 7, 2010

The Ohio Department of Development
Technology Division
77 South High Street, 25th Floor
Columbus, OH 43215
Email: OTFAEP2011@development.ohio.gov

To the Third Frontier Commission: On behalf of the proposed collaborative team for the demonstration of On Site Hydrogen Generation and Storage Fueling Systems to power fuel cell lift trucks in daily operation, please accept this letter of intent for the Third Frontier's Advanced Energy Program. The details required for the LOI are as follows:

Lead Applicant's Name: The Parker Hannifin Corporation
Address: 6035 Parkland Boulevard
Cleveland, OH 44124

Phone Number: 216-896-2872
Contact Person: Brian Lane, Vice President, Filtration Group
Email Address: brian.lane@parker.com

Known Collaborators: The Ohio Aerospace Institute, Heinen's Fine Foods

Proposed Project Title: "On-site Hydrogen Generation and Storage Demonstration for Fueling Fuel Cell Lift Trucks"

Estimated Grant Funds Requested: \$993,000

Brief Description: The objective of this project is to acquire end user experience and to demonstrate the commercial readiness of a Parker Hannifin, on-site, electrolysis-based, hydrogen generation and fueling product. The product to be demonstrated represents a cost effective option for meeting the fueling needs of the rapidly expanding fuel cell lift truck market. Specifically, a demonstration hydrogen generation and storage fueling system will be installed at a Heinen's Fine Foods company warehouse to provide hydrogen fuel for a fleet of fuel cell lift trucks. The commercially available fuel cell lift trucks along with the new Parker Hannifin hydrogen fueling system will be inserted into the normal daily operations of the Heinen's warehouse to provide Parker Hannifin user data that will be invaluable in taking the fuel system product to market.

Thank you for considering this exciting opportunity
Sincerely,



Brian Lane
Vice President, Filtration Group
The Parker Hannifin Corporation

ToChi Technologies Inc

4200 Regent Street, Suite 200
Columbus, OH 43219

Tel: 614 537 0261
Fax: 614 737 3772

www.tochitech.com

September 02, 2010

Ohio Department of Development,
Technology and Innovation Division
77 South High Street, 25th Floor
Columbus, OH 43215

Attention: OTFAEP2011@development.ohio.gov
Subject: 2011 OTFAEP LOI

Dear Sir/Ma'am,

Please accept this letter of Intent from ToChi Technologies Inc. to affirm our current preparation to submit a **Third Frontier Advanced Energy Program (TFAEP)** proposal. We can confirm the following details for your records:

Lead Applicant: ToChi Technologies Inc
Lead Address: 4200 Regent Street, Suite 200
Columbus, OH 43219
Lead Telephone: 614 537 0261
Contact Person: Ugo Nwoke, Chief Executive Officer
Contact email: ugon@tochitech.com

Project Title: **Commercialization and Deployment of an Energy Recovery powertrain technology for the mainstream automotive market**

Estimated Grant request: \$1,000,000

Confirmed Collaborators: AJ Rose Manufacturing
Melamed Communications

Sincerely,

Ugo Nwoke
Chief Executive Officer
ToChi Technologies Inc.
Tel: (614) 537 0261
Email: ugon@tochitech.com

Summary of the Proposed Project

Each time a consumer fills up their gas tank only 12% of the energy content represented in that purchase will actually be used to propel the vehicle. Some of the energy currently lost in the internal combustion (IC) powertrain during propulsion can be retrieved and utilized to increase fuel economy. Increased fuel efficiency will reduce emissions, decrease U.S. dependency on foreign oil, and provide significant savings in average transportation expenditures for American families.

ToChi Technologies Inc has designed and successfully completed initial testing on a hybrid transmission that reduces engine revolutions per minute (rpm) by regenerating electric current from within the transmission to complement output torque. The transmission easily configures to fit into existing vehicle architectures and the results show increased fuel efficiency and responsive performance at low rpm. Projected near-term market entry will be in the aftermarket space and unlike other designs this configuration is compatible with fuel cell, electric, biofuel, CNG, gasoline and diesel vehicles irrespective of the engine size.

ToChi Technologies and its collaborators are proposing to demonstrate an innovative design utilizing existing Ohio manufacturing capacity and expertise in the field of regenerating electric current within a stand-alone hybrid transmission to complement output torque to the wheel. The project will commercialize the technology and lead to manufacture of hybrid transmissions for the global automotive market.

Building on the work already done to validate the proof of concept, the team will address various challenges through design refinement, rigorous independent testing, and real-life evaluations. The team will leverage the fuel economy value proposition with the results of the demonstration partners to show significant cost-savings for fleet operators and other end users. Once market entry is realized, it is anticipated that the project will result in the creation of significant economic benefits for the State of Ohio.

Following successful testing and demonstration, ToChi will have the necessary data and design refinements to enter the aftermarket space in both North American and overseas markets. The near market entry and scalability provide huge cost savings, especially for fleet vehicle operators. The Third Frontier Advance Energy grant and matching funds are sufficient to complete full demonstrative activities and move the hybrid transmission technology into the market entry phase.

The last ten months have brought a noticeable recovery to the automotive industry with GM, Ford and Chrysler posting profits and companies like Tesla recently issuing the first IPO for an auto-company in the US since the 1950s. After declining market share from highs of the past decades, Ohio still retains a sizable and sustainable competitive advantage in the industry with very significant capital assets and a highly skilled workforce that still reside in the state.

To: OTFAEP2011@development.ohio.gov
Subject: 2011 OTFAEP LOI

Lead Applicant: Polyflow LLC
Address: 39 S. Main St., Ste 606, Akron, Ohio 44308
Telephone: 330-253-5912
Contact: Jay Schabel, schabeljl@polyflowcorp.com 440-773-3517
Project Title: Semi-Works Demonstration of Polyflow's Waste to Fuels Processor
Grant Funds Requested: \$1,000,000 in Third Frontier R&D funding and up to \$1,000,000 in Wright Capital Funds

Collaborators: Chemstress Engineering 39 S. Main Street, Akron, OH 44038.
Youngstown State University – One University Plaza, Youngstown, OH 44555
Defense & Energy Systems, LLC – 1802 Paulin Rd, Poland, OH 44514
Others - TBD

Project Summary: Polyflow has developed an enhanced chemical pyrolysis process that converts unsorted streams of post consumer, post commercial and post industrial polymer waste into a light hydrocarbon liquid that is convertible to transportation fuels and chemical intermediates. The company has constructed and operated a 410 pound batch production processor and has achieved:

- Independent lab results from over 63 runs proving the chemistry of the process:
 - Quantified the critical process design parameters
 - Confirmed the repeatability and robustness of the process
 - Proved the ability to vary the input feedstock and maintain high quality results
- Processing of over 7 tons of polymer waste proving the production capability:
 - Proved the high yields of the process with pilot plant operating results.
 - Defined the high positive net energy balance and green footprint of the process.
 - Proven a viable market for the end product with a customer order for existing product.
- Angel investment of over \$1,200,000.00 throughout the past 28 months supporting:
 - Confirmed feedstock availability with letters of supply covering 72% of future demand.
 - Development of the detailed production processor designs.
 - Intellectual property development leading to an issued patent.

This project addresses the final gate to commercial acceptance through the proof of scale up of the technology from the present 410 pound to a 7,000 pound capacity processor. Through over \$1.2 million in angel investment in research and development, Polyflow and its design collaborators have established sufficient technical confidence in the planned scaled up design to warrant investing in this project to prove the increased throughput and consistent chemistry from a commercial sized Polyflow processor. The plan consists of constructing a full sized processor and operating the unit in batch operation six times to prove that the scaled up process can achieve the same performance characteristics as those achieved by the pilot processor. The ability to produce similar chemistry product in batch operation at the larger volume will confirm a viable business plan to warrant investment by our partners to build the first commercial production facility to be located in Ohio. This will provide Polyflow with an established location to sell additional plants and further develop the technology. The follow on step will be to design and market the scalable production facility which consists of multiple high volume production processors operating in parallel throughout Ohio and the rest of the world.

Letter of Intent for Ohio Third Frontier Advanced Energy Program

Project Title: Advanced Durability Wind Energy Composite Systems

Lead Applicant: Nanomaterials Innovation Ltd., 1109 Millcreek Lane, Columbus, Ohio 43220

Contact Person: Li Yu Lee, President, Nanomaterials Innovation Ltd. , E-mail: lienyu4675@yahoo.com, Phone: (614) 442-1231

Project Director: Yong G. Min, Chief Scientist, Nanomaterials Innovation Ltd.

Project Co-Director: Alex W. Kawczak, President, StrateNexus Technologies LLC

Collaborators and Supporters: MFG Composites Systems Company (Astabula, Ohio), The Ohio State University, StrateNexus Technologies LLC (Dublin, Ohio), Ashland, Inc. (Dublin, Ohio), Oak Ridge National Laboratory, and the Sandia National Laboratory

Grant Funds Requested: \$1.25 million

Summary: The fastest growing renewable energy industry is Wind Energy. To increase Ohio's economic and innovation impact to the supply chain for both land and marine based Wind Energy market segments, a *Wind Energy Composite Innovation Alliance* is being formed that includes MFG Composite Systems Company Inc.,(Ashtabula, OH), The Ohio State University, Nanomaterial Innovation Ashland Inc.,(Dublin, OH) The Ohio State University, StrateNexus Technologies LLC (Dublin, OH), Nanomaterial Innovation Ltd. (Columbus, OH), ORNL and the Sandia National Laboratory. This innovation alliance will address the market needs for improved performance material systems, and enhanced quality manufacturing processes for improved durability wind energy blades for existing wind turbines, and next generation wind energy turbines that possess blade lengths greater than 60 meters.

During Phase-I of this project the innovation team will develop an improved fatigue resistance polymer resin formulation and composite system that has a 20-30 percent manufacturing cycle time advantage relative to industry benchmarks. In addition to a 10-20 percent improvement in fatigue resistance, the new Wind Energy Composite System will have improved performance in "leading-edge erosion" initiated crack propagation testing. For the Phase-II milestone targets of this project the innovation team will develop a next generation improved fatigue resistance and erosion resistance Wind Energy Composite System that has lightning-strike protection attributes and is further compatible with commercial lightning strike mitigation systems.

McKay, Michael J.

From: Battles9512@aol.com
Sent: Friday, September 10, 2010 12:37 AM
To: OTFAEP2011
Subject: 2011 OTFAEP LOI

OTFAEP 11-338

GREGORY WALKER JOHNSON
516 DAKOTA STREET
DAYTON, OH 45402
937-474-8279
BATTLES9512@AOL.COM

I GREGORY WALKER JOHNSON, INVENTOR CREATOR OF SOLAR CELL PHONE, LAP TOP, DESK TOP BUILT IN BATTERY.

ST. G. TECHNOLOGY IS REQUESTING \$2,000,000 FOR CREATING A SOLAR POWERED BATTERY IN A CELL PHONE, LAP TOP, DESK TOP. THE PROJECT WILL CREATE ONE HUNDRED JOBS IN OHIO.

THIS DAYTON, OHIO BASE COMPANY HAS THE UNIVERSITY OF DAYTON AS COLLABORATOR AND DAN KRAMER AS ITS LEADER.

ST. G. TECHNOLOGY TRULY BELIEVE THAT THIS IS THE MOST INNOVATIVE TECHNOLOGY OF THE 1ST CENTURY. THE COPYRIGHTS HAS ALREADY BEEN STARTED AND THE PATENT WILL BE BACK BY JUNE 2011.

THIS WILL PLACE OHIO AS ONE OF THE LEADERS IN TECHNOLOGY AND ALSO MAKING THE USA A WORLDWIDE LEADER IN SOLAR POWER WHICH IS THE FUTURE OF THE PLANET.

REGARDS,

GREGORY WALKER JOHNSON
CEO

FY 2011 OHIO THIRD FRONTIER ADVANCED ENERGY PROGRAM

Lead Applicant: The Ohio State University Office of Sponsored Programs, 1960 Kenny Road, Columbus, OH 43210
Proposal Title: Center for Lifecycle Certification - Advanced Energy Storage (Battery) Applications
Budget Request (Estimated): \$2,000,000 (\$1,000,000 OTFRDF funding plus \$1,000,000 Wright Capital funding)
Industry Partners: CAR Technologies, Major Battery OEM, Major Utility, Major Vehicle OEM, and others
Contact: Dr. Giorgio Rizzoni, Center for Automotive Research and Mechanical Engineering Department – 930 Kinnear Road, Columbus, OH 43212, e-mail: rizzoni.1@osu.edu, tel. (614-688-3856), fax. (614) 688-4111. Principal Investigator: Dr. Yann Guezennec, email: guezenec.1@osu.edu.

Advanced propulsion battery costs remain high and current approaches to optimizing cost, life, and safety of those batteries has been likened in the industry “to squeezing a balloon.” Advanced batteries for electric vehicles (EVs) alone can cost as much as a competing conventional internal combustion (IC) vehicle. These current economics threaten successful, let alone widespread commercialization of fully electrified vehicles.

Several strategies could help, including battery downsizing, standardization, and leasing. All of these strategies require a much better understanding - and ultimately certification - of the life and health of these advanced batteries across their use, repurposing, and re-use. The successful commercialization of high accuracy battery life/health estimation - sometimes called “a battery odometer”- will: help shorten initial vehicle deployment; facilitate down-cycling/re-purposing of the batteries into stationary use for alternative energy and grid-support services; enable third-party or other non-conventional ownership, such as battery leasing and other “battery as a service” models, and; allow the net present value (NPV) of battery re-use and recycling services to be brought forward into the initial vehicle transaction as “residual value.”

The goal of this program is to validate and commercialize the core technologies necessary to enable the proper characterization/modeling, quantification, and capture of the “residual value” of an advanced battery system to enable third-party or other non-conventional ownership, such as battery leasing, and to enable second-life battery businesses. The Center is intended to be a partnership between battery manufacturers, commercial and passenger vehicle manufacturers, insurance and financial services players, and utility and alternative energy partners with a keen interest in enabling the certification of residual value for financing, warranty/repair, insurance, and secondary-life markets. Ohio is a leading employer in the automotive parts and assembly, energy, insurance, financial services, and automotive recycling services business sectors – and all of those employment markets stand to benefit.

In addition, second-life batteries present an ideal solution to the renewable-energy sector, allowing energy to be stored for later use. Such ecological application of second-life batteries would contribute to a net reduction of CO₂ beyond what is achieved by the all-electric car. By 2020, second-life batteries are expected to be in high demand for applications, such as: energy storage with photovoltaic solar panels for residential and industrial needs; back-up and uninterruptable power supplies; load leveling for the electricity grid; and leveling of energy from both photovoltaic solar and wind power.

Funding will be used to expand the existing battery characterization and aging facilities at OSU-CAR, managed by CAR Technologies, necessary to further validate and commercialize an emerging model for high-accuracy estimation of remaining life and health of an advanced Lithium-Ion battery to enable residual value-based financial services transactions and battery re-use applications.

**Letter of Intent
Request for Proposals
Ohio Third Frontier Advanced Energy Program Fiscal 2011**

Prospective

Lead Applicant: SuGanit Systems Inc.,
Suite # 2000E
Research and Technology Complex 1,
2600 Dorr Street,
Toledo, OH 43606

Collaborators: The University of Toledo,
Toledo, OH 43606

Contact persons: (Technical contact) Guneet Kumar
VP of Research, Bio-Renewable Technologies, SuGanit Systems Inc.
phone: 443-745-4196
Email: kumarg@suganit.com

Praveen Paripati (Business and Commercialization issues)
President, SuGanit Systems Inc.
Phone: 703-371-6718
Email: praveen@suganit.com

Proposed Project Title: **Pilot Scale Demonstration of Ligno-Cellulosic Fuel and Fuel-additive Production.**

Estimated Grant Funds

To be requested: \$1,000,000 from Ohio Third Frontier program + \$1,000,000 for equipment + \$2,000,000 (Cost Share by the applicants)

A brief summary of the proposed project is provided on the next page.

Pilot Scale Demonstration of Ligno-Cellulosic Fuel and Fuel-additive Production

Lignocellulosic biomass (agricultural and forestry residues, herbaceous and woody crops) is abundantly available and can be a major resource for making renewable fuels. Bio-fuels are an important part of the solution to the US Government's stated goal of providing 20% of the nation's fuel needs through renewable fuels by 2020. Producing fuels economically from biomass has proven to be a highly challenging technical problem, due to the crystalline nature of cellulose and the structure of the biomass complex as a whole. Suginit Systems Inc. has collaborated with the University of Toledo to develop highly imaginative and effective solutions to address production of bio-fuels from biomass. The results are an effective pretreatment process for successful enzymatic hydrolysis, as well as an efficient process for the conversion of the five carbon sugar, xylose, to xylulose, an isomeric form that is more amenable to conversion to different fuels. While we have successfully shown the production of cellulosic ethanol from biomass (thanks in large part to earlier Third Frontier Advanced Energy Program awards), the cost effective isomerization enables us to produce other drop-in fuels – mainly furans. Our technologies are covered by issued and pending patents.

We intend to continue scale-up and implement cellulosic ethanol production technology at pilot/demonstration scale, and refine the process for production of drop-in fuels. Implementation at this level will immediately lead to green manufacturing jobs and become a significant part of the solution enabling local, renewable and sustainable production of transportation fuels.



**WRIGHT STATE
UNIVERSITY**

James A. Menart, Ph.D.
Professor of Mechanical Engineering
Department of Mechanical & Materials Engineering
3640 Colonel Glenn Hwy.
Dayton OH 45435
Phone: (937) 775-5145
Fax: (937) 775-5009
e-mail: james.menart@wright.edu

SUBJECT: 2011 OTFAEP LOI

September 9, 2010

Dr. James A. Menart
Department of Mechanical and Materials Engineering
Wright State University
Dayton, OH 45435-001
Phone: (937) 775-5145
e-mail: james.menart@wright.edu

OTFAEP2011@development.ohio.gov
The Ohio Department of Development
Technology and Innovation Division
77 South High Street, 25th Floor
Columbus, OH 43215

Dear OTFAEP 2011:

I am writing to make you aware of my intention to submit a proposal to the Ohio Third Frontier Advanced Energy Program. My colleagues and I intend to submit a proposal in the area of city based geothermal heating and cooling. The information that you requested is listed below, as well as a short description of the project.

LEAD APPLICANT: Wright State University, Department of Mechanical and Materials Engineering, 3640 Colonel Glenn Highway, Dayton, Ohio, 45435-0001

LEAD APPLICANT CONTACT: Professor Jim Menart, Department of Mechanical and Materials Engineering, Wright State University, 3640 Colonel Glenn Highway, Dayton, Ohio, 45435-0001
Phone: (937) 775-5145
e-mail: james.menart@wright.edu

TITLE OF PROJECT: City Based Geothermal Heating and Cooling

ESTIMATED GRANT FUNDS REQUESTED: \$1,000,000 Third Frontier Research and Development Funding + \$1,000,000 Wright Capital Funds

KNOWN COLLABORATORS: Governmental Collaborator: City of Dayton, Ohio, 101 West Third Street, Dayton, Ohio, 45401-0022.
For Profit Corporation Collaborator: Heapy Engineering, 1400 West Dorothy Lane, Dayton, Ohio, 45409-1310.

SUMMARY OF PROJECT:

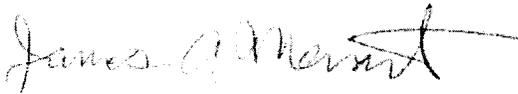
A renewable energy source that is plentiful in Ohio and many parts of the county is ground source geothermal energy. While ground source geothermal energy is low quality energy, it can be useful in reducing heating and cooling costs in commercial and residential buildings. Ohio and the Mid-Atlantic region are good locations for ground source geothermal energy because of their relatively balanced heating and cooling seasons. For balanced heating and cooling loads the ground can act as a large energy storage device.

An additional advantage that the City of Dayton and other commercial districts in the State of Ohio have is a large reservoir of underground water. In the City of Dayton, the Great Miami Buried Valley Aquifer system has an estimated capacity of 1.5 trillion gallons of water. This is a spectacular energy resource that this region must utilize. The advantage of an underground aquifer is that it can supply unlimited amounts of water at the ground temperature, which greatly reduces the footprint of your geothermal system, as well as the initial cost of the geothermal system. Both of these aspects are critical to making ground source geothermal energy feasible in a metropolitan area.

The purpose of submitting this Third Frontier proposal is to obtain financial resources to demonstrate the economic feasibility of utilizing geothermal heating and cooling in a metropolitan area with good underground water resources. In particular this economic feasibility demonstration will be performed on a building or buildings already present in the Dayton area. It is known that geothermal heating and

cooling in a new building will pay for itself in a reasonable amount of time, but the difficult issue is retrofits. We intend to demonstrate economic feasibility of a geothermal heating and cooling system using ground water in a retrofit situation. As mentioned the City of Dayton has an overabundance of ground water, but there are a number of smaller cities along the Miami River that have access to good underground water resources as well. In addition to this, there are other cities in the State of Ohio and across the country that possess decent ground water resources. Thus if our demonstration project is able to prove the economics of this renewable energy technology, there are a number of places that it can be implemented.

Sincerely,

A handwritten signature in cursive script that reads "James A. Menart". The signature is written in black ink and includes a long, sweeping horizontal stroke at the end.

James A. Menart.
Professor, Wright State University

MINSTER®

THE MINSTER MACHINE COMPANY

Ohio Department of Development
Technology and Innovation Division
Attention: Advanced Energy Program 2011 RF
77 South High Street, 25th Floor
Columbus, Ohio 43215

September 9, 2010

OTFAEP 11-342

The Minster Machine Company is pleased to submit this Letter of Intent in response to the Ohio Third Frontier Advance Energy Program 2011 RFP.

Lead Applicant: The Minster Machine Company
240 West Fifth Street
Minster, Ohio 45865

Contact Person: David Champagne
Business Manager, Minster Wind
419-628-1952, david.champagne@minster.com

Project Title: The Engineering Design and Prototype Manufacturing of a 1MW horizontal axis Wind Turbine.

Grant Funds Requested: A combined incentive package totaling \$5 M, this grant being a portion of this total.

Collaborators – Engineering and Component Development:

University	The University of Dayton Research Institute 300 College Park, Dayton, Ohio
Public	EMTEC 3155 Research Blvd, Dayton, Ohio 45420
Turbine Engineering/Controls	Dynamic Design Engineering, Inc 123 C Street, Davis, CA 95616
Industry/Technical Consultant	Haller Wind Consulting 228 Plainview Drive, River Falls, WI 54022
Blade Design	Global Blade Technologies 865 Southmeadow Circle, Cincinnati, OH 45231
Gearbox Design	Fairfield Engineered Drive Solutions US 52 South, Lafayette, IN 47903
Tower Design	Minner, Stinnett, Koo & Agbayani 1716 Oak Street, Bakersfield, CA 93301
Generator/Power Electronics Design	The Switch Ayritie 8 C, FL-01510, Vantaa, Finland
Installation Site Partner	The Village of Minster 5 West Fourth Street, Minster, OH 45865

MINSTER®

THE MINSTER MACHINE COMPANY

In addition to these collaboration partners, the project will involve a multitude of other component suppliers, many of them Ohio companies. Including: Midwest Manufacturing & Logistics, Rotek, SKF, Tuf-Tug, Retterbush, KK Electronics.

Project Description:

The Minster Machine Company is ready to begin the final design phase of a product development project that will result in the production of two prototype 1MW horizontal axis wind turbines. The engineering concept study is complete, which defined the specifications for the wind turbine, identified the supply chain partners and defined the turbine cost, quantified the development and inventory costs, and established the timeline for the engineering project. The result of this project is for Minster to have a mid-sized wind turbine ready to take to the market. Once in serial production, this manufacturing effort will result in the need to purchase over \$500 million dollars in components through 2018. This project has engaged with many Ohio companies to provide these goods, some are listed in the collaborators section. Further, Global Blade Technologies plans to open a wind turbine blade mold production and blade manufacturing facility within the state to support the sale of Minster turbines.

The market for The Minster Machine Company mid-sized turbine is the distributed generation market, projected to be 10% of the U.S. market by 2016, equating to an annual market of \$165 million. The specific technology advantages that the turbine will possess provide a 20% gain in energy capture compared to any other mid-size product on the market today.

The timeline for the engineering design phase is scheduled to begin in 4Q2010 and conclude in 18 months with the completion of the two prototypes. The incentives from the state of Ohio are crucial for The Minster Machine Company to be able to begin the next phase of the project. We have spent over \$550,000 over the past three years investigating the wind turbine market and gaining valuable knowledge that has led to the confidence in ourselves and the collaborators listed to make this project successful. The Minster Machine Company will be funding the project at a matching level of investment.

David Champagne
Business Manager, Minster Wind



September 10, 2010

Ohio Department of Development
State of Ohio
77 South High Street
Columbus, OH 43215
OTFAEP2011@development.ohio.gov

Re: LETTER OF INTENT
2011 OTFAEP LOI
Project Title: Battery Energy Storage System

To Whom It May Concern:

Greater Cleveland Regional Transit Authority (GCRTA), a Public Transit System located in Cleveland, is pleased to submit this letter of intent for a \$1.5 million commercially oriented demonstration project to be located in Cuyahoga County, with \$750,000 requested in Third Frontier program funding. The project will comprise an advanced, grid connected, energy storage device and control systems to demonstrate benefits including increased energy efficiency, operational cost savings, capital cost savings, and emissions reductions from electricity usage in the operation of the electric overhead-catenary rail transit system.

**The Greater Cleveland
Regional Transit Authority**

Main Office
1240 West 6th Street
Cleveland, Ohio 44113-1302
Phone 216 566-5218
Fax 216 781-4043
email: jcalabrese@gcrta.org
website: www.rideRTA.com

The project's purpose would be the demonstration of advanced energy related technologies that maximize incorporation of Ohio systems and components and are operating under final use conditions. Working with a consulting firm as a collaborator, GCRTA would identify commercialized, energy storage technologies and control systems supplied by Ohio companies and would operate the device in a wayside configuration on one of its electrified light or heavy rail lines.

The pilot project will capture electricity generated by braking trains, much like a hybrid automobile produces power when it slows down. The electricity will be stored in a large, rail-side battery array and reused when the train accelerates. The system is expected to reduce electrical power purchases by 10 percent to 20 percent at each location of the energy storage device.

The power-storage system is potentially so large, each battery array would store one megawatt of power. The GCRTA could further reduce its electric bill by purchasing cheap power at night to use or resell during expensive peak hours. GCRTA could also collect fees from the regional grid operator, Midwest ISO, by providing power on short notice – one or two seconds – to stabilize regional power flows on the grid.

Joseph A. Calabrese, CEO
General Manager/
Secretary-Treasurer

The pilot project, involving a single battery array at a GCRTA electric substation in Cleveland, would cost about \$1.5 million, with \$750,000 from the Ohio Department of Development.

If the project proves economic, one battery array could generate \$500,000 a year in value. GCRTA envisions installing the technology at all electric substations that serve its light and heavy rail lines. The energy storage devices, in addition to capturing the regenerated power, will help increase the system's electrical efficiency and stabilize the voltage.

Sincerely

Joseph A. Calabrese, CEO
Greater Cleveland Regional Transit Authority
1240 West 6th Street
Cleveland, Ohio 44113-1302
216-566-5218
jcalabrese@gcrta.org

Ohio Third Frontier Advanced Energy Program

2011 Request for Proposals Application Information Page

Letter of Intent (LOI) Notification Number (Issued by ODOD)

LOI #: OTFAEP 11-_____

This Application: Does Not include information considered a "trade secret" under Ohio Revised Code Section 1333.61 (D)

Lead Applicant Name: Dr. Pingshan Wang

Lead Applicant Address: E3 Materials, LLC 411 Wolf Ledges Suite 105 Akron, OH 44311

City: Ohio County: Summit

State: Zip Code: 44311

Project Title: Combustion Products (Coal, Gas, Biomass Fuels) Cleanup of Heavy or Toxic Metals in Water and Gas Streams Using High Surface Area NanoEngineered Polymeric Materials

State Funds: OTFRDF\$500,000 Wright\$0 Total\$500,000 **Cost Share:** \$500,000

Is the Lead Applicant the lead in any other proposal submitted under this RFP? No

If yes, provide the Other Project Title/LOI #:

Typed Name of Authorizing Agent: E3 Materials, LLC

Title of Authorizing Agent: Wil Hemker, President

Signature: 

Date: September 10, 2010

For ODOD Use Only Date Received Proposal ID #

Ohio Third Frontier Advanced Energy Program

Lead Applicant Contact Information

Authorizing Agent: E3 Materials, LLC

Name: Dr. Pingshan Wang

Title: CTO

Organization E3 Materials, LLC

Address: 411 Wolf Ledges Pkwy. Suite 105

City, State, Zip: Akron, OH 44311

Telephone: 330-972-6457

E-Mail: hemker@uakron.edu

Project Director Name: Wil Hemker

Title: President

Organization: E3 Materials, LLC

Address: 411 Wolf Ledges Pkwy. Suite 105

City, State, Zip: Akron, Ohio, 44311

Telephone: 330-972-6457 or 740-516-0099

E-Mail: hemker@uakron.edu

Fiscal Agent Name: Wil Hemker

Title: President

Organization: E3 Materials, LLC

Address: 411 Wolf Ledges Pkwy. Suite 105

City, State, Zip: Akron, Ohio, 44311

Telephone: 330-972-6457

E-Mail: hemker@uakron.edu

Grant Administrator: see Project Director & Fiscal Agen

Authorizing Agent – the individual authorized by the Lead Applicant to accept the terms and conditions of an award of Grant Funds.

Project Director – the individual authorized by the Lead Applicant to direct the Project for which the Grant Funds have been awarded.

Fiscal Agent – the individual authorized by the Lead Applicant to sign Grant - related financial documents, *e.g.*,

Requests for Payment, Grant financial reports, *etc.*

Grant Administrator – the individual authorized by the Lead Applicant to oversee the day-to-day administration

of the Grant Funds, including preparing progress reports, monitoring project progress, *etc.*

Note: The same individual may hold more than one of these positions.

Ohio Third Frontier Advanced Energy Program

Collaborator Information

Attach additional forms as needed.

1. Name: Dr. Chris Miller

Title: Associate Professor Civil Engineering

Organization: University of Akron, Department of Civil Engineering

Address: University of Akron 162B Schrank Hall North

City, State, Zip: Akron, OH 44325-3905

Telephone: (330) 972-5915

E-Mail: cmmiller@uakron.edu

2. Name: Dr. Wei-Ping Pan

Title: Director of Institute for Combustion Science and Environmental Technology (ICSET),

Organization: Western Kentucky University

Address: 2413 Nashville Road, Suite C-2

City, State, Zip: Bowling Green, KY 42101

Telephone: 270-745-2272

E-Mail: wei-ping.pan@wku.edu

September 10, 2010

Subject: 2011 OTFAEP LOI

Dear Madam or Sir,

Dr. Pingshan Wang, CTO and co-founder of E3 Materials, LLC (E3M). is the Lead Applicant for 2011 OTFAEP Letter of Intent.

E3M is affiliated with The University of Akron Research Foundation. E3M is the recipient of **2010 Federal NSF SBIR Phase I** technology commercial development grant and has file for 2011 Federal NSF SBIR Phase II funding.

E3M collaborates with University of Akron Civil Engineering Department to validate performance of metal capture in water and Western Kentucky University Institute for Combustion Science and Environmental Technology (ICSET) for metal capture, such as mercury (Hg) in combustion gases.

E3M materials are robust solid media (stable up to 250C) designed to capturing toxic, precious, or nuisance metals in liquids (aqueous or non-aqueous) or gases (post- or pre-combustion environments). The captured metals can be recovered, isolated, recycled and the media regenerated using molecularly designed low energy and cost 'smart capture / release cuing' technology designed directly into the media. These media are known as E-Capture™

Sorbents(ECM). ECM effectively sequestered and adsorbed heavy metals from liquids and gases. ECM nano-functionalized polymeric solids proved superior to current best technologies for selective reduction of waterborne lead (Pb) and nickel (Ni), and comparable to commercial cationic resins for mercury (Hg) and cadmium (Cd) reduction. ECM was found to have high removal capacity of toxic metals present in coal fired flue gas desulfurization (FGD) wastewater and ECM can be regenerated with acid to greatly reduce brine waste.

Objectives:

1. Engineer ECM's gas and water Hg capture properties into a novel coal-fire and other combustion fuel simulation process. The goal is to demonstrate >70% Hg elimination using a sequential flue-gas and FGD wastewater treatment. Projected commercial opportunity will be 1.4% of the 2015 U.S. flue-gas sorbents market of \$500 million.
2. Design ECM solid particle into a marketable filtration media product to meet industrial user needs for gas, biomass and engineer production scale-up of ECM for selenium and other toxic metal capture for commercialization.

E3M products are patent-pending capture media targeted for the needs of environmental, energy generation, sustainable mining or petroleum extraction markets.

E3 Materials, LLC
411 Wolf Ledges Pkwy, Suite 105.
Akron, OH 44311

Tel: 330 972 6457; Fax: 330 794 6271
E-mail: Wil Hemker: wil.hemker@gmail.com
Pingshan Wang: chemwps@gmail.com



September 9, 2010

Ohio Department of Development
Technology Division
77 South High Street, 25th Floor
Columbus, OH 43215

Dear Ohio Department of Development:

Please accept this letter of intent from Calgon Carbon Corporation for our Fiscal Year 2011 Ohio Third Frontier Advanced Energy Program (“OTFAEP”) proposal.

Lead Applicant Name: Calgon Carbon Corporation
Address: 835 North Cassady Avenue
Columbus, Ohio 43219
Telephone: (614) 258-9501
Contact Person: Dr. Walter G. Tramposch, Director of Commercial Development
Contact Email: wtramposch@calgoncarbon-us.com
Project Title: Development and Commercialization of Advanced Activated Carbons for Energy Storage Applications
Estimated Grant Amount: \$1 million
Known Collaborators: JME and others to be determined

Summary of the Proposed Project:

Calgon Carbon Corporation (“CCC”) is the leader in the activated carbon industry through unmatched innovations in the purification, separation and concentration of liquids, gases and other media. As the activated carbon industry forerunner, CCC offers carbon technologies used in over 700 distinct market applications from purifying air and drinking water, to purifying foods and pharmaceuticals, to separating gas and removing mercury emissions from coal-fired power plants.

Activated carbon is the material of choice for electric double-layer capacitor electrodes because it is highly porous, electrically conductive, and stable in harsh electrolytes and under high voltages. However, the ultracapacitor industry is hindered by carbon electrode cost pressures, performance deficiencies and supply challenges. With support from the OTFAEP, CCC and project collaborators will overcome the cost and performance problem and develop next-generation activated carbons. These novel activated carbons will add value to specific end-user processes used to manufacture carbon electrodes.



OTFAEP project work will create the first domestic source of activated carbon—manufactured in Columbus, Ohio—for energy storage and contribute to the expansion of ultracapacitors in price-sensitive applications. CCC and project collaborators propose to maximize the performance benefits and improve the cost viability of activated carbon for the ultracapacitor value chain, strengthening Ohio’s energy storage cluster of innovation.

CCC will commercialize a novel activated carbon for energy storage applications in Ohio and advance the OTFAEP goal of accelerating the development and growth of Ohio’s advanced energy industry and its supply chain and help position Ohio as a leader in advance energy technology commercialization.

Sincerely,

A handwritten signature in black ink, appearing to read 'Walter G. Trampuson', is written over a faint, larger version of the same signature.

Dr. Walter G. Trampuson,
Director of Commercial Development

Ohio Third Frontier Advanced Energy Program

2011 Request for Proposals

Letter of Intent
(B&W LOI-10-007)

PROJECT TITLE	
Low Temperature Catalytic Co-Gasification of Biomass and Coal	

PROJECT FINANCIALS			
Total Project Cost:	\$1,350,000	Funding provided by applicant:	\$675,000
Funding Requested from Ohio Third Frontier:	\$675,000	Project period:	3 years

LEAD APPLICANT'S INFORMATION			
Name:	Babcock & Wilcox Company (B&W) – Power Generation Group, Inc.		
Address:	180 South Van Buren Avenue, Barberton, Ohio 44203		
Contact person:	Hamid Sarv		
E-mail address:	hsarv@babcock.com	Phone number:	330-860-6639

COLLABORATOR'S INFORMATION			
Name:	Ohio State University (OSU) – Department of Chemical & Biomolecular Engineering		
Address:	140 West, 19 th Ave., Columbus, Ohio 43210		
Contact person:	Professor Umit S. Ozkan		
E-mail address:	ozkan.1@osu.edu	Phone number:	614-292-6623

Low Temperature Catalytic Co-Gasification of Biomass and Coal

Economic and environmental challenges faced today put development of clean energy conversion technologies to the forefront of research and development efforts. Gasification is widely recognized as one of the key technologies to enable clean utilization of biomass and coal. Successful development of biomass and coal co-gasification technology can lead to a new commercial product for clean energy and liquid fuel production using two important resources in the State of Ohio. Commercial design, engineering, construction, and operation of catalytic co-gasification units can ultimately create great employment opportunities in Ohio.

Co-gasification of biomass and coal has significant scientific and technical challenges. Compared to lower rank lignite and sub-bituminous coals, the higher rank Ohio bituminous coals have lower reactivity toward gasification and syngas production, especially at low temperatures and atmospheric pressure. The technical hurdles associated with Ohio coal gasification can be successfully overcome by the introduction of a catalyst. Although biomass offers an attractive alternative as a potentially carbon-neutral source, its relatively low heating value and seasonal supply limit its role in fulfilling the nation's energy needs. Also, gasification of biomass, due to the variability in its composition poses additional challenges that can be overcome by a catalytic approach. Catalysts can be used to facilitate the gasification process and enhance the product yield for both coal and biomass feeds. Combined or co-gasification of coal and biomass offers several significant benefits:

- It offsets the carbon footprint of energy generation;
- It reduces the formation of the hazardous gases such as NH_3 and H_2S due to the inherent low contents of nitrogen and sulfur for certain biomass like woody biomass;
- It puts only limited demand on the supply of biomass;
- The intrinsic high content of elements such as potassium and sodium in biomass can potentially enhance the gasification rate via catalysis.

In addition, catalysts not only improve the syngas quality by offsetting the negative impact of higher tar formation and agglomeration caused by biomass, they can also convert, in-situ, harmful gases to environmentally benign emissions. Effective catalysts can also tailor the molar ratio of H_2 to CO in the product stream, making it suitable as the feedstock for liquid fuel production without a need for a downstream water-gas shift unit. To increase the gasification rate to commercially acceptable levels and to achieve the desired gas composition, the development of effective catalysts is crucial.

Fluidized-bed technology offers great fuel flexibility due to its inherently long residence time during the combustion/gasification process. The intimate contact between bed material and fuel particles facilitates introduction of a catalyst, by either replacing the bed entirely or by physical mixing. Continuous, low-temperature, fluidized-bed catalytic gasification of coal-biomass blend with oxygen and/or steam at atmospheric pressure could be a technically and commercially viable approach to produce syngas. Our more specific research objectives are:

- Demonstrate the feasibility of integrated operation of the catalytic co-gasification process in a Bubbling Fluidized Bed (BFB) facility
- Establish the chemistry of catalytic co-gasification under atmospheric pressure at relatively low temperatures
- Quantify the improvements in gasification rate, gas yield, and optimum ratio of H_2 to CO for subsequent liquid production, etc. due to fuel blending and catalyst addition
- Assess the economic viability of commercial application of the technology.

These objectives will be accomplished by the joint research efforts between B&W and OSU through a series of bench-scale characterization tests with stage-gate[®] decisions. B&W has extensive knowledge in designing and operating gasifiers for commercial applications through many years of experience. B&W is also a leading provider of BFB technology that is used in a variety of industrial and utility boiler applications. A current on-going research project funded internally by B&W has a strong synergy to the proposed work. Catalytic co-gasification tests will be executed at the B&W Research Center on an existing 10 KW BFB reactor. Based on the test results, plans will be developed to scale-up the design for demonstration at a to-be-constructed 0.5 MW BFB facility. Sample analysis, catalyst synthesis and characterization at the micro-level, and economic analysis will be performed jointly by B&W and OSU. The key personnel involved in the proposed project possess expertise in areas of catalysis, coal combustion and gasification, and economic analysis. Through teamwork, the project activities will be coordinated and carried out smoothly and the objectives will be accomplished within the proposed timeframe.

September 9, 2010

Ohio Department of Development Technology Division
77 South High Street
Columbus, Ohio 43215

Dear Sir or Madam:

I am writing to inform you of our interest to submit a full proposal for the Ohio Third Frontier Advanced Energy Program. Below, you will find the requested information to be included in our Letter of Intent:

Lead Applicant: Delphi Automotive

Lead Applicant Address: 4551 Research Parkway NW; Warren, Ohio 44483-1973

Lead Applicant Contact: Alex Delavan

Contact Telephone Number: 248-813-8012

Contact Email Address: alex.b.delavan@delphi.com

Proposed Project Title: Aluminum Shielded Large Size/Battery Cable Development for Electric Vehicle/Hybrid Electric Vehicles (EV/HEV)

Estimated Funding Request: \$1,000,000

Known Collaborators: Youngstown State University

Sincerely,



Andrew Brown Jr.
Executive Director and Chief Technologist

Summary of Project Proposed:

Delphi is a leading global supplier of electronics and technologies for automotive, commercial vehicle and other market segments. Operating major technical centers, manufacturing sites and customer support facilities in 30 countries, Delphi delivers real-world innovations that make products smarter and safer, as well as more powerful and efficient. With our global engineering headquarters and cable manufacturing facility in Warren and divisional headquarters in Streetsboro, the Packard Electrical/Electronic Architecture division maintains a strong presence in northeast Ohio.

Due to advances driven by recent funding initiatives, such as the Ohio Third Frontier program, as well as the 2009 American Recovery and Reinvestment Act, technologies once deemed economically infeasible are becoming a cost effective reality. Vice President Biden recently announced the U.S. is now on track to achieve three major innovation breakthroughs related to advanced energy:

- Cutting the cost of solar power in half by 2015
- Cutting the cost of batteries for electric vehicles by 70 percent between 2009 and 2015
- Doubling U.S. Renewable energy generation capacity and U.S. renewable manufacturing capacity by 2012

JP Morgan projects that electric vehicles will total 9.6 million by 2018. U.S. Under Secretary of Energy Kristina Johnson is expecting up to 100 million cars on American roads will be electrically-powered or Hybrid Electric Vehicles by 2030. With such an explosion in demand, financial support invested to bring advanced energy components to commercialization now will ensure that Ohio will see the economic benefit of this promising new technology.

In a traditional vehicle the battery cable must carry the current necessary to operate the starter motor. Being entirely battery powered, Electric and Hybrid Electric Vehicles place a significantly increased workload on their electrical system. To accomplish this additional workload, electrical systems within Electric and Hybrid Electric Vehicle must now maintain and distribute up to 240 volts throughout the accessories and components typically powered by the internal combustion engine. Currently, Delphi must rely on suppliers outside the state of Ohio for large size/battery cable necessary for Electric and Hybrid Electric Vehicle wiring harness manufacturing.

Aluminum cable is a cost-effective, lightweight wiring alternative that offers up to 48 percent mass reduction compared to traditional copper core cable. With such mass savings, aluminum wiring can offer significant advantages for weight reduction, carbon dioxide emissions as well as gas mileage. Globally, there are a limited number of suppliers of aluminum cable and currently, there are no North American suppliers offering large size aluminum cables.

Our project proposes to develop the material, product, and process necessary to manufacture aluminum shielded large sized/battery cable ourselves, within the state of Ohio. Funding from this project will accelerate re-engineering of traditional battery cable technology for use in Electric and Hybrid Electric vehicles while integrating the weight savings and benefits of aluminum wiring. Creating our own manufacturing process would allow Delphi to gain a significant competitive advantage and enable greater control over specifications, quality, and cost as the demand grows. Process and product ownership would ensure that our technologies are able to be adapted and optimized for future advanced energy applications.

The Ohio Third Frontier program and this investment will further highlight and reinforce Ohio's position as a leader in advanced energy. An investment today by Delphi, our collaborators, and the Ohio Third Frontier is not just supporting the implementation of the new advanced energy technologies today, but is also bringing promise to Ohio advanced energy manufacturing.



ECHOGEN

POWER SYSTEMS INC.

405 S. HIGH STREET

AKRON, OH 44311

(234) 542-4379

405 S. High Street
Akron, OH, 44311

(234) 542-4379

(234) 542-4379

(234) 542-4379

(234) 542-4379

VIA EMAIL @ ezdankiewicz@echogen.com

OTFAEP 11-348

September 9, 2010

Ohio Department of Development, Technology Division
77 S. High St., 25th Floor
Columbus, OH 43216-1001

Subject: Letter of Intent – Ohio Third Frontier Advanced Energy Program FY2011

Dear ODOD Program Director:

This letter provides notice of intent for Echogen Power Systems Inc., to submit a proposal in response to the ODOD Advanced Energy Program RFP released on July 27, 2010.

Lead Applicant: Echogen Power Systems Inc.
405 S. High St.
Akron, OH 44311
(234) 542-4379

Contact Person: Mark Terzola, VP Corporate Affairs; mterzola@echogen.com

Collaborators: Edison Welding Institute, Velocys Inc., and Case Western Reserve University

Proposed Project Title: **Development of State of the Art Heat Exchangers for Transforming Waste Heat to Power**

Estimated Grant Funds Requested: \$1 million State funding with a minimum of \$1 million matching funds

Summary:

Industry, and particularly Ohio heavy industries such as steel, cement, glass and other energy intensive industries, face dramatically increasing energy costs in a carbon constrained economy while at the same time facing pressure to reduce operating expenses to remain competitive. We have all seen the results – plant shutdowns and job losses. As noted by the U.S. Department of Energy, one of the most cost effective means of mitigating this escalating competitive disadvantage is to recover relatively abundant waste heat from these industrial processes and convert that heat into electricity. The U.S. DOE, in fact, believes that as much as 20% of the total U.S. electrical demand can be sourced by converting this wasted energy into electricity.

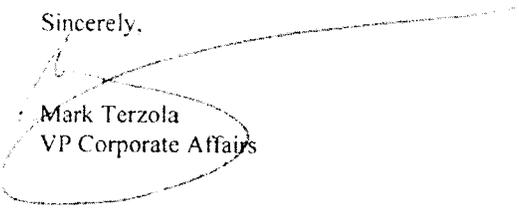
For industry partners wishing to pursue waste heat to power systems, the return on investment for capital expense of such a project may be attractive by relative standards (typically 3 to 5 years) but still too long for them to implement under their respective internal business policies, which will often require a payback of less than 24 months. As a consequence, good governmental policy reflects the creation of economic incentives to help reduce this payback period; for example, the U.S. House of Representatives has recently introduced a bill (the “Heat is Power Act”, HR 5977) that will incent industry by providing a 30% tax credit against such capital investment. It does so because it recognizes the power of converting waste heat to electricity as a vehicle to make US industry stronger and to create jobs.

Echogen and its well recognized team of collaborators seek to impact heat to power systems by advancing the technology necessary for its execution. In a waste heat recovery system, one of the largest cost drivers is the heat exchange interface that must be placed within the Industrial process to “capture” the waste heat. Current technology offers large, complex and bulky heat exchangers that are expensive to build, install, maintain and often reduce the effectiveness of the industrial process. The Echogen team intends to change that by developing and building a state of the art heat exchanger that leverages the power of supercritical carbon dioxide and meso/microchannel heat exchangers to provide a unit that is

expensive and less disruptive to the industrial process. The state of the art heat exchanger will be uniquely "Ohio" with all of the necessary supply chain location within Ohio and leveraging its excellent, existing manufacturing strengths.

We intend to file an application as noted above to seek the assistance of the RCP program to advance this project.

Sincerely,



Mark Terzola
VP Corporate Affairs



Dr. Tim C. Keener
Professor
**Senior Associate Dean for Research
and Graduate Studies**
*College of Engineering and Applied
Science*
665 Baldwin Hall (ML 0077)
Cincinnati, Ohio 45221-0077
Phone (513) 556-3676 (Voice Mail)
FAX (513) 556-2599
e-mail tim.keener@uc.edu

September 10, 2010

RE: RFP to the Ohio Department of Development and Third Frontier Advanced Energy Program for the 2011 Advanced Energy Program

Title: "Commercialization of Processes for the Production of Jet Fuel from Algae."

The Ohio Department of Development
Technology and Innovation Division
77 South High St, 25th Floor
Columbus, OH 43215

To Whom It May Concern,

This Letter of Intent (LOI) serves to signify the collaboration between the University of Cincinnati (Lead Applicant), General Electric Company acting through its Aviation operating unit (GE), Cincinnati, Ohio, and Algaeventure Systems Corporation, Marysville, Ohio for the development and commercialization of processes for the production of jet fuel from algae biomass, and our intent to submit a joint RFP to the Ohio Department of Development and Third Frontier Advanced Energy Program for the 2011 Advanced Energy Program.

The project will incorporate each team member's expertise and efforts into microalgae cultivation, harvesting, lipid extraction, and conversion into jet fuels. Each group has its own function in order to achieve the overall objective of the project. All group activities will be coordinated by the management team housed at the University of Cincinnati who will serve as the lead organization. Algaeventure Systems has developed and patented an innovative technology for removing the water from suspended algae that dramatically reduces energy consumption by utilizing surface physics and capillary action. The Harvest-Dewater-and-Dry (HDD) technology dramatically improves the economics of algae-based biofuel production, and removes a major barrier to large-scale commercialization of this renewable alternative fuel source. Furthermore, this technology holds the potential to revolutionize the removal of solids from dilute solutions in a wide range of industries. GE is developing a process for the direct upgrading of lipid oils to form Jet A fuel which minimizes chemical addition and byproduct formation with a significant reduction in operating energy costs and net greenhouse gas emissions. The project will consist of the design, construction and operation of a pilot photobioreactor located at the GE Aviation Evendale Campus utilizing nutrients from existing water and wastewater streams at the site. The reactor will be designed to produce a lipid volumetric production rate of from 5 - 30 gallons per day for subsequent testing and optimization studies.

The University of Cincinnati will design the photobioreactor based on our growth kinetic study results which are being conducted in conjunction with the Hamilton County Metropolitan Sewer District, and also study lipid extraction methods for the development of economic lipid extraction methods for the first two years. The University of Cincinnati will also provide optimum operating conditions for selected microalgae strains for the photobioreactor based on our growth kinetic study. After harvesting the microalgae with the Algaeventure's harvesting, dewatering, and drying technology, the University of Cincinnati will extract lipids with the goal of developing and optimizing the extraction method which produces the most consistent and purest hydrocarbon oil product. The extracted lipids will be converted into transportation fuels, with a focus on jet fuels, using an upgrading technology developed by GE. Under separate funding, GE is designing scaled-up facilities for this technology - a vital step in the jet fuel production commercialization process. UC and GE will also work collaboratively to identify optimized methods for producing oil with sufficient purity and quality to allow for minimum cost conversion.

We anticipate that approximately \$1,000,000 will be requested for this five-year study which will include two years of actual deployment and development activities funded via Third Frontier and cost-shared funds, followed by three years of commercialization and marketing activities and reporting activities to the State of Ohio.

Thank you for considering this exciting opportunity,

Sincerely,

A handwritten signature in black ink, appearing to read "Tim C. Keener". The signature is fluid and cursive, written in a professional style.

Tim C. Keener
Senior Associate Dean
College of Engineering and Applied Science

OTFAEP 11-350

To: The Ohio Department of Development
Technology Division
77 South High Street, 25th Floor
Columbus, Ohio 43215
OTFAEP2011@development.ohio.gov

From: Tremont Electric, Incorporated
2379 Professor Avenue
Cleveland, Ohio 44113
(P) (614) 563-5310
(E) candres@nPowerPeg.com

To: ODOD

Please find this document as our Letter of Intent (LOI) in response to your Ohio Third Frontier Advanced Energy Program, fiscal year 2011, request for proposals. We intend on supplying you with a proposal prior to the published due date of 2:00 PM October 7, 2010. We appreciate the opportunity to participate in such an exciting program. Thank you for your time and consideration.

Regards,

Corey J. Andres
Director of Business Development
Tremont Electric, Incorporated

Lead Applicant's Name: Tremont Electric, Incorporated
Lead Applicant's Address: 2379 Professor Avenue
Cleveland, Ohio 44113
(P) (614) 563-5310
(E) candres@GREENnPOWER.com

Contact: Corey J. Andres
Director of Business Development
Tremont Electric, Incorporated
2379 Professor Avenue
Cleveland, Ohio 44113
(P) (614) 563-5310
(E) candres@GREENnPOWER.com

Project Title: Advancing Production and Development for Full Commercialization of nPower® Kinetic Energy Harvesting Devices

Estimated Grant Funds to be requested: Up to \$1,000,000

Collaborators: The University of Akron
Libra Industries

Tremont Electric, a Cleveland-based company, was founded in May of 2007 to commercialize a technology that efficiently captures kinetic energy. The technology can be applied on a small scale to recharge personal mobile electronic devices and on a large scale to produce commercial level power for the electrical grid. Tremont Electric has developed and begun initial commercialization of nPower® Personal Energy Generator (PEG) and seeks Third Frontier funding to advance production and development for full commercialization of nPower® kinetic energy harvesting devices.

Tremont Electric, The University of Akron and Libra Industries are collaborating to develop a second generation nPower® Personal Energy Generator (PEG) that offers increased power creation and storage capabilities. The research and development necessary to advance the existing technology will also serve the secondary purpose allowing for a scaled nPower® device which will lead to multiple opportunities for product differentiation, licensing revenue, and further intellectual property.

Libra Industries, in conjunction with Tremont Electric, will also continue to build and refine the production and assembly process at an optimal level to meet consumer demand for the first generation nPower® PEG.

Production of the nPower® PEG will lead to significant direct and indirect job growth in Ohio over the three year project. The research and development from the project will provide the company with an advanced production and assembly process, a second generation nPower® PEG, and the refinement of the nPower® technology that will lead the company into new markets and applications.

OTFAEP 11-351

Letter of intent for OTFAEP (Ohio Third Frontier; Advanced Energy Program 2011) 9/5/10

Lead Applicant: Ultramax Corporation (UMC), 35 Oliver Rd. Cincinnati, OH 45215 513 469 8629
www.ultramax.com

Contact: Carlos W. Moreno, CEO carlos.moreno@ultramax.com

TITLE: Systematic Approach to Reducing Energy Footprint in Manufacturing w/o Capital Investment

Estimated Grant Funds: \$350,000

Contacted Potential Collaborators:

1. RoviSys, Aurora, Ohio, www.rovisys.com is capable and willing to provide personnel as demand for services increases above what UMC can provide. Ref: John Cunningham (330) 995-8124 jc@rovisys.com.

Next: one page Summary of Product and Business Development Plan...

Systematic Approach to Reducing Energy Footprint in Manufacturing w/o Capital Investments

In many production operations it is possible to reduce energy consumption -- while maintaining or improving other aspects of performance – without changing equipment and controls. This energy efficiency is achieved with advanced analytics to properly balance operating parameters. In other words, it is possible to get more productivity from energy consumption without capital expenditures, thus aiding the sustainability of industrial production.

Such reductions in energy consumption have already been achieved with the current version of Ultramax[®], in those rare cases the process managers included reduction of energy costs as an objective in improving operations. In 27 boilers for power generation fuel efficiency was increased in the range of 0.16% to 5%. A paper making application saved 7.1% in energy costs just through better machine adjustments, plus another 8.5% by increasing the recycle flow (larger fan and duct sizes, at less than \$100K capital expenditure) as indicated by the constraint sensitivity analysis. These improvements were also made to another eleven mills for multi-million annual dollar savings. These experiences provide an insight to what might be possible with proper focus, methods and technology.

Ultramax[®] is a Method and Analytics for learning how to adjust settings of production processes so that operations achieve the most desirable levels possible with the existing equipment and controls. The basic endeavor does not require capital expenses to achieve these improvements; this is a fairly unique feature of this technology. Choosing to improve the process capabilities as indicated by the constraint analysis does require capital investment.

The plan to develop and commercialize a version of Ultramax particularly focused on energy conservation is:

1. **Motivational:** Explore with the State of Ohio for some “Energy Metric” by which they wish to recognize the contribution of production industry in energy conservation, something that will motivate managers to be more aggressive reducing energy consumption. Having such a metric is an aid, not a requirement to continue.
2. **Market Research:** With help from a Collaborator or a party associated with OTF, identify ten production processes whose managers are willing to try out Ultramax for energy conservation, in addition to possibly other valuable improvements. From this experience we will **learn**: (a) the metrics which represent managers’ interest in energy conservation; and what improvements they deem a success; (b) document the effort required on the part of the users (according to experience, about 10 days of trained personnel); and (c) the functional changes to make to the product (method and technology) to best solve these customer needs.
3. **Innovate:** Refine the procedures to define and include desired benefits, and the analytics, focused on energy productivity/conservation, based on what was learned in the Market Development stage.

In addition to improving the product, there are **methodological** ways to deliver better results. For instance, if a client applies constant adjustments values of *temperature* and *time* settings, this product will find the best values (together with those of other adjustments). However, it is possible that those adjustments over-treat the product under some conditions of the raw materials and environment. In such case this product would provide dynamic optimization solutions to indicate the right value of *temperature* and *time* – that is, using the right amount of energy – for each combination of (measured) conditions.

4. **Apply** the new product to about 10 production processes to fully evaluate the impact and business potential.
5. **Commercialize:** Based on this data complete a business plan, a partner will establish a new company or division in Ohio with capital and personnel resources, and proceed with marketing, sales and service. At this stage UMC will continue as a technical partner of the enterprise.

A very roughly estimate to implement this plan up to the first few steps of Stage 3 is about \$350K in our part, and corresponding support from OTF AEP.



OTFAEP 11-352

Letter of Intent to Submit a Proposal for the Ohio Third Frontier Advanced Energy Program 2011

Lead Applicant: American Trim, LLC
1005 W. Grand Ave.
Lima, OH 45801

Contact Person: Steve Hatkevich
Director, Research & Development
419-996-4740
shatkevich@amtrim.com

Expected Collaborators: Crown Equipment Corporation, The Ohio State University, Ohio Northern University, Edison Materials and technology Center, Ohio Energy & Advanced Manufacturing Center

Proposed Project Title: Commercialization of an Advanced High Voltage Cable Crimping System

Estimate Dollars Requested: \$1,000,000 Operational Funding

Description:

American Trim and its partners will support and advance the state-of-the-art in electromagnetic force (EMF) crimping of high voltage cables and wiring used in advanced industrial lift trucks from prototype to production applications. The team will leverage previous experience and grant related activities to move the technology through the “Demonstrating” phase and into the early phases of “Market Entry”. The processes developed and delivered as part of this program will serve to demonstrate the technical feasibility and ultimately be set in place as a pilot manufacturing system to prove commercial viability in a production setting.

EMF crimping will be shown to effectively eliminate oxidation and spring back issues that can negatively impact power cable and motor connections in industrial lift truck power systems thereby improving the life and performance of the truck and the energy storage system (ESS). Once demonstrated on electric lift trucks, the technology could expand into other high power electrically driven applications such as automated guided vehicles (AGV) and hybrid and electric cars. Success could significantly improve efficiencies for these and many other applications, creating employment in the State of Ohio as the technology spreads.

Working with Crown Equipment as a collaborator provides the opportunity to transition the technology from “Demonstration” to “Market Entry” and prove commercial viability in a true production setting within the scope of this project.

McKay, Michael J.

From: Pierre-Yves Bertholet [pierre Yves@ashlawnenergy.com]
Sent: Friday, September 10, 2010 11:20 AM
To: OTFAEP2011
Cc: Norma Byron; Jodi Startari; Julian Norley; Orest Adrianowycz
Subject: Ashlawn Energy 2011 OTFAEP LOI

Lead Applicant: Ashlawn Energy, LLC

Address: 101 S. Whiting Street, Suite 308, Alexandria, VA 22304

Phone: (703) 461-3600

Contact & Email: Joseph F. Startari, Program Manager, jstar@ashlawnenergy.com

Project Title: Novel Low-Cost Electrolyte for Redox Flow Battery Energy Storage

Estimated Grant Funds: \$1 million

Known Collaborators: Graftech, Pacific Northwest National Laboratory (DOE)

Project Summary:

Ashlawn Energy is currently under contract to the Painesville Municipal Electric Power Plant (PMEP) to design, manufacture, and start up a 1 MW 8 hour vanadium redox flow battery at the PMEP, owned and operated by the City of Painesville, OH, under a grant co-funded by the U.S. Department of Energy (DOE). PMEP is chartered to demonstrate peak shaving and other benefits associated with incorporating this battery. Ashlawn has committed to the City of Painesville to establish manufacturing capability in Painesville for battery stacks in conjunction with this project.

Market potential for energy storage systems is quite large. However, in order to facilitate adoption of flow batteries as energy storage devices in utility peak shaving management and in power leveling for renewable energy solutions, Ashlawn has committed to driving battery costs down by 40%. The cost of the electrolyte is a major cost driver in redox flow battery systems, currently accounting for approximately 35% of total battery costs.

To this end Ashlawn leverages the commitment of its partners: PNNL has several suitable electrolyte candidates that show much promise at the laboratory level; GrafTech bipolar plates leverage prior Third Frontier investments; the team is augmented and strengthened through the skills and capabilities of Ohio manufacturers, academic institutions, and service providers. The team will work together to refine basic chemistries, select and test materials, and demonstrate a 2 kW hour prototype within 24 months that will be capable of commercial scale within 12 months after that.

Ashlawn hereby states its intent to participate in the Third Frontier Grant Program in 2010.

Sincerely,

Pierre-Yves Bertholet

--

Pierre-Yves Bertholet
Program Controls and Cybersecurity
Ashlawn Energy, LLC - Painesville Battery Team

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OTFAEP 11-354

Parker Hannifin Corporation
Hydraulics Group
6035 Parkland Boulevard
Cleveland, OH 44124-4141

Dr. Joe Kovach
Vice President, Technology & Innovation
direct: 216-896-2159
jkovach@parker.com

September 10, 2010

The Ohio Department of Development
Technology and Innovation Division
77 South High Street, 25th Floor
Columbus, OH 43215 Ohio Third Frontier
Phone: (614) 466 - 2480
E-mail: OTFAEP2011@development.ohio.gov

RE: 2011 OTFAEP LOI – Letter of Intent

Dear Department of Development:

On behalf of Parker Hannifin Corporation, I am pleased to submit our letter of intent for the 2010 OTFAEP project in the Advanced Energy area. This program will build onto the work that we are currently doing with Case Western Reserve University on the WERC program. We believe that this program coupled with the Hydraulic Hybrid Drivetrain will provide for a truly innovative solution to position Parker, Case Western Reserve, and the State of Ohio as a leader in the alternative energy area.

Per the RFP, please find the key contact information for Parker:

- Lead Applicant's name – Dr. Joseph A Kovach Ph.D.
- Address – 6035 Parkland Blvd, Cleveland, OH 44124
- Phone number – (216) 896 - 2159
- Lead Contact person – Dr. Joseph A Kovach Ph.D.
- E-mail: jkovach@parker.com
- Project Title – Alternative energy efficient systems for active blade pitch control
- Estimated Grant Funds to be requested - \$1,000,000.00
- Known Collaborators – University Partnership with Case Western Reserve University, Commercial Partnerships being finalized

Summary: The purpose of this project is to demonstrate and commercialize advanced pitch control systems and hardware to maximize energy generation during constant velocity wind conditions and maximum peak velocity during non constant operation.

In addition to the environmental and health benefits, this project initiative will serve to generate and/or retain jobs in the industry for this program specifically related to the manufacture, test, development, and service of these alternative energy systems, details to be provided in our proposal. Please don't hesitate to contact me should you require additional information.

Sincerely,

Dr. Joe Kovach



10900 Euclid Avenue, Nord 500
Cleveland, Ohio 44106
(216) 368-4436
www.engineering.case.edu

September 10, 2010

Dear Ohio Department of Development,

Please accept this Letter of Intent (LOI) from Case Western Reserve University (CWRU) for our 2011 Advanced Energy Program proposal.

Lead Applicant's Name:	Case Western Reserve University
Address:	10900 Euclid Avenue, Nord 500 Cleveland, Ohio 44106 (216) 368-5122 (Dr. Garcia-Sanz) Dr. Mario Garcia-Sanz mario@case.edu
Telephone:	
Contact Person:	
Contact Email:	
Proposed Project Title:	Advanced Smart Blade Systems for Offshore Wind Energy Cost Reduction and Reliability Maximization
Estimated Grant Funds to be Requested:	\$2 million (\$1M AEP R&D / \$1M WCF)
Known Collaborators:	Wind Logistics, Inc. (an affiliate of The Great Lakes Towing Company), MT Energy USA, and others to be determined

Project Summary

Wind power has taken hold in Ohio and along its manufacturing supply chain. Many companies have realized this potential – for themselves and the region – and so now work diligently to adapt their services for the fastest growing alternative energy market. Currently, the greatest momentum for Ohio's leadership in this industry is offshore, in Lake Erie. Recently, the economic impact of an initial 20MW pilot project and eventually a 1,000MW project, in Lake Erie, has been estimated at up to 8,000 jobs and \$7.8 billion in wages over the next 20 years.

Possibilities for innovation and economic growth arise from each component of a wind turbine, from the foundations to the towers to the nacelles. At the end of these components are the blades. These critical pieces are not only the crux of wind turbines, but also evidence perhaps the best opportunity for immediate and wide-ranging impact on both performance and cost. Reducing the mechanical load of turbine blades alone can trigger a chain reaction of weight reduction throughout the entire machine. As blades become lighter, so too can the drive trains, towers, and foundations that support them, as well as the requirements of deployment vessels needed for offshore installation. With the current cost of offshore wind too high to be economically competitive, each cost-saving advancement improves the economic viability for wind energy for the Great Lakes and across the U.S.

This project team will improve the performance of turbine blades by the strategic and novel use of sensors. These sensors will produce not one, but three innovative benefits specifically applicable to offshore challenges. First, new sensor configurations in a novel control system will allow for improved load attenuation, which will immediately allow for the reduction of blade weight. This advance proportionally reduces cost throughout the wind turbine (as mentioned above).

Second, the planned sensor configuration and control system will allow operators to monitor ice collection in a "smarter" fashion. The economic dangers of icing just recently became apparent at the Caribou Wind Park in Canada. According to *CBC News*, the Park lost no less than 20 days of operating time this winter, a time when wind quality is best. In Lake Erie, where moisture may cause frequent icing challenges, such a shut-down could be even longer term and could produce even more catastrophic loss of electricity production and revenues. In addition, running expensive de-icing equipment continuously in a blade, without understanding exactly when it



CASE SCHOOL
OF ENGINEERING

CASE WESTERN RESERVE
UNIVERSITY

10900 Euclid Avenue, Nord 500
Cleveland, Ohio 44106
(216) 368-4436
www.engineering.case.edu

has succeeded and in what locations, leads to extensive waste of energy that, in turn, drives up cost. By using improved sensors and controls, the conditions that lead to icing can be pinpointed, meaning de-icing systems can be run only when needed, both saving energy and improving long-term performance.

Third, and finally, improved sensors and control systems within smart blades will allow blade condition turbine performance monitoring, which can enable “predictive maintenance.” By addressing this issue, the project team will address one of the critical elements lost in the rush to place wind turbines offshore: the challenges and significant cost of maintaining such turbines, which will be considerably higher than on land. More accurate sensor data and new control strategies, such as proposed here, will allow the first signs of performance failure to be detected and tracked so that early trends can be extrapolated. With this information, operators will be able to better predict and run maintenance projects. When taking into account the time, cost, and unpredictable conditions requisite of marine repairs, the ability to optimize and reduce offshore maintenance trips provides a major opportunity for businesses looking to set-up cost-effective operations serving the new Lake Erie offshore industry.

Partners in this team include Cleveland-based Case Western Reserve University (CWRU), MT Energy USA, and Wind Logistics, Inc. (Cleveland, Ohio). Case Western Reserve is one of the nation’s leading independent research universities, ranking in the top 50 of all national colleges and earning \$345 million in annual sponsored research. CWRU currently pursues multiple R&D projects intended to enable the transition to sustainable energy, including multiple commercially- and industry-focused wind power projects. CWRU is also home to an internationally leading center in advanced controls for wind energy systems.

MT Energy USA is parented by the MTorres Company, which initiated their activities in large composite structures for the aerospace industry and in the wind energy field about 20 and 15 years ago, respectively. The company is furthermore a world-recognized leader in wind-energy direct-drive technology and in automatic manufacturing systems for aerospace companies (Boeing, Airbus, Northrop Grumman, etc). It is also the very first company in the world to develop, just recently, an automatic system for blades manufacturing.

Wind Logistics, which has been established to provide offshore operations and maintenance services, is developing advanced engineering facilities and a highly skilled workforce for sensor embedded smart blade production. Wind Logistics is an affiliate of The Great Lakes Towing Company, the largest U.S.-flag tugboat company engaged in marine operations on the Great Lakes. It operates a full service shipyard located on the Cuyahoga River and specializes in all types of highly engineered marine construction and repair services. It is currently expanding and engaging in the wind power industry, particularly operations and maintenance, wind deployment vessels, and wind farm construction. These activities occur in closer partnership with LEEDCo, Cleveland Water Department, and other developers.

Together, and along with its other partners (for advanced sensors and de-icing systems), this proposal team will combine its expertise, infrastructure, and access to develop smart blade technology in Ohio that will lead to rapid innovation of new products. While potentially applicable to the entire wind industry, these new products are of immediate value to the young offshore industry of Lake Erie. By creating innovations along its shore, this project team, with Ohio Third Frontier support, intends to ensure that the economic growth and job creation that comes with this innovation remains in Ohio.

Sincerely,

A handwritten signature in black ink that reads "Mario Garcia-Sanz".

Mario Garcia-Sanz
The Milton and Tamar Maltz Professor in Energy Innovation
Director, Wind Energy and Control Systems Center
Case Western Reserve University

Case Western Reserve University | Case School of Engineering



PPG Industries, Inc.
Office of Science and Technology
4325 Rosanna Drive
Allison Park, Pennsylvania 15101
Telephone (412) 492-5529
Fax (412) 492-5696

David N. Walters
Proposal Manager
Corporate Science and Technology

September 8, 2010

The Ohio Department of Development
Technology and Innovation Division
77 South High Street, 25th Floor
Columbus, OH 43215

Re: Letter of intent to submit proposal to Ohio Third Frontier Advanced Energy Program

Dear Sir or Madam:

PPG Industries Inc. is pleased to provide this Letter of Intent to submit a proposal in response to the Ohio Third Frontier Advanced Energy Program fiscal year 2011 request for proposals. The proposed program will seek to develop coating formulations for the wind energy market which are designed to mitigate the effect of ice accretion on wind blades. This technology will increase efficiency of wind turbines by minimizing energy losses due to ice accumulation, mitigate risks associated with ice released from spinning turbines and provide a value added product to wind farm operators and turbine manufacturers. The proposed program will leverage experience and resources of Ohio based collaborators such as Case Western Reserve University and NASA Glenn Research Center while commercial production of the coating materials will create jobs in PPG's Delaware, Ohio production plant.

PPG is a global supplier of paints, coatings, chemicals, optical products, specialty materials, glass and fiber glass. The company has more than 140 manufacturing facilities and equity affiliates and operates in more than 60 countries. Sales in 2009 were \$12.2 billion. PPG's fiber glass business is one of the top fiber producers in the world and has been selling fiber glass into the wind energy market for more than fifteen years. Our market share for fiberglass products to wind blade fabricators is estimated to be over 30% and products are qualified in 9 out of 10 blade builders/turbine builders. Since PPG's first foray into coatings in 1900, the company has had a long history of novel product development, with much of it focused on environmentally friendly technologies such as reduced VOC coatings and hexavalent chrome free coatings for corrosion control. Since 1971, PPG has been granted about 1,700 US Patents in the coatings arena with over 650 in the past 12 years. Coatings for the wind energy market are produced in our Delaware, Ohio plant and distributed worldwide through PPG's Refinish coatings network. These materials have been engineered for the wind industry operating environment to extend blade life while also improving performance. Accordingly, PPG is well positioned to successfully develop and market next generation specialized coatings for the growing wind energy market.

Sincerely,

Lead Applicant name: PPG Industries Inc.
Address: 19699 Progress Drive
Strongsville, OH 44149
Phone number: 440-572-6815
Contact person: Mr. John Motley
Email address: jmotley@ppg.com

Proposed Project Title: "Wind Turbine Blade Ice Mitigation Coating System"
Estimated Request: \$1,000,000

Known Collaborators: Dr. Iwan Alexander
Case Western Reserve University

Dr. Mario Vargas
NASA Glenn Research Center

Project Summary:

Plans released by the Lake Erie Economic Development Corporation (LEEDCo) and NorTech Energy envision two scenarios depicting different deployment rates of wind turbines in Lake Erie. Both feature an initial offshore installation of 20 megawatts (MW) by 2012, but differ thereafter, leading to 300 turbines or 5000MW (1,000 turbines) installed by 2030. Both scenarios are based upon the costs for installation, operations and maintenance of hypothetical 5.0 MW wind turbines, along with the costs of specialized vessels necessary to install off shore wind turbines. The larger deployment of 5000MW by 2030 generates 8,000 jobs in Ohio, \$7.8 billion in wages and salaries, \$22.6 billion in public revenues. The smaller deployment scenario (which entails deploying 1500MW) creates or maintains a total of nearly 3,000 jobs in Ohio, induces \$2.2 billion of wages and \$6.5 billion and produces \$171.5 million of public revenue, both state and local.¹

While these plans contribute to goals for American energy independence and offer the potential to become a leader in wind resource management, technology advances are needed to maximize the yield and reduce costs of wind generated power. For example, the American Wind Energy Association has studied the effect of ice accretion and found that eight of the top ten wind power generating states in the United States are located where wind turbines are susceptible to freezing conditions for several months throughout the year. Ice buildup in these areas causes both safety and energy capture issues. The release of large amounts of ice that have formed on wind turbine blades can damage nearby structures and threaten people who live in the area. Furthermore, ice accumulation can decrease power output. John Maissan, Director, Technical Services, at Energy Corporation, presented data which indicated that the efficiency of a wind turbine can be reduced as much as 75% due to ice accretion.³ Ice accretion may lead to: 1) heavier wind turbine blades, reducing the wind energy to rotate and 2) a less aerodynamic surface, increasing drag and decreasing wind turbine efficiency and 3) total stoppage of the wind blades (and power generation) due to significant ice build up.

The program proposed for funding by the Ohio Third Frontier will seek to; 1) identify coating practices and physical characteristics leading to improved ice mitigation performance, 2) develop alternative polymer architectures which maximize the ice mitigation properties, 3) model ice formation and ablation processes on relevant substrates and coatings, 4) test performance of prototype coating formulations in wind tunnel test chambers and finally 5) scale-up coating materials to production volumes and introduce them into the energy industry. This will be accomplished through the unique collaboration that has been formed between PPG Industries, Case Western Reserve University and NASA Glenn Research Center.

As PPG is already a supplier of coatings to the wind industry we are keenly aware of the unique challenges by coatings expected to perform for as long as 20 years in an aggressive environment. We will leverage our know-how and portfolio of coatings technologies to identify a range of materials suitable as a starting point for advanced performance coatings development. Our polymer synthesis labs in Allison Park, PA provide a world class resource to modify functional polymers for improved ice mitigation properties. These new polymer architectures will then be formulated into prototype coating formulations designed to maintain the adhesion characteristics required for the wind industry. In addition to performance testing these coatings will also be characterized by resources at Case Western Reserve University and modeled for the interaction with ice and coating surfaces. Model validation will be performed through wind tunnel testing at the Research Center in Cleveland, OH. Throughout the entire program technical resources at our Allison Park, OH will perform coating formula optimization and physical testing to wind blade OEM specifications. Concurrently, marketing resources at our Strongsville, OH site will guide the product commercialization through development of marketing materials, analysis of market studies and outreach to manufacturers and wind farm operators. Through an iterative process of design, modeling, and testing a coating formulation will be selected for scale-up to commercial volumes.

¹ The Potential Economic Impacts in Ohio Associated With the Emergence of a Lake Erie Offshore Wind Industry “, July 2010, LEEDCo

² <http://www.awea.org/projects/>

³ http://www.nrgsc.yk.ca/pdf/overcoming_icing_effects_wind_turbines.pdf

MAYOR
MERLE S. GORDEN

September 10, 2010

**Letter of Intent to Submit a Proposal
Ohio Third Frontier Advanced Energy Program, FY 2011**

Lead Applicant: City of Beachwood
Address: 25325 Fairmount Blvd., Beachwood, OH 44122
Phone: 216-591-2192 or 216-849-0110
Primary Contact Person: Howard Thompson, howard.thompson@beachwoodOhio.com, Manager of the
Beachwood Business Development Center
Project Title: Beachwood Knowledge and Innovation Center
Estimated Grant Funds requested: \$1,000,000
Collaborators: Cleveland State University

Project Summary:

In today's global market, innovation is viewed as our best hope to directly address the world's social and technological challenges, and to fuel the engine of prosperity. While there is widespread recognition of the crucial role of innovation, the concept still remains deceptively complex and often misunderstood. University communities are well-positioned to support innovation through their academic and professional schools by fostering cross-institutional interactions and collaborations that spark new ideas and drive innovation, and engaging schools to support the institutional strategy for technology transfer.

Cleveland State University's Nance College of Business Administration and the Fenn College of Engineering, in collaboration with the City of Beachwood and its Beachwood Business Development Center, are proposing to develop a Knowledge Innovation Center and Advanced Energy Research Lab to:

- Develop a vertical market for renewable energy with a focus on wind power systems.
- Develop skills and resources to support innovation and knowledge transfer.
- Foster entrepreneurship and new business creation.
- Identify and convene the key players in relevant innovation systems.
- Explore partnerships with other public, private and institutional entities to develop outreach activities that will directly impact the innovation capacity of the region.

The Knowledge Innovation Center and Advanced Energy Research Lab will work to strengthen the partners' niche by providing services to help meet the educational and economic development needs of the region, while building a unique and distinctive image that generates local and national recognition of the partners and their quality programs.

The partners wish to redevelop up to 65,000 square feet in a building that the City has purchased in the Commerce Park Commercial District. This District has received a designation by Cuyahoga County as a Cuyahoga Innovation Zone, with a particular focus on this building's role as a Hot Spot. The space would

contain offices and client space for the Beachwood Business Development Center, a successful technology incubator; shared knowledge or classroom areas for graduate-level study; a renewable energy laboratory; and conference rooms, communication rooms and an interior atrium with an administrative area. We will seek LEED certification for the interior renovation under standards set by the US Green Building Council under LEED-MR (Major Renovation). The facility is located at 23550 Commerce Park in Beachwood, and its Permanent Parcel Numbers are 742-22-015 and -022.

The project will include a unique public-private-institutional partnership program that will engage the collaboration of the City of Beachwood, Cleveland State University's Nance College of Business Administration, Fenn College of Engineering and local business partners such as Parker Hannifin and Lubrizol. The goal of this partnership is to use engineering and business development resources available at Cleveland State University and the City of Beachwood to tackle realistic and long-felt problems in the area of renewable energy, more specifically wind power systems. The outcomes of the proposed partnership will help develop emerging technologies in Cuyahoga County and Ohio that will be engaged in renewable energy systems and devices, and stimulate the creation of new jobs.

Sincerely



Vincent A. Adamus
Economic Development Director

c: Mayor Merle S. Gorden
City Council
David Pfaff, Finance Director
Margaret Cannon, Law Director
Dean Robert Scherer, CSU Nance College
Dean Bahman Ghorashi, CSU Fenn College
Colette Hart, CSU Nance College
Howard Thompson, BBDC Manager
Jennifer Ruggles, ODOD Region 8
Greg Zucca, Cuyahoga County DOD

McKay, Michael J.

From: Herb Crowther [hccrowther@capling.com]
Sent: Friday, September 10, 2010 11:40 AM
To: OTFAEP2011
Cc: 'John R Miller'; 'Patrick O'Brien'; Thomas.Stuart@utoledo.edu; 'Kenneth A. Loparo';
rsastry@aep.com
Subject: MegaJoule Storage Inc 2011 OTFAEP Letter of Intent: Renewable Energy Electric Storage
Demonstration

MegaJoule Storage, Inc

September 10, 2010

Ohio Department of Development
Technology Division
77 South High Street, 25th Floor
Columbus, Ohio 43215

Subject: 2011 OTFAEP Letter of Intent
VIA: E-mail to OTFAEP2011@development.ohio.gov

To Whom It May Concern:

Please let this letter serve as MegaJoule Storage Inc.'s notice of intent to apply for the fiscal year 2010 Ohio Third Frontier Advanced Energy Program (OTFAEP). Below is the information requested in Section 1.3.3 of the Request for Proposal for the OTFAEP. The attached project summary provides additional details about our project.

Lead applicant: MegaJoule Storage, Inc.
Contact: Herb Crowther, President
Address: 1112 Kenilworth Avenue, Cleveland, OH 44113
Telephone: 216-496-8302
Fax: 216-751-9537
E-mail: hccrowther@megajouleinc.com
Proposed project title: Renewable Energy Electric Storage Demonstration
Estimated grant funds to be requested: \$1 million
Target collaborators: Crown Battery, University of Toledo, Case Western Reserve University, and American Electric Power.

Thank you for your assistance. Please feel free to contact me if you need additional information.

Sincerely,

Herb Crowther
President

Attachment: Project Summary

**MegaJoule Storage Inc.: Renewable Energy Storage Demonstration
2010 Ohio Third Frontier Advanced Energy Program Project Summary**

Project Description: MegaJoule will demonstrate and test partial-scale full-function energy storage systems integrated with renewable energy from photovoltaic solar panels. OTFAEP funds will accelerate the commercialization of MegaJoule's products by providing capital that will allow MegaJoule to develop and demonstrate systems in field conditions. This will allow MegaJoule to enter the marketplace faster and accelerate reductions in product cost.

DJW TECHNOLOGY, LLC

September 9, 2010

Third Frontier Fuel Cell Program
The Ohio Department of Development
Technology Division
77 South High Street 25th Floor
Columbus, OH 43215

Dear Sir/Madam:

SUBJECT: 2011 OHIO THIRD FRONTIER ADVANCED ENERGY PROGRAM LETTER OF INTENT

This is the letter of intent (LOI) that we plan to submit a full proposal for the 2011 Ohio Third Frontier Advanced Energy Program by 2:00 PM October 7, 2010. The requested information is as follows:

The prospective Lead Applicant's name with the address and phone number is:

DJW TECHNOLOGY, LLC
5018 Ballybridge Drive
Dublin, OH 43017-8201
Phone: 614-761-9287

The contact person with his E-mail address is:

Douglas Wheeler
E-mail: douglas.wheeler@djwtechnology.com

The proposed Project title is:

Manufacture and Commercialization of Membrane Separation System for Syngas Purification

The estimated Grant funds to be requested are:

\$1,000,000

The known Collaborators are:

The applicant's team consists of DJW TECHNOLOGY, LLC and The Ohio State University Research Foundation.

The one page summary of the proposed Project is:

The team of Professor Winston Ho, University Scholar Professor of Chemical and Materials Science and Engineering at the Ohio State University (OSU), and DJW TECHNOLOGY, LLC continues the successful development of a Membrane Separation System for the Purification of Syngas. The proposed project will build on the team's successful demonstration and design of a Membrane Separation System for hydrogen enrichment of reformed fuels for the Office of Naval Research (ONR). The proposed project will apply this proven enrichment and purification to fuels produced by anaerobic digestion, fermentation, composting (landfill) and gasification of biomass. The purification and enrichment of synthesis gas from coal gasification will be addressed. It will be demonstrated that the Membrane Separation System will optimize Fischer Tropsch production of liquid fuels by purification and enrichment of the hydrogen and carbon monoxide feedstock from coal gasification.

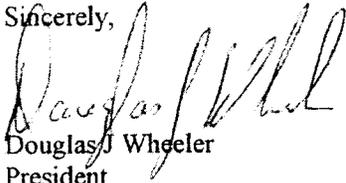
The proposed project will develop commercial channels for the application of the proven Membrane Separation System to biomass and coal produced fuels. DJW Technology, LLC will staff and conduct a marketing activity that will focus on application of the Membrane Separation System to Ohio based biomass to gas production.

DJW TECHNOLOGY will expand its development of a manufacturing facility to include commercial biomass or coal conversion / purification Membrane Separation Systems. The on-going manufacturing development program is sponsored by ONR and emphasizes enrichment and purification of hydrogen streams produced by reforming of JP-5 and JP-8. At Ohio State University, Professor Ho will supplement the on-going ONR effort for the manufacture of membrane for the Membrane Separation System to emphasize production capability consistent with biomass and coal conversion / purification systems.

DJW TECHNOLOGY and OSU successfully completed the ONR Phase I STTR program to design a Membrane Separation System for the enrichment of the hydrogen stream produced through reforming of logistic fuels JP-8 and JP-5. The Ohio based academic and industry team was awarded the STTR Phase II program for the manufacture, delivery, and demonstration of the Membrane Separation System. The \$1.7 million effort sponsored by the Office of Naval Research establishes the manufacturing base for the Membrane Separation System.

Ohio State University previously received support from the Ohio Department of Development's Third Frontier Wright fuel cell capital funds (Grant 342-0561; OSU Research Foundation Project No. 747312 and 747450), NSF's grant (Grant: CTS-06-25758; OSURF Project No. 60008308), DOE's grant (Grant/Contract Number: DE-FC36-03AL68510), and DJW TECHNOLOGY (Agreement No. DJWTLLC-OSURF-0001).

Sincerely,

A handwritten signature in black ink, appearing to read "Douglas J. Wheeler". The signature is written in a cursive style with a large initial "D".

Douglas J. Wheeler
President

DJW TECHNOLOGY, LLC



H₂ Engine Systems, LLC

▪University of Toledo▪Clean and Alternative Energy Incubator▪

▪2600 Dorr Street▪Suite 2000B▪Toledo OH 43607 USA▪

The Ohio Department of Development
Technology and Innovation Division
77 South High Street, 25th Floor
Columbus, OH 43215

OTFAEP 11-360

Re: 2011 OTFAEP LOI

September 10, 2010

To whom it may concern:

This letter is to inform you that H2 Engine Systems, LLC intends to submit a proposal for the Ohio Third Frontier Advanced Energy Program FY 2011.

Lead Applicant

H2 Engine Systems, LLC
University of Toledo
Clean and Alternative Energy Incubator
2600 Dorr Street, Suite 2000C
Toledo, OH 43607 - USA

Contact Person

William J. Niedzwiecki, CEO
H2 Engine Systems, LLC
419-205-1748
wniedzwiecki@h2es.com

Project Title

HDC-100A retro-kit production-part approval process (PPAP)

Estimated Grant Funds to be Requested

\$1,000,000

Known Collaborators

Toledo Area Regional Transit Authority (TARTA)
University of Toledo
City of Toledo
Penta Career Center
H. G. Carroll & Associates, Ltd.

Sincerely,

William J. Niedzwiecki, CEO
H2 Engine Systems, LLC



H₂ Engine Systems, LLC

*University of Toledo*Clean and Alternative Energy Incubator*

*2600 Dorr Street*Suite 2000B*Toledo OH 43607 USA*

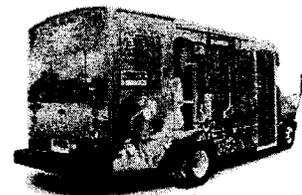
Project Summary

H2ES was formed in January 2010 to commercialize technology developed, tested and proven as part of a 2½ year research grant in partnership with the University of Toledo and the Toledo Area Regional Transit Authority (TARTA). This technology involves the application of hydrogen gases as an enhancement of the burn characteristics in engines, in particular those using renewable fuels. The results of these early tests demonstrated a 25% reduction in fuel and exhaust emissions, thus virtually eliminating the energy penalty of biofuels and making the miles per gallon of biofuels competitive with fossil fuels. In addition, the device can be utilized to increase the fuel efficiency of traditional fossil fuels, thus making the engine significantly more fuel efficient thus making it competitive with existing hybrid technology at a fraction of the cost of today's hybrid-electric engines.

H2 Engine Systems, LLC (H2ES) has designed an improved prototype device from the original design for the modification of existing engines that will significantly increase the fuel efficiency of existing diesel engines through the injection of hydrogen into the fueling system and controlling the electronic interface with existing engine controls. H2ES intends to market this under the kit model number HDC-100A. External funding will increase the speed with which H2ES will be able to move from the initial design stage to the manufacturing and retrofit installation of 300 HDC-100A kits to commercial truck or bus fleet vehicles with the capability to produce high-energy hydrogen on-demand from water and reduce fuel costs and exhaust emissions. The HDC-100A 300 unit test sample is a requirement of the automotive industry's production-part approval process (PPAP). This level of testing will validate the integrity of the design and secure the ability to market and warranty the kit on a larger commercial scale. In addition, the PPAP process will allow H2ES to market the technology to the OEM market with the proper validation information in order to minimize hurdles for adoption of the technology.

H2ES will complete this process with the support of our partners:

- 100 buses - Toledo Area Regional Transit Authority (TARTA)
- 150 vehicles - City of Toledo
- 15 buses - University of Toledo
- 35 vehicles – Other Participating Entities

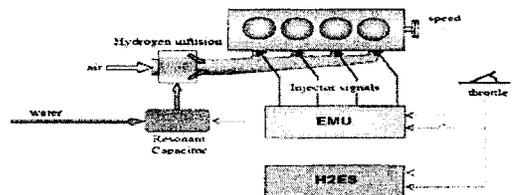


The benefits of this project on the local economy and community include:

- Fuel savings of \$800,000.00 annually
- Reduction of CO₂ emissions of 3000 Metric Tons
- The creation of 30 new jobs in Northwest Ohio
- Influx of \$1,000,000 into local suppliers for parts

Other benefits of the HDC-100A system:

- Fits on existing vehicles
- advantages over hybrids
 - only 6% of the cost of a Hybrid (bus)
 - Same benefits at low speed as hybrid technology
 - "Truly Green" with no additional environmental impact such as disposal of battery, or heavy metal components
 - Lower maintenance cost over Hybrids – does not need special transmission or drive trains.





Applied Sciences, Inc.
PO Box 579 • 141 W. Xenia Ave. • Cedarville, OH 45314-0579
Phone: 937-766-2020 • Fax: 937-766-5886

September 10, 2010

The Ohio Department of Development
Technology and Innovation Division
77 South High Street 25th Floor
Columbus, OH 43215

Subject: 2011 OTFAEP LOI

Attention : OTFAEP2011@development.ohio.gov

This Letter of Intent serves to communicate Applied Sciences, Inc.'s intention to submit a proposal in response to the FY 2011 Ohio Third Frontier Advanced Energy Program for the following project:

Lead Applicant:	Applied Sciences, Inc. (Ohio for-profit company)
Address:	141 W. Xenia Ave., Cedarville, OH 45314
Phone:	937-766-2020 x100
Contact person:	Max L. Lake, President / CEO
Email:	mllake@apsci.com
Proposed Project Title:	Low Cost Manufacturing of Advanced Lithium Ion Batteries for Military and Commercial Systems
Estimated Request	\$ 1,000,000
Known Collaborators	Pyrograf Products, Inc. (Ohio for-profit company) Yardney Technical Products, Inc. General Motors Corp.

Sincerely,

Max L. Lake
President



Applied Sciences, Inc.
PO Box 579 • 141 W. Xenia Ave. • Cedarville, OH 45314-0579
Phone: 937-766-2020 • Fax: 937-766-5886

Applied Sciences, Inc.'s proposed project for the FY 2011 Ohio Third Frontier Advanced Energy Program

Project Title:

Low Cost Manufacturing of Advanced Lithium Ion Batteries for Military and Commercial Systems

Project Description:

Designers of systems which rely on portable power are constantly seeking lighter weight and smaller energy storage devices. Manufacturers have responded to this demand by continually seeking materials which have higher specific energy and energy density values to reduce the overall mass and volume of the cells and battery package. This drive has led to the development of battery chemistries based on lithium which have supplanted other chemistries such as nickel-cadmium, nickel hydride, and nickel metal hydride to become the battery of choice for numerous military and commercial applications. Many systems, such as the unmanned aerial vehicles, soldier power, sensors, and satellites currently rely on lithium ion batteries to provide power. In some cases, lithium ion battery (LIB) technology has been the mission enabling technology. These systems are increasingly more reliant on battery power having reduced operating cost and life cycle costs, for operation of complex instrumentation during longer missions. Furthermore, there is a need to stimulate *domestic* production of advanced batteries to serve Defense needs as well as strategic national needs for alternative energy production.

In this Third Frontier-funded project, Applied Sciences, Inc. (ASI) will work with its collaborators to manufacture lithium ion secondary batteries with twice the specific energy and energy density of current state-of-the-art LIB. These advanced LIBs will be based upon a specialty anode developed by ASI. The LIB produced will extend the duration and capability of military missions and enable the production of all-electric vehicles. The goal of this project will be to demonstrate market-readiness of the advanced LIB technology, and accelerate development and commercialization of advanced LIB using resources within the State of Ohio and US domestic battery producers. The project will be leveraged by the strong track record of developing and commercializing innovative carbon materials at ASI. ASI-development of carbon nanofibers has led to the success of the world's third largest carbon nanofiber producer – Pyrograf Products, Inc. (PPI). In part from the contributions of ASI and PPI, Ohio is home to 25% of the world's manufacturing capacity for carbon nanofibers. Carbon nanofibers, and their more expensive variant, carbon nanotubes, are key components of the nanomaterials industry.