



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

August 24, 2009

Re: 2010 OTFAEP LOI

To Whom It May Concern:

This letter is to inform you that AlphaMicron, Inc. intends to submit a proposal for Ohio Third Frontier FY2010 Advanced Energy Program.

**Lead Applicant:**

AlphaMicron, Inc.  
1950 State Route 59  
Kent, OH 44240  
Phone: 330-676-0648

**Contact Person:**

Volodymyr H. Bodnar, Ph.D.  
Director of Technology  
volodymyr@alphamicron.com

**Project Title:**

Manufacturing of Liquid Crystal Films for Adaptive Window Applications

**Estimated Grant Funds to be Requested:**

\$1,000,000

**Known Collaborators:**

NASA Glenn Research Center  
Cleveland Botanical Gardens  
Kent State University

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**Project Summary:**

AlphaMicron proposes to develop a manufacturing system and equipment to allow it to implement its VALID technology on a 3' wide plastic film. The film can be used in window applications for automotive industry, commercial and residential buildings, and green houses to provide energy conservation and temperature control. The team will fabricate films and test the performance in known environments including green houses.

It is anticipated that the program will lead to manufacturing capabilities in the area of green technology for architectural and automotive glazing applications.

Sincerely,

Volodymyr H. Bodnar, Ph.D.  
Director of Technology

## Stock, Pete A.

**From:** DenyseDBQ@aol.com  
**Sent:** Monday, August 24, 2009 6:21 PM  
**To:** OTFAEP2010  
**Subject:** 2010 OTFAEP LOI

AirWars Defense Ip t: 937 766-4660

100 W. Elm Street Contact: Denyse DuBrucq  
Cedarville OH 45314-8575 e: [DenyseDBQ@aol.com](mailto:DenyseDBQ@aol.com)

Project Title: Making Hydrogen All the Way.....Secret? Calcium

Grant Funds to be Requested: \$300,000 from Ohio Third Frontier

\$300,000 from collaborator or Venture group.

Collaborators: To be determined.

Developers are working on Fuel Cells that require Hydrogen and cars that drive on hydrogen to cut the carbon emissions. Hydrogen, because it is so tiny sneaks between molecules in the rubbers and other parts of pressure containments making it hard to stay bottled and when it doesn't, it is very volatile.

To make Hydrogen enroute, one can drop calcium metal into water and poof, there is a jug of Hydrogen. This would help when the pressurized containment of Hydrogen is empty and there is still more road to cover. It can also be the Hydrogen feed for the fuel cell. Were it the main source of fuel, there must be an inexpensive means to produce the pure Calcium.

Reduction of  $\text{Ca}(\text{CO}_3)_2$  using hydrolysis of water is possible. Where the power companies are paying for excess solar power generation at \$0.03/ kilowatt and charging \$0.08/kilowatt, perhaps the use of this excess power put to purifying the Calcium would be more profitable. Certainly with the current price of pure Calcium metal being in the \$30 range per pound, the use of excess power might bring the pure Calcium cost to reasonable levels to allow the 'going all the way using on the spot produced Hydrogen. DuBrucq patent application 11/825,992 with pending PCT US2008/008504 cover this technology along with a gas stack scrubber for coal burning plants and the use of  $\text{Ca}(\text{OH})_2$  for carbon emission capture in trucks and heavy off-road vehicles and other products with heavily used diesel engines.

A small box at the energy junction can take the excess power from wind generators or solar panels and run the hydrolysis when power is maxed for storage getting the owner a better return for overproduction at high noon. This can either be used in one's own vehicle or be sold to the supplier of calcium for those needing the Hydrogen source.

This study will prepare this Calcium purifier for Green power homes and offices and build the Hydrogen engine for development during Phase I. These techniques have been lab tested and require the engineering to properly house these processes. By year III, the units should be ready for test usage and commercialization the following two years.

Fortunately for the non-volatility of the Calcium metal and the availability of limestone - especially here in the Cedarville Area with Cedarville Limestone known world around - we have the raw materials locally to develop this process.

AEP 368



Peter V. Buca  
Vice President, Technology & Innovation  
Fluid Connectors Group  
Parker Hannifin Corporation  
6035 Parkland Boulevard  
Cleveland, OH 44124

Office 216 896 3000  
Fax 216 896 4022

Attention: OTFAEP  
Technology and Innovation Division  
The Ohio Department of Development  
77 South High Street, 25<sup>th</sup> Floor  
Columbus OH 43215  
Email: [OTFAEP2010@development.ohio.gov](mailto:OTFAEP2010@development.ohio.gov)

August 24, 2009

Dear Sir or Madam:

On behalf of our proposed development team, please accept this letter of intent for the Ohio Third Frontier Advanced Energy Program. The details are as follows:

Lead Applicant: Parker Hannifin, Inc.  
Address: 6035 Parkland Boulevard  
Cleveland OH 44124-4141  
Contact: Peter Buca, VP Technology & Innovation  
Fluid Connectors Group  
Phone number: (216) 896-3000 (main)  
(216) 896-2174 (direct)  
E-Mail: [pbuca@parker.com](mailto:pbuca@parker.com)

Proposed Project Title: Construction of a renewably-generated-hydrogen fueling station as a template to be replicated for commercialization.

Estimated Grant Funds Requested: \$1.3M (\$1M operating, \$300K capital)

Known Collaborators: Cleveland State University, NASA Glenn Research Center, Great Lakes Science Center, Greater Cleveland Regional Transit Authority, Hydrogen and Fuel Cell Consultants, Proton Energy Systems, United Technologies Corporation, Hamilton Sundstrand Corporation, Sierra Lobo, Stark State College Fuel Cell Prototyping Center, The Great Lakes Institute for Energy Innovation at Case Western Reserve University, Cleveland-Cuyahoga County Port Authority, Ohio Aerospace Institute, Midwest Sustainable Solutions.

A one-page summary of the proposed project is also included. Thank you for considering this exciting opportunity.

Sincerely,

PVB/tv

AEF 369

One Page Follows

## Proposed Advanced Energy Project Summary

The objective of this project is to design, construct, and operate a renewably-powered electrolysis-based hydrogen fueling station. The construction and operation of this prototype station is a critical element in the current, ongoing effort to commercialize this type of hydrogen station as an Ohio product. Further, it will enable "beta unit" marketing to proceed with identified customers such as fuel cell lift truck fleet operators for which this type of station is the only viable option.

The station will be built on the grounds of The Great Lakes Science Center (GLSC) and will utilize a high capacity commercial electrolyzer provided by one of the program collaborators, Proton Energy Systems. The electrolyzer will be powered by the GLSC's existing wind and solar power systems, and will electrolyze water into its hydrogen and oxygen elements. The hydrogen will be stored on-site and will be ready for use in hydrogen fuel cell vehicles that range from a hydrogen fuel cell bus in revenue service on a downtown Cleveland route, to fuel-cell-powered fork lifts, hydrogen fuel cell cars, and Cleveland Port Authority service equipment.

The design, construction and operation of the station will be managed by a team of experts assembled by NASA Glenn Research Center as well as a supporting R&D effort to enhance commercial viability by improving electrolyzer efficiency. The R&D element will be a collaborative effort between the NASA Glenn researchers and the Chemical Engineering Department of The University of Toledo and will focus on adapting efficiency improvements NASA is making in space-type electrolyzers to the commercial units to be used in hydrogen fueling stations.

This project provides an opportunity for an Ohio company, Parker Hannifin, to commercialize the design and perfect the building techniques for renewably-generated-hydrogen fueling stations. The project will leverage an implementation program provided by NASA Glenn and United Technologies Corporation, placing a no-cost lease hydrogen fuel cell bus in revenue service for two years by the Greater Cleveland Regional Transit Authority.

The implementation and commercialization program is supported by The Cleveland Foundation, the GLSC, the Greater Cleveland Regional Transit Authority and many others in the region. Funds are needed to complete and site the station on the ground of the GLSC. This site offers the opportunity for using water, wind, and solar to generate non-fossil fuel clean hydrogen and to be a public venue for education and demonstration of an Ohio sustainable hydrogen economy.

Ohio has the unique opportunity to be a world leader in sustainable hydrogen power commercialization, and the resource to develop a green manufacturing supply chain and create green jobs. The Ohio Aerospace Institute will be used to integrate Ohio resources already in place, such as Cleveland State University's Nance College of Business to provide the Commercialization Planning and Marketing Capability for economic development of the Hydrogen Economy of Ohio; utilizing the fuel cell expertise that exists at NASA Glenn Research Center; the Stark State College Fuel Cell Prototyping Center and Fuel Cell Technology Training capabilities to provide workforce training of technicians; the Ohio State University Center for Automotive Research (CAR) to provide expertise on hydrogen fueling station site issues and build issues; the Greater Cleveland Regional Transit Authority for the operation, maintenance, and lease of the hydrogen fuel cell bus; the GLSC and the City of Cleveland for providing outreach and education on the Hydrogen Economy; and the Cuyahoga County Port Authority for providing commercial use and visibility of hydrogen powered vehicles and equipment.

AEP 369

**Stock, Pete A.**

**From:** aprakash@wiretough.com  
**Sent:** Monday, August 24, 2009 4:45 PM  
**To:** OTFAEP2010  
**Subject:** 2010 OTFAEP LOI- Light Weight CNG Tanks- REVISED-!  
**Attachments:** OTFAEP-POLYWIRE-1R1.pdf

--- On **Mon, 8/24/09**, **aprakash@wiretough.com** <aprakash@wiretough.com> wrote:

From: aprakash@wiretough.com <aprakash@wiretough.com>  
Subject: 2010 OTFAEP LOI- Light Weight CNG Tanks  
To: OTFAEP2010@development.ohio.gov  
Date: Monday, August 24, 2009, 4:30 PM

Lead Applicant's Name: Polywire Tough Composites Ltd. (Amit Prakash)  
Address : 105 Keswick Dr., Hudson, OH 44236  
Phone Number : 330 475 3121  
Contact Person: Amit Prakash  
e-mail address: aprakash@wiretough.com  
Project Title:

A Light Weight Pressure Vessel for on-board storage of Compressed Natural Gas (CNG)

Estimated Grant Fund: \$600,000

Collaborators: RJS Co., Akron, OH and Iten Industries, Ashtabula, OH

Abstract enclosed

Amit Prakash  
President

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**Polywire Tough Composites Ltd.** , 105 Keswick Drive, Hudson, Ohio 44236  
330-475-3121 [aprakash@wiretough.com](mailto:aprakash@wiretough.com)

AEP 370

POLYWIRE TOUGH COMPOSITES LTD.105 Keswick Dr., Hudson, OH 44236; 330-665-9553; aprakash@wiretough.com

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Amit Prakash, Ph.D. FASM  
 President  
 Adjunct Professor  
 Department of Mechanical Engineering  
 University of Akron, Akron, OH

August 24, 2009

**Subject : Ohio Third Frontier Advanced Energy Program****A Light Weight Pressure Vessel for on-board storage of Compressed Natural Gas (CNG)**

In USA, number of CNG powered vehicles is about 120,000, including 20% city buses and increasing at over 20% rate annually. Globally there are over 8 million vehicles on CNG.

*THE KEY TO SUCCESS for CNG or hydrogen powered / fuel cell vehicle is a light weight and cost effective storage tank.*

On board a vehicle, CNG is stored at 3600 PSI, (hydrogen at 5000 to 10000 PSI). There are three designated designs of CNG tanks. In USA the most popular design is Type II where an alloy steel liner is reinforced in the transverse direction by fiber glass-epoxy composite. Another design in use is a Type IV which is a fully wrapped by carbon fiber. All city buses in USA use Type IV carbon fiber yielding a cost differential between regular diesel and CNG buses to about \$50000. Most other commercial vehicles however, use Type II and all Type II are currently imported.

Based on tire reinforcement and other composite technologies, we have developed a Type II which is circumferentially wrapped with a 450 KSI strength tire cord quality steel wire composite. A patent is in process. NK Company of South Korea, the second largest CNG tank manufacturer in world, recently conducted a trial of our technology by using a machine designed and made by RJS Corporation of Akron, Ohio. The results showed an improvement in burst and simplification in manufacturing compared to regular Type II.

The data was presented to Akron Metro and they have plans to equip their future buses with this design to save over \$20000 per bus. Beside the cost, these tanks are far better for impact properties and the material is 95% recyclable.

As the full technology is developed in Ohio and is subject to a US Patent application, we plan to start manufacturing of these cylinders locally. There is no manufacturer of any Type II tanks in USA or North America. We plan to get at least 10% market in the first year, which will be over 1500 tanks per month. A direct employment of 30 staff and indirect (steel, machine shop, transportation) employment of 50 bringing a total to 80 is expected within 2 years of start up of the program.

This program presents innovation, clean energy, domestic leadership and employment opportunities in Ohio. The proposed cost to start the manufacturing to the above 1500 tanks per month level is \$1,800,000 to be used over 18 months period. Three Ohio companies have budgeted \$1.2M to this effort. A significant cost has already been used in the development and fabrication of machines and trials at South Korea plant. The requested funding from Ohio Third Frontier is \$600,000.

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The Center of Solutions

Ph. 937-259-1365  
Fax 937-259-1303  
1-888-55-EMTEC  
[www.emtec.org](http://www.emtec.org)

3155 Research Blvd.  
Dayton, OH 45420

## Letter of Intent to Submit a Proposal for the Third Frontier Program

**Prospective Applicant's Name:** Edison Materials Technology Center

**Applicant's Legal Structure:** 501(c)3 non-profit

**Organization's Address:** 3155 Research Blvd.  
Suite 101  
Dayton, OH 45420

**Contact Person:** Jon VanDonkelaar

**Phone Number:** 937-253-0034

**Email Address:** [jvandonkelaar@emtec.org](mailto:jvandonkelaar@emtec.org)

**Expected Collaborators:** Emerson Liebert  
The University of Toledo  
Juice Technologies

**Proposal Type:** Advanced Energy Program

**Proposed Project Title:** **Integration of Smart Grid Storage Technologies**

**Estimate Dollars Requested:** \$1,000,000 from Advanced Energy Program and \$1,000,000 from Wright Capital Fund over two years

Liebert is a division of Emerson Network Power, a business unit of Emerson Electric (NYSE:EMR). Emerson is the global leader in enabling Business-Critical Continuity™. The company is the trusted source for adaptive and ultra-reliable solutions that enable and protect its customers' business-critical technology infrastructures. For more information on Liebert visit [www.Liebert.com](http://www.Liebert.com) or visit [www.emerson.com](http://www.emerson.com).

Juice Technologies, LLC addresses significant market opportunities for advanced "intelligent" devices in the utility space. Juice Technologies was formed in Q1 of 2008 to focus on the invention, design and development of a series of innovative products and services, targeted to mass market deployment.

For more than 20 years, The University of Toledo has been involved with advancing solar technology. The nation's largest manufacturer of solar cells, First Solar located in nearby Perrysburg, Ohio, actually had its origins in laboratories on the campus of The University of Toledo. In 2001, The University of Toledo committed to building a program of national excellence in alternative and renewable energy – beginning with a focus on solar energy and then expanding into fuel cells, biomass, hybrid vehicles and now wind energy.

EMTEC is a non-profit technology center that offers technical assistance, business assistance, funding opportunities, and research management to member companies. The mission of EMTEC is to enhance competitiveness and create opportunities for Ohio companies. [www.emtec.org](http://www.emtec.org)

*Jon L Van Donkelaar*

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- EMTEC Programs**
- Energy Operations**
  - Alternative Energy Materials
  - Supply Chain Development
- Advanced Materials**
  - Core Technology
  - New Product Development PDQ Center
- Customer Solutions**
  - Business Development
  - Materials Help Desk – RFH
- International Services**
  - Bilateral Trade Support
  - Foreign Company Attraction
- Technology Transfer**
  - Air Force Research Lab
  - SBIR Support
- Procurement/Technical Assistance Center**
  - Training
  - Networking
- Small Business Grants**
  - Business Assistance
  - Capital Formation

The Edison Materials Technology Center

An Ohio Edison Technology Center



Ohio Department of Development

## Integration of Smart Grid Storage Technologies

A renewable energy storage system must supply enough power for load following, spinning reserve sales and frequency droop services to allow it to be fully integrated into the electric grid. Load following services are used to compensate for a lack of insolation during cloud crossings or when the insolation forecast was incorrect for PV systems and for lulls in wind speed for wind turbine systems. If the storage can be recharged using off peak power or from excess renewable power without shortening the life of the storage system then it may make economic sense to use storage.

Lead acid batteries form the bulk of current storage systems but new alternatives are being developed. The team will use the University of Toledo's renewable energy microgrid to test and demonstrate various storage technologies so that a new technology can be characterized and further developed to meet Emerson Liebert's needs for large scale storage systems for advanced energy and critical power systems.

Pumped storage similar to First Energy's Seneca Pumped Storage Generating Station could be used. It is a hydroelectric power plant using pumped water storage to accommodate peak electrical load by storing potential energy in water pumped into an upper reservoir by using base load electricity, then reclaiming that energy when it is needed by allowing the water to fall back down and drive generators along the way.

Since pumped hydro, such as Seneca, and pressurized gas systems require specific geological formations, mountain lakes and deep caves, they are rare and difficult to locate. Consequently, other more practical forms of large energy storage are being explored. Two of the more promising are high-temperature batteries and flow batteries.

Flow batteries either involve zinc-bromide or vanadium-redox technologies. The flowing electrolyte energy storage system stores and releases electricity through a reversible electrochemical reaction. Flowing electrolyte systems are typically made up from three sub-systems (cell stacks, electrolyte tank system and an electronics and control system.) Zinc flow systems derive their energy and power from the reaction between two aqueous solutions containing zinc and bromide ions that differ only in their concentration. Zinc-bromide flow technology is totally reversible with no degradation of the electrolyte or other components from the reaction; this strength provides these products with an operational lifespan of 30 years, even under harsh conditions. Flow battery systems are roughly equivalent to pumped hydro energy storage, at less than 2 cents/kWh, on a long-term basis.

Since the mid 1960s much development work has been undertaken on rechargeable batteries using sodium (Na) for the negative electrodes. Sodium is attractive because of its high reduction potential of -2.71 volts, its low weight, its non toxic nature, its relative abundance, ready availability and its low cost. In order to construct practical batteries the sodium must be used in liquid form. Since the melting point of sodium is 98°C this means that sodium based batteries must operate at high temperatures, typically in excess of 270°C.

Sodium-sulfur and lithium sulfur batteries comprise two of the more advanced systems of the molten salt batteries. The NaS battery has reached a more advanced developmental stage than its lithium counterpart; it is more attractive since it employs cheap and abundant electrode materials.

The zebra battery was invented in 1985 by a group led by Dr. Johan Coetzer at the CSIR in Pretoria, South Africa, hence the name zebra battery (for the Zeolite Battery Research Africa Project) and has been under development for almost 20 years. The technical name for the battery is Na-NiCl<sub>2</sub> battery.

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**Organization's Address:** 3155 Research Blvd.  
Suite 101  
Dayton, OH 45420

**Contact Person:** Jon VanDonkelaar

**Phone Number:** 937-253-0034

**Email Address:** [jvandonkelaar@emtec.org](mailto:jvandonkelaar@emtec.org)

**Expected Collaborators:** Emerson Liebert  
The Ohio State University

**Proposal Type:** Advanced Energy Program

**Proposed Project Title:** **Cyber Control of Wind Generators in the Smart Grid as Dispatchable Units**

**Estimate Dollars Requested:** \$1,000,000 from Advanced Energy Program and \$250,000 from Wright Capital Fund over two years

Liebert Corp. is a division of Emerson Network Power, a business unit of Emerson Electric (NYSE:EMR). Emerson is the global leader in enabling Business-Critical Continuity™. The company is the trusted source for adaptive and ultra-reliable solutions that enable and protect its customers' business-critical technology infrastructures. For more information on Liebert visit [www.Liebert.com](http://www.Liebert.com) or visit [www.emerson.com](http://www.emerson.com).

Founded in 1870, The Ohio State University is a world-class public research university and the leading comprehensive teaching and research institution in the state of Ohio. With more than 52,000 students enrolled at its main Columbus campus, 18 colleges and 170 majors, the university offers its students exceptional breadth and depth of opportunity in the liberal arts, the sciences and the professions. A national research powerhouse, the university ranks seventh among all public universities in research expenditures and a remarkable second place when it comes to industry-sponsored research.

EMTEC is a non-profit technology center that offers technical assistance, business assistance, funding opportunities, and research management to member companies. The mission of EMTEC is to enhance competitiveness and create opportunities for Ohio companies. [www.emtec.org](http://www.emtec.org)

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### EMTEC Programs

#### Energy Development

- Alternative Energy Materials
- Supply Chain Development

#### Advanced Materials

- Core Technology
- New Product Development PDQ Center

#### Commercialization

- Business Development
- Materials Help Desk – RFH

#### International Trade

- Bilateral Trade Support
- Foreign Company Attraction

#### Technology Transfer

- Air Force Research Lab
- SBIR Support

#### Entrepreneurial Technology Assistance Center

- Training
- Networking

#### Small Business Center

- Business Assistance
- Capital Formation

The Edison Materials  
Technology Center

An Ohio Edison  
Technology Center



Ohio Department of Development

## Cyber Control of Wind Generators in the Smart Grid as Dispatchable Units

Ali Keyhani, Professor  
Mechatronics-Green Energy Laboratory  
Keyhani@ece.osu.edu

Wind power development in the United States is exceeding expectations as the price of wind power has come into parity with other forms of conventional power production. Distributed Generation (DG), in the form of a wind farm, can be more feasibly deployed with a smart grid deployment. Utilities have a need to bring wind resources under grid control for reliable and efficient operation. The deployment of wind technology can result in a new industry base of suppliers, installers and software energy management developers at the domestic end of the energy supply chain. The rapid increase of non-dispatchable wind power production would impact the economic operation of a power system by not providing the ancillary services required for a reliable system operation. As the penetration of wind power generators increases, wind generators are needed to participate in ancillary services.

*The research objective is to identify a new approach to allow wind generators to act as dispatchable units that can participate in power system regulation. We will use the new technology of flow battery storage systems to create a storage system that, with its inverter, acts as a steam power plant. We will also evaluate the charging and discharging performance of battery-flywheels and super-charging capacitors as storage systems. In these architectures, the storage would provide inertia energy rapidly as the direct current voltage bus drops and, under appropriate control, the charging and discharging storage system would be used to keep the system stable.*

To accomplish this objective, a Matlab<sup>®</sup> simulation test bed will be constructed to study the operation of wind turbines, wind generators and supporting power converters. The proposed control technology is based on the use of a Robust Servomechanism Controller (RSC) for voltage control and a discrete-time sliding mode controller for current control. The RSC is adopted for voltage control due to its ability to perform zero steady-state error tracking under unknown loads and its ability to eliminate harmonics of any specified frequencies with guaranteed system stability. The theory behind the RSC is based on the solution of the Robust Servomechanism Problem (RSP), where the internal model principle and the optimal control theory for linear systems are combined. The internal model principle is applied in DG voltage control by including the fundamental frequency mode and the frequency modes of the harmonics to be eliminated, into the controller. Concurrent with the development of the simulation test bed, a laboratory experimental test bed will be constructed to validate the proposed control technology for dispatchable wind generating units. The objective of the laboratory test bed is to validate the control algorithms for parallel operation of the DG inverter and its storage system with the grid and to act as dispatchable units that can participate in power system regulation.

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LETTER OF INTENT

Ohio Third Frontier Advanced Energy Program  
Fiscal Year 2010

Submitted by:  
AP Alternatives, LLC

**Lead Applicant:** AP Alternatives, LLC  
P.O. Box 326, 19-911 Road T  
Ridgeville Corners, OH 43555

(419) 267-5240

**Contact Person:** Kristi Von Deylen  
[kristi.vondeylen@alexproducts.cc](mailto:kristi.vondeylen@alexproducts.cc)

**Project Title:** Commercialization of the "Solar Paver"

**Est. Grant Funds:** \$1,000,000.00

**Collaborators:** The Wright Center for Photovoltaics Innovation and  
Commercialization at the University of Toledo

The University of Toledo

Advanced Distributed Generation

Alex Products, Inc.

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## Commercialization of the “Solar Paver” Project Description

A cost element of ground-mounted solar arrays which needs to be addressed is the cost of mounting structures and installation. For small to medium sized solar arrays, the cost to develop innovative products and automated installation has been prohibitive. However, as utilities have begun to order large-scale solar installations of 10MWs to 100 MWs in capacity, orders are beginning to emerge which could support the investment needed in designing and manufacturing new mounting structure components and the equipment specially designed and built to install them. AP Alternatives has developed such products and installation technology.

A demonstration of a commercial scale prototype of the “Solar Paver” is needed to prove to potential customers the ability to reduce both the time and cost of erecting large-scale solar power plants. AP Alternatives is in the process of securing financing commitments for initial product tooling and production. What is needed is the funding to manufacture and demonstrate a commercial-scale prototype, and assistance with development and implementation of a commercialization strategy. We believe the reduction in installation costs and field erection time will make the Solar Paver the economic choice for large-scale solar projects. However, we need to determine the best path to market to stave off possible copycat technologies from developing and to keep the manufacturing jobs created in Ohio. AP Alternatives will be assisted in this project by the Wright Center for Photovoltaics Innovation and Commercialization at the University of Toledo, Advanced Distributed Generation, and Alex Products, where the success of this project will result in the reutilization and redeployment of existing assets that have been idled by the downturn in the automotive industry, as well as the re-hiring and re-training of a laid-off workforce.

The successful emergence of the Solar Paver as the economic choice for large solar projects will serve to reduce project costs and make large solar arrays even more competitive with conventional power generation. The technology will not displace solar installers, but will serve to create a greater demand for solar installations, and the work of installers in the field will be less manual labor and more equipment operator oriented. Much as highway construction evolved from a highly manual labor based industry, solar power plant construction is destined to evolve in a similar fashion. AP Alternatives “Solar Paver” technology will lead the way.

AEP 373



To: [OTFAEP2010@development.ohio.gov](mailto:OTFAEP2010@development.ohio.gov)  
Subject: 2010 OTFAEP LOI

Please be advised of our intent to submit a full proposal for the Ohio Third Frontier Advanced Energy Program, Fiscal Year 2010

**Lead Applicant:**

Algaeventure Systems, Inc.  
13311 Industrial Parkway  
Marysville, OH 43040

**Contact Person:**

Ross Youngs, CEO  
(937) 645-4605  
ryoungs@algaevs.com

**Project Title:** Industrial Remediation and Feedstock for Fuels

**Estimated Grant Funds Requested:** \$1,000,000

**Potential Collaborators:**

- (1) Marathon Oil, Findley, Ohio
- (2) The Anderson's, Maumee, Ohio
- (3) Ohio Bioproducts Innovation Center/Agricultural Research and Development Center,  
The Ohio State University, Columbus, Ohio

**Summary of Proposed Topic:**

The commercial viability and feasibility of an Industrial Remediation and Feedstock for Fuels System in a commercial setting can be demonstrated at a location such as an Ethanol plant. This demonstration will show that **sustainable infrastructure** can be economic and practical at scale. This project will also demonstrate sequestration of carbon in an environmentally friendly manner.

AEP 374



## LETTER OF INTENT TO TFAEP PROGRAM

Date: August 24, 2009  
Lead Applicant: Schmack BioEnergy, LLC ("Schmack")  
Address: 7624 Riverview Road, Cleveland, OH 44141  
Contact Person: Steven Smith, Chief Financial Officer  
Phone: (216) 986-9999 x 111  
E-mail: ssmith@schmackbioenergy.com  
Project Title: Accelerating commercialization of anaerobic digestion for bioenergy production  
Funds Requested: \$1,000,000 from Third Frontier and \$2,000,000 from Wright Capital Funds  
Collaborator(s): The Ohio State University /OBIC WCI and College of FAES  
Other OBIC Alliance Members

**Summary of Project:** A new solid-state anaerobic digestion (AD) system will be developed and commercialized to recover energy from waste biomass. The innovative process was invented at the Ohio State University and has been tested in bench scale reactors with favorable results. Schmack, together with the Ohio State University, will design, build, and operate a demonstration waste-to-energy facility to evaluate the process capability at a commercial scale. The new process will efficiently recover energy from underutilized sources of biomass, such as municipal solid waste, yard waste, and crop residue. Operational cost savings and increased revenue potential over currently available AD systems can be realized through improved efficiencies and a new method for organic residual management. Schmack and its collaborators seek Third Frontier funding to accelerate commercialization of their technology.

Schmack has extensive experience with complete-mix anaerobic digesters (liquid AD) with over 300 separate plants operating in Europe and one digester at Akron, Ohio. Additionally, Schmack is working on several other AD projects both in and outside Ohio.

This proposal builds on prior public investments by the US Department of Energy, US Department of Agriculture, Ohio Department of Development, and Ohio BioProducts Innovation Center (OBIC) to accelerate the utilization of biomass to energy via anaerobic digestion. Program objectives include:

- 1) Develop and commercialize new AD process technology by designing, building, and operating a demonstration waste-to-energy facility.
- 2) Identify and engage Ohio-based businesses to manufacture and supply equipment for new facilities.
- 3) Implement an educational curriculum to prepare Ohioans for jobs in this emerging industry to create high salary and wage jobs in the state of Ohio.

AEP 375

BioEnergy  
7624 Riverview Road  
Cleveland, OH 44141

(216) 986-9999  
info@bioenergy.com  
bioenergy.com



To: [OTFAEP2010@development.ohio.gov](mailto:OTFAEP2010@development.ohio.gov)  
Subject: 2010 OTFAEP LOI

Please be advised of our intent to submit a full proposal for the Ohio Third Frontier Advanced Energy Program, Fiscal Year 2010

**Lead Applicant:**

Algaeventure Systems, Inc.  
13311 Industrial Parkway  
Marysville, OH 43040

**Contact Person:**

Ross Youngs, CEO  
(937) 645-4605  
ryoungs@algaevs.com

**Project Title:** Animal and Food Waste to Energy

**Estimated Grant Funds Requested:** \$1,000,000

**Known Collaborators:**

- (1) Columbus Zoo, Columbus, Ohio
- (2) Rockwell Automation, Advanced Technology, Mayfield Hts, Ohio
- (3) Case Western Reserve University, Cleveland, Ohio
- (4) CIFT, Toledo, Ohio

**Potential Collaborators:**

- (1) Ohio Bioproducts Innovation Center/Agricultural Research and Development Center,  
The Ohio State University, Columbus, Ohio

**Summary of Proposed Topic:**

The commercial viability and feasibility of an Animal and Food Waste to Energy System in a commercial setting can be demonstrated at a location such as the Columbus Zoo. This demonstration will show that **sustainable infrastructure** can be economic and practical at scale. This project will demonstrate the improved economic and feasibility to be gained by integrating several emerging technologies into a synergistic closed loop system that can be replicated. Although the described system has many applications in an agricultural setting, it will be demonstrated in a non-traditional setting, like the Zoo, in order to showcase its diversity of applications.

AEP 376

**Stock, Pete A.**

**From:** DenyseDBQ@aol.com  
**Sent:** Monday, August 24, 2009 2:29 PM  
**To:** OTFAEP2010  
**Subject:** 2010 OTFAEP LOI

Fuel Harvest, Inc. Letter of Intent - **This is a Second Letter of Intent for Fuel Harvest, Inc.**

Fuel Harvest, Inc. Ohio Registered Corporation w/ Franchise Number  
100 W. Elm Street t: 937 766-4660  
Cedarville OH 45314-8575  
Contact Person: Denyse DuBrucq EdD e: [DenyseDBQ@aol.com](mailto:DenyseDBQ@aol.com)

Proposed Project Title:

**Developing Fuel Extraction *in situ* from Landfill and Oil Shale Seams**

Estimated Ohio Third Frontier Grant contribution: Between \$2,300,000 and \$2,800,000  
Matching funds: Venture Capital \$2,300,000  
Leasing Company \$1,000,000 payments over 3 years.

Collaborators will be disclosed when contracts are in place.

Summary of the Proposed Project:

Applying the methods defined in two pending patents of Denyse DuBrucq, 11/903,346 and 12/217,915, titled respectively Hydrocarbon Harvesting from coal, shale, peat and landfill seams and Hydrocarbon Harvesting from Methane hydrate Deposits and shale seams, Liquid Nitrogen is used as the prime reagent.

Jerry Boak, Director of Oil Shale Research at Colorado School of Mines finds "no show stopper." Here are the unique features that bring him to that conclusion:

- has a small impact on the landscape.
- has no moving parts in the extraction process.
- uses no water from the environment.
- bathes the entire process in Nitrogen – a fire suppressant.
- has no exhaust except in some configurations, Nitrogen gas.
- leaves the ash in the ground taking only the fuels and water.
- separates the fuel fractions in the extraction process.
- supports a totally thermal driven movement starting at – 195°C, hitting midpoint at fuel evaporating maximum temperature and ending at -190°C.

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With this exclusive ability to draw fuel from oil shale and landfills implemented, the US oil imports diminish.

Economically, the \$1.00 per gallon price of Liquid Nitrogen delivered in quantity produces 250 gallons of cryogenically cold Nitrogen gas which freezes things instantaneously. Starting with the frozen block, a center is heated and the evaporating fuels are carried to the surface by the available Nitrogen gas, a fire suppressant according to NFPA Code 2000, allowing the hot extract to be cooled dropping one segment of fuel type after another starting with heating oil and going on through kerosens (jet fuel and diesel) gasoline, and natural gas.

The thermally driven method separates fuel fractions in extraction. Equipment needed includes cooling units, heaters and vertical drill. Fuel Harvest is applying for demonstration funds for both the pollution extraction through EPA and for BLM RD&D lands to have 160 acres for Proof of Concept and 4,860 acres more making 5,120 acres to extract in either the Picean area of Colorado or in eastern Utah. We are funding to the first third of the Proof of Concept in

the field and plan to use revenues from fuel sales to cover the remaining extraction costs:

Total Zones worked at one time 1 unit – on 2 acres; 9 units – on 20 acres

Extraction Zone 300 x 300 x 15' Volume 1,350,000 Cu. Ft.

Fuel to Shale ratio 22% Anticipated but wide varying in landfills, fuel to landfill material ratio: 50%

Landfill depths of over 15' will require stacked extraction zones where the first will be the top layer. Once the carbon material is removed, iron can be collected with an electric magnet, other metals and precious items can then be gleaned further reducing the material in that layer. Once complete, the top is again sealed and the next extraction zone of 15' depth is extracted. This repeats until all the landfill materials have been processed.

The oil shale work will begin with leased land in the RD&D project anticipated to be offered later this summer by the Bureau of Land Management (BLM) in the US Department of Interior. Nick Douglas, coordinator of the Oil Shale activities of BLM in Washington DC indicated to me that Secretary Salazar would be coming forward with Obama Administration program on this before the end of this summer. The timing of the Ohio Third Frontier Project meshes well with this if what was discussed is the case. Our proposal for the RD&D program under the Bush administration that was due March 2, 2009, but pulled by the new secretary of Interior, was ready for submission and can be easily updated. It contains the needed lab exploration of the kerogen done in the science facilities of the Cedarville University - a fine college some three blocks away.

The process includes at each extraction zone startup, a core drilling of the central hole which allows an 18" sample of the material at that layer. This will be "barrel" tested to determine extraction contents. This determines the configuration of the condenser section. The material in the area of the main hole is frozen using Liquid Nitrogen as the cooling agent. As the cold spreads, eight auxiliary holes are drilled in a 25' matrix around the center at 8" diameter and cooling units are inserted and the zone volume frozen further. The central drilling is then heated to crack and extract the fuels from the landfill contents. The heat zone increases in the frozen zone and the frozen zone is expanded as the matrix expands from the 9 point matrix to 25, 49, 81, 121 and 169 point matrix with the outer points preserving the frozen state and the center expanding the heat zone within it. The fuel is collected in the thermally separated segments and sold to small, local fuel companies for refining.

Once proven to be a viable method, first, on landfill and, second, on oil shale, these efforts will commercialize and the method applied to other landfills throughout the USA and abroad and subsequently on other oil shale fields throughout western United States and Canada and wherever else oil shale beds are located throughout the world. This produces Ohio jobs and export of equipment, training for crews and general profits taxed in the USA and State of Ohio.

This should suffice for the one page description.

AEP 377



To: [OTFAEP2010@development.ohio.gov](mailto:OTFAEP2010@development.ohio.gov)  
Subject: 2010 OTFAEP LOI

Please be advised of our intent to submit a full proposal for the Ohio Third Frontier Advanced Energy Program, Fiscal Year 2010

**Lead Applicant:**

Algaeventure Systems, Inc.  
13311 Industrial Parkway  
Marysville, OH 43040

**Contact Person:**

Ross Youngs, CEO  
(937) 645-4605  
ryoungs@algaevs.com

**Project Title:** Low Energy Algae Harvesting, Dewatering, and Drying

**Estimated Grant Funds Requested:** \$1,000,000

**Known Collaborators:**

- (1) Ohio University, Athens, Ohio
- (2) Rockwell Automation, Advanced Technology, Mayfield Hts, Ohio
- (3) Case Western Reserve University, Cleveland, Ohio
- (4) Univenture, Inc., Marysville, Ohio

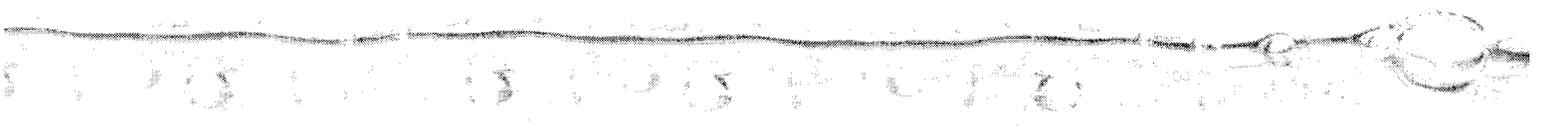
**Potential Collaborators:**

- (1) Miami University, Oxford, Ohio
- (2) Ohio Bioproducts Innovation Center/Agricultural Research and Development Center,  
The Ohio State University, Columbus, Ohio

**Summary of Proposed Topic:**

Algaeventure Systems has developed and demonstrated an innovative method for removing the water from suspended algae that utilizes surface physics and capillary action rather than differential pressure, centrifugal action or bubbling technologies. In fact, the technology is showing a factor of 10 to 100 in energy savings when compared to these and other methods. This novel system is extremely efficient and by addressing one of the most critical steps in algae-oil production redefines the economics for commercial algae-oil systems. This method efficiently removes water from algae in a continuous process that extracts algae and produces a biomass that is dry to the touch with less than 5% moisture and that is ready for oil extraction.

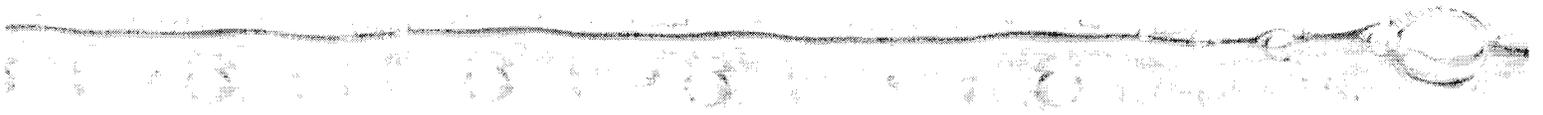
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The proposed research will propel the harvester from the incubating stage laboratory proof-of-concept system through market entry of a commercially viable continuous production system with harvesting rates in excess of 60 gallons per minute. Multiple systems will be developed to address specific commercial applications from fresh to salt water, and for markets ranging from laboratory researchers to large-scale aquaculture farms. The prototype production systems will be tested in a variety of environmental conditions to evaluate performance and provide the needed real-world information for a successful commercial system.

This platform technology can also be applied to other de-watering applications such as food products.

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August 24, 2009

Lead Applicant's Name:

Myers Motors, LLC  
180 South Avenue  
Tallmadge, OH 44278

Contact Person:

Dana Myers  
President and Managing Partner  
Tel. 330-630-3768, ext. 3200  
Dana.myers@myersmotors.com

Project Title:

Demonstrating Electric Vehicle Affordability

Estimated Grant Amount:

\$1,000,000

Summary of Project:

Myers Motors and its collaborators have been developing the next generation highway speed electric vehicle. This project is a commercial demonstration of a lower-cost electric vehicle manufacturing system in order to make advanced energy transportation affordable for the general public.

Consumers who have expressed interest in purchasing electric vehicles often state high purchase price and lack of availability as deterrents. This project would develop a commercial demonstration of Myers Motors' lean manufacturing process to build a two-passenger, highway speed electric vehicle. Successful implementation of this process will lead to an electric vehicle meeting more than 80% of America's transportation patterns with a price that can compete with traditional auto purchases. This will make Ohio the first state with a system to mass produce a competitively priced highway-speed electric vehicle. The growing demand for this type of vehicle across the globe will provide consumers with an affordable means to reduce oil dependence while strengthening Ohio's position as a leader in a vehicle market expected to grow rapidly over the next several years. At this time Myers Motors' collaborating partner is The University of Akron.

Best wishes,

Kammy Willis for Dana Myers

*Myers Motors - Globally Cool Transportation*

180 South Avenue  
Tallmadge, OH 44278  
330-630-3768  
[www.MyersMotors.com](http://www.MyersMotors.com)

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## Letter of Intent for 2010 Ohio Third Frontier Advanced Energy Program

Lead Applicant: MonoMobile Corporation  
2692 Madison Road, Suite N-1  
Cincinnati, Ohio 45208

Contact: Jay Andress, President  
[Jay.andress@monomobile.com](mailto:Jay.andress@monomobile.com)  
513-460-6687

Project Title: Liberator Car Demonstration Track

Amount Requested: \$500,000

Collaborators: Air Force Institute of Technology, Wright State University, Henry M. Wood Company, Premier Rides, Birket Engineering, MonoMobile Corporation

### **Summary of Project:**

Background: The Liberator Car by the MonoMobile Corporation involves an electric car that drives like an automobile to local destinations but then for longer distance trips it connects to an overhead rail. While drivers relax, work or even sleep the car is automatically guided along the rail to its destination and the batteries are recharged. It solves the number one problem with electric cars, lack of travel distance, and has some very significant additional benefits:

- Complete independence from oil
- 300% increase in fuel efficiency versus the automobile
- 70% reduction in transportation greenhouse gas emissions
- Safer, more convenient and faster (100 mph) travel than the automobile
- Less costly infrastructure than the automobile roads and highways
- High capacity system incorporating many ITS technologies.

Because of the significant promise of this technology many of the top United States research laboratories, including Oak Ridge, Argonne, National Renewable, have joined together to conduct research on aspects of the technology. This effort by the MonoMobile Corporation would establish Ohio as the center of the commercial effort with this technology. The success of this technology could have a major economic benefit for Ohio and an opportunity to reopen many of the closed automobile plants in the State.

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In 2010 and 2011, the United States will be experiencing the introduction of electric cars by some of the world's largest automobile manufacturers (Nissan, GM, Chrysler and others). With continuing problems with travel distance, the benefits of the Liberator Car technology will be seen as the solution.

Proposal: The MonoMobile Corporation has raised funds privately to construct a demonstration track (possible sites include Wright-Patterson Air Force Base, abandoned DHL facility in Wilmington or in the Cincinnati area). This request is for additional funds to develop and build a switch, connection station and conduct tests of the system.

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**Ohio Third Frontier Advanced Energy Program**

**Letter of Intent**

New Generation Engineering Knowledge, Inc. (NgEK)

August 25, 2009

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## Letter of Intent

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### Lead Applicant

Name: ..... Mr. George Brunemann  
Address: ..... 3342 Parkhill Drive  
   Cincinnati, OH 45248-2878  
Phone Number: ..... (513) 598-8578 (O)  
   (513) 520-7824 (M)  
Fax Number: ..... (513) 598-8579  
Email Address: ..... george@ngek.com

### Contact Person

Name: ..... Mr. Douglas Dennis  
Address: ..... 3342 Parkhill Drive  
   Cincinnati, OH 45248-2878  
Phone Number: ..... (513) 598-8578 (O)  
   (513) 295-3666 (M)  
Fax Number: ..... (513) 598-8579  
Email Address: ..... doug@ngek.com

**Project Title:** ..... Computer Configured Combustion Cycle for Internal  
   Combustion Engine (C4)

**Estimated Grant Funds:** . \$1,000,000

**Known Collaborators:** .... Silverstone Advisors

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## Letter of Intent

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### Project Summary:

The Computer Configured Combustion Cycle (C4) is an internal combustion engine with expanded control of air, fuel and exhaust mixing and flow to increase power density, improve thermal efficiency and lower emissions. These changes provide a 30% to 60% extension in vehicle miles per gallon and similar reduction in emissions. While mechanical additions are the visible changes, the actual advancement is the algorithm architecture used to manage these parameters. The NgEK approach relies on a form of artificial intelligence using embedded real-time models to select combustion cycle and actuator settings based on the exact operating conditions.

The C4 technology is a fundamental change to the underlying combustion cycle and the computer architecture used to control the engine. In the same way that fuel injection replaced carbureted mixing and lean burn has replaced stoichiometric air/fuel control, the C4 system takes the engine operation into a new direction to provide dramatic fuel economy improvements and emission reductions without changing basic manufacturing process, infrastructure needs and with minimal cost increases.

The Computer Configured Combustion Cycle addresses the optimization of the emission and efficiency performance of the internal combustion engine by introducing additional degrees of freedom to manage the energy conversion process. Conventional engines manipulate fuel quantity and spark timing as the only variables to control the engine operating point. Valve timing is usually set by a single cam or a set of cams/cam variations that are mechanically preset as a function of speed and/or load. The basic four-stroke, Otto cycle combustion process has been the foundation for the automotive engine for almost all of modern times. The Computer Configured Combustion Cycle has the ability to execute the four stroke process as well as other approaches to manipulating the combustion parameters in order to optimize performance and efficiency to match the exact operating environment and driver demand.

The request under this LOI will provide incremental funds to an existing project which has been funded by NgEK over the past 24 months, bringing it to its current state of development and commercialization. In addition, funds will also augment venture funding which is currently set at \$9,000,000 for the three year development period for this project. Third Frontier funds will be used to prove out additional technology in engine, transmission, and system controls over the entire scope of the project.

While not in the "sweet spot" of the stated target industries for this grant, NgEK's project has a direct impact on the Ohio economy by providing both direct and indirect jobs as well as opportunities for subcontract manufacturing and supply chain resources. The impact of this technology, the product developments, and acceptance by industry are certainly as far reaching as wind or solar energy generation. With over 250 million automobiles on the road and a horizon of nearly 30 years before broad availability and adoption of electric vehicles, the potential to eliminate pollution, global warming green house gasses, and the ability to reduce the dependency on foreign oil are as significant, if not more so, as the impact of these other targeted opportunities. We appreciate the opportunity to present our full proposal for consideration.

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Ohio DOD,

It is the intention of Logotec Construction, Inc., an Ohio Company, to submit a proposal for demonstrating storing hydrogen in hollow glass microspheres for use in a PEM fuel cell powered vehicle. In compliance with Ohio Department of Development guidelines the requested information is provided below.

- Lead Applicant:  
Logotec Construction, Inc  
9113 Greeno Street  
Stoutsville, OH 43154  
Phone: (740) 474-1249  
Fax: (740) 474-1249  
Web Site: <http://www.LogotecConstruction.com>
  
- Contact Person  
John H. Chumley  
e-mail [JChumley@Columbus.rr.com](mailto:JChumley@Columbus.rr.com)
  
- Title:  
Storing Hydrogen in Hollow Glass Microspheres
  
- Estimated of Grant Funds to be Requested:  
\$750,000.00
  
- Collaborators:
  - Timothy Schmelzer, KOPA Inovations Group, Inc·21420 Winstead Drive  
Circleville, OH 43113·(740) 215-2192
  - Prof. Matthew Hall, NYS College of Ceramics·2 Pine Street·Alfred NY,  
14802·(607) 871-2470
  - Michael Conaway, PHPK Technologies·2111 Builders Place·Columbus,  
OH 43204·(614) 486-4750
  
- Abstract: attached.

Sincerely,

John H. Chumley

AEP 383

# Storing Hydrogen in Hollow Glass Microspheres (HGMS)

John H. Chumley<sup>a</sup>,

Matthew M. Hall<sup>b</sup>,

Timothy E Schmelzer<sup>c</sup>

<sup>a</sup>Logotec Construction, Inc. 9113 Greeno Street, Stoutsville, Ohio 43154, USA [JChumley@Columbus.RR.com](mailto:JChumley@Columbus.RR.com)

<sup>b</sup>NYS College of Ceramics, 2 Pine Street Alfred NY 14802 [HallMM@Alfred.edu](mailto:HallMM@Alfred.edu)

<sup>c</sup>KOPA Innovations Group 2965 Election House Rd NW Lancaster, OH 43130 [tschmelz@columbus.rr.com](mailto:tschmelz@columbus.rr.com)

**ABSTRACT:** At least in the near-future, and perhaps indefinitely, if the technology proves effective, the hydrogen to power PEM fuel cell vehicles will be stored as a compressed gas. The objective of this project is to demonstrate a commercially viable method for storing hydrogen gas compressed to 10,000 psi (70 MPa ) at near ambient temperatures in hollow glass microspheres. The individual HGMS are only 50  $\mu\text{m}$  in diameter with a 1  $\mu\text{m}$  wall thickness. The HGMS are can be used to store hydrogen because their hydrogen permeability changes almost instantaneously when exposed to infrared light. – Shine an IR light on the HGMS and hydrogen goes in or out. Turn off the light and the hydrogen is trapped.

This project includes:

- Making enough HGMS to support a small fleet (6 to 8 vehicles) of PEM fuel cell powered vehicles.
- Building and testing a pressure vessel capable of filling the HGMS to 10,000 psi (70 MPa )
- Building and testing a “fuel tank” to hold the HGMS and release hydrogen to the fuel cell.

The HGMS approach avoids the challenges associated with storing hydrogen in a bulk container since each individual HGMS contains less than 4 billionths of a gram of hydrogen. HGMS would also be used to store the hydrogen away from the vehicle. To meet a cost of \$2.00 to \$3.00 gge it is only necessary to make and fill HGMS for \$400 to \$600 per tone (The HGMS could cost more if they are reused). Also, since the onboard component of the system is not required to provide high pressure hydrogen containment, meeting even the “long term” DOE goal of building a tank for \$300.00 that is capable of storing 5 kg of hydrogen is easily attainable.

*KEY WORDS: HGMS, PEM fuel-cell, hydrogen storage, IR, photo activated.*

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**Ohio Third Frontier Advanced Energy Program**

**Letter of Intent: Wind Energy Corporation**

**Lead Applicant:** Wind Energy Corporation

**Contact Person(s) for Wind Energy Corporation:**

**Technical:**

Sean Brown  
6857 Pallid Road  
Holland, OH 43528  
Phone: (419) 327-7983  
Email: [sbrown@windenergycorp.com](mailto:sbrown@windenergycorp.com)

**Administration:**

Michele Hilbig  
P.O. Box 6036  
Elizabethtown, KY 42702  
Phone: 502.212.2654  
Fax: 866.579.2750  
Email: [mhilbig@windenergycorp.com](mailto:mhilbig@windenergycorp.com)

**Project Title:** Commercial and Community Vertical Axis Wind Turbine

**Estimated Grant Funds Requested:** \$1,000,000

**Collaborators:**

The University of Toledo, 2801 West Bancroft Street, Toledo, OH 43606.  
Dr. Abdollah Aliakbarkhan Afjeh

SSOE, Inc., 1001 Madison Avenue, Toledo, OH 43604.  
Mr. Jerry Carter

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**Proposed Project Summary:**

Wind Energy Corporation (WEC) will introduce a vertical axis wind turbine (VAWT). Our market analysis and customer conversations revealed there is a significant opportunity in the Commercial and Community markets for our wind turbine -- a solution that is aesthetically pleasing, quiet, and not harmful to birds and bats. If these turbines were installed on 247,000 buildings in the target market (a conservative 10% of the total buildings of relevant size and use in an appropriate wind category), the impact could save 3000 Gigawatts required from non-renewable resources.

Wind Energy's wind turbines are a new and innovative solution for this untapped market. Using specifications developed from our full scale prototype installed for 8 months in Weslaco, Texas at H-E-B, the large grocery chain, WEC confirmed it has a reliable design that can generate a relevant amount of energy for customers in commercial and community settings. Being a "plug and play" device, there is no need for costly transmission lines -- this is a point of use device giving the customer control over a portion of their energy production on-site. We have early adopter's in queue to receive the first production models and commitments to purchase more upon the success of the demonstration phase.

By locating its manufacturing facilities in northwest Ohio, WEC anticipates creating 300 new jobs and stimulating approximately 1400 ancillary new jobs by the end of the third year of operations and an estimated 3000 total jobs in five years.

The project scope is as follows:

Product engineering is currently being accomplished by DEKA Research and Development under the direction of Dean Kamen, the world renowned inventor. That work will yield a manufacturable wind turbine in approximately six months.

Once the wind turbine engineering is complete, WEC will contract with SSOE, an OH base A&E firm, to create a mounting structure suitable for installing the wind turbines on roofs and open spaces around a customer's location and connect the generator to the customer's electricity system.

Emerging from this engineering work in an estimated 6 - 9 months, Wind Energy Corporation will establish a manufacturing operation that will propel the product into the market place. The first units will be installed at early adopter customers.

The University of Toledo will be an early demonstration site for one or more wind turbines. They will be a collaborator in evaluating the first wind turbines. Longer-term, we may collaborate in product and application development support utilizing the University's engineering and wind tunnel capabilities.

AEP 384

## Stock, Pete A.

**From:** Joe Hensel [henseljd@polyflowcorp.com]

**Sent:** Sunday, August 23, 2009 10:02 PM

**To:** OTFAEP2010

**Subject:** 2010 OTFAEP LOI

To: [OTFAEP2010@development.ohio.gov](mailto:OTFAEP2010@development.ohio.gov)

Subject: 2010 OTFAEP LOI

Lead Applicant: Polyflow LLC

Address: 526 S. Main St., Ste 230, Akron, Ohio 44311

Telephone: 330-253-5912

Contact: Joseph D. Hensel, [henseljd@polyflowcorp.com](mailto:henseljd@polyflowcorp.com), 330-807-2962

Project Title: The Commercialization of Alternative Fuels from Polymer Waste

Grant Funds Requested: \$1,000,000

Collaborators: TBD

**Project Summary:** Polyflow and its collaborators have developed an enhanced chemical pyrolysis technique that converts unsorted streams of post consumer, post commercial and post industrial polymer waste into gasoline blendstock and diesel fuel.

- Independent lab results from over 50 runs have proven 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
- Processed over 5 tons of polymer waste to prove the production capability:
  - Confirmed the availability of feedstock
  - Proved the high yields of the process
  - Defined the energy requirements
  - Sold all the product produced to confirm the value of the end product
- Defined the path to commercialization:
  - Developed the A-level designs for the production facility
  - Selected a Chemical Engineering Construction firm to build multiple facilities.
  - Have down selected the facility sites to the final contenders.
  - Has the support of municipal, institutional, industrial and waste industry suppliers
  - Has strategic collaborators and customers

This project is to build and commercialize the first Polyflow high volume production processor and production facility. 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.

Joseph D Hensel , Chairman

Polyflow

526 South Main St. Ste 230

Akron, OH 44311-4413

C: 330-807-2962

O: 330-253-5912

[www.polyflowcorp.com](http://www.polyflowcorp.com)

AEP 385

8/26/2009

## LETTER OF INTENT

### THIRD FRONTIER ADVANCED ENERGY PROGRAM

**Lead Applicant:**     **The University of Akron Research Foundation ( UARF )**

Address: 411 Wolf Ledges Parkway, Suite 105  
Akron, Ohio 44311

Phone Number: 330 972 8821

Contact Person: Dr Barry Rosenbaum, Senior Fellow, UARF  
E mail: [barry@uakron.edu](mailto:barry@uakron.edu)

Principal Investigators at The University of Akron College of Polymer Engineering and the College of Computer and Electrical Engineering:

- Assoc Professor Kyonsuku Min
- Professor Mukerrem ( Miko ) Cakmak
- Professor Tom Hartley

**Project Title:**   **Novel Polymeric Separator Membranes for Advanced Energy Storage Devices: Batteries and Fuel Cells**

**Estimated Funds Requested:**   **\$1,000,000 to be expended over a 2 year program period**

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**Known Collaborators:**

- **eVionyx, Inc** – An energy technology company currently located in Hawthorne, NY
- **ZnErgy, Inc** – An early stage company formed in Akron, Ohio that will commercialize the new separator membrane technology
- **Case Western Reserve University** - Professor Uzi Landau, electro chemistry expert in Chemical Engineering Department
- **University Innovation Ventures** – A for-profit company which builds collaborations to develop and commercialize private sector technologies as regional initiatives for wealth creation
- **Eaton Corp.** - Industrial partner to test, develop, and commercialize energy storage applications.

## SUMMARY OF PROPOSED PROJECT

### Novel Polymeric Separator Membranes for Advanced Energy Storage Devices: Batteries and Fuel Cells

#### **The Background / Market Opportunity**

Advanced energy storage technologies have been identified as a national strategic priority for the United States to achieve energy independence. Billions of dollars have recently been appropriated by the Federal Government to support Li ion technology and battery manufacturing, in spite of the inherent issues with lithium: high cost, safety concerns, environmental impact, and limited strategic lithium supply. Li ion batteries work well for relatively small applications, but scale up to support larger battery packs for transportation, industrial, utility storage, or some military applications create major problems. A lower cost, safe, environmentally compatible alternative to Li ion technology without sacrificing performance would capture significant market share and provide enormous business potential for Ohio.

Nickel – Zinc electro chemistry would address all of these deficiencies if battery life and multiple deep charge / discharge cycles can be obtained and confirmed in market driven end use applications. The raw materials are plentiful, relatively cheap, non toxic, and the power / energy density of Ni – Zn batteries is extremely high. A novel polymeric separator membrane has now been developed which allows Ni Zn batteries to achieve a minimum of 500 – 1000 deep discharge cycles. Optimization and commercialization of the separator membranes will revolutionize the rechargeable battery industry.

eVionyx, Inc and The University of Akron have confirmed that these separator membranes eliminate the formation of dendrite – imperfections that can grow on the surface of the zinc electrode quickly leading to short circuiting of the battery. Under an existing Third Frontier Program Advanced Energy Grant, battery performance has been confirmed and optimized separator membrane compositions have been developed. The Proposed Project will bring this technology to commercial readiness for Ni Zn batteries, and will demonstrate separator membrane application for other battery electro chemistries..

#### **The Project Proposal**

Under an existing Third Frontier Program Advanced Energy Grant the University of Akron has confirmed Ni Zn battery performance in laboratory testing at 500 deep discharge cycles, has characterized separator membrane structure / property performance, has developed proprietary approaches to improve membrane performance, and confirmed battery performance in a plug - in electric vehicle. The proposed project would address the commercialization issues associated with product / process development to position Ohio as a global leader in advanced energy storage.

The project would have three primary focus areas:

- + Complete membrane coating process development using the state of the art Coating Pilot Line at the College of Polymer Engineering that was supported by The Third Frontier CMPND Grant Program. The deliverable would be creation of a separator membrane manufacturing business in Ohio supplying membrane globally. Achieving 6 sigma standards of quality control is essential.

- + Continued optimization of membrane composition / performance. The deliverables for Ni Zn batteries would be extending battery life up to 10 years, increasing upper service temperature to 80C, and increasing battery energy density to 150 wh/kg by optimizing battery component design. Separator membrane performance in other battery electro chemistries would be confirmed in collaboration with Battelle and in fuel cell applications with Rolls Royce

- + Battery testing in end use applications to achieve multiple customer approvals. Beta testing customers have been identified in several areas: Hero, India for electric bicycles, Myers Motors for electric vehicles, Eaton for UPS back up power supply, and EPRI for utility energy storage applications.

A strong research and development team has been assembled including eVionyx, The University of Akron, and Case Western Reserve University. This team, working with strategic customer / partners, will support development of a strong energy industry cluster in Ohio based upon commercialization of the proprietary polymer separator membrane and Ni Zn Batteries.

AEP 386

**LETTER OF INTENT TO FILE A PROPOSAL  
FY 2010 Ohio Third Frontier Advanced Energy Program RFP**

**Name of Company:** HP2g, LLC

**Address:** 2611 North Scott Street  
Napoleon, Ohio 43545

**Phone:** 419-592-2677

**Contact Person:** Douglas Pelmeor or Mark Schnitkey

**Email of Contact:** [team@hp2g.com](mailto:team@hp2g.com)

**Proposed Project Title:** Commercialization of 110 MPG HP2g Engine for Automotive and Agricultural Use

**Estimated Grant Funds Requested:** \$400,000.00

**Known Collaborators:** None

**Summary of Proposed Project:**

HP2g, LLC is an automotive and engineering technology company. The company has developed, built, and tested a prototype V-8 automotive engine that runs on E-85 fuel called the HP2g. In over 20,000 miles of testing, the HP2g achieved 110 MPG in average fuel economy while producing 400 horsepower and 500 lb-ft of torque upon demand. It has been EPA tested for emissions and achieved a rating of 86.5 grams per mile of hydrocarbon emissions, one-third of the 250 g/mi EPA emissions standard set to go into effect in 2016. Due to the pioneering design and technologies it possesses and its efficient operation, the useful life of the HP2g is five times that of the normal automotive engine. The company is now trying to obtain funding to complete an EPA fuel economy verification for automotive applications of the engine.

The company is in the process of obtaining full U.S. and International Patent protection. Once the patent filing process is completed, mass production of the HP2g can begin at the company's facility in Wauseon, Ohio and at two outsourced OEM facilities in Ohio. There has arisen a large demand for the HP2g for agricultural applications as well. For automotive and agricultural applications, the company has a present demand for over 300,000 HP2g engines in year one.

Money from this grant program will assist the company in bringing the HP2g to market by helping to fund patent protection and the machining changes that need to be made for agricultural application production.

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**Stock, Pete A.**

**From:** Ksquaredtrdgco@aol.com  
**Sent:** Thursday, August 20, 2009 3:04 PM  
**To:** OTFAEP2010  
**Subject:** 2010 OTFAEP LOI

Prospective Lead Applicant: AIGalCo, LLC

Address: 6532 Castle Knoll Court, Indianapolis, Indiana 46250 We are currently an Indiana domiciled LLC but will relocate.

Phone Number: 317-361-2787

Contact Person: Kurt C. Koehler

Email Address: [ksquaredtrdgco@aol.com](mailto:ksquaredtrdgco@aol.com)

Proposed Project title: Hydrogen from Aluminum and Water: Full Cycle Implementation

Grant Funds: \$1,000,000

Collaborators:

1. Dr. Tim Lowe; Energy Technologies, Inc.
2. Stan Ream; EWI
3. Vinny Gupta, Dave Nestic; JumpStart, Inc.

#### PROPOSED PROJECT SUMMARY

AIGalCo, LLC has the exclusive license from Purdue University to commercialize a technology in which hydrogen can be generated on demand simply by adding water to an alloy comprised of 95% common aluminum. The last four years have been spent perfecting the composition of the alloy to ensure a maximum of energy output at the lowest possible cost. Currently, the alloy is in the final cost reduction phase with all testing being completed by the end of 2009.

The next step in the commercialization process is to introduce hydrogen produced by our technology into actual applications. The company has identified several existing opportunities in the state of Ohio which can benefit from a hydrogen feedstock that is completely renewable. Most, but not all of the existing applications are fuel cells for both commercial and military use. The technique for quickly and cheaply removing the catalyst from the spent alloy is already developed. The catalyst has been recovered and incorporated into new alloy numerous times without loss of hydrogen production per gram of alloy.

Included in the next step of commercialization is scaling up the size of the existing catalyst recovery device to be able to process substantially larger quantities of the catalyst from the spent alloy. We also propose exploring the use of the Hall process to recharge the spent alloy on site using windmills and/or solar energy. Three major advantages could occur:

1. Reducing the intermittent nature of wind power by offering a means of capturing excess energy.
2. A reduction in the cost of the alloy to a point below that of the current price of gasoline and diesel.
3. Assisting in decentralizing energy production by allowing hydrogen to be safely stored and transported.

It is the intent of the company to match the funds granted by the state of Ohio with additional monies from the current investors in AIGalCo.

If we are successful, the state of Ohio's position as the leader in fuel cell manufacturing will be bolstered by helping to implement a hydrogen feedstock that is portable, economic, and completely renewable. One of the most important obstacles in the adaptation of fuel cells, safely storing and transporting hydrogen, will be overcome. The concomitant increase in the number of related jobs in systems engineering, recovery device manufacturing and additional development could very well be substantial.

If additional information would be of benefit, please advise.

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8/26/2009

Please be advised of our intent to submit a full proposal for the Ohio Third Frontier Advanced Energy Program, Fiscal Year 2010

Lead Applicant

Arisdyne Systems, Inc.  
17909 Cleveland Parkway  
Suite 100  
Cleveland, Ohio 44135  
Contact Person: Dave Coleman, Phone: 216.458.1991 ext 430, email: [dcoleman@arisdyn.com](mailto:dcoleman@arisdyn.com)

Project Title

Transitioning existing corn based ethanol production facilities to allow biomass / cellulosic ethanol production concurrently with starch based production.

Estimated grant funds requested: \$1,000,000

Known collaborators: 1.) Ohio Agricultural Research and Development Center, The Ohio State University, Wooster, Ohio. 2.) The Andersons, Maumee, Ohio

Potential Collaborator: Mennel Milling, Fostoria, Ohio

Summary of Proposed Topic

This grant builds upon Arisdyn's prior Third Frontier grant which has produced a method of increasing the yield of corn ethanol producers. Currently, corn ethanol plants produce fuel solely from the fermentation of sugars derived from starch. Also present at each plant is a meaningful quantity of cellulosic corn fiber (biomass). This "filler" material currently passes inertly through the ethanol production process, creates no fuel, and exits in the form of low value animal feed. Arisdyn proposes to use hydrodynamic cavitation in conjunction with particular enzymes, to prepare the corn fiber biomass for conversion to sugars, and fermentation downstream with the already available starch based stream. These feedstock streams would be fermented concurrently. With additional conversion of the corn fiber, yield per bushel of corn would exceed the current theoretical yield, which is based solely upon starch conversion. Phase two of the project would be to introduce additional biomass, arising from corn stover, corn cobs, wheat midlings and / or other readily available biomass into that stream. The project would include the building of demonstration equipment that would be capable of running at scale. Adding retrofit equipment to existing ethanol producers allows for fast track commercialization

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**PI: Ali Keyhani, Professor, The Ohio State University, Electrical and Computer Engineering, Mechatronics-Green Energy Laboratory 2015 ,Neil Ave. Columbus, Ohio 43210; 614-353-4691, Contact Person Ali Keyhani; email: [Keyhani@ece.osu.edu](mailto:Keyhani@ece.osu.edu) Project Title: Development of a Cyber Controlled Smart Microgrid Demonstration Research Laboratory; Requested fund: AEP \$1,000,000. WCF \$2,000,000; Collaborators: EMTEC and in negotiation with one more Ohio Company. Submitted To: [OTFAEP2010@development.ohio.gov](mailto:OTFAEP2010@development.ohio.gov) Subject: 2010 OTFAEP LOI**

Summary: The proposed effort, depicted in Figure 1, describes a highly integrated smart microgrid testbed including several renewable energy sources (i.e., PV cells, fuel cells, and wind turbines). To this end, exchange of vital information from various nodes (e.g., generators, consumers, and distributors) allow monitoring and ultimately modifying system behavior through pricing mechanisms to reduce demands and costs. In turn, benefits include increase in energy efficiency, optimal allocation and matching of demand and resource, and increase of overall grid reliability via self-organizing self-healing microgrids. A unique experimental demonstration system is being proposed with the vision of developing crucial technologies that play a vital role in design and operation of the next-generation smart grid system with high penetration of renewable and green energy sources. The proposed system will facilitate expansion of the interdisciplinary knowledge base spanning the required technology in power systems design and operation, power electronics modeling, and control systems.

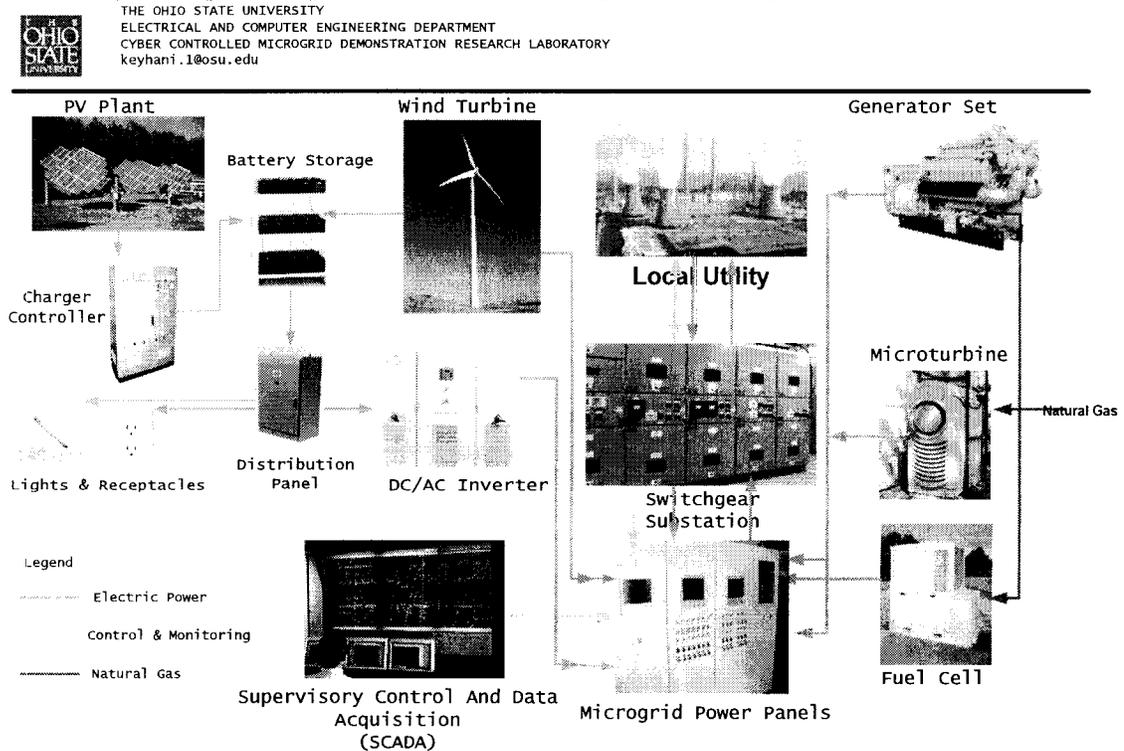


Figure 1. OSU Cyber Controlled Microgrid Demonstration Research Laboratory.

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**PI: Ali Keyhani, Professor, The Ohio State University, Electrical and Computer Engineering, Mechatronics-Green Energy Laboratory 2015 ,Neil Ave. Columbus, Ohio 43210; 614-353-4691, Contact Person Ali Keyhani; email: [Kevhani@ece.osu.edu](mailto:Kevhani@ece.osu.edu) Project Title: Control of Wind Generators as Steam Units; Requested fund: AEP \$1,000,000. WCF \$250,000; Collaborators: EMTEC of Dayton, Ohio and Liebert-Emerson of Delaware Ohio.  
Submitted To: [OTFAEP2010@development.ohio.gov](mailto:OTFAEP2010@development.ohio.gov)  
Subject: 2010 OTFAEP LOI**

**Summary:** Wind power development in the United States is exceeding expectations as the price of wind power has come into parity with other forms of conventional power production. Distributed Generation (DG), in the form of wind farm, can be more feasibly deployed with a smart grid deployment. Utilities have a need to bring wind resource under grid control for reliable and efficient operation. The deployment of wind technology can result in a new industry base of suppliers, installers and software management developments at the domestic end of the energy supply chain. The rapid increase of non-dispatchable wind power production would impact the economic operation of a power system by not providing the ancillary services required for a reliable system operation. As the penetration of wind power generators increases, wind generators are needed to participate in ancillary services. The research objective is to develop control technology that will facilitate the operation of wind generators to act as dispatchable units so that wind generators can participate in power system regulation. We will use the new technology of the flow battery storage system that with wind generators and supporting inverters can act as a steam power plant. We will also evaluate the charging and discharging performance of battery-flywheels and super-charging capacitor as storage systems. In these architectures, the storage system would provide inertia energy rapidly, as DC voltage bus drops, and under appropriate control technology, the charging and discharging of storage system would be controlled to keep the wind farm system stable.

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**Stock, Pete A.**

**From:** Jim Doutt [jdoutt@ebogroupinc.com]  
**Sent:** Tuesday, August 18, 2009 11:20 AM  
**To:** OTFAEP2010  
**Subject:** 2010 OTFAEP LOI

Ohio Department of Development  
77 S. High Street  
Columbus, OH 43216

Re: 2010 OTFAEP LOI

Dear Sir:

The purpose of this letter is to express our intent to submit a full proposal for the 2010 OTFAEP. The following data is provided concerning the Lead Applicant.

Name: EBO Group Inc.  
Address: 1441 Wolf Creek Trail  
P. O. Box 305  
Sharon Center, OH 44274-0305  
Telephone: 330-590-8105  
Contact: James A. Doutt  
Email: [jdoutt@ebogroupinc.com](mailto:jdoutt@ebogroupinc.com)

Proposed Project Title:

“Oil Cooled Electric Drive Modules to Enable Battery Powered Zero Emission Hybrid Drive Systems for Commercial and Off-Highway Vehicles, and Other Engine Driven Equipment”

Estimated Grant Funds Requested: \$1 Million

Known Collaborators:

The University of Akron, Akron, Ohio;  
Industrial Control Design & Maintenance (ICDM), Tallmadge, Ohio;

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Summary of Proposed Project:

EBO Group Inc. and its subsidiary company, PT Tech Inc., (original name Power Transmission Technology), have a 31-year history of successful product development and commercialization of drive components and systems for electric motor and diesel engine driven equipment. In 2008, EBO Group received a \$1 million TFAEP grant (Grant Agreement 08-059) for its Triton Hybrid Drives subsidiary to develop oil cooled electric drive (OCED) modules for commercial vehicles. To date, we have successfully demonstrated an OCED module for use with a launch assist system that can be used on delivery vans and buses that meets or exceeds the specifications outlined in the 08-059 grant award. Furthermore, market need drove the development of an input disconnect for the system, and we are working with a committed end user to integrate the system in a plug-in hybrid school bus demonstration project.

To ensure successful adoption of our OCED technology, we are incubating other OCED module designs to meet the application requirements of additional committed end users. The Triton name has subsequently been changed to eZEhybrid Drives Inc. to reflect the unique capability of the next generation advanced OCED modules to enable “zero emission” operation of commercial buses and trucks, off-road vehicles, and other engine driven equipment. EBO Group has

8/26/2009

assembled a team of companies to develop and commercialize these advanced OCED modules. The world is awakening to the many advantages of powering its mobile equipment from a smart electric grid with energy stored in advanced batteries. The widespread use of plug-in electric vehicles will also create a much larger market for wind and solar power as these plug-in electric vehicles can store their intermittently generated energy. EBO Group is seeking funds to support development of the next generation of OCED modules that will enable plug-in hybrid commercial vehicles and electrification of other engine powered equipment, helping the State of Ohio to capitalize on these rapidly growing markets.

Sincerely

James A. Douth  
Manager, Business Development  
EBO Group Inc.  
P. O. Box 305  
Sharon Center, OH 44274-0305

330-239-4933

AEV 392



August 13, 2009

Dear Ohio Department of Development:

Please accept this Letter of Intent from Kelly Aerospace Inc. for our 2010 Third Frontier Advanced Energy Program proposal.

**Lead Applicant Name:** Kelly Aerospace Inc.  
**Address:** 1625 Lost Nation Road, Willoughby, Ohio 44094  
**Telephone:** (440) 951-4744  
**Contact Person:** Erik Pederson, Vice President of Engineering and General Manager  
**Contact Email:** epederson@kellyaerospace.com  
**Project Title:** Development and Commercialization of Wind Turbine Ice Protection Systems for Additional Platforms  
**Estimated Grant Amount Requested:** \$1 million  
**Known Collaborators:** To Be Determined

**Summary of Proposed Project:**

Kelly Aerospace Thermal Systems (“KTS”) is an aviation design and development company dedicated to the integration of aircraft systems for general aviation and commuter aircraft. KTS has created innovative products in airplane environmental systems including the Thermawing ice protection system, capable of meeting all aspects of ice protection for the general aviation fleet.

KTS’s primary platform technology involves thin foil graphite heating elements. These heating elements allow an efficient system to be built for in-flight de-icing of aircraft. KTS expanded its engineering and prototyping development efforts to explore wind energy applications for its heating element platform technology. The technology proved extremely effective for the anti-icing and de-icing of wind turbine blades. KTS currently specializes in research, development and production of electro-thermal ice protection technologies for use in wind turbines from its 12,500 sq/ft facility at Lost Nation Airport (KLNN) in Willoughby Ohio.

The use of wind turbines to harvest energy comes with a number of challenges. Icing events in cold climate regions cause ice buildup on wind turbine blades creating issues that must be resolved to economically harvest wind power in cold climates around the world. Icing events significantly impact wind turbine structural loads, forced downtime, energy capture, increased and more difficult maintenance, higher project risk, site accessibility, and safety concerns. The increased use of wind turbines in cold regions requires wind turbines to be adequately equipped with ice mitigation equipment to face the associated extreme operating conditions.

In September 2008, the KTS electro-thermal ice protection system was successfully installed and commissioned on a two megawatt Vestas 90 wind turbine in Dorotea, Sweden. In addition, KTS secured a FY2009 Ohio Third Frontier (“OTF”) ORCGP grant to continue its work on manufacturing process scale-up and commercialization activities. KTS is on track to meet its ORCGP Level A metrics and enter the market with an industry leading

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electro-thermal Wind Turbine Ice Protection System (“WTIPS”) specifically for Vestas wind turbines. KTS has developed and demonstrated the WTIPS for use on the Vestas 90 2-MW turbine and is building its production capability to serve this market. Furthermore, the ORCGP has permitted KTS to lay the technical foundation and market validation necessary to offer WTIPS tailored to additional wind turbine platforms (specific wind OEM turbine models).

KTS and project collaborators propose to further develop the WTIPS and integrate the system into additional wind turbine platforms. Third Frontier Advanced Energy Program resources will facilitate work with wind turbine OEMs to develop, demonstrate and commercialize the system for additional wind turbine platforms. Implementation of the KTS WTIPS into additional wind turbine platforms will alleviate icing problems in the wind power industry with a competitively unmatched Ohio technology that meets critical market needs.

Thank you for your consideration.

Respectfully yours,

A handwritten signature in black ink, appearing to read 'Erik Pederson', with a horizontal line extending to the right.

Dr. Erik Pederson

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**ADSORPTION RESEARCH INC.**

6175-D Shamrock Court  
Dublin, OH 43016-1200

Phone: 614-798-9090  
Fax: 614-798-9091

13 August 2009

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

**Attention:** [OTFAEP2010@development.ohio.gov](mailto:OTFAEP2010@development.ohio.gov)

**Subject: 2010 OTFAEP LOI – Conversion of Landfill Biomass into Pipeline Quality Natural Gas via Pressure Swing Adsorption**

Dear ODOD – Technology Division Representative:

Please accept this Letter of Intent (LOI) for the above project from Adsorption Research Inc., Dublin Ohio. Below is all of the information required from the OTFAEP 2010 RFP (Ohio Third Frontier Advanced Energy Program) that was issued on July 31, 2009.

**Lead Applicant's Name:** Adsorption Research Inc. (ARI)

**Address:** 6175 Shamrock Court, Suite D, Dublin, Ohio 43016

**Phone Number:** 614-798-9090

**Contact Person:** Dr. Kent Knaebel, President

**E-mail for Contact Person:** [k.knaebel@adsorption.com](mailto:k.knaebel@adsorption.com)

**Project Title:** Conversion of Landfill Biomass into Pipeline Quality Natural Gas via Pressure Swing Adsorption

**Estimated Grant Funds Requested:** \$1,000,000

**Known Collaborators:** City of Dublin, Dublin, Ohio; Columbia Gas of Ohio, Columbus, Ohio; Centennial Associates LLC, Dublin, Ohio

**One Page Summary:** Please See Attached Page

If you have any questions or require additional information, please feel free to contact me at 614-798-9090 x 12.

Sincerely Yours,

A handwritten signature in cursive script that reads "Kent S. Knaebel".

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Dr. Kent Knaebel  
Founder and President  
Adsorption Research Inc.

## **Proposed Project Summary: Conversion of Landfill Biomass into Pipeline Quality Natural Gas via Pressure Swing Adsorption**

### *Pressure Swing Adsorption is Revolutionizing Gas Separations*

There are currently over 2,300 USA landfills listed by the EPA and a like number in Europe that are producing *methane rich landfill gas* (LFG). This gas can be harvested and upgraded for pipeline distribution, and is a renewable fuel. To date much of the harvest/use has been focused on electricity generation or low BTU gas use due to technology limitations and economics. The proposed project, if funded by the Ohio Third Frontier will allow Central-Ohio-developed and patent-pending Pressure Swing Adsorption (PSA) technology to upgrade the LFG to pipeline quality natural gas, replacing conventional fossil-fuel gas with a renewable biomass-based gas source.

One of the most respected separation technology development companies in the world, Adsorption Research, Inc. (ARI), is a Dublin, Ohio based small business. It was founded seventeen years ago by a former Ohio State University professor, Dr. Kent Knaebel. ARI has developed and taken through pilot plant stage, a LFG upgrading process based on PSA that rejects the CO<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, and other contaminants found in LFG. It allows the recovery of high purity methane (the main component of natural gas) at pipeline quality or higher quality, if desired (e.g. for vehicle fuels as CNG or LNG). Pipeline grade gas can be introduced into existing natural gas pipelines for transport and sale to end-users.

This project proposes to spend \$2 million of Ohio Third Frontier Advanced Energy and collaborator funds to allow ARI to design, manufacture, and place into operation a small commercial demonstration facility at an Ohio landfill in close proximity to a Columbia Gas of Ohio pipeline. The gas will then be delivered and sold to the City of Dublin through their existing aggregation program and to other end-users. Once complete and in operation, this facility will become **ARI's Reference Plant** that will generate revenues, and will enable immediate implementation of an aggressive market entry program to make the PSA process commercially available to other landfill owner/ operators. Funding of this project by the Third Frontier will allow ARI to build a multi-million/year Central Ohio business by 2015 and to grow thereafter, with strong Ohio supply chain partners. It will create attractive (number, quality, and salaries) Ohio jobs to serve not only Ohio and the USA, but also European markets with associated exports. Commercial use of the ARI PSA technology will make landfills more economical to operate, more environmentally friendly, and will incorporate these existing facilities in a renewable fuel supply chain.

ARI has established an initial group of Ohio Project Collaborators that include existing gas suppliers, gas consumers, and experienced industry professionals: Columbia Gas of Ohio, the City of Dublin, and Centennial Associates LLC. Columbia Gas is a major Ohio/USA based pipeline transportation company who will receive and transport the renewable gas to the City of Dublin. Dublin will purchase the gas and supply it to the local businesses and residents through their existing aggregation programs and label the gas as "renewable fuel." Centennial's associates will lead the commercial/market entry activities as the new ARI LFG Business Division or Central Ohio spin-off is established. Job creation for ARI's new technology does not only stop with ARI's new business unit. It extends to the Ohio supply chain that will create manufacturing jobs required to supply major process equipment, instrumentation/controls, and fabricate the PSA skids. It extends to the other landfills in Ohio and other states that will operate the facilities.

Funding of this project will establish Ohio as leading participant in the advanced biomass-based energy industry. It will allow ARI to transition its PSA Process Technology from the center of the Third Frontier Incubating Phase, through the Demonstration Phase, and into the Market Entry Stage of Commercialization, which will create attractive Ohio jobs. ARI expects to have commercial contracts for larger PSA facilities in place before the project is completed.

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INDUSTRIAL AUTOMATION, INC.

7900 E. PLEASANT VALLEY ROAD  
INDEPENDENCE, OHIO 44131-5529

PHONE: (216) 642-1230 x1286  
FAX: (216) 642-6037  
E-MAIL: [dkosnik@avtron.com](mailto:dkosnik@avtron.com)

August 10, 2009

Dear Ohio Department of Development,

Please accept this Letter of Intent from Avtron Industrial Automation, Inc. for our 2010 Third Frontier Advanced Energy Program proposal.

<b>Lead Applicant Name:</b>	Avtron Industrial Automation, Inc.
<b>Address:</b>	7900 East Pleasant Valley Road, Independence, OH 44131
<b>Telephone:</b>	(216) 642-1230
<b>Contact Person:</b>	Mr. Donald Kosnik
<b>Contact Email:</b>	<a href="mailto:dkosnik@avtron.com">dkosnik@avtron.com</a>
<b>Project Title:</b>	Absolute Magnetic Encoder Commercialization
<b>Estimated Grant Amount Requested:</b>	\$1 million
<b>Known Collaborators:</b>	The University of Akron, MAGNET, and others to be determined

**Summary of Proposed Project:**

Independence, Ohio-based Avtron Holdings, LLC, along with its subsidiary Avtron Industrial Automation, Inc., is a leading technology provider for automatic test equipment, automation systems, and other products for industries ranging from aviation to alternative energy. Avtron has been in business since 1953 and is recognized globally for engineering and manufacturing high-quality products that function efficiently and reliably in harsh environments.

Avtron Industrial Automation currently manufactures a broad range of incremental, rotary magneto-resistive encoders for use in wind turbines. Encoders are used anywhere position or speed feedback is required to control equipment. Encoders enable communication between the machinery that performs a task and the software that controls the task by translating motion into position or velocity feedback signals.

Wind power is one of the fastest growing alternative energy industries in the world and represents an enormous economic opportunity for Ohio's robust wind energy supply chain. Avtron has been designing and manufacturing encoders in Northern Ohio for over 35 years and, as a supplier of incremental encoders to wind power OEMs, has a thorough understanding of the crucial need for encoders in the wind power industry.

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**QUALITY, RELIABILITY, SERVICE, AND VALUE**



INDUSTRIAL AUTOMATION, INC.

7900 E. PLEASANT VALLEY ROAD  
INDEPENDENCE, OHIO 44131-5529

PHONE: (216) 642-1230 x1286  
FAX: (216) 642-6037  
E-MAIL: dkosnik@avtron.com

Wind power customers are dissatisfied with the performance and durability of absolute optical encoders. In particular, sensitive optical encoder components are adversely affected by the rigors of extreme temperature and other environmental conditions, which contribute to costly encoder failures and wind turbine downtime.

With Ohio Third Frontier support, Avtron will focus on the development of commercially superior *absolute single and absolute multi-turn rotary magneto-resistive encoders* for use in a number of wind power applications. These absolute magnetic encoders are required in a range of form factors and sizes to meet market demands.

Avtron and its Ohio team of collaborators will direct the Ohio Third Frontier Advanced Energy grant and matching funds toward the development and commercialization of a superior absolute magnetic encoder technology. The proposed project would benefit Ohio's wind energy supply chain and further secure Ohio's place at the forefront of the wind power industry.

The Absolute Magnetic Encoder Commercialization project team will ensure the commercial success of this endeavor and generate technology based economic development through increased investment, sales, and quality green-collar jobs created.

Sincerely,

Mr. Donald Kosnik

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**QUALITY, RELIABILITY, SERVICE, AND VALUE**

## **Ohio Third Frontier Advanced Energy Program – Letter of Intent**

Lead Applicant: ADF Engineering

Address: 228 Byers Road, Suite 202  
Miamisburg, OH 45342

Phone: (937) 847-2700

Contact Person: Alex Fishman, President

Email Address: [afishman@adfengineering.com](mailto:afishman@adfengineering.com)

Project Title: Thin Stillage Optimization

Estimated Grant Funds Requested: \$50,000

Collaborators: The Andersons Marathon Ethanol LLC  
Flottweg Separation Technology

### Summary of Proposed Project:

Thin Stillage Optimization is a technology that improves the yield of the fermentation ethanol process. A problem occurs in this process when evaporators become unreliable from handling different concentrations of solids in the thin stillage, causing an undesirable portion to be recycled to the front of the process. This allows less fresh corn or grain feed to enter the process.

Thin Stillage Optimization applies a high-efficiency decanter centrifuge to the thin stillage stream to remove insoluble solids. Being fed a more consistent, lower solids stream results in improved reliability of the evaporators, which causes an optimal portion of the thin stillage stream to be recycled. As an additional benefit, because the recycled thin stillage contains fewer dissolved solids, the amount of fresh feed entering the process is further increased.

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ADF Engineering intends to use this grant to purchase a high-efficiency decanter centrifuge, tanks, pumps, piping, and controls. These will be assembled onto a skid and installed in a commercial ethanol facility for a six-month pilot trial to determine the reliability and medium-term functionality of Thin Stillage Optimization.

If test results demonstrate that the high-efficiency decanter centrifuge removes all insoluble solids as expected, yield efficiency is expected to increase by up to twenty percent therefore increasing throughput resulting in increased conversion of corn into product. This technology will benefit the state of Ohio not only by improving the yield of its ethanol facilities but also by providing employment in construction and installation during the market entry phase.

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Title: Development of Power Controller for Non-gasoline Multi-Hybrid Vehicles

Lead Applicant: Ohio University

Address: Stocker Engineering Center  
Ohio University, Athens, OH 45701

Contact Name (PI): Anima Bose  
Phone: (740) 597 3297  
Email: [bosea@ohio.edu](mailto:bosea@ohio.edu)

Co-Principal Investigator: Tadeusz Malinski  
Phone: (740) 593 9899  
Email: [malinski@ohio.edu](mailto:malinski@ohio.edu)

Collaborator: General Motors, Inc.

Grant Funds Requested: \$ 1,000,000

Ohio University in partnership with General Motors proposes to design a prototype hybrid power controller for multi-hybrid electric vehicles. The multi-hybrid vehicles will include at least three energy sources, fuel cells, high performance Li-ion battery, and ultracapacitors. The project is based on the hybrid power distribution technology fuel cells and long-lasting Li-ion battery developed by the applicants. This power controlled technology and onboard energy sources will allow motorists to drive non-gasoline hybrid vehicles at least 300 miles maintaining at least 60% state of charge of the Li-ion battery. These power controllers will maximize and optimize the utilization of the power of each of the sources without requiring high demand from one particular source and hence will enhance the durability of the entire power sources.

Currently, there is no cost affordable power controller which can be used in a vehicle with different electrical energy sources: fuel cells, Li-ion battery and others. The proposed power supply will be a crucial component of a new generation of electrical multi-hybrid vehicle and may eventually eliminate the need for gasoline engines in automobiles.

Funding will help support the development of plug-in hybrid technology for the U.S. automobile market – creating a new and unique mobile energy system that will allow for longer trips and widespread utilization that supports the way Americans drive and use their cars. The technology will also eliminate the use of gasoline in light vehicles and reduce or eliminate carbon dioxide emissions.

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