

July 30, 2010

OTFAEP 11-301

Pete Stock, Technology & Innovation Division
Ohio Third Frontier
The Ohio Department of Development
Technology and Innovation Division
77 South High Street, 25th Floor
Columbus, Ohio 43215

Dear Mr. Stock:

This letter is to inform you that Allen Hydro Energy Corporation (AHEC) intends to submit a proposal for Ohio Third Frontier Advance Energy Program.

Lead Applicant:

Allen Hydro Energy Corporation (AHEC)
Charles E. Campbell, Founder & CEO
1542 McNaughten Road Columbus, Ohio 43232
Cell Phone: 614-313-7090 Email: ahecgreen@live.com Website: <http://www.ahecgreen.com>

Contact Person:

Charles E. Campbell Founder & CEO ahecgreen@live.com

Project Title:

The Innovation to Zero of Large-Scale Hydroelectricity Research and Development.

Estimated Grant Funds to be Requested:
\$1,000,000

Known Collaborators:

None

Project Summary:

Allen Hydro Energy Corporation (AHEC) proposes to research and develop an innovative process that generates large-scale hydroelectricity within a 70-Story Facility without the use or requirement of a river, lake or dam. It is anticipated that this process will generate over 10,000 green jobs in Ohio, provide 25% of the revenue back to Ohio, reduce our customer's energy bill by 50%; produce zero CO2 gases and requires no long distance transmission line.

Sincerely,

Allen Hydro Energy Corporation (AHEC)
Charles E. Campbell, Founder & CEO
1542 McNaughten Road
Columbus, Ohio 43232
Cell Phone: 614-313-7090
Email: ahecgreen@live.com
Website: <http://www.ahecgreen.com>
Providing Renewable Hydro Energy for the World

Letter of Intent

Third Frontier Alternative Energy Proposal

Lead Applicant Contact Details

Name: Mr. Stephen Spoonamore

Address: ABSMaterials Inc. 770 Spruce St. Wooster OH 44691

Phone: (330) 234-7999

Email: s.spoonamore@absmaterials.com

Grant Funds Requested: \$1,000,000.00

Advanced Separation Technology for BioFuels / AgroEnergy - Renewable Energy Production

Ohio has the opportunity to become the national leader in biofuel synthesis and production. The footwork is already underway with high value Agro-Energy crops like corn-ethanol, switchgrass-biofuels, algae-fuels and biomass-digestors continually produced here in Ohio. However, all of current biofuel technologies face one stubborn and expensive problem: poor oil/water separation resulting in low oil recovery yields.

Most biofuel extraction procedures culminate in a final aqueous/oil slurry wherein the desired fuels compose 3-10% of the total slurry volume and the remaining 90-97% are occupied by a water/biological waste mix. The process to separate the desired oils from water requires more energy than all the other steps in the process combined. Consequently this energy demand, in many cases, creates a system where more energy is required to produce biofuels than the resulting energy gained from using the created biofuels. This energy deficiency caused by the challenges of fuel/water separation have kept biofuel technologies in the experimental research phase and have prevented economically viable biofuel production unless heavily subsidized.

ABSMaterials inc. has tested and patented an advanced glass material which vastly improves the agro-fuel/water separation issues. ABSMaterials' shape-changing silica material, trade-named Osorb, easily separates and recovers bio-fuels and other volatile organics from a water/biological material mix. Osorb is robust, nonhazardous, and completely regenerative making it the ideal green technology for industrial scale separations. The oil recovery is performed under ambient temperature and pressure resulting in extremely high yields. Initial testing indicates that using Osorb for agro-fuel water separations reduces energy inputs during separation by 10-60% depending on the initial fuel type. When compared to conventional systems, the energy savings in production are huge. The challenge now is to convert this unparalleled testing to usable systems.

ABSMaterials currently has contracts with Fortune 1000 oil and gas firms, flavor and fragrance firms, and environmental remediation firms. In all cases, ABSMaterials is using Osorb-based systems to separate low concentration volatile organics from water. ABSMaterials experience and success in these markets create high confidence its ability to develop new separation systems to process agro-fuels and bio-fuels. ABS' goal is to leverage a large number of other Ohio based assets and investments in the area by providing the most energy efficient separation technology possible for fuel-water separation.

ABSMaterials seeks Third Frontier funding to develop novel systems using Osorb's extraction and recovery capabilities to enable all existing and emerging agrofuels and biofuels to have financially viable and scalable fuel-water separation technology.

Letter of Intent
2011 Ohio Third Frontier Advanced Energy Program

Lead Applicant: Nanotek Instruments, Inc.
1240 McCook Ave. Dayton, Ohio 45404
Phone (937) 331-9884

Contact Person: Dr. Chen-Guang Liu
Chenguang.Liu@AngstromMaterials.com

Project Title: Nano Graphene-Enabled Supercapacitors for Electric Vehicle, Renewable Energy, and Modern Grid Technology Applications

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

Known Collaborators: Angstrom Materials, Inc. and Maxwell Technologies, Inc.

Project Summary:

The intent of this Ohio TF-AEP project is to commercialize a new generation of supercapacitors and create high-paying jobs in Ohio. The proposed technology overcomes the most critical problems associated with supercapacitor electrodes: **performance** (e.g., energy density, device weight, and compactness) and **cost**. These issues are addressed by developing a new class of nano-materials, commonly known as nano-scaled graphene platelets (NGPs), as the primary supercapacitor electrode material. The NGPs, developed by scientists at Nanotek Instruments, Inc., exhibit attractive properties like carbon nanotubes, but can be readily mass-produced and are available at much lower costs and in larger quantities. The NGPs refer to isolated, individual, nano-scaled graphene sheets. A broad array of NGPs with tailored sizes and properties can be produced by a combination of thermal, chemical and mechanical treatments.

Supercapacitors are being considered for uses in hybrid electric vehicles (EVs) where they can supplement a battery or fuel cell used in an electric car to provide bursts of power needed for rapid acceleration, the biggest technical hurdle to making battery-powered cars commercially viable. A battery or fuel cell would still be used for cruising, but supercapacitors (with their ability to release energy much more quickly than batteries and fuel cells) would kick in whenever the car needs to accelerate for merging, passing, emergency maneuvers, and hill climbing.

2011 OTFAEP Letter of Intent

OTFAEP 11-304

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

Re: 2011 OTFAEP LOI

Dear Sir:

The purpose of this letter is to express our intent to submit a full proposal for the 2011 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

Proposed Project Title:

“Oil Cooled Electric Drive Modules Powered by a Switched Reluctance Motor to Enable Battery Powered Zero Emission Hybrid Drive Systems for 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;

Summary of Proposed Project:

EBO Group Inc. and its subsidiary company, PT Tech Inc., (original name Power Transmission Technology), have a 32 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 (now known as eZEHybrid Drives) to develop oil cooled electric drive (OCED) modules for commercial vehicles. To date, we have successfully demonstrated an OCED module for use on delivery vans and buses that meets or exceeds all the specifications outlined in the 08-059 grant award. The next generation of advanced OCED modules will be powered by a low cost, high efficiency switched reluctance motor that will enable “zero emission” operation of commercial off-road vehicles, and other engine driven equipment. EBO Group has assembled a team that

includes the College of Engineering at the University of Akron which is recognized internationally for its expertise in advanced motor design and development. Of particular importance to this project is the direct involvement of faculty members with significant experience in the field of switched reluctance (SR) motors, controls, and testing.

We are seeking funds to support this R&D effort and capitalize on the rapidly growing markets as the world is awakening to the many advantages of powering engine driven equipment from a smart electric grid with energy stored in advanced batteries.

Sincerely

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

330-239-4933
jdouth@ebogroupinc.com

OTFAEP 11-305

Friday, September 10, 2010

To: The Ohio Department of Development

Please accept this letter of Intent to submit a full proposal for the Fiscal Year 2011 Ohio Third Frontier Advanced Energy Program.

Lead Applicant's name, address, phone number:

Ohio Hi-Point Career Center
2280 State Rte 540
Bellefontaine, OH 43311
(937) 599-3010

Contact person including email address:

Jeniffer Brubaker
Jbrubaker@ohp.k12.oh.us

Project title: Renewable Energy Technology Development Program

Estimated Grant Funds to be requested: \$818,903.70

Known Collaborators: Rhodes State College, Owens Community College, Clark State Community College, Hardin County Chamber of Commerce, Champaign County Chamber of Commerce, Local Job and Family Services offices and One-Stops.

One Page Summary

Wind is the fastest growing energy source in the United States and new incentives from State and local governments are promoting expansion in the solar industry (*The US Bureau of Labor Statistics Fall 2008 Occupational Outlook Quarterly*). As these industries grow, so does the need for workers to manufacture, install, operate, and maintain wind turbines and solar systems. Additional workers are needed to work in the industries that manufacture renewable energy components.

Ohio Hi-Point Career Center provides technical training to over five counties in the heart of one of the windiest regions of Ohio. The school has the foundation for a renewable energy technology training program already in place and desires to build upon this foundation to bring wind turbine and geothermal solar panel technician training designed to prepare technicians to confidently assess and remedy the many challenges they will face on-the-job.

Installation, troubleshooting and problem solving will be the focus of the prospective program. Skill development necessary for job and employer success, ranging from basic operation to complex troubleshooting will be a key element in addition to knowledge assessment to prepare students for jobs and career paths in renewable energy. This project will focus on wind and geothermal solar training for both the manufacturer and technicians.

The goals and outcomes of the Renewable Energy Technology program are:

- Establish training centers in Hardin and Champaign Counties, and to enhance an existing training center in Logan County, providing workforce training in career pathways that will support areas of growth in renewable energy.
- Continue current partnerships while seeking new partnerships and opportunities to place program graduates with nationally recognized certifications into the current and upcoming green projects within the community.
- Purchase equipment to provide training to unemployed and underemployed workers in counties impacted by automotive-related restructuring to create a workforce prepared for careers in renewable energy.
- Provide foundational training to persons interested in furthering their education and training in these emerging fields and utilize articulation and/or dual enrollment agreements with Clark State Community College and Rhodes State College that will provide transferable and concurrent college credit for those pursuing higher education.

The project will support current skill gaps that exist in Ohio's Workforce in wind (environmental engineers, iron and steel workers, millwrights, sheet metal workers, machinists, electrical equipment, assemblers, construction equipment operators, industrial truck drivers, industrial production managers, first-line production supervisors) and solar (electrical engineers, electricians, industrial machinery, mechanics, welders, metal fabricators, electrical equipment, assemblers, construction equipment operators, installation helpers, laborers, construction managers).

The program is targeted to provide training to unemployed and underemployed workers in counties impacted by automotive-related restructuring. The project targets Auglaize, Champaign, Hardin, Logan and Wyandot counties. The Ohio Office of Workforce Development reports that the cumulative unemployment rate in these five counties is 12.64%, which is more than both the US rate of 10.6% and the Ohio rate of 11.8%. There are no community colleges, technical colleges or university campuses located in any of the 5 counties mentioned above. Other counties outside the target area will also benefit from this project.

Ohio Hi-Point plans to support the development of renewable energy sources in the State of Ohio by working with our communities to create a workforce ready to enter renewable energy jobs and career pathways. If this project is funded through the Ohio Third Frontier Advanced Energy Program, it will allow us to meet all of the goals, objectives and outcomes of this project that are vital to both our community and the renewable energy goals of the State of Ohio. The funds would be used to purchase training equipment necessary to develop the program.

Thank you for your consideration.



ADSORPTION RESEARCH INC.

6175-D Shamrock Court
Dublin, OH 43016-1200

Phone: 614-798-9090

Fax: 614-798-9091

3 September 2010

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

Attention: OTFAEP2011@development.ohio.gov

Subject: 2011 OTFAEP LOI – Upgrading Landfill Gas to 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 2011 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

Project Title: Upgrading Landfill Gas to Pipeline Quality Natural Gas via Pressure Swing Adsorption

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

Known Collaborators: Civil & Environmental Consultants, Inc., Dublin Technical Services Inc., and others TBD

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 ext 12.

Sincerely Yours

Dr. Kent S. Knaebel
Founder and President
Adsorption Research, Inc.

Proposed Project Summary: Upgrading Landfill Gas to Pipeline Quality Natural Gas via Pressure Swing Adsorption

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). To date, most LFG has been left uncollected, or if collected merely flared. The proposed project, if funded by the Ohio Third Frontier (OTF), will allow a Central-Ohio developed and patent-pending pressure swing adsorption (PSA) process, called *AdvanSorb-LFG™*, to upgrade the LFG to pipeline quality natural gas, to CNG, replacing conventional fossil-fuel with this renewable gas.

One of the most respected separation technology development companies in the world, Adsorption Research, Inc. (ARI), is a Dublin, Ohio based small business. Founded 17 years ago by former Ohio State University (OSU) professor, Dr. Kent Knaebel, ARI developed and piloted this PSA-based LFG upgrading process. It is distinct from competitors' processes in that it removes CO₂, N₂, O₂, and other contaminants found in LFG, and allows recovery of high purity methane.

This project proposes to spend \$2.0 million of OTF Advanced Energy, ARI, and collaborator funds to allow ARI to design, fabricate, and place into operation a commercial demonstration facility of the *AdvanSorb-LFG™* process at an Ohio landfill in close proximity to a gas pipeline. The gas will be delivered and sold to end-users and/or converted to CNG for use by collaborator fleets. Once complete and operating, this facility will become "ARI's Reference Plant" that will generate revenue, and will enable implementation of a market entry program to make the LFG PSA process available to landfill owners/operators in Ohio, North America, and Europe.

Funding of this project by the OTF will allow ARI to develop and prove commercial designs of the *AdvanSorb-LFG™* process, optimize its energy usage, and build a multi-million/year Central Ohio business, with strong Ohio supply-chain partners. This project will allow ARI to transition its PSA process technology from the center of the Third Frontier Incubating Phase through to the beginning of the Market Entry Stage of Commercialization, when ARI expects to have commercial contracts for larger PSA facilities in place. Commercial use of the ARI PSA technology will make landfills more economical to operate, more environmentally friendly, and will generate a renewable fuel supply chain.

Funding of this project will also further the efforts of the Ohio Third Frontier program to establish Ohio as a leading participant in the advanced biomass-based energy industry. ARI has established an initial group of Ohio Project Collaborators that include existing gas suppliers, gas consumers, and experienced industry professionals. Job creation for ARI's new technology includes the new business unit, as well as the Ohio supply chain and collaborators, which will create manufacturing jobs required to supply major process equipment, instrumentation & controls, and to fabricate the PSA skids. It also extends to landfills in Ohio and other states that will operate the facilities.

Letter of Intent - Ohio Third Frontier Advanced Energy Program

Proposed Project Title: **Integrated Biorefinery Application Center**

Lead Applicant Name: Chemtex International, Inc.

Lead Applicant Address: P O Box 590
6951 Ridge Road
Sharon Center, OH 44274

Lead Applicant Phone: 330-239-7401 (Office)
330-351-6261 (Cell)

Lead Applicant Contact Person: Delane N. Richardson
Director of Research and Development Americas

Lead Applicant Email Address: Delane.N.Richardson@gruppomgus.com

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

Known Collaborators: Ohio Agricultural Research and Development Center, Wooster
Berry Farm II, Wadsworth
Ohio BioProducts Innovation Center, Columbus
PolymerOhio, Inc., Westerville
The University of Akron, Akron
Ohio State University, Columbus

Project Duration: 3 Years

Summary of the Proposed Project:

Funding from the Ohio Third Frontier Advanced Energy Program will support the ***Integrated Biorefinery Application Center*** project in planning, design, capital purchase, equipment installation, construction, and operation. The Ohio based ***Integrated Biorefinery Application Center*** will validate and market second-generation bioethanol technology in the US. Chemtex International, Inc., (Chemtex) has developed this technology in Europe based on cellulose as a feedstock as opposed to corn. Extensive agronomic studies in Italy have demonstrated the feasibility of *Arundo donax* as an excellent non-food biomass, making it the initial targeted feedstock for Ohio. Advancement of second-generation cellulosic bioethanol technology in Ohio requires construction of a facility from which the process may be demonstrated and European agronomic studies validated for Ohio and US feedstocks and agronomic methods.

The Integrated Biorefinery Application Center will be co-located with a proprietary one ton / day second-generation biorefinery process facility uniquely designed to evaluate potential feedstocks. This center will provide a single location where an existing first-generation corn ethanol producer can validate conversion of his process from corn to cellulosic feedstock, as well as a new producer may validate a completely integrated biorefinery, beginning with cultivation of selected energy crops. Without a facility of this kind it is extremely difficult, if not impossible, to validate and justify capital modifications, expansions and new installations, preventing the necessary capital investment to make biorefining a vibrant and healthy industrial sector. This one of a kind, state of the art facility is essential to grow the biorefining industry in Ohio and the United States.

Chemtex, a worldwide engineering and construction company, is a major developer of cellulosic ethanol technology in Europe. Parent company, Gruppo M&G (M&G), entered the biofuels arena by opening a research and development center focused on agronomic and process research to support the development of second-generation cellulosic biorefining in 2006 in Tortona, Italy. M&G also owns M&G Polymers USA, LLC, which has operated a polyethylene terephthalate (PET) plastic research and development facility in Sharon Center, Ohio, since 2002, supporting over 3.5 billion pounds per year of PET production.

Chemtex will be working in collaboration with multiple Ohio based organizations:

- Ohio Agricultural Research and Development Center, Wooster
- Berry Farm II, Wadsworth
- Ohio BioProducts Innovation Center, Columbus
- PolymerOhio, Inc., Westerville
- The University of Akron, Akron
- Ohio State University, Columbus



OTFAEP 11-308

Sept 5, 2010

Ohio Third Frontier Advanced Energy Program
Research and Development Fund 2011
Ohio Department of Development

Re: 2011 Ohio Third Frontier Advanced Energy Program Fund 2011 - RFP

Ohio University partnering with E3 Technologies, LLC intends to submit a proposal in response to the Ohio Third Frontier Advanced Energy Program/Research and Development Fund fiscal year 2011 Request for Proposals (RFP) as follows:

Lead Applicant: Ohio University

Address: 165 Stocker Center
Athens, OH 45701

Contact Name: Gerardine (Gerri) G. Botte, PhD
Professor
Director Center for Electrochemical Engineering Research

Telephone Number: 740-593-9670

Email: botte@ohio.edu

Project Title: **"GreenBox Power Generation Unit"**

Project Areas: **Alternative Energy from Agriculture/Animal Urine (biomass)**

Estimated Grant Funds: \$1,000,000

Collaborators: E3 Technologies, LLC
Ohio University-Innovation Center
340 W. State St., Unit 135C
Athens, Ohio 45701
Office: (740) 249-1095

Project Summary: Livestock production is a major component of the agricultural activity in the United States with over 130,000 concentrated animal feeding operations for cattle and hogs alone. The waste generated from these operations pose a significant threat to the environment particularly with regard to the generation of urea/ammonia resulting from the breakdown of animal urine. The EPA considers ammonia a large-scale threat to environmental quality relative to impaired air quality, surface water eutrophication, and nitrate contamination of ground water and has limited the nitrate contamination level in drinking water to 10 mg/L.

Ohio University has a patented technology, an ammonia/urea electrolyzer (GreenBox), that provides an economical, efficient, green, and safe solution to convert environmentally damaging ammonia/urea into fuel grade hydrogen (along with pure water and environmentally neutral nitrogen) and that can be coupled with existing infrastructure already in place in many farms to provide a "free" source of energy from which to generate heat and/or electricity.

Ohio University and its commercial partner E3 Technologies, LLC seeks funds from the Ohio Third Frontier Advanced Energy Program/Research and Development Fund to develop prototypes with technical specifications under a commercial context and validate market acceptance. That is funds will be used for an Analysis, Design and Prototype Demonstration followed by a Field Demonstration. That is funds will be used to transition from the Demonstrating Phase into the Market Entry Phase.

Thank you,



Gerardine G. Botte, PhD
Ohio University

2011 OTFAEP Letter of Intent

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

OTFAEP 11-309

Re: 2011 OTFAEP LOI

Dear Sir:

The purpose of this letter is to express our intent to submit a full proposal for the 2011 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

Proposed Project Title:

“Enhanced torque control technology to solve wind turbine gearbox life problems”

Estimated Grant Funds Requested: \$750,000

Known Collaborators:

The University of Akron, Akron, Ohio;

Summary of Proposed Project:

EBO Group Inc. and its subsidiary company, PT Tech Inc., (original name Power Transmission Technology), have a 32 year history of successful product development and commercialization of drive components and systems for electric motor and diesel engine driven equipment. PT Tech is a world leader in torque control technologies.

There are over 20,000 large-sized wind turbines installed in the U.S. and over 100,000 worldwide. Ninety five percent of these wind turbines use a common design consisting of low speed blades and a speed-increasing gearbox coupled to a high speed electric generator. All have been designed for 20 years life or more. However, the vast majority of these wind turbines are experiencing serious issues with gear box reliability. Recent studies indicate a 7 to 10 year average gearbox life. A gearbox replacement or rebuild typically costs the wind farm owner between \$200,000 to \$500,000. The solution has become so elusive that several major wind turbine manufacturers have introduced new models without

speed increasing gearboxes. The resulting designs require an enormous generator that sacrifices the cost and weight advantages of higher speed generators.

Building on PT Tech's 32 years of experience in improving drive system reliability and productivity with effective torque control products, we have identified a novel, cost effective solution to wind turbine gear box life problems. EBO Group has assembled a team that includes the College of Engineering at the University of Akron.

We are seeking funds to support this R&D effort and commercialize this product into the rapidly growing world-wide wind turbine market. This project will address both the OEM's needs for new production and wind farms owners need to retrofit existing wind turbines.

Sincerely

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

330-239-4933
jdouth@ebogroupinc.com



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

OTFAEP 11-310

Lead Applicant

Vadxx Energy
1768 East 25th Street
Cleveland, OH 44114
Contact Person: James W. Garrett, CEO, Vadxx Energy
440-591-8994; jgarrett@vadxx.com

Project Title

Commercialization of Advanced Thermal Depolymerization to Manufacture Synthetic Crude Oil

Grant Funds Requested

\$1,838,000 Project
\$888,000 Grant
\$950,000 Matching

Collaborators

Sherwin Williams (Cleveland, OH)
Dominion (Cleveland, OH)
Case Western Reserve University, Department of Macromolecular Science and Engineering
(Cleveland, OH)
Case Western Reserve University, Fowler Center for Sustainable Value (Cleveland, OH)
NC Manufacturing (Alliance, OH)
Breakthrough Technology Development (Brecksville, OH)
Three (3) Ohio Recycling Firms

See Next Page for Summary of Proposed Project

Summary of Proposed Project—Third Frontier/Vadxx Energy

Vadxx Energy Background

Vadxx Energy manufactures synthetic crude oil, natural gas, and carbon using raw material feedstocks consisting of petroleum-based wastes. The company has a crude oil manufacturing pilot plant facility operating daily at its Akron Research & Development Center. Raw material feedstocks Vadxx has utilized to date include recyclable and non-recyclable plastics, tires, auto shredder residue (ASR) and various used oils. Vadxx Energy presently has 4 Letters of Intent for these feedstocks with Vadxx customers/collaborators. The Vadxx product, synthetic crude oil, will be sold to energy marketers who will then sell that energy commodity to oil refiners. Refiners will produce gasoline from the crude oil feedstock. Every barrel of crude oil that Vadxx produces results in one less barrel of crude oil imported by the US and reduced landfill requirements.

All Vadxx oil production units will be operated by Vadxx employees. Vadxx units will be engineered, manufactured and installed by Akros Equipment Company (Akron, OH). Akros is 50% owned by Vadxx Energy and 50% owned by NC Manufacturing (Alliance, OH). Each Vadxx unit requires 15-20 employees to operate. Akros will hire another 10 employees to manufacture each unit. The Vadxx objective is to operate >50 oil producing units in 5 years. Just one of Vadxx's partner has the requirement for as many as 20 units at one of its Ohio facilities. A typical Vadxx unit capital cost is about \$2 million and will produce 90,000 barrels of crude oil annually. At \$75/barrel oil, a unit's EBITDA will be \$1.5-\$2 million annually.

Vadxx financial contributors to date have included the Ohio Department of Development, Cuyahoga County Economic Development Department, the City of Akron, Great Lakes Innovation (Lorain County) and private investors.

Proposed Project Purpose

This project will greatly enhance Vadxx's commercialization efforts. The purpose of this 24 month, \$1.84 million project is to commercialize the use of other petroleum based feedstocks for Vadxx collaborators and partners. Current efforts with feedstocks (ASR, tires, plastics, used oils) will be advanced and extended to the conversion of e-wastes, paint, carpet, roofing materials and other petroleum based solid and liquid feedstocks. The program will also provide necessary engineering development efforts for manufacture and operation of commercial units.

Additional Project Details

The Vadxx approach to evaluating various feedstock "recipes" for commercialization is based on a statistical Design of Experiment approach. Variables analyzed include liquid/solid mixture, residence time, pressure, catalyst, feedstock portfolio and other factors. After receiving extensive laboratory output analysis from autoclave and pilot plant runs, conclusions can be made. These conclusions focus on economic viability, environmental impact, quality of crude oil, production rate of crude oil, percent conversion of crude oil and market acceptance. Importantly, the Vadxx approach is to involve feedstock partners (recycling companies and other collaborators) every step of the way. The Vadxx business model is to share oil profits with feedstock and recycling partners. This involvement extends to the research efforts, prior to commercialization. Vadxx personnel include former Fortune 200 energy holding company corporate officers, professionals with IPO successes, oil/gas operations managers, environmental experts and various Fortune 500 researchers.

Project Technology/Competitive Attributes

Four key Vadxx technical advantages will be leveraged with the project: 1) The Thermal Advantage of combining solid with liquid feedstock. Liquid serves as heat transfer agent; oxygen is minimized; oil yields are maximized. 2) The process an efficient Continuous Process, not a slower and energy inefficient batch process. 3) Vadxx units require Relatively Low Capital costs and are easily scalable and modular. 4) The Environmental Hurdles are Low, unlike those encountered by a refinery.



CANTON DROP FORGE

OTFAEP 11-311

Tuesday, September 07, 2010

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

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

This letter serves of notice of intent for Canton Drop Forge, Inc. to submit a proposal to the Ohio Third Frontier Advanced Energy Program RFP, which was released July 29, 2010.

Applicant: Canton Drop Forge
4575 Southway Street SW
Canton, OH 44706

Main Contact: Todd D. Gray, V.P. Finance – Chief Financial Officer
(330) 477-4511 extension 144
tgray@cantondropforge.com

Project Title: Rotary Forge Furnace Regenerative Burner Installation Project

Project Summary: This project is to install emissions reducing, high efficiency equipment on two existing rotary forge furnaces. This includes installing “regenerative” burners and oxygen monitoring equipment. The project would dramatically improve the efficiency of not only the furnaces but, all subsequent operations as well will enjoy increases in production efficiency due to reduced scale and faster processing times. This technology is critical to our ability to produce larger forgings such as those we are currently producing for wind power transmissions.

Project Cost: Total project cost is estimated to be \$1,800,000 with \$900,000 of Ohio Third Frontier Advanced Energy Program funds and \$900,000 in cost sharing by Canton Drop Forge.



Inorganic Specialists, INC.

OTFAEP 11-312

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

Letter of Intent for Ohio TFAEP 2011

Sept 8, 2010

Lead Applicant

Inorganic Specialists
965 Capstone Dr.
Miamisburg, Ohio 45343
Phone (937) 865-4491

Estimated Grant Funds Requested \$1,000,000.

Proposed Project Title: Lithium Ion Material Commercial Demonstration Project

Contact Person: Dr. David W. Firsich, dwfirsich@inorganicspecialists.com

Known Collaborators: Miamisburg Mound CIC, Southeast Nonwovens, EaglePicher Technologies, Ultramet

I. ABSTRACT

In 2009, the Dept. of Energy initiated its ARPA-E program, whose mandate is to fund energy projects that are so novel, powerful, and practical that they could transform America. 3700 proposals were submitted; 37 were chosen for funding. Our work is one of them; it involves the creation of a silicon coated carbon nanofiber paper as a lithium ion battery anode. Our 2-million dollar ARPA-E program is now in progress; it is a collaborative effort with participants from across America, 3 from Ohio.

Silicon coated nanofiber paper has two manufacturing steps - making the carbon paper and then coating it with silicon. A collaborator is providing the silicon coating. The papermaking component falls to Inorganic Specialists, who have created a sophisticated nonwoven papermaking process to make the paper on a continuous basis. The demo-scale machinery for this process is currently located where it was fabricated, in South Carolina. It is 50 ft. long and weighs thousands of pounds, yet it is only a small version of a typical commercial system. It will be ready to move to Ohio by mid-year 2011.

An Ohio Commercial Demonstration Project is proposed for silicon-coated nanofiber paper. One part of the effort will be to bring the demo-scale papermaking equipment to Ohio and install it in a space adjacent to Inorganic Specialists' facilities at the Mound Advanced Technology Center in Miamisburg Ohio. This will allow us to work with the unit and design its scaled-up successor. It will also provide a physical demonstration of the practicality of this technology to sources of private and government investment.

Other activities within this Commercial Demo Project will include the preparation of scaled-up battery prototypes by our current battery manufacturing partner, the multi-national EaglePicher Technologies. Additional development and commercialization activities are also anticipated.



Office of the Dean
College of Engineering
Akron, OH 44325-3901
(330) 972-7816 Office – (330) 972-5162 Fax
(330) 972-2413 Fax

OTFAEP 11-313

24 August 2010

Ohio Third Frontier Advanced Energy Program Fiscal Year 2011 (OTFAEPFY11)
The Ohio Department of Development
Technology and Innovation Division
77 South High Street, 25th Floor
Columbus, Ohio 43215

RE: Letter of Intent to Submit an OTFAEPFY11 Proposal to ODOD

Dear Sir or Madam:

The University of Akron hereby submits a Letter of Intent in response to the Fiscal Year 2011 Ohio Third Frontier Advanced Energy Program Request for Proposals.

Prospective Lead Applicant's Name: The University of Akron

Prospective Lead Applicant's Address: College of Engineering
The University of Akron
Akron, OH 44325-3901

Contact Person: J. Alexis De Abreu-García

Contact Person Phone Number: (330) 972-6709

Contact Person E-Mail: alexis4@uakron.edu

Proposed Project Title: Development of Lithium-Ion Batteries for Prototype Electric Duo Vehicles as On-Road Test Beds

Estimated Funds Requested: \$1,000,000

Known Collaborators: Stratum Technologies, Myers Motors, The University of Akron Research Foundation, and others to be determined.

Sincerely,

Ajay Mahajan, Ph.D.
Associate Dean for Research
College of Engineering
The University of Akron

xc: Luis Proenza, President, The University of Akron

Proposed Project Summary: Development of Lithium Ion Batteries for Prototype Duo Vehicles as On-Road Test Beds

This grant application seeks funding for the development, management, and integration of innovative lithium-ion battery packs for mid-range electric vehicles. Cleveland-based Stratum Technologies will develop prototype stacked-cell lithium-ion polymer batteries for Tallmadge-based Myers Motors' Duo electric vehicles. The University of Akron (UA) research team will develop the associated battery management system (BMS), controls, and instrumentation, which when incorporated into the battery will yield a complete battery pack. The UA team will also be responsible for integrating the prototype battery pack into the Myers Motors vehicle. Additionally, the UA team will develop the power electronics interface (PEI) between the vehicle and the utility grid for vehicle-to-grid (V2G) capability. Like the battery pack, this PEI will be integrated into the Myers Motors vehicle and commercialized as an integral part of the vehicle's energy storage system. For the latter, the UA team will develop the hardware unit, the control algorithms, the communication interface between the vehicle and the smart-grid, and conduct a behavioral study on charging/discharging. Further, the UA team, with the support of the University of Akron Research Foundation, will set up a "start-up" company to manufacture and commercialize the BMS technology and other systems that are expected to result from this endeavor. The goal is to develop two prototype Duo vehicles as on-road test beds. We expect that these activities will lead to the high-volume production in Ohio of electric vehicles, lithium batteries, and control systems that can compete in global markets on the basis of price, features, and advanced technology.

Stratum Technologies is the first Ohio-based company to industrialize the manufacture of polymer lithium-ion batteries constructed in a stacked cell format. The company's U.S. production facilities use automated, state-of-the art manufacturing processes to produce precise, high-performance, high-quality batteries that meet their individual customers' requirements. We expect that Stratum's lithium-ion batteries will not only be priced substantially below competitor's prices, but will also eliminate most shipping and associated costs, as most of these batteries are currently being imported into the U.S.

Myers Motors has established itself as a leading manufacturer of electric vehicles. Myers Motors is dedicated to providing creative, innovative, functional, and responsible alternative forms of transportation with a zero carbon footprint. The company specializes in one- and two-seat electric vehicles that sport unique styling, do not rust, are light weight, and can be charged overnight from a standard 110-volt home outlet without requiring any special charging system.

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

OTFAEP 11-314

09 September 2010

OTFAEP2011@development.ohio.gov

2011 OTFAEP LOI

Thank you for accepting our Letter of Intent to submit a proposal to the Ohio Third Frontier Advanced Energy Program as outlined in the 2011 Request for Proposals (RFP) released 27 July 2010 and located at:

<http://www.development.ohio.gov/ohiothirdfrontier/AdvancedEnergyProgram2011RFP.htm>

Lead Applicant: Pilus Energy LLC, 4240 Airport Road, Suite 101, Cincinnati OH 45226

Phone: 513.448.8081 or 513.225.8765

Contact: Joe Winterberg, P.E.

Contact email: jwinterberg@pilusenergy.com

Project Title: Electrogenic Bioreactor with a Hydrogen Fuel Cell at JTM Food Group

Grant Funds Requested: \$1,000,000

Collaborators:

Ballard Power Systems, Inc. Burnaby, British Columbia, Canada

Plug Power, Inc., Latham, New York

Axane Fuel Cell Systems, Sassenage, France

Air Liquide, Paris, France

JTM Food Group, Harrison, Ohio

Smith Environmental Engineering, Inc., Cincinnati, Ohio

University of Cincinnati, Cincinnati, OH

Glenn Lebowitz, Investor, McLean, VA

Rick Lisi, Investor, Loveland, OH

Ron Lichtenstein, Investor, Hermosa Beach, CA

SUMMARY, 2011 OTFAEP LOI

Electrogenic Bioreactor with a Hydrogen Fuel Cell at JTM Food Group

Pilus Energy proposes to design and demonstrate an Electrogenic Bioreactor (EB) with a hydrogen fuel cell accessory at an Ohio food processing plant. The EB will utilize a feedstock that consists of a collection of cooking cleanup, cooking condensate, and general wash down waters, resulting from food processing operations. This feedstock will be used as fuel for the bioreactor to directly produce electricity and hydrogen by microbial action.

The Pilus EB harnesses genetically enhanced bacteria that generate direct current (DC) electricity and hydrogen gas from their metabolism of organic compounds found in wastewater. The hydrogen gas co-product will be used to fuel a hydrogen fuel cell to produce additional electricity. This provides processing plants with a cleantech power supply that is not dependent on the weather or time of day, like intermittent wind and solar technologies. A secondary benefit of this energy production process is the lowering of the chemical oxygen demand (COD) of the waste stream as it leaves the bioreactor. Therefore, the effluent leaving the bioreactor will be significantly cleaner than the influent entering it.

The goals we will pursue are:

1. Technology

This project will focus on the EB performance in the context of developing product performance specifications. The design, fabrication, site infrastructure modifications, installation, startup, and operation of the bioreactor will define performance specifications. This will determine how well the applied technology can meet the outlined specifications.

2. Commercial

The relative success of the technology in this application will determine the commercial viability of the concept. The commercial concept has application to numerous unused organic waste streams in a wide variety of businesses including: dairy & livestock production, brewing, rendering, and food processing.

Year 1: Allocated for the completion of the design and installation of the bioreactor.

Year 2: Devoted to optimization of the most important features, such as maximizing the anode surface area, optimizing bioreactor array geometry, and component refinement for the most economical, efficient, and reliable unit.

Year 3: The final year of the project will concentrate on the performance of the bioreactor in a commercial context. It will develop the technology into market ready applications for other businesses with high organic waste streams.

The ultimate goal of the project is to develop commercially viable clean energy sources that will create a variety of technical, manufacturing, construction, and operations jobs in Ohio.

6842 Commodore Drive
Walbridge, OH 43465
p. 419.666.6554
f. 419.666.7004
gemincorporated.com

OTFAEP 11-315

September 8, 2010

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

Dear Ohio Department of Development:

Please accept this Letter of Intent from GEM Energy Management for our Fiscal Year 2011 Ohio Third Frontier Advanced Energy Program proposal.

Lead Applicant Name: GEM Energy Management, LLC

Address: 6842 Commodore Dr
Walbridge, Ohio 43465

Telephone: (419) 666-6554

Contact Person: Mr. Sam Brewer, General Manager, Eastern Region

Contact Email: sbrewer@rlcos.com

Project Title: Modular Integrated Energy Systems for Critical Operations

Estimated Grant Amount Requested: \$1 million

Known Collaborators: The University of Toledo, JDRM

Summary of Proposed Project:

GEM Energy Management and its affiliate GEM Inc. (collectively "GEM") were founded in 1982 and are based in Toledo, Ohio. GEM is Northern Ohio's leading single source specialty contractor with a focus on energy management and implementation of emerging technologies. GEM provides energy management services specifically designed to lower energy costs and reduce environmental impacts.

GEM and its Hudson, Ohio based subsidiary, BHP Energy ("BHP") design, build, install and maintain turnkey combined cooling, heat and power ("CCHP") energy generation systems to reduce energy costs and protect the environment with near-zero emissions.

GEM continues to provide CCHP systems that address its customers' unique power generation requirements. After eight years of development, GEM and BHP introduced the ReliaFlex™ solution. Founded on the principles of energy conservation and more efficient use of limited natural resources,

ReliaFlex leads the way forward as a total energy solution that bundles advanced technologies to produce electric power, heating, and cooling in a single, integrated system.

CCHP energy generation technology enables increased power reliability and flexibility, while reducing energy usage and operating costs at a variety of energy dependent facilities in diverse settings. Specifically, facilities such as data centers, with extremely large electric demands and immense cooling needs, benefit greatly from CCHP implementation. CCHP systems use an engine to produce electrical energy and exhaust heat. This heat is then usefully recovered in a hot or chilled water module, which does not use electricity. Through the CCHP process, data centers can be powered by natural gas as a primary energy source. The electrical grid is only used as a backup source, in case of a system outage.

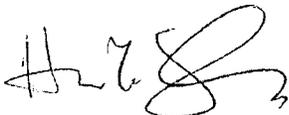
GEM is in the process of developing the ReliaFlex Modular Mission Critical Power System ("MMCPs"). The modular system will provide customers with a prepackaged, fully integrated CCHP system to include micro-turbines, a heat exchanger, an absorption chiller, integrated bypass controls, and an uninterruptible power supply ("UPS"). The modular ReliaFlex system will be delivered to the customer site ready for connection, and can be seamlessly integrated into existing infrastructure without complicated engineering or electrical upgrades. ReliaFlex CCHP systems provide continuous uninterruptible power supply to host sites, 24-hours a day.

The proposed project will build upon GEM's expertise in CCHP technology, leverage and bolster a robust Ohio supply chain, and create a partnership with the University of Toledo as a research based demonstration site for the ReliaFlex MMCPs. GEM will be the first CCHP developer to commercialize modular, mission critical CCHP systems of this nature. Commercializing the ReliaFlex MMCPs at GEM's Toledo and Hudson facilities will create a significant sustainable competitive advantage for the State of Ohio.

An Ohio Third Frontier Investment will enable GEM to: (1) Commercialize the first modular CCHP technology in the marketplace; (2) increase reliability and flexibility of mission critical operating systems independent of the electric grid; (3) reduce demand for traditional energy through the electric grid and associated emissions; and (4) help position Ohio as a world leader in energy efficiency systems development and commercialization.

Sincerely,

GEM Energy Management, LLC



Hussien Y. Shousher
President

Precision Polymer Casting, LLC dba CASTINITE

www.CASTINITE.com

August 30, 2010

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

OTFAEP 11-316

RE: LETTER OF INTENT, OHIO THIRD FRONTIER ADVANCED ENERGY PROGRAM

Title: DEVELOPMENT AND COMMERCIALIZATION OF LOW COST POLYMER CAST WIND
TURBINE TOWER

Lead Applicant Information: Terry Capuano, PE
Precision Polymer Casting, LLC
140 Greentree Road
Chagrin Falls, OH 44022
(440)343-0461
terry@castinite.com
www.castinite.com

Collaborators: Case Western Reserve University, GE, Fairmount Minerals and Poly-Carb

Grant funds requested: \$1.2 million

Project Summary:

Wind turbines currently use steel fabricated towers. Steel towers are difficult and expensive to transport, amplify the noise generated by the turbine and are susceptible to rust and corrosion. Turbine noise is a major complaint of wind turbines. Steel towers are not well suited for use in bodies of water where ice impacts can cause excessive corrosion.

The proposed development is intended to produce polymer cast (PC) towers that are lower cost than steel or fiberglass, can absorb impacts from ice without damage, reduce sounds generated by the turbine, utilize Ohio labor, resins, fillers and facilities, and allow easier assembly than current towers. PC is far better suited to absorb ice impacts than fiberglass and much more stable when subjected to sunlight, due to fiberglass's much higher linear expansion rate.

The polymer casting process typically uses 85% less energy than steel structures. We propose using recycled materials and polymers, from Ohio. The filler materials will also include locally mined aggregates. Case Western recently completed a test lab ideally suited for this product development. Fairmount Minerals will supply the aggregate fillers, Poly-Carb will supply the polymers, including biomass polymers and GE will provide technical guidance.

Plant: 7272 Justin Way, Mentor, OH 44060
Office: 140 Greentree Road, Chagrin Falls, OH 44022

Phone (440)343-0461
FAX (440)815-2152

Ohio Third Frontier Advanced Energy Program

Request for Proposal

Letter of Intent

Lead Applicant: FinnResearch

Contact: Mark Finneran
886 Woodmere
Wooster, Ohio 44691
330-317-8500
mfinneran@aol.com

Project Title: Advanced Electricity Conservation

Collaborators: Primo Design Group: Electrical Engineering Services, Columbus, Ohio
AdL Technology: Electronics Manufacturing Services, Columbus, Ohio
Thogus Products Company, Injection Molding, Avon Lake, Ohio
R. Krehnovi, PE

Grant Funds Request: \$200,000.00

Summary: Electricity is a staple commodity that will continue to increase in price until less expensive, renewable methods of production come online. The United States Department of Energy (DOE), 18 year old ENERGY STAR program has reduced electricity consumption in some consumer electronics by 70-90%, but growth in the consumer electronics industry has led to dramatic increases in “phantom” power products. Phantom power is electricity drawn while a device is plugged in, but is not in use.

Cell phones, I-phones, I-pods, I-pads, TVs, DVD players, stereos, X-Boxes, Play Stations, Wii stations, laptops, Kindles, microwaves and coffee pots all consume “phantom power”. Whenever a battery charger, a remote controlled device, or an auto-on device is left plugged in, it draws phantom power. It is as if each home has 10-15 leaky faucets, all dripping a small amount of electricity. As much as 50% of a household’s electric bill can be from phantom power draw.

The DOE and EPA have both recognized phantom power and have suggested that consumers unplug the device; use outlet strips that can be turned off and turn the strip off after the device has been used; or purchase smart strips. In reality, most people simply forget to unplug their phone or laptop chargers or turn off their power strips. There is a variety of commercially available electricity saving smart strips and timers but they are cost prohibitive; some requiring an electrician to hardwire, and others are so complex that even an educated consumer has a hard time using them.

FinnResearch has developed a working prototype advanced electricity saving platform product that is simple to use and will be inexpensive to manufacture and inexpensive to buy in quantity. It is robust and should have a 10-15 year lifespan. A six month in home trial showed monthly electric bills reduced by 50%. A patent search has been completed and the product can be manufactured without infringement. Further IP work needs to be completed. We believe we can be to market and commercially viable in 18 to 24 months.

The lead applicant has brought an advanced medical electrodiagnostic device through development, UL approval, FDA clearance and market launch. The lead applicant’s technology was the recipient of a \$900,000 Third Frontier Grant that has been leveraged into \$9 million dollars in Angel and Venture Capital financing, producing more than 25 high tech and high paying Ohio jobs. The Collaborators on this project each have 25-40 years experience in their respective fields and are fully capable of meeting this project’s needs.

This project’s target market is single mothers with teenagers at home that leave their phone and laptop chargers, Play Stations and X-Boxes, stereos and other electronic devices plugged in when not in use. This group has monthly electric bills of \$300-\$500. The elderly on fixed incomes and the poor that receive government assistance with utility bills will be a secondary market. Big box stores will be a tertiary market. We expect this product to be copied offshore, so a quick launch with a focus on Green American made Ohio quality is important. Follow on products from the platform technology are already in the pipeline.

OTFAEP 11-318

September 6, 2010

Subject: 2011 OTFAEP LOI

Dear Sir/Madam,

Millennium Reign Energy LLC. is very pleased to submit this Letter of Intent (LOI) in preparation for submittal of our proposal in response to the FY2011 Ohio Third Frontier Advanced Energy RFP.

Lead Applicant Information:

Chris McWhinney, CEO
Millennium Reign Energy LLC
125 West Wenger Road, Suite C
Englewood, Ohio 45322
(937)832-9840 – Phone
(937)832-7779 – Fax
www.mreh2.com – website
Chris@mreh2.com - email

Project Title: *Small Hydrogen Fueling Appliance (SHFA)*
Estimated Grant Funds requested \$ 1,000,000

Known Collaborators:

University of Dayton Research Institute (UDRI)
Mound Technical Solutions, Inc. (MTS)

Summary of Project:

Millennium Reign Energy's technology provides a solution to the hydrogen fuel needs of the fuel cell industry and helps provide needed infrastructure. Millennium Reign Energy currently assembles the *AutoARK*® and Small Hydrogen Fueling Appliance (SHFA) at our Englewood, Ohio facility. The *AutoARK*® separates hydrogen from water, then sends it to the SHFA which then compresses, stores and dispenses the hydrogen fuel. The ***AutoARK*® SHFA** moves beyond the competitive technology with benefits that exceed current capacity limits by incorporating the ability to compress hydrogen at 5000 psi for all in one unit. It includes on board hydrogen storage cylinders, easy-to-use hose, and nozzle hookup apparatus with many safety features built in for use by non-technical workforce end-users.

Millennium Reign Energy's *AutoARK*® SHFA is poised for the Market Entry Phase as defined by the Technology Commercialization Framework. The *AutoARK*® offers significant advantages over other electrolyzers. It exceeds the current industry's efficiency average regarding hydrogen production per watt consumed. At the same time, the *AutoArk*® has a significant price advantage that benefits the market and sustains our growing business. The *AutoARK*® SHFA unit offers superior quality and design, and is 100% assembled in Ohio with parts and manufacturing currently provided by as many as 17 Ohio based vendors. There is already significant interest in this packaged product by end-users such as Plug Power, CAT, Crown, Lift One, Battelle, the U.S. Air Force and the Department of Energy. An investment by Ohio Third Frontier will offer the opportunity to solidify Millennium Reign Energy's *AutoARK*® SHFA in core areas related to product sustainability and commercialization, specifically for demonstration, evaluation, design improvements, certification and job creation in Ohio over the grant allocation period and beyond. When brought to market at multiple entry points, support will develop through creating jobs related to product installation and sales in the power lift truck and automobile market segments. An educational unit is already being manufactured and sold in the educational arena that also contributes to creating additional sales and jobs.

POLYWIRE TOUGH COMPOSITES LTD.

105 Keswick Dr., Hudson, OH 44236; 234-738-1228; aprakash@wiretough.com

September 8, 2010

Amit Prakash, Ph.D. FASM
President

Subject : Ohio Third Frontier Advanced Energy Program, Letter of Intent

Higher Capacity On Board Natural Gas Cylinder and an Efficient Portable Compressor

Abstract

Three key success factors for commercialization of CNG (Compressed Natural Gas) powered vehicle are a cost effective light weight pressure vessel, the convenience of filling the gas to the tank and the driving range per fill. CNG in USA is stored at 3600 PSI (250 Bar). Increasing the pressure will increase the driving distance. We therefore propose that a cost effective light weight system be designed where an **onboard compressor** can be connected to any natural gas outlet, home or commercial, to fill the on-board tank to **6000 PSI**.

This higher pressure will allow around 70% increase in the driving range (or corresponding savings in cylinder space or both). The increase in weight is only 50% and the increase in cost is estimated to be only 13% compared to the current \$7.50/liter. The on-board compressor will receive natural gas from a 0.5 to 4000 PSI source and compress to 6000 PSI. Technology for the compressor is available at NASA-Glenn and will be redesigned to meet weight, volume and power requirements. Our technology for 6000 to 7000 PSI tank is ready for implementation. A patent is pending.

It should be noted that in an electric vehicle, a transformer - inverter system is required to charge the batteries. We believe that charging a CNG cylinder even in homes (with natural gas supply) will be faster than charging a comparable electric vehicle. Charging at locations with higher flow rate will be faster. Commercial CNG fill stations have gas at 3600 PSI and can be elevated to 6000 PSI by using the on board compressor for a quicker fill.

Our company has expertise in pressure vessels. We have worked with General Motors, Lawrence Livermore Lab., NASA-Glenn and NASA-Marshall, TATA Motors and NK Cylinders South Korea in the development and prototype manufacturing of pressure vessels in 3000 to 10000 PSI range. We have full facility to Composite wrap Type II cylinders and are working closely with a DOT designated inspector for approval of our various products.

The proposed system will bring a quantum improvement in the transportation industry by increasing the driving range of vehicles and convenience of filling at home or outside. The demand for CNG vehicle is increasing at over 25% annual rate and higher range system is expected to be in good demand by the global market when introduced.

**LETTER OF INTENT****2011 Ohio Third Frontier Advanced Energy Program**

September 9, 2010

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

RE: TIRE FUEL DELIVERY SYSTEM FOR CEMENT KILNS WITH CALCINERS

Dear OTF Program Administrators:

I submit this letter to notify the Ohio Department of Development of AFS Technology, LLC's intent to submit a proposal as Lead Applicant for the 2011 Ohio Third Frontier Advanced Energy Program.

President John Tiernan will be the primary contact for the purposes of this proposal and project, and can be reached at:

- Address: 4060 Gibson Drive; Tipp City, OH 45371
- Phone: 937-669-3548; x203
- Email: john@afstechnology.com

AFS Technology, LLC designs, fabricates, installs and commissions alternative fuel systems for cement kilns. We have completed a concept design that significantly improves upon a product we currently have on the market. The improved design is a fuel injection device for precalciner cement kilns that could replace 30% of the overall primary (fossil) fuel with discarded whole tires. For comparable cost to the end user, this is a 100% improvement over our previous design, currently being used at two cement plants in Texas and Chile. While our previous model has established proof of the patented concept of suspension burning of calciner fuel, the new design would allow for both greater allowable amounts and greater control of tire fuel, resulting in:

- Total combustion of the whole tire fuel's organic matter, while in suspension.
- Reduced risk of sulfur buildup and CO formation
- Reliable reduction in thermal NOx formation.
- Average fuel replacement of 28,500 tons of coal per year, with estimated fuel cost savings of \$2.5M per unit/kiln.
- Removal of 2.6 million scrap tires from landfills, per unit/kiln.

We are requesting an estimated \$150,000 in Grant Funds to finalize design specifications, fabricate and test a working prototype of the system. The prototype will be quality tested in-



house, then temporarily installed and commissioned for test burning at several prospective cement plants in the U.S. and overseas, at their expense (which will be recouped in fuel savings during the testing period).

The scope of the project will include:

- Securing committed interest from identified test burn sites, as part of our proposal.
- Full patent filings and global protections of intellectual property relating to this technology and its applications, through known Collaborator:
 - Attorney Thomas E. Lees
 - Address: 67 Rhoads Center Dr.; Dayton, OH 45458
 - Phone: 937-610-9888
 - Email: info@lees-ip.com
- Preparation of site-specific layout drawings & written proposals to install and commission prototype for test burning.
- Finalization of design drawings and prototype specifications.
- Procurement of controls to monitor fuel feed rates.
- Fabrication of prototype in Ohio, through known Collaborators:
 - Weldments, Inc.
 - Address: 167 Heid Ave.; Dayton, OH; 45404
 - Primary Contact: Chuck Kraft
 - Phone: 937-235-9261
 - Email: ckraft@weldments.com
 - American Quality Fabrication, Inc;
 - Address: 4125 Gibson Dr.; Tipp City, OH; 45371
 - Primary Contact: Joe Beidelschies
 - Phone: 937-667-2861
 - Email: aqfab@verizon.net
 - Industrial Control System
 - Address: 3731 Alex-Bell Rd.; Dayton, OH 45449
 - Primary Contact: Kirk Vendel
 - Phone: 937-859-7136
 - Email: kirkvendel@acsohio.com
- In-House quality assurance testing, PLC programming, and instrument calibration.
- Data collection, analysis, reporting and dissemination for global market entry.

The duration of this project is expected to be 14-20 months overall - broken down by milestone as follows: Six months for design and fabrication of prototype, 6-12 months for testing, 2 months for data analysis and final reporting. Upon successful implementation, we expect sales commitments for permanent systems among test-burn sites where key performance metrics are met. Broad global market entry is expected within six months of test-burn project completion.

Thank you for the opportunity to participate in the Ohio Third Frontier program. We are excited at the prospect of extending our development of homegrown technologies for the global economy, and helping to create & sustain high-quality jobs for Ohio.

Sincerely,

John Tiernan
President – AFS Technology, LLC



AFS technology

Alternative fuel systems engineered for cement kilns

OTFAEP 11-321

USA

Phone: 937 669 3548

Fax: 858 300 5404

www.afstechnology.com

LETTER OF INTENT

2011 Ohio Third Frontier Advanced Energy Program

September 9, 2010

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

RE: TIRE INJECTOR FOR BURNER END OF CEMENT KILNS

Dear OTF Program Administrators:

I submit this letter to notify the Ohio Department of Development of AFS Technology, LLC's intent to submit a proposal as Lead Applicant for the 2011 Ohio Third Frontier Advanced Energy Program.

President John Tiernan will be the primary contact for the purposes of this proposal and project, and can be reached at:

- Address: 4060 Gibson Drive; Tipp City, OH 45371
- Phone: 937-669-3548; x203
- Email: john@afstechnology.com

AFS Technology, LLC designs, fabricates, installs and commissions alternative fuel systems for cement kilns. We have completed a concept design for a fuel injection device that could replace 25-30% of the overall primary (fossil) fuel with discarded whole tires. This will become the only technology currently available in the global marketplace that injects whole tire fuel into the burner end of the kiln, making it a cost effective and versatile method that would work with any major type of kiln design used in the industry.

The injection device would allow cement plants to control the placement of fuel inside the kiln at its optimal distance from the main burner, allowing for greater control of CO and SOx formation.

We are requesting an estimated \$150,000 in Grant Funds to finalize design specifications, fabricate and test a working prototype of the system. The prototype will be quality and performance tested in-house, then temporarily installed and commissioned for test burning at several prospective cement plants in the U.S. and overseas, at their expense (which will be recouped in fuel savings during the two-week testing period).



The scope of the project will include:

- Securing committed interest from identified test burn sites.
- Full patent filings and global protections of intellectual property relating to this technology and its applications, through known Collaborator:
 - Attorney Thomas E. Lees
 - Address: 67 Rhoads Center Dr.; Dayton, OH 45458
 - Phone: 937-610-9888
 - Email: info@lees-ip.com
- Preparation of site-specific layout drawings & written proposals to install and commission prototype for test burning.
- Finalization of design drawings and prototype specifications, based on findings.
- Procurement of controls to monitor fuel feed rates.
- Procurement of conditions monitoring equipment to gather test data.
- Fabrication of prototype in Ohio, through known Collaborators:
 - Weldments, Inc.
 - Address: 167 Heid Ave.; Dayton, OH; 45404
 - Primary Contact: Chuck Kraft
 - Phone: 937-235-9261
 - Email: ckraft@weldments.com
 - American Quality Fabrication, Inc;
 - Address: 4125 Gibson Dr.; Tipp City, OH; 45371
 - Primary Contact: Joe Beidelschies
 - Phone: 937-667-2861
 - Email: aqfab@verizon.net
 - Industrial Control System
 - Address: 3731 Alex-Bell Rd.; Dayton, OH 45449
 - Primary Contact: Kirk Vendel
 - Phone: 937-859-7136
 - Email: kirkvendel@acsOhio.com
- In-House quality assurance & performance testing, PLC programming, and instrument calibration for various kiln lengths and diameters.
- Field testing, analysis, reporting and dissemination for global market entry.

The duration of this project is expected to be 16-24 months overall, broken down by milestone as follows: 6-10 months for successful fabrication of prototype, 8-10 months for testing, 2 months for data analysis and final reporting. Upon successful implementation, we expect sales commitments for permanent systems among test-burn sites where key performance metrics are met. Broad global market entry is expected within six months of test-burn project completion.

Thank you for the opportunity to participate in the Ohio Third Frontier program. We are excited at the prospect of extending our development of homegrown technologies for the global economy, and helping to create & sustain high-quality jobs for Ohio.

Sincerely,

John Tiernan
President – AFS Technology, LLC

Letter of Intent
to submit a proposal in response to the
Ohio Third Frontier Advanced Energy Program
Fiscal Year 2011 RFP
(Ohio Department of Development)

Title: Scale up of Infrastructure-Compatible Biofuels Production from Ohio-
Relevant Algal Biomass

Lead Applicant: Algaeventure Systems
13311 Industrial Parkway
Marysville, OH 43040
Phone: 937.645.4600

Contact Person: Ross Youngs
CEO
Algaeventure Systems
Email: ryoungs@algaevs.com

Known
Collaborators:

- 1) The University of Toledo, Department of Chemical and Environmental
Engineering
2801 W. Bancroft St.; Toledo, OH 43606-3390
Personnel (a) Dr. Sasidhar Varanasi, Professor,
(b) Dr. Sridhar Viamajala, Assistant Professor

Estimated Grant Funds to be requested: \$2 million from ODOD (\$1 million Third Frontier R&D
funding + \$1 million Wright Capital Funds) with another \$2 million cost share from the lead
applicant and the collaborators.

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

Scale up of Infrastructure-Compatible Biofuels Production from Ohio-Relevant Algal Biomass

Biofuels produced from microalgae promise 10 to 100 times greater yield per land acre than other crops. Two routes are possible for producing liquid transportation fuels from algal biomass: (1) Transesterification of algal lipids (oils) to biodiesel and/or (2) Thermochemical methods to produce diverse infrastructure-compatible biofuels.

In the first method, oils derived from algae (mostly triacyl glycerides, or TAGs, similar to vegetable oils) are extracted and converted into biodiesel by transesterification. In the thermochemical approach, the biomass is pyrolyzed to recover bio-oils that can be deoxygenated and/or hydro-treated (through catalytic means) to produce liquid transportation fuels that would serve as green diesel or gasoline replacements. Gas products known as "Syn-Gas" can serve as a replacement for natural gas or can also be converted to liquid fuels via Fisher-Tropsch (FT) synthesis. Residual char, known as biochar, can be sold as a high-value soil amendment and fertilizer.

Transesterification and thermochemical conversion can be complementary technologies for maximizing biofuel yield from lipid-rich microalgae. Residues remaining after oil extraction from oleaginous strains can be further subjected to thermochemical conversion to generate fuels in addition to biodiesel. However, when algae is harvested from naturally occurring blooms in lakes and rivers, the lipid content is generally very low. Also, some of the fastest growing algal strains cultivated in dedicated algal bioreactors also have inherently low amounts of oils. Thermochemical conversion methods, when applied to such highly productive algal biomass generation systems, can result in conversion of 50% or more of the biomass into liquid fuels even when there is no cellular oil available for transesterification to biodiesel. This method thus generates fuel from otherwise nuisance (or even toxin-producing) algae.

One of the major challenges associated with algal biofuels is the cost of harvesting algal biomass from the aqueous medium in which they grow. Traditional methods such as centrifugation or flocculation are either energy intensive or require large amounts chemical additives. Algaeventure Systems (AVS) has developed, patented and demonstrated innovative technologies for pre-concentration of algae from dilute systems (Rapid Algae Concentration (RAC) technology) and for downstream dewatering and drying (HDD technology). These technologies that were recently funded by a highly competitive, merit-based ARPA-E award, dramatically improve the economics of feedstock acquisition and preparation for downstream fuel processing steps. University of Toledo (UT) has developed a patent-pending process for simplified lipid extraction and conversion to biodiesel. UT has also developed novel pyrolysis techniques that are unique to algal feedstocks capable of producing high quality bio-oils with superior oxidative stability and properties close to petro-crude.

Through this AEP project, these novel technologies of UT and AVS will be integrated to scale-up production of infrastructure compatible biofuels. Byproducts such as biochar will further enhance the overall process economics. We propose to use native algal strains harvested from natural local waters, such as Lake Erie, Grand Lake St. Marys and the Maumee river, or grown in dedicated algae reactors. Overall, this Ohio-based technology has the potential to generate a significant local and sustainable biofuel industry with associated economic development and job creation.



Applied Systems and Technology Transfer
241 Federal Plaza West, Suite 508
Youngstown, Ohio 44503
(330) 599-4591 (ext)
(330) 599-4592 (fax)

September 9, 2010

Ms. Lisa Patt-McDaniel
Director
The Ohio Department of Development
77 South High Street, 25th Floor
Columbus, OH 43215

Subject: 2011 OTFAEP LOI

Dear Ms. Patt-McDaniel:

Applied Systems & Technology Transfer (AST²) is pleased to submit this Letter of Intent to the Ohio Department of Development in response to the Request for Proposal (RFP) under the Ohio Third Frontier Advanced Energy Program. Required information on our planned submission is provided below, and a one-page summary of the proposed project is attached.

Lead Applicant Name:	Applied Systems & Technology Transfer
Address & Phone Number:	241 Federal Plaza West, Suite 508 Youngstown, Ohio 44503 (330) 599-4591
Contact Person:	Jim Osterloh, PE (330) 599-4591 Jim.Osterloh@ast2.net
Proposed Project Title:	80KW Transportable Wind Generator
Estimated Grant Funds To Be Requested:	\$1.5M
Collaborators:	ADI Wind Mike Winiasz, President 4686 French Creek Road Sheffield Village, Ohio 44054

AST² requests the issuance of a LOI Number for our proposed project. Please contact me at (330) 599-4591 if we can provide any additional information. AST² is looking forward to working with the Ohio Department of Development to leverage Ohio innovation into Ohio jobs.

Respectfully Submitted,

A handwritten signature in cursive script that reads 'Jack Scott'.

Jack Scott, President AST²

Proposed Project Title: 80 KW Transportable Wind Generator

Today's commercial utility scale wind generators have a heavy multi-stage planetary gear box between the blade hub and the electrical generator. Wind turbine gearbox failure is a leading cause of downtime and maintenance cost. ADI Wind of Sheffield Village Ohio has recognized this weakness in today's wind generator gear boxes as a market entry point for their novel planocentric gear box. The planocentric technology is a single stage gear reduction technology with substantially fewer parts, inherently significantly lighter weight, and thus enabling the development of transportable wind generator systems.

The ADI planocentric gear box was awarded US Patent 4,228,698 in October 1980 as a speed reducing gear box. ADI Wind has applied for another patent, USPTO application 20100084872, for a modified planocentric gear box utilized for increasing speed with a focus on wind turbine generator applications.

AST2 and ADI Wind have teamed together to design and demonstrate the planocentric gear box for application in a 80 KW transportable wind generator package. The technical phase to be funded and executed under this grant will be to design, assemble and test a 80 KW transportable generator incorporating the planocentric gear box. The planocentric gear box will be designed with two orbiting spur gears, 180 degrees apart so as to balance the assembly. With only three gear components, one driven internal ring gear and two spur gears orbiting inside, significant weight savings will be achieved relative to today's multi-stage planetary gear box design. The very nature of the non-rotating spur gear diameter being approximately 98% the diameter of the internal ring gear results in substantially higher gear tooth engagement and thus much more robust design in the cyclic loading experienced in wind generators. This new balanced planocentric gear box will be substantially lighter and more robust compared to the conventional multi-stage planetary gear boxes used in today's wind generators.

Due to the gear box weight savings and size reduction, a wind generator package on the order of 80KW can be mounted on a transportable telescoping, one hundred foot tall boom commonly used in mobile cranes. This 80 KW transportable, self erecting design has significant commercial application for military and emergency response remote micro-grid applications. Following this grant phase, AST2 and ADI Wind will couple the new 80 KW planocentric gear box / generator package with a rotor and self erecting boom for demonstration to government clients, immediately seeking sales in these niche markets.

The 80 KW scale unit will be the first marketable embodiment of the planocentric gear box originally invented and patented by Mike Winiasz in 1980. The next substantial commercial market for this innovative Ohio gear box will be retrofitting existing decommissioned wind generators between 100 KW and 600 KW with new gearbox / generator packages based on the planocentric design. The ultimate market will be retrofitting today's 1.0-1.5MW wind turbine generators with a planocentric gearbox design as today's multi-stage planetary gearboxes fail.

September 9, 2010

Ohio Third Frontier
Advanced Energy Program
Fiscal Year 2011
OTFAEP2011@development.ohio.gov

Letter of Intent
"2011 OTFAEP LOI"

Lead Applicant's Name: Energy Focus, Inc.
Lead Applicant's Address: 32000 Aurora Rd.
Solon, OH 44139
Lead Applicant's Phone #: 440-715-1288
Contact Person: Laszlo Takacs
Director of Research and Development
ltakacs@efoi.com

Proposed Project Title: "Supply Response Demand Located Electronics System"
Estimated Grant Funds: \$1,000,000
Known Collaborators: None

Project Summary:

A demand response driver and system will be developed and manufactured in Ohio. The proposed effort will encompass LED efficiency, thermal management, optical coupling, power supply efficiency/electrical design, and reliability characterization. The product will incorporate an advanced energy management feature known as Demand Response which receives signals from power companies that demand, and therefore price, are spiking. A unique feature will be that the proposed fixture will still maintain Illuminating Engineering Society lighting level requirements while in a special demand response mode. The main route to market for this technology is via the well established Energy Services Company lighting retrofits. A unique alternative is for customers to pay for the lights out of savings in their electricity bills, they will not need to make any up-front investment.

Thank you.



Date: 9th September 2010

To,
Ohio Third Frontier Advanced Energy Program, 2011,
Ohio Department of Development

OTFAEP 11-325

Re: Letter of Intent to submit a proposal for the Ohio Third Frontier Advanced Energy Program, 2011.

Dear Ohio Department of Development,

Kindly consider this document as a letter of intent from MesoCoat, Inc. to submit a proposal for the Ohio Third Frontier Advanced Energy Program, 2011. Mentioned below are the all the details required for the 'letter of intent'

Lead Applicant

Name: MesoCoat Inc.

Address: 24112 Rockwell Drive, Euclid, OH, 44117-1252\

Phone number: (216) 453-0866

Contact Person

Name: Anupam Ghildyal

Email address: aghildyal@mesocoat.com

Collaborators

Name: University of Akron

Project

Title: Advanced materials and CRA Cladding Demonstration plant for Energy, Alternative Energy, Biomass, and Construction Infrastructure

Abstract: This project focuses on the commercial demonstration of a breakthrough metal bonding process that provides 40-100 year wear and corrosion resistance for energy infrastructure like heat exchangers, boilers, super heaters used in biomass and other applications, turbines and bearing for wind energy, nuclear vessels, and oil and gas pipelines. In the United States, the annual cost associated with wear and corrosion damage of structural components is greater than the combined annual cost of natural disasters, including hurricanes, storms, floods, fires and earthquakes. According to a 2002 Federal Highway Administration study, corrosion costs the US economy \$270 billion (B) annually in early replacement, unscheduled downtime and maintenance costs. This Project will construct a very high rate metal cladding demonstration plant to commercialize the multiple R&D 100 award winning 'high energy density fusion cladding' process; and also transition laboratory nanocomposite and



ceramer coating technologies to full scale demonstration components. Target applications include surface coatings of tubular steel products (both inside and outside surfaces), steel plate and sheet products, and bar stock products. These will be demonstrated using a high rate powder metal bonding process that eliminates the use of volatile organic solvents, toxic chemicals (such as chromate primers), and energy intensive processes. The resulting prototypes and economic data gathered through this project will allow End User qualification and rapid adoption of these advanced materials and the high performance metal bonding process into the energy, alternative energy, infrastructure, marine, and several other markets.

The proposed fusion cladding technology has been validated by Oak Ridge National Laboratory (DOE National Lab) for over a decade, and MesoCoat, Inc. has been conducting performance testing and evaluation for over a period of two years to further refine it. The core technologies for the proposed advanced nanocomposite materials have won a R&D 100 award, and have been developed and refined for over a decade. These nanocomposite materials are in active field trials with a leading oilfield products and services provider, and MesoCoat has been awarded \$4 million by DOE to accelerate commercialization of these materials for several applications. Development of the proposed ceramer coatings has been part of an ongoing research at University of Akron (primary collaborator), and studies have shown that these coatings have superior adhesion to the substrate, are self-drying, have better barrier properties than drying oils, have potential as electrical insulating coatings, have corrosion resistance which is competitive with the presently used epoxide-based primers, and apart from having inherent environmental advantages they are also very inexpensive.

Additionally, MesoCoat and its partners have been awarded seven contracts from Department of Energy, two grants from Department of Defense, one award from Edison Materials Technology Center, and the prestigious 'Technology Innovation Program' from the National Institute of Standards and Technology. These grants/contracts validate the substantial merit of this technology, considering all these grants/contracts were awarded to the proposed technology in a highly competitive scenario. Apart from the federal awards and contracts, MesoCoat's products are being tested in field trials with major players in the target markets, and MesoCoat is on the final stages of a financial agreement with a leading Oil and Gas provider.

The commercialization of this novel technology will enable Ohio to become a global leader in the \$32 billion metal coating and \$3.2 billion metal cladding industry and revitalize critical sectors of the Ohio steel industry. Furthermore, it will position our Ohio collaborators with clear advantage against their competitors, and result in a well-characterized coating product and application process with a wide range of commercial applications that will generate wealth, new jobs, and new businesses in Ohio.

Sincerely,

Anupam Ghildyal
Senior Business Associate, MesoCoat Inc.

Email: aghildyal@mesocoat.com
Phone: (216) 375-6393



September 9, 2010

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

Dear Ohio Department of Development:

Thank you for the opportunity to submit this letter of intent for the Fiscal Year 2011 Ohio Third Frontier Advanced Energy Program ("OTFAEP").

Lead Applicant Name: Kelly Aerospace Thermal Systems
Address: 1625 Lost Nation Road
Willoughby, Ohio 44094
Telephone: (440) 951-4744
Contact Person: Dr. Eric Pederson, Vice President of Engineering/General Manager
Contact Email: epederson@kellyaerospace.com
Project Title: Commercialization of Next Generation ThermaBlade Packages for Wind Turbines in Arctic and Cold Climate Geographies
Estimated Grant Amount: \$1 million
Known Collaborators: The University of Toledo, REpower, Nordex

Summary of the Proposed Project:

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 and arctic regions requires wind turbines to be adequately equipped with ice mitigation equipment to face the associated extreme operating conditions.

Kelly Aerospace Thermal Systems ("KTS") began as 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 the heating element platform technology. The resulting ThermaBlade Wind Turbine Ice Protection System ("ThermaBlade") technology has proven extremely effective for the anti-icing and de-icing of wind turbine blades.

KTS secured a FY2009 Ohio Third Frontier ORCGP grant to continue its work on ThermaBlade manufacturing process scale-up and commercialization activities. As a result of this award, KTS has entered the market with an industry leading ice protection system specifically designed for Vestas wind turbines. KTS has developed and demonstrated its technology for use on the Vestas 90 2-MW turbine and is building its production capability to serve this market. Furthermore, the ORCGP helped KTS lay the technical foundation and market validation necessary to offer the ThermaBlade solution tailored to additional OEM wind turbine platforms.



KTS seeks funding from the OTFAEP to commercialize an advanced ThermaBlade Arctic Deluxe Package and a Cold Climate Package for extreme cold and arctic temperatures around the world and secure large wind turbine OEM customers.

OTFAEP resources will facilitate work with wind turbine OEMs to develop, demonstrate and commercialize the system for additional wind turbine platforms targeting both cold and arctic geographies. KTS will work with project collaborators REpower, Nordex and the University of Toledo to install varying ThermaBlade packages in cold climates in Ohio, Canada and Europe. Implementation of the KTS ThermaBlade solution into additional wind turbine OEM platforms will alleviate icing problems in the windpower industry with a competitively unmatched Ohio technology that meets critical market needs.

The combination of the cold climate and arctic ThermaBlade packages will enable KTS to expand its market from wind turbines located in severe cold climates to more moderate climate geographies. Turbines facing all levels of icing events will have the ability to perform at peak production regardless of weather conditions, and without reducing power output by operating systems that do not need to be running.

The cold climate package will include ice protection on the tips of the turbine blades, where even the smallest buildup can have significant impact on turbine performance. This system will provide considerable benefit to turbine OEMs and wind farm developers with planned installations in locations with harsh winters, but temperate climates the remainder of the year.

The arctic climate package will include ice protection on the entire leading edge of each turbine blade, including the blade tips. In the harshest arctic weather conditions, the wind turbine will be able to operate since the blades are protected from ice buildup. When the temperature becomes more moderate, turbine operators have the ability to turn off specific ThermaBlade zones and heat only the tips of the blades. This reduces the energy consumption required by the ThermaBlade system while continuing to prevent ice interference, and increasing turbine energy output.

Building upon a strong foundation of experience in the wind energy sector, KTS and its collaborators will successfully develop and commercialize next generation ThermaBlade packages for wind turbines in arctic and cold climate geographies. The project aligns with the purpose, goals and objectives of the OTFAEP and will benefit Ohio's robust wind energy cluster, further solidifying Ohio at the forefront of renewable energy innovation.

Thank you for your consideration.

Respectfully yours,

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

Dr. Erik Pederson

UniControl Inc.

UniControl Inc.
1111 Brookpark Road
Cleveland, OH 44109

September 10, 2010

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

Subject:
Ohio Third Frontier
Advanced Energy Program
Request for Proposals; Fiscal Year 2011
Letter of Intent to Apply

Dear Sir or Madam:

Prospective Lead Applicant:
UniControl Inc.
1111 Brookpark Road
Cleveland, Ohio 44109

(216) 398-4414

Contact person: Steve Craig – President email: scraig@unicontrolinc.com

Proposed Project Title: Biomass Combustion Control System

Estimated grant funds to be requested: \$100,000

Known collaborators: Cleveland State University

Regards,

Steve Craig
President
UniControl Inc.

Attached: Summary of Proposed Project

**Ohio Third Frontier
Advanced Energy Program
Request for Proposal; Fiscal Year 2011
Letter of Intent from Lead Applicant: UniControl Inc.**

Proposed Project Title: Biomass Combustion Control System

Summary of Proposed Project

This project will research and develop for commercialization an advanced biomass-fuel combustion control system for use on commercial and industrial boilers and hot water generators. The control system will have the following features:

- Combustion gas analyzers for monitoring key compounds in the combustion flue gas, including oxygen, nitrogen oxides, carbon oxides, and sulfur oxides
 - Various transmitters for monitoring process variables including pressures, temperatures, levels, and flows
 - Programmable control system hardware and software including advanced energy control logic
 - Operator interface
 - Supervisory control and data acquisition interface
 - Final process elements interface
-

**Ohio Third Frontier Advanced Energy Program
Fiscal Year 2011**

Letter of Intent

Lead Applicant –

The University of Akron; 302 Buchtel Common, Akron, Ohio 44325; 330-972-6459

Contact Persons –

Technical Point of Contact: Lu-Kwang Ju

Title: Professor and Chair

Address: Department of Chemical and Biomolecular Engineering
The University of Akron, Akron, OH 44325-3906

Phone: (330) 972-5760

FAX: (330) 972-5856

Email: lukeju@uakron.edu

Business Point of Contact: Valerie Boaz

Title: Senior Grants Coordinator

Address: Office of Research Services and Sponsored Programs
The University of Akron, Akron, OH 44325-2102

Phone: 330-972-7694

FAX: n/a

Email: vboaz@uakron.edu

Project Title – Advanced biomass pretreatment by supercritical CO₂-based technologies for bioethanol and biobutanol production

Estimated Grant Funds to be requested – \$1 million

Known Collaborators –

Gruppo Mossi and Ghisolfi (M&G):

Co-Investigator – Guliz A. Elliott, Manager, M&G Polymers USA, LLC, M&G Polymers Technology Center, P. O. Box 590, 6951 Ridge Road, Sharon Center, OH 44274 – 0590; Phone: (330)239-7411, Fax: (330)239-7403, e-mail: guliz.a.elliott@gruppomgus.com

Ohio State University:

Co-Investigator – Shang-Tian Yang, Director of Ohio Bioprocessing Research Consortium, and Professor of Chemical and Biomolecular Engineering, The Ohio State University, 321B Koffolt Labs, 140 West 19th Avenue, Columbus, OH 43210; Phone: (614) 292-6611, Fax: (614) 292-3769, e-mail: yang.15@osu.edu

Summary

We will establish a complete chain of crop-to-biofuel processes in this project, with the primary emphasis on optimization and incorporation of the advanced supercritical CO₂-based biomass pretreatment technology. The Ohio Bioprocessing Research Consortium (at the University of Akron and Ohio State University) and the Ohio Supercritical Fluid Consortium (at UA), both originally established by grants from the Ohio Board of Regents, will collaborate with Gruppo Mossi and Ghisolfi (M&G) on this important bioenergy project.

Biomass pretreatment is one of the most costly and/or ineffective steps in biorefinery processes. Conventional pretreatment methods such as acid hydrolysis have well known limitations. Funded by grants from DOE-USDA Biomass Research and Development Initiative program and Yulex (Maricopa, AZ), the UA team has been developing supercritical CO₂-based methods to remove lignin and pretreat guayule bagasse. (Guayule is a rubber-bearing desert plant used for commercial production of hypoallergenic latex and specialty resins.) When subjected to enzymatic hydrolysis, the biomass pretreated by the supercritical method gave similar sugar yields to those from the dilute-acid pretreated biomass. No inhibitory effects to cell growth or enzyme production were observed when the biomass pretreated by the supercritical method or its enzyme hydrolysate was used in *Trichoderma reesei* fermentation. We are scheduled to conduct the pilot-scale testing/demonstration of the new pretreatment method in the spring of 2011. In this project we seek to optimize the supercritical methods for pretreatment of energy crops and integrate it into a complete biorefinery chain for production of bioethanol or biobutanol.

The energy crops to be used are those selected by Gruppo Mossi and Ghisolfi (M&G) to plant in Ohio at an industrial scale. M&G is the largest PET (polyethylene terephthalate) polymer producer in the world, with 11 plants, 2,600 employees, and \$3 billions revenues in 2008. M&G has a Polymer R&D Center at Sharon Center, Ohio. The company has developed platform technology (with 11 patents) on the use of renewable resources and plans to build a new Research and Development Technology Center for Renewable Resources, potentially at the same Ohio location as its Polymer R&D Center.

The pretreated biomass will be evaluated for biofuel production by the Ohio Bioprocessing Research Consortium (OBRC): bioethanol at UA and biobutanol at OSU. Dr. Shang-Tian Yang, director of OBRC at OSU, was awarded \$1 million in 2008 by the Ohio Third Frontier Advanced Energy Program for developing biobutanol production technology. Evaluation and integration of the supercritical pretreatment method with the advanced biofuel production technologies will facilitate its commercial realization.

With synergistic collaboration of the universities, research consortiums and an industrial leader in biomass utilization technology, this project will lead to successful development and demonstration of advanced technologies for biofuel production using renewable energy crops planted in Ohio.

McKay, Michael J.

From: skanakk106@aol.com
Sent: Thursday, September 09, 2010 2:59 PM
To: OTFAEP2011
Subject: Letter of Intent

Ohio Third Frontier Advanced Energy Program. 2011 - OTFAEP2011

Letter of Intent.

Lead Applicant: United Polymer Technology LLC
526 South Main Street, Suite 811
Akron, Ohio 44311

Key Personnel: Sebastian Kanakkanatt

Phone: 330-714-6059
FAX 309-401-4940

Title of the Project: ADVANCED ENERGY EFFICIENT LOW COST SMART WINDOW.

Proposal:

The project envisages manufacture and marketing of low cost Multichromic technology based Smart window developed by United Polymer Technology. This is the most advanced energy efficient window which darkens by turning on a switch to allow a low voltage, low amperage current in a few seconds to several minutes depending on the area of the window. Turning off the switch does not make the darkened window lighten or clear. In other words the darkened window will maintain the shade without continued use of electricity.

On turning on the switch the darkened window can be made clear again in a few seconds to several minutes.

A combination of several chromic technologies is simultaneously used in the Advanced Energy Efficient Low Cost Smart Window.

Project period: 24 months.

Total Project cost: \$750,000:
This includes : \$250,000 Grant
\$250,000 Matching fund
\$250,000 Wright Capital Fund.

Collaborators: The University of Akron,
302 E. Buchtel Avenue
Akron, Ohio 44325

Key Person: Jon Hu, Professor of Chemistry
The University of Akron,
Akron, Ohio 44325

Collaborator: United Biotechnology LLC
2459 Audubon Road,
Akron, Ohio 44320

Technical Director: Sebastian V. Kanakkanatt Ph.D.
Professor Emeritus

The University of Akron.

Expected Starting Date: January 20, 2011 Expected completion date: January 20, 2013 (Except for continued Marketing)

Date: September 9, 2010

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

From: The Timken Company
1835 Dueber Avenue S.W., P.O. Box 6930, Mail Code TEC-05
Canton, OH 44706

Subject: 2011 Third Frontier Advanced Energy Program Letter of Intent

Lead Applicant: The Timken Company

Contact Person: Robert Kolarik, Ph.D.
(330) 471-2378
bob.kolarik@timken.com

Project Title: Wind Energy Component R&D Center

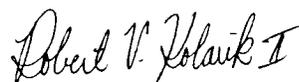
Grant Funds to be Requested: \$1,000,000 R&D / \$1,000,000 WCF

Collaborators: Stark State College of Technology
6200 Frank Avenue NW
North Canton, OH 44720
Contact: Dorey Diab / Caroline Maloney
ddiab@starkstate.edu / cmaloney@starkstate.edu

Stark County Port Authority
116 Cleveland Ave. NW
Canton, OH 44702
Contact: Steve Paquette
steve@starkcoohio.com

Project Summary: See attachment

Respectfully Submitted,



Robert V. Kolarik II
Technology Program Manager
The Timken Company

Project Summary

Recent wind industry trends show turbines growing larger and larger to support the need for more reliable and cost effective energy generation. The drive systems of these larger turbines currently are failing to perform as reliably as the industry expects, resulting in unacceptably high maintenance and repair costs. The anti-friction bearings used in these applications, which can range from 48 to 126 inches in outside diameter, have been identified as one of the performance-limiting components in the wind turbine's drive system. The development of advanced bearings to improve reliability and reduce turbine costs is critical to the commercial viability of meeting the U.S. Wind Energy initiatives. As the only U.S.-headquartered anti-friction bearing manufacturer capable of producing wind turbine bearings up to the 126 inch diameter size, The Timken Company believes creating a component test capability to ensure system reliability is critical.

The Timken Company will partner with Stark State College of Technology (SSCT) and the Stark County Port Authority (SCPA) to develop a world-class wind energy component R&D center as a part of the college's campus in North Canton, Ohio. The critical element of this Center will be the development of a unique, instrumented test machine capable of testing large-diameter components simulating the load, speed and environmental conditions experienced in the field. The Center will facilities to educate and train incumbent and future industry technicians.

The unique large-diameter wind energy component test machine will provide a capability missing in the industry. The development and validation of improved bearing design and manufacturing rules is currently limited by the small amount of performance data from the field and the lack of component data generated by driveline system testing. Thus, component-level testing capability is required to cost effectively develop bearing and component designs with improved reliability and reduced system costs. Such capability will allow for the investigation and development of bearing designs in areas such as new design concepts, optimized materials, manufacturing processes, lubrication requirements, sealing and condition monitoring.

The scope of this project includes designing and constructing a building outfitted with the special needs associated with handling very large product, along with the fabrication and commissioning of a specially designed component test machine. Stark State College will work collaboratively with the Timken to supervise the construction and run-off of the equipment to ensure adequate test capability is achieved. Conducting the initial testing of an ultra-large main shaft bearing under application conditions to validate the operation, data collection and safety of this new testing machine will be the final phase of the project.

This last phase will provide the opportunity to develop and train technicians on the proper handling, installation and testing of large bearing components. To advance technician training, SSCT will explore with Timken what academic programs exist or need to be developed to provide technician training for workers to support the company's wind business, as well as the potential for internships and externships for students and faculty, respectively.

The project team anticipates the proposed project will require approximately 30 months and \$11,521,600 to complete. These estimates may be higher than expected due to anticipated long lead times for the unique size and capability of the test machine components. The state of Ohio has committed funding to the project. The team is seeking \$1 million in Ohio Third Frontier Advanced Energy Program funding for research and development and \$1 million in Wright Capital Funds for equipment purchases to assist in project completion. Timken is prepared to provide matching funds with SSCT contributing its expertise to design and develop the facility.

The Center will be instrumental in accelerating the technical development and commercialization of large scale bearing systems with improved reliability and lower component and system costs for the wind industry. Improved bearing designs will support the growth of the wind energy industry and enable the trend to larger, more effective turbines by driving down the development costs and speeding up the commercial viability of large components for the wind energy market. Establishing a local supply chain for bearing system components may attract producers of the larger, next generation wind turbines to locate their North American manufacturing facilities in the state of Ohio.