OTFFCP 11-101

September 2, 2010

OTFFCP FY11 Letter of Intent

Rolls-Royce Fuel Cell Systems is pleased to provide this expression of intent to submit a proposal in response to the FY11 OTFFCP Request for Proposals:

Title – "Automation and Demonstration of Pilot-Scale Manufacturing and Assembly for SOFC's."

Estimated Grant Funds to be requested - $1.5 Million ($1 M OTFFC R&D, $0.5M WCF)

Lead Applicant – Rolls-Royce Fuel Cell Systems (US) Inc., 6065 Strip Avenue NW, North Canton, OH 44720

Contact– Rodger McKain, 330-491-4813; rodger.mckain@rrfcs.com

Collaborators - RoviSys, Aurora, OH
Stark State College of Technology, Canton OH.

Summary of Proposed Project:

Rolls-Royce Fuel Cell Systems (RRFCS) is progressing megawatt-scale Solid Oxide Fuel Cell (SOFC) Research and Technology development to the point that plans are now being prepared for moving forward with commercialization. Commercialization requires production of fuel cell components at a higher rate than the current capacity of the semi-automated fuel cell prototyping facility. To achieve the required capacity, support cost projections, and be positioned for the transition of this process to commercial scale, further automation and process control must be developed. Before RRFCS makes a significant investment in a large scale production facility, confidence in a these areas must be achieved.

RRFCS, RoviSys (a commercial manufacturing process control and process automation company) and Stark State College of Technology will develop and implement the automation and integration of key process control parameters into the pilot-manufacturing line at the Fuel Cell Prototyping Center so appropriate methodology can be established to show manufacturing readiness for producing commercial-scale fuel cell components. Such manufacturing readiness is necessary for RRFCS to enter its field demonstration phase. The process control and process automation systems will be the foundation for a high-volume production facility for manufacturing and assembly of fuel cell tubes and components.

The proposed project will integrate precision weighing and vision systems into the pilot *print* line, establish pass/fail criteria for manufacturing fuel cell active tubes, and automate the fuel cell tube *assembly* process such that highly reliable active fuel cell tube manifolded bundles can be produced. A manufacturing enterprise system will be developed to integrate the manufacturing control system with critical business inputs such as active tube supply requirements. Lastly, a roadmap will be developed for progressing from the current pilot-facility to a commercial factory.

US General Fuel Cell, Inc. is a Delaware-incorporated two-person startup located at 7614 Mendota Place, Springfield, Virginia, 22150. With just $750,000 in friends and family funding the Company developed and preliminarily tested a very high efficiency electrolyzer, proton exchange membrane fuel cell (PEMFC) and leak-proof composite material gas storage system. Our preliminary testing of these devices showed that their performance was better than the future-state targets (2011-2012) established by the US Department of Energy. Furthermore, our very conservative and detailed production cost analyses show that, once we are through low rate initial production (LRIP) and into the early phases of commercialization, our PEMFC will be below the cost target established by DOE. The importance of our being able to achieve this paradigm-setting performance should put us far ahead of the remainder of the industry.

This was definitely brought home during a DOE fuel cell conference we attended earlier this year. Many industry representatives, large and small, private, university and government laboratory, made requests that the Federal government allocate much more money for what is essentially basic research in materials because many industry segments are having problems meeting warranty predictions. For example, one potential competitor advertises a 2,500 hour warranty, but this is only applicable if the unit is run at 50% of its rated capacity during the warranty period. USGFC is far beyond facing these problems and in fact has solved a number of major issues:

- Beats the price threshold; in low rate initial production we will be able to drive the costs down to below the DOE's 2011 goal of $750/kW, a target we are sure no competitor will be able to meet in the near future;
- Overcomes poor efficiency: our proprietary design approach has guaranteed - and we have demonstrated – the ability to prevent hot spot generation and resulting degradation of the Nafion membrane without the need for an external hydration system;
- Solves water management problems: USGFC has determined how to maintain the necessary water balance within the stack by developing a unique "room temperature" operating stack design configuration; and
- Substantially extends cell and stack lifetimes: by paying attention to the causes of heat buildup within the cell, USGFC's proprietary design eliminates two major problems that have led to cell degradation and shortened stack life.

An issue that we face is that USGFC has a challenging current financial status. A logical question would therefore be: "Given their technological success, why has USGFC not already taken a commanding presence in the marketplace?" This requires a multi-pronged answer:

- USGFC is a very small company and would like to retain control of its own destiny; we are loathe to affiliate ourselves with major competitor corporations for fear of losing control of our intellectual property because we haven't the resources to fight patent infringement;
- Like many startup companies, USGFC is idea-rich but cash-poor; having exhausted the original funding has put us in the position that we have temporarily mothballed the first generation of our equipment until we can get funding for making advancements and complete testing, followed by entry into LRIP; and
- Because of our existing cash-flow position, we have affiliated ourselves part-time as the engineering and program management resources for a start-up wind power company.

Rather than being a drawback, this relationship with the wind power company is actually a major plus for us, because the intermittency and variability of wind represents a unique opportunity for the introduction of components of one USGFC commercial product, the uninterruptible power supply / load-leveling system. With this system, the wind farm operator can use our electrolyzer and gas storage system to

generate and store hydrogen when power needs are low, then burn the hydrogen in modified diesel generators to generate electricity when the wind speed is insufficient to turn the turbine blades. Adding our fuel cell to the other USGFC components in this system will allow us to enter commercialization with another flagship product, the residential/commercial uninterruptible power supply and hydrogen filling station. This unit will generate hydrogen at night when electric rates are low, then allow its owner to "self-power" the home through the fuel cell – or sell power back to the utility – when rates are higher during the day. It can also fill a hydrogen-powered vehicle at the system owner's home – or the electrolyzer can be used in a hydrogen filling station – making possible the advent of the hydrogen-powered economy by solving the "Catch 22" situation involving reluctance to make cars until the infrastructure is established and reluctance to build infrastructure until there are enough cars to justify the expenditure. We are also pursuing opportunities within the military, which is trying to reduce its large amount of fossil fuel usage and for which hydrogen power can serve a multitude of uses.

This represents our vision: to be able to provide a range of efficient products that meet home, local, regional and national requirements and that represent a major technological leap forward for the US.

Our plans are to raise at least $2.0 Million to allow our hiring personnel for non-recurring engineering and getting our products into accelerated testing. That testing can take place at Stark State College; we have already discussed our needs and the college's capabilities with Dr. Jim Maloney. Stark also has fuel cell workforce development programs, which will be of major assistance to us in our goal of establishing a facility in Ohio that can manage the production of our components and their integration.

We are especially pleased to apply for $1 Million of Ohio Third Frontier Fuel Cell Program funding because:

- The funding will allow us to make rapid progress toward formally proving the capabilities of our components and their integrated systems, as well as entering low rate initial production;
- The recognition we get from such an award will gain us notice and additional backing required to meet our goals; and
- Ohio is an excellent location for the establishment of our production facilities, both for low rate initial production and for the eventual full suite of product lines

Our proposal, which we will title "Introduction of Paradigm-Setting Fuel Cells, Systems and Ancillaries," will expand on these facets and provide substantial detail about the technological advancement of our components, our competition and our marketing plans. We invite any questions that the Department of Development might have and suggest that we be contacted as follows:

- Dick Snaider, CEO and President, dicksnaider@gmail.com, cell (703) 395-5148
- Bill Richards, SVP-R&D, wrrichards@gmail.com, cell (703) 579-7767
- Phone (703) 451-8064 for both of us at the lab in Springfield, VA.

OTFFCP 11-103

September 3, 2010

Battelle Reference OP61199

To: Ohio Department of Development
At: OTFFCP2011@development.ohio.gov

Re: 2011 OTFFCP LOI

Battelle Memorial Institute, Corporate Operations (Battelle) intends to submit a proposal as the lead applicant in response to the July 27, 2010 *Request for Proposals* (RFP) that is part of the Ohio Third Frontier Fuel Cell Program (OTFFCP.) The requested information per Section 1.3.3 of the RFP is provided as follows.

- Lead Applicant: Battelle
- Address: 505 King Avenue, Columbus OH, 43201
- Phone Number: (614) 424-7977
- Contact Person: Jeffrey Melaragno
- Contact e-mail: MelaragnoJ@Battelle.org
- Project Title: "Improving the Manufacturing Readiness of a Solid Oxide Fuel Cell Military Power Generator"
- Estimated Funds: $1,000,000
- Collaborator: (1) The Air Force Research Laboratory (AFRL)
  1950 Fifth Street
  Wright-Patterson AFB, Ohio 45433
- Collaborator: (2) UES, Inc.
  4401 Dayton-Xenia Road
  Dayton, OH 45432-1894

Please direct questions of a business or contractual nature to the undersigned at (614) 424-5543 or via email address jamesl@battelle.org. Technical questions should be directed to Jeff Melaragno at (614) 424-7977.

Sincerely,

LaDonna F. James

Digitally signed by LaDonna F. James
DN: cn=LaDonna F. James, o=Battelle Government Contracts, ou=Contracting Officer, email=jamesl@battelle.org, c=US
Date: 2010.09.03 12:54:00 -04'00'

LaDonna James
Contracting Officer

Attachment 1

Attachment 1

Letter of Intent
One Page Project Summary

To

Ohio Department of Energy
Third Frontier Fuel Cell Program

From

Battelle

September 2, 2010

Improving the Manufacturing Readiness of a Solid Oxide Fuel Cell Military Power Generator

Battelle is proposing to improve the manufacturing readiness of a military power generator that combines a breakthrough solid oxide fuel cell stack manufactured by NexTech Materials with a compact, high performance fuel processor capable of operating on high sulfur military logistics fuel. This project leverages the success of the FY09 OTFFCP project (09-057) conducted by Battelle and NexTech Materials. In that project, Battelle successfully integrated their fuel processor, hydrodesulfurization system, and balance of plant with the NexTech solid oxide fuel cell stack. The resulting system offers many benefits to a variety of military and civilian customers. Improvements in the packaging, controls, reliability, and cost of manufacturing are required to meet the requirements of these customers. The proposed project will address each of these issues.

OTFFCP 11-104

1025 Faultless Drive
Ashland, OH 44805
Ph: (419) 281-5800
Fax: (419) 281-0059

9/2/2010

RE: Letter of Intent 2011 OTFFCP

Dear Ohio Third Frontier,

Americarb Inc. is a carbon and graphite manufacturing company located in Ashland, Ohio. Since 2006, Americarb has been contract manufacturing services for customers for the production of gas diffusion layers for phosphoric acid fuel cells. Americarb's proposal is to develop a new gas diffusion layer with improved thermal conductivity, electrical and corrosion resistance properties. Americarb will collaborate Ballard Material Products Inc., a division of Ballard Power Systems one of the foremost companies in fuel cell technology in the world.

Americarb's successful proposal will produce a new GDL that will increase the efficiency of fuel cell power systems making them more viable for commercial applications. Upon the completion of the project the lab testing results can be used to assist in the marketing and commercialization of the products for existing customer applications in a multi-billion dollar world market for clean, efficient power generation.

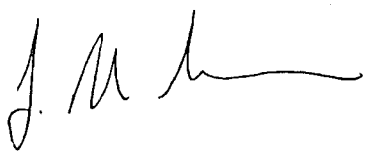
Lead Applicant Contact Information:
Americarb Inc.
1025 Faultless Drive
Ashland, Ohio 44805
Email: mattr@americarbinc.com
Phone (419) 281-5800
Fax (419) 281-0059
Contact Name: Matt Reineke, President

Collaborator Information:
Ballard Material Products Inc.
2 Industrial Avenue
Lowell, MA USA 01851-5199
Att: Guy Ebbrell

Proposed Project Title: Improved Gas Diffusion Layer for fuel cell applications.

Estimated Grant Funds requested: $350,000

Sincerely,



Matt Reineke
President

PRECISION
Energy and Technology

OTFFCP 11-105

Lead Applicant's Name:	Precision Energy and Technology
Address:	2000 Composite Drive, Kettering, OH 45420
Phone Number:	937-558-2708
Contact Person:	Thomas Willis, PE
Email:	twillis@petfc.com
Proposed Title:	Determining the Manufacturing Limit on Thickness and Size (length and width) of a Metal Injection Molded (MIM) Bipolar Plate for PEM Fuel Cells
Est. Grant Funds:	$900MM
Known Collaborators:	MPEC -Pennsylvania State University University of Dayton Research Institute (UDRI) United Technologies Corp – Power (UTC-Power) General Motors (GM) IdaTech

Project Summary

This project focuses on making substantial alternations in the current Metal Injection Molding (MIM) processes by making enhancements that improve the economics and delivery time of MIM parts, specifically metal bipolar plates. The greatest innovation resulting from the PET's previous NSF and DOE development was debunking the belief that thin wall metal plates by MIM were not feasible. These previous programs proved that not only was it possible, but that metal bipolar plates offered several benefits over the traditional graphite bipolar plates. The MIM process has three steps – developing the part mold, the molding step, and the debind/sintering step. This proposal will concentrate on the advantages that resulted from PET's previous MIM work and change the economics and execution of two of the steps – Developing the mold and the debind/sintering process. This project is supported by three prominent fuel cell customers – UTC Power, General Motors, and IdaTech.

In this proposed project, a collaborative team consisting of Precision Energy Technology (PET) and Microwave Processing and Engineering Center of Pennsylvania State University and University of Dayton Research Institute will address these two steps - 1st mold-making directly by converting solid model molds into hardware via a new process utilizing a composite polymer-carbon nanofiber material wire by a 3D laser system and 2nd replace the energy and time intensive furnace sintering by use of microwaves for the sintering process. The MPEC-PSU is a world leader in microwave processing of materials and all sintering work will be conducted there.

This new development brings an experienced and highly skilled technical and scientific team together to understand the thin metal processing. With a successful project, not only will metal bipolar plates advance in technology and economics, but complex sheeting parts that support structure through webs or bosses can be integrated into the design without secondary parts or joining processes. These features can be molded directly into the new part concept- for not only bipolar plates, but also in aerospace, automotive,

appliance, etc. industries. This technology provides greater control of quality, reduces manufacturing steps (welding, seaming, machining), and minimizes inventory, by generating less parts. By utilizing microwave sintering of MIM, delivery time to market is minimized, providing a benefit to commercial manufacturing. Society and commercial benefits result from an important aspect of microwave sintering namely huge energy savings. Further, this proposed approach eliminates metal waste, alleviates the costs of recycling waste metals, and could eliminate as much as 80% of the energy usage versus the current furnace sintering process. There is little doubt that microwave sintering and 3D laser mold making are at the grass roots level of direct fabrication methods. It is these types of manufacturing methods that will thrust commercial industry into the next level of manufacturing and reduce human manual labor efforts.

2000 Composite Drive Kettering, OH 45420 Ph 937-558-2708 Fax 937-5582836
www.petfc.com

Lockheed Martin MS2
1210 Massillon Road
Akron, OH 44315-0001

OTFFCP 11-106

LOCKHEED MARTIN

8 September 2010

To: Ohio Department of Development
Technology and Innovation Division
OTFFCP2011@development.ohio.gov

From: Lockheed Martin MS2
1210 Massillon Road
Akron, OH 44315

Subject: 2011 Ohio Third Frontier Fuel Cell Program Letter of Intent

Lead Applicant: Lockheed Martin MS2

Contact Person: Steven Sinsabaugh
steven.sinsabaugh@lmco.com
(330) 796-6107

Project Title: Military SOFC Genset Demonstration

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

Collaborators:

Technology Management Inc.	Cleveland, Ohio
Catacel Corp.	Garrettsville, Ohio
Refractory Specialties Inc.	Sebring, Ohio
Energy Technologies Inc.	Mansfield, Ohio
Edison Welding Institute	Columbus, Ohio
Core Technology, Inc.	Avon, Ohio
Gorman-Rupp Co.	Bellville, Ohio

Project Summary: See attachment

Respectfully Submitted,

S L Sinsabaugh

Steven L. Sinsabaugh
Lockheed Martin Fellow
Lockheed Martin MS2
1210 Massillon Road
Akron, Ohio 44315

Military SOFC Genset Demonstration
Summary

Lockheed Martin MS2 (Akron, Ohio) and Technology Management, Inc. (TMI) (Cleveland, Ohio) intend to submit a proposal that builds upon our existing Ohio Third Frontier Fuel Cell project focused on military SOFC generator sets (gensets). The goal is to push early entry into the emerging DoD market for fuel cell gensets and related systems, ultimately resulting in manufacturing jobs at Lockheed Martin's Akron facility and elsewhere in the Ohio fuel cell supply chain.

The DoD has a large inventory of generator sets which consume a massive amount of very-expensive-to-deliver JP-8 fuel. Providing a next generation of more efficient gensets will greatly reduce the amount and cost of fuel needed to run these generators, including the cost in soldiers' lives. Solid oxide fuel cells are significantly more efficient than other means of producing electric power for mobile applications, including internal combustion technologies. The convergence of the DoD's need to reduce fuel usage and the maturation of solid oxide fuel cell technology has created a market opportunity for our team to exploit. This project will be part of our team's overall effort to bring SOFC system technology to a level of readiness required to make significant inroads to the DoD genset and APU markets.

This proposed project builds upon our existing OTFFCP programs. The first has a specific goal of demonstrating a 1kW system operating with JP-8 (without need for desulfurization); water neutrality; and doing both for at least 1000 hours. The second OTFFCP effort builds on this, developing shock and vibration concepts, faster startup, and improved thermal insulation. These programs are making progress and are on schedule.

Our proposed FY11 Ohio Third Frontier Fuel Cell Program will build on this foundation in three major areas:

(1) Close coordination with other members of the Ohio Fuel Cell Cluster in identifying and customizing critical system components.

(2) Further advancements in system readiness for DoD fielding

(3) A final field demonstration

Lockheed Martin will provide the majority of the cost share in the form of internal research and development (IRAD) funds. These IRAD funds will be directly used to perform a share of the work that will be outlined in our forthcoming proposal.

It has been an exciting two years for our team's pursuit of the DoD genset and APU markets. Lockheed Martin has invested significant resources in this activity for technology development and commercialization. Ohio's investments in this activity, via the two previous OTF grants, have played a role in the Akron facility becoming recognized as the fuel cell development Center of Excellence within Lockheed Martin Corporation. Significant resources have been put in place to 'shape the market' in preparation of our upcoming system demonstrations and to start transitioning from R&D to a procurement. Even now we are just starting a program with the U.S. Army CERDEC lab on JP-8 fueled SOFC genset development.

With TMI's unique SOFC technology, Lockheed Martin's position as the DoD's largest supplier, and our Ohio Fuel Cell Cluster partners, our team brings an unmatchable synergy to transition our Ohio-based fuel cell system into a critical early adopter market.

OTFFCP 11-107

Mound Technical Solutions, Inc.
965 Capstone Drive Suite 140 Miamisburg, OH 45342 USA
937.865.3715 www.moundtech.com

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

September 7, 2010

REF: 2011 OTFFCP LOI

Mound Technical Solutions, Inc. is very pleased to submit this Letter of Intent (LOI) in preparation for submittal of our proposal in response to the FY2010 Ohio Third Frontier Fuel Cell Program RFP.

Lead Applicant Information:

Doug M^{c}Clelland, President
Mound Technical Solutions, Inc. (MoundTech)
965 Capstone Drive Suite 140
P.O. Box 203
Miamisburg, OH 45343-0203
937-865-3715
doug@moundtech.com

Project Title:

Comprehensive Fuel Cell Evaluation Products and Services

Estimated Grant Funds to be requested:

$ 1,000,000

Known Collaborators:

Air Force Research Laboratory (AFRL)

University of Dayton Research Institute (UDRI)

Summary of Project:

As the fuel cell industry matures and manufacturing of components and products increases, there is an increasing need for test and evaluation of materials, components, systems, and products. MoundTech manufactures and markets a comprehensive line of fuel cell test instrumentation for multiple technology platforms including Polymer Electrolyte Membrane (PEM), Solid Oxide Fuel Cell (SOFC), Direct Methanol (DM), and Phosphoric Acid (PA). Mound Technical Solutions is leveraging its successful fuel cell test instrumentation manufacturing and sales business to expand into the fuel cell testing service industry. The customers of this vast market include cell materials manufacturers, stack producers, system integrators, and regulating/certifying organizations. The addition of comprehensive testing services and specialized test hardware will grow our market share in the fuel cell industry.

The focus of this proposal is commercialization and market entry of comprehensive fuel cell testing services. Through our current business, we are experiencing strong and real market need for testing on a variety of levels. Manufacturers require specific test hardware and standardized test protocols to evaluate their products and properly specify them to the market. First adaptors of fuel cell products, including the Federal government, require a suite of standardized tests performed on newly introduced fuel cell products ranging from tens of watts to several kilowatts.

Our collaborative team has worked with other fuel cell entities throughout the State of Ohio to ensure that we are augmenting and leveraging existing efforts. This proposed effort will further strengthen Ohio's status as the leader in fuel cell technologies through this "market-pull" effort. Through this proposed effort, MoundTech will provide the job growth and commercial development sought by the Ohio Third Frontier Fuel Cell Program.

Thank you for the opportunity of the Ohio Third Frontier Fuel Cell Program.

Sincerely,

Doug M°Clelland
President, Mound Technical Solutions, Inc.

OTFFCP 11-109

Swagelok

Swagelok Company
29500 Solon Road
Solon, Ohio 44139-3492

440.248.4600
440.519.1085 Fax
www.swagelok.com

9 September 2010

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

Via e-mail: OTFFCP2011@development.ohio.gov
Subject line: 2011 OTFFCP LOI

Reference: Ohio Third Frontier Fuel Cell Program, Fiscal Year 2011, Request for Proposal: Letter of Intent

To whom it may concern:

Swagelok Company, an Ohio-based business with headquarters at 29500 Solon Road, Solon, OH 44139, (phone 440-248-4600) intends to submit a proposal in response to the above solicitation. The contact person is Dr. Sunniva Collins, Senior Research Fellow, email Sunniva.collins@swagelok.com . We will be collaborating with Case Western Reserve University, Cleveland, OH 44106 (Wright Fuel Cell Center and the Departments of Materials Science and Engineering and Macromolecular Science and Engineering). Our project title is "Surface Modified Stainless Steel Bipolar Plates for PEMFC Applications." A one-page summary of the proposed project is attached.

We estimate that the project will begin March 1, 2011 and grant funds requested will be $1 million; total project cost is projected to be $2 million.

Please feel free to contact me if you need additional information. I can be reached by email or at 440-456-3511.

Sincerely,

Sunniva R. Collins, Ph. D.

Sunniva R. Collins, Ph. D.
Senior Research Fellow

Cc: Mike Butkovic, Vice President, Marketing, Swagelok
Dave Peace, Vice President, Engineering, Swagelok
Arthur H. Heuer, Professor, Materials Science and Engineering, CWRU
David Schiraldi, Professor, Macromolecular Science and Engineering, CWRU

Surface Modified Stainless Steel Bipolar/End Plates for PEMFC Applications

Summary of Proposed Project

Polymer electrolyte membrane fuel cells (PEMFCs) are clean alternative energy systems that hold excellent potential for cost effectiveness, durability, and relatively high overall efficiency. The PEM fuel cell is recognized by the U.S. Department of Energy (DOE) as the main candidate to replace the internal combustion engine in transportation applications. The bipolar/end plate forms one of the most important and costliest components of the PEMFC stack, accounting for over 80% of the weight and cost. Graphite bipolar plates are currently being used. However, the commercial use of graphite in fuel cells still remains a challenge. Graphite's manufacturability, permeability, and durability for shock and vibration are unfavorable in comparison to metals.

Austenitic stainless steel satisfies many of the requirements for PEMFC bipolar/end plates; it is inexpensive, readily available, and easily manufactured into strip or sheet form for stamping operations. However, its corrosion response under long-term fuel cell operating conditions can cause failure of the PEMFC. Metal oxide formation leads to contact resistance, and metal dissolution can cause contamination of the membrane electrode assembly (MEA). These problems can be solved by engineering stainless steel plates with corrosion resistant and conductive layers. The goal of this project is to develop bipolar/end plates for PEMFCS that are economical, lightweight, corrosion resistant, and have low permeability and high electrical conductivity. Our intention is to achieve cost and performance standards that fuel cell end-users define as necessary for successful commercial applications.

Swagelok has developed and patented a novel surface carburization treatment, also called low-temperature colossal supersaturation, currently being commercialized as the SAT12® process, for chromium-containing alloys in general, and stainless steels in particular. The process is a gas phase heat treatment performed at temperatures around 450° C. It is a diffusional and conformal process, and can be performed on finished components without distortion or change to dimension. Preliminary studies of SAT12 316SS in a simulated PEMFC environment indicate that this material/treatment combination satisfies the DOE specified norm, and shows excellent corrosion resistance with a thin oxide layer and decreased contact resistance, making it an excellent candidate material for PEMFC bipolar/end plates.

Swagelok will treat stainless steel bipolar/end plates using the SAT12 technology. These plates will be constructed into fuel cell stacks and tested at CWRU. Long-term performance characteristics will be quantified in comparison with current technologies (untreated 316SS and graphite). This will include evaluation of metal dissolution through effluent testing, and surface analyses of tested plates. In addition, life-cycle cost analyses for the stacks will be developed, and identification and development of an Ohio-based supply chain will be defined.

Letter of Intent (LOI) - Summary

Under the Third Frontier Fuel Cell Program, State of Ohio
for a Proposal on

Chemical Hydrogel Based Polymer Electrolyte Membranes and Catalyst Binders for Fuel Cells

Collaborative effort by ITN Energy Systems INC., 8130 Shaffer Parkway, Littleton, CO 80127 &
The Ohio State University, Columbus, OH 43210

Lead Applicant and Contact Person: ITN Energy Systems, INC., Dr. Paul Thoen, Director, Fuel Cell and Membrane Division, 8130 Shaffer Pkwy, Littleton, CO 80127, email: pthoen@itnes.com, Phone: 303-285-5113

Strategic Partners and Collaborators: ITN Energy Systems, INC. – Dr. Paul Thoen (pthoen@itnes.com), The Ohio State University – Profs. Yogeshwar Sahai (sahai.1@osu.edu) and Rudolph G. Buchheit (Buchheit.8@osu.edu)

Grant Funds Requested - $1,000,000 for two years from the Department of Development of the State of Ohio.

Introduction: The two biggest hurdles facing the commercialization of fuel cells are its cost and durability. The cost of polymer electrolyte membrane and catalyst binder electrolyte are about one-third of the total cost of a fuel cell. This makes fuel cells in automotive and other applications prohibitively expensive, which is the biggest barrier to its commercialization. The current cost of the most commonly used DuPont's Nafion membrane ranges from $200 to 700 per square meter. Similarly the Nafion binder material used in fuel cells is very expensive. The DoE's target cost of polymer membrane is $20 per sq. m by 2010. Less expensive alternatives to Nafion membrane and binder material are required to make fuel cells commercially competitive with other technologies for use in transportation and other applications.

The authors of this letter of intent (LoI) have developed chemical hydrogel based polymer electrolyte membranes and binders which are much cheaper alternatives with much better performance to the currently used expensive materials for use in any polymer electrolyte membrane fuel cells (PEMFC). These less expensive polymeric materials will significantly reduce the cost of PEMFCs. The Ohio State University has filed a patent application for these materials.

Objectives: The main objective of this development and commercialization project is to produce and commercialize chemical hydrogel based polymer electrolyte membrane and catalyst binder of optimized composition and properties for use in fuel cells.

Technical approach: Researchers at The Ohio State University have developed and prepared PVA and Chitosan hydrogel membranes and catalyst binders by chemically cross-linking aqueous solutions of polyvinyl alcohol with glutaraldehyde in the presence of an acid catalyst, and by chemically cross-linking Chitosan solutions dissolved in acetic acid with glutaraldehyde. OSU has filed a patent application for this exciting technology. These catalysts binders and membranes have been utilized to fabricate direct borohydride fuel cells and have achieved power densities close to or better than Nafion® membranes and catalysts binders under identical test conditions.

ITN proposes to team with OSU to optimize and scale-up this technology for PEMFC's. Specifically, ITN and OSU will fully characterize and optimize these materials at the laboratory scale to achieve optimum performance and durability properties. Following the optimization of the membrane and catalysts binders, ITN will demonstrate the production of these materials on a pilot scale level, demonstrating that these materials will be ready for commercialization. ITN Energy Systems hold extensive expertise in thin film and polymer membrane production with cost effective large volume manufacturable protocols employing intelligent process controls to provide increased yield and product uniformity. ITN Energy Systems also has considerable expertise in fuel cell technology and systems integration.

Business Opportunity: The cost of our proposed chemical hydrogel membranes and catalyst binders will be less than 1% of that of currently used Nafion membrane and catalyst binder. The membrane and catalyst binder segment of the PEM fuel cell market was about $150 million in 2008 and is rising at 25.6% per year. The worldwide sales of synthetic polymer membranes for all separation technologies including fuel cells are over $2 billion per year increasing at 10 to 15% per year.

OTFFCP 11-111

Letter of Intent-Ohio Third Frontier-2011 OTFFCP LOI//

Lead Applicant Name: CK Technologies, LLC
Address: 1701 Magda Drive, Montpelier, OH 43543
Telephone Number: 419-485-1110x7326
Contact Person: Mike Ellerman, Vice President of Technology and New Business Development
Proposed Project Title: Residential Fuel Cell System Demonstration
Estimated Grant Funds to be Requested: $1 million
Known Collaborators: Technology Management, Inc., Columbia Gas of Ohio/NiSource

Project Summary:
The team proposes to build and demonstrate residential scale prototype fuel cell and electronic interconnect systems generating clean electricity from natural gas. The small-scale power systems would transform today's residential power grid – operating 24/7 and producing electric power for on-site use with the potential for grid export and/or heat recovery for cogeneration. Small on-site generation provides a critical missing component to the "smart grid" equation – intelligent on-site power generation that can adapt to user loads, including electric and plug in hybrid vehicles.

OTFFCP 11-112

HOCKING
COLLEGE
LOGAN CAMPUS

September 9, 2010

Ohio Department of Development
77 S. High Street, Fl 27
Columbus, OH 43215

Subject: Letter of Intent

Dear Sir or Madam:

The Hocking College Energy Institute and Delphi Automotive Systems are excited to submit this Letter of Intent for the FY '11 Ohio Third Frontier Fuel Cell Program. The joint Hocking-Delphi project will demonstrate solid oxide fuel cells running on natural gas and biomass fuel. From this demonstration, we will show that oxide fuel cells, used as a stationary power source, will reduce fuel consumption and emissions while having a positive economic impact on Ohio's economy.

Lead Applicant: The Hocking College Energy Institute
Address: 30140 Iles Road, Logan, OH 43138
Phone Number: (740) 380-9315 ext. 6602
Contact: Jestinah McDonald
Email Address: mcdonald_j@hocking.edu
Project Title: Solid Oxide Fuel Cell Stationary Power Generation Demonstration

Estimated Grant Funds to be Requested: $750,000- $1,000,000

Collaborators: Delphi Automotive Systems

Project Summary

As the United States continues to look towards electric power generation solutions that reduce its dependency upon imported fossil fuels, wind, photovoltaic, natural gas, coal gas, and fuel cells present viable alternatives. The retooling of buildings, retrofits or new builds, to be more energy efficient through improved design and construction are actively being evaluated as part of this effort. Solid Oxide Fuel Cells ("SOFC") have attractive attributes that strongly support these national energy objectives.

The Hocking College Energy Institute ("Hocking") and Delphi Automotive Systems ("Delphi") propose a series of tasks that meet the deliverables and expectations outlined by the Ohio Third Frontier Fuel Cell Program. Specifically, we will:

- Demonstrate two natural gas powered SOFC energy systems at Hocking. If a reliable fuel source is available, one of the SOFC energy systems would be fueled by a biomass derived fuel.
- Deliver verified energy savings, with an emphasis on efficiency improvements and reduced emissions in residential, commercial, industrial, and public buildings from SOFC installations at Hocking.
- Leverage existing grant funding in order to significantly enhance the resources available for supporting the program.
- Serve as a pilot building retrofit program that demonstrates the benefits of gaining economy of scale [resulting from wider deployment of SOFC power systems].
- Demonstrate the market-readiness of a technology through a commercially-oriented project that maximizes incorporation of Ohio components and are operating under final use conditions.

As part of the proposed project, the team will demonstrate two 5kW SOFC power systems. The proposed SOFC-based power system provides a cost effective approach that supports a robust smart grid with reduced CO_2 emissions. Under this proposal, the power systems will provide power peak shaving/base loading functionality.

A SOFC power system can provide upwards of 85% combined electric and thermal efficiency. This compares to the ~30% efficiency of distributed generation (DG) supplied through the grid. The majority of the DG efficiency loss is due to the parasitic loss from transmitting the electricity from the power plant to the end user. Since the SOFC power system generates electricity on-site, this efficiency loss is avoided, providing for reduced fuel consumption and associated CO_2 emissions. Additionally, SOFC can export excess power to the grid during times of low power demand, thus helping to provide relief to strained regional grids. Using the Hocking facility as its demonstration site, the team will be able to verify the amount of energy savings recognized under this joint effort.

In addition to the energy savings recognized at Hocking, the team will present a potential roll-out plan that will show the benefits of introducing SOFC power systems on a larger scale.

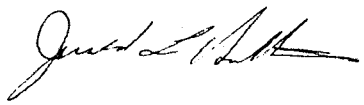
Hocking College, a two-year technical college in Southeastern Ohio, has a history of training technicians in natural gas drilling, production, and vehicle operations, and other advanced energy technologies. Currently, the college offers two associate degree programs: Advanced Energy & Fuel Cells and Advanced Energy & Vehicular Hybrids. One-year ago the college opened its newest campus in Logan, Ohio, approximately 20 miles from the main campus in Nelsonville. The Logan Campus is home to the Hocking College Energy Institute and houses all of the college's energy and transportation technologies.

With more than 10-years of fuel cell experience, Delphi is recognized as an industry leader in fuel cell technology development. By leveraging its global expertise in engine and thermal management systems, power conditioning and control electronics, heat exchangers, sensor technology, and lean manufacturing. Delphi is able to provide complete SOFC system solutions. Delphi offers component manufacturing and systems integration capabilities—including cell and stack build, fuel processing and reforming, balance of plant, systems controls and power conditioning electronics.

Specifically in Ohio, Delphi's Packard Electrical/Electronic Architecture division will play an integral supporting role within the project. Packard is a leader not only in cable quality, but also in managing the complex connections and durability issues associated with new innovative electrical system products. By employing expertise in wiring and electrical connection systems at the Champion Technical Center in Warren, Ohio, Packard will adapt and re-engineer existing components, currently utilized in electric and hybrid electric vehicles, specifically for development of the fuel cell power systems proposed.

Thank you for your consideration of the proposed agreement.

Sincerely,



Jerrold L. Hutton, Ph.D.
Dean
Energy Institute

JH/alm

InnoVentures Incorporated
4413 Hamann Parkway
Willoughby, OH 44094
ph: (440) 975-0603
fax: (440) 975-0286

OTFFCP 11-114

September 10, 2010

Ohio Third Frontier Fuel Cell Program (OTFFCP)
Ohio Department of Development
Technology & Innovation Division
77 South High Street, 25th Floor
Columbus, OH 43215

LETTER OF INTENT

InnoVentures, Inc. with operations in Willoughby, Ohio intends to submit a proposal entitled "Reduced Cost Manufacturing of Composite Bipolar Plates" for fuel cell applications in response to the Third Frontier Fuel Cell Program (OTFFCP) fiscal year 2011 Request for Proposals (RFP).

Per the requirements of the OTFFCP Request for Proposal please note the following:

Lead Applicant's Name:	**InnoVentures Incorporated**
Address:	4413 Hamann Parkway Willoughby, OH 44094
Contact Name:	Charles Tanzola
Telephone Number:	973-945-9560
Email:	charles.tanzola@innoventuresfcc.com
Project Name:	Reduced Cost Manufacturing of Composite Bipolar Plates
Est. Funds Requested:	Third Frontier R&D Funding: $1.0 million; Wright Capital Funds: $1.0 million

The project team includes key representation in the targeted technology and markets from:

- Bulk Molding Compounds, Inc. (Perrysburg, OH). Formulation and compounding of conductive plate materials for use in fuel cells and flow batteries.
- The Edison Materials Technology Center (EMTEC). Experience in project management, product development and commercialization.
- Case Western Reserve University Case Fuel Cell Center. World-class technical leadership and state-of-the-art equipment specializing in fuel cells, batteries, and fundamental/applied electrochemistry.

The team is pleased to provide this letter indicating our intent to submit a full proposal for the fiscal year 2011 OTFFCP funding.

Yours truly,

Charles Tanzola
Chief Technical Officer
InnoVentures Incorporated

McKay, Michael J.

From: Diane Sadowski [dlsdesign@cox.net]
Sent: Thursday, September 09, 2010 9:40 PM
To: OTFFCP2011
Cc: 'FirstFuelCells.com'
Subject: 2011 OTFFCP LOI: FirstFuelCells.com Response Letter

September 8, 2010

OTFFCP 11-115

The Ohio Department of Development
Technology Division
77 South High Street, 25th Floor
Columbus, OH 43215
Email: OTFFCP2011@development.ohio.gov

Please accept this letter of interest submitted in response to the recent Ohio Third Frontier request for proposal:

Lead Applicant's Name: Diane Sadowski
Address: FirstFuelCells.com
11163 Blossom Ave.
Parma Heights, OH 44130

Office Phone Number: 440-884-2503
Cell Phone Number: 440-554-4711
Contact Person: Diane Sadowski, President
Email Address: diane@firstfuelcells.com

Proposed Project Title: "Establishing a Fuel Cell Business based on a Competition-Driven Education Program"

Estimated Grant Funds Requested: $250,000.

Brief Description: The objective of this project is to establish a fuel-cell business in the State of Ohio based on work pioneered by FirstFuelCells.com over the past 4 years. The company has established a competition-driven fuel cell education program with Ohio-based suppliers, colleges, and instructors creating an effective model for both learning and early adoption business sales. The Grant Funds will be used to hire full-time instructors, sales, and operations people (5) located in Ohio to demonstrate the new competition format and to replicate the competition throughout the State of Ohio by 2012. The company projects the business will be self-sufficient by 2013 if demonstration is successful this year.

Thank you for considering this exciting opportunity,
Sincerely,

Diane Sadowski
President FirstFuelCells.com

OTFFCP 11-116

2011 BOSE OTFFC- LOI.doc

Letter of Intent in response to Ohio Third Frontier Fuel Cell Program (2011 RFP)

Lead Applicant:	Ohio University
Address:	Institute Sustainable Energy & Environment, Chemical and Biomolecular Engineering Ohio University, Athens, OH 45701
Contact Person:	Anima Bose, Ph.D. Phone: (740) 597 3297; (740) 818 7154 Email: bosea@ohio.edu
Project Title:	**High Temperature PEM Fuel Cell Systems with Practical Fueling Options**
Estimated Grant Funds To be requested:	~ $1,000,000
Collaborator:	WESys Technologies, Inc. Contact: Mohammad Enayetullah, Ph.D. E-mail: maenayetullah@gmail.com Phone: 781-771-7785 (moblile)
Consultant:	Argonne National Laboratory Contact: Junbing Yang, Ph.D. E-mail: yangj@anl.gov Phone: (630) 252-4699

High Temperature PEM Fuel Cell Systems with Practical Fueling Options (Project Summary)

Under the Frontier Fuel Cell Program, Ohio University in collaboration with WESys Technologies, Inc. (WESys) proposes to pursue an advanced product development effort aimed at producing high temperature (HT) (up to 200°C) proton exchange membrane (PEM) fuel cell systems (power range: ~1kW) for a variety of portable as well as small stationary power applications in existing niche and emerging large-scale industrial/commercial markets.

Development of high temperature PEM materials over the past several years has opened the opportunity to address the following major issues that have thus far impeded the commercial success of PEM fuel cell technology:

- Cost – Non-fluorinated PEM (low-cost); no need of reactant gas humidifier (cost & size reduction); minimal cooling load for stack (cost & size reduction);
- Durability – Phosphoric acid doped HT PEM follows PAFC chemistry with proven durability of > 50,000 hours as compared to <5,000 hours for conventional PEMFC; and
- Convenient Fueling – At high temp (150-200°C) PEM fuel electrodes are much more resistant to contaminants (e.g., up to 2-3% CO); cheap reformates derived from readily available fuels (alcohols, methane, propane, butane, kerosene, etc.) are practical options.

The proposed project will be aimed at demonstrating the stated benefits of HT-PEM technology in functional stacks/systems. Specifically, this project will include the following activities:

- Design, development and demonstration of a 500W fuel cell stack using HT PEM MEAs containing advanced catalysts;
- Optimization of assembly process for stacks and their performance with respect to operating regime, manufacturability and durability; and
- Design, integration and evaluation of the first system prototype by the end of the project.

Ohio university has placed special emphasis on alternate energy research which is an integral part of recently created 'Energy and Environment" Center of Excellence approved by the Chancellor of the Ohio Board of Regents. Ohio University has resources and infrastructure to pursue the research and development work proposed in this Letter of Intent. WESys, a new start-up company, currently located in Boston suburb (MA), is engaged in developing/advancing HT PEM and related technologies including catalysts, membrane electrode assembly (MEA) and stack and system integration. WESys is exploring the opportunity to relocate Ohio University Innovation Center and develop the proposed technology in partnership with Ohio University (OU) and Argonne National Laboratory (ANL) by utilizing proprietary materials jointly developed by OU and ANL.

Bulk Molding Compounds, Inc. a Citadel Plastics Holdings Company
P.O. Box 3354 • Dublin, Ohio 43016 • USA
Cedric A. Ball - Global Marketing Director

OTFFCP 11-117

September 10, 2010

Ohio Third Frontier Fuel Cell Program (OTFFCP)
Ohio Department of Development
Technology & Innovation Division
77 South High Street, 25th Floor
Columbus, OH 43215

LETTER OF INTENT

Bulk Molding Compounds, Inc. (BMCI) headquartered in West Chicago, Illinois and with active fuel cell material production operations in Perrysburg, Ohio intends to submit a proposal entitled "Reduced Cost Manufacturing of Composite Bipolar Plates" for fuel cell applications in response to the Third Frontier Fuel Cell Program (OTFFCP) fiscal year 2011 Request for Proposals (RFP).

Per the requirements of the OTFFCP Request for Proposal please note the following:

Lead Applicant's Name:	**Bulk Molding Compounds, Inc.**
Address:	12600 Eckel Road Perrysburg, OH 43551
Contact Name:	Cedric A. Ball, BSGE, MBA
Telephone Number:	614-477-2139
Email:	cball@bulkmolding.com
Project Name:	Reduced Cost Manufacturing of Composite Bipolar Plates
Est. Funds Requested:	Third Frontier R&D Funding: $1.0 million; Wright Capital Funds: $1.0 million

The project team includes key representation in the targeted technology and markets from:

- InnoVentures, Inc. (Willoughby, OH). Design and manufacture of composite bipolar plates for fuel cell and vanadium redox batteries.
- The Edison Materials Technology Center (EMTEC). Experience in project management, product development and commercialization.
- Case Western Reserve University Case Fuel Cell Center. World-class technical leadership and state-of-the-art equipment specializing in fuel cells, batteries, and fundamental/applied electrochemistry.

The team is pleased to provide this letter indicating our intent to submit a full proposal for the OTFFCP funding.

Yours truly,

Cedric A. Ball
Bulk Molding Compounds, Inc.
Global Marketing Director and Commercial Leader, Fuel Cells

Bulk Molding Compounds, Inc. a Citadel Plastics Holdings Company
P.O. Box 3354 • Dublin, Ohio 43016 • USA
Cedric A. Ball - Global Marketing Director

Project Title

Reduced Cost Manufacturing of Composite Bipolar Plates

Description of Proposed Project

Proton Exchange Membrane fuel cells (PEMFC) have emerged as one of the most cost-effective types of fuel cell technologies available to the market. However, even in the case of PEM-based fuel cells, their high cost relative to other power sources has inhibited widespread application. The bipolar plates that comprise the stack constitute a major cost component of the total fuel cell. Depending on the design, the cost of the stack can make up one-third of the fuel cell cost. Metallic bipolar plate concepts have some advantages, but issues such as total cost (especially due to the use of precious metals), corrosion resistance, interfacial contact resistance (ICR) and reactant gas impurities still need to be resolved. Advances in polymer composites for bipolar plates, on the other hand, have proven to be an effective alternative to conventional metallic plates. The broader use of polymer composites has been dismissed based on the assumption that they cannot be produced cost effectively at relatively high volumes (> 100,000 p.a.). Short cycle time, net shape molding of polymer composite plates are practical and can significantly reduce the cost of stack assemblies without sacrificing critical performance characteristics such as corrosion resistance, electrical and thermal conductivity, parallelism, physical properties, and longevity. Building upon existing work and knowledge by the collaborating team, this project aims to demonstrate the feasibility of high volume, low cost, polymer composite plates meeting these criteria via improvements in material composition and molding techniques.

OTFFCP 11-118

Letter of Intent

Lead Applicant Name: Columbia Gas of Ohio a NiSource Company
Address: 200 Civic Center Drive, Columbus, Ohio 43215
Telephone Number: 614-460-6947
Contact Person: Charles Crews, Director, Customer Programs, NiSource Gas Distribution
Proposed Project Title: Natural Gas Fueled Residential Fuel Cell System Demonstration
Estimated Grant Funds to be Requested: $1 million
Known Collaborators: Technology Management, Inc., CK Technologies LLC

Project Summary:
The Columbia Gas of Ohio team proposes to build and demonstrate natural gas fueled residential scale prototype fuel cell and electronic interconnect systems generating clean electricity. Natural gas is available throughout the United States and small-scale power systems present an opportunity for distributed generation that could transform today's electrical power grid. In addition to clean reliable on-site electricity, small scale systems can provide adaptable power production to the future "smart grid" providing the opportunity for management of on-site electricity generation as well as user loads. Residential power systems are also expected to help ease the transition from internal combustion engine vehicles to plug-in hybrid and electric vehicles, providing power at the source of charging, where needed.

OTFFCP 11-119

Ohio Third Frontier Fuel Cell Program
Letter of Intent

Lead Applicant: The University of Akron
302 Buchtel Common
Akron, Ohio 44325

Contact Person: Prof. Robert A. Weiss
Department of Polymer Engineering
Polymer Engineering
Academic Center
The University of Akron
Akron, OH 44325-0301

Email: rweiss@uakron.edu
Phone: 330-872-2581

Project title: Advanced Composite PEMs for Fuel Cells

Anticipated grants funds to be requested: $1,100,000 ($1,000,000 from the Third Frontier Research and Development Fund and $100,000 from Wright Capital Fund)

Known collaborators: Akron Polymer Systems
2990 Gilchrist Rd.
Akron, OH 44305

University of Akron
Profs. Robert Weiss, Miko Cakmak and Alamgir Karim
Department of Polymer Engineering

Proposal Summary

State-of-the-art polymer electrolytes for proton exchange membranes (PEMs), such as Nafion™, have a number of deficiencies, including high cost, relatively low operating temperature, insufficient durability in the swollen state, poor resistance to crossover of hydrogen to the oxygen electrode and difficult water management. Those problems and the large market potential for fuel cells have motivated considerable research in pursuit of alternative materials for PEMs for fuel cells. The essential property requirements of a PEM are chemical and electrochemical stability, durability and adequate mechanical stability and strength to ensure dimensional stability when swollen and under tension, surface properties compatible with bonding catalytic electrodes to the membrane, low permeability for reactants and products and high ionic conductivity for large current densities and low internal resistances.

For Nafion™ and similarly designed single-ion polymers, the transport and mechanical properties are intimately coupled, which does not allow independent optimization of the transport and mechanical properties. High ion-exchange capacity (IEC) membranes have high water absorption, which reduces the mechanical stability and durability of the membrane. Optimizing mechanical properties reduces the proton conductivity. This proposal concerns the development of composite PEMs wherein both proton transport and durability can be independently addressed. That will be accomplished with multi-phase systems, where a dispersed phase has high ion-exchange capacity (IEC) for high proton conductivity and a continuous phase is hydrophobic and provides mechanical stability. Under a grant from the National Science Foundation, Prof. Weiss developed polymer blend PEMs where a high IEC phase was dispersed in a relatively hydrophobic polymer and electrically aligned to develop high proton conductivity, Fig. 1 [1]. That work demonstrated the concept for small samples produced in a batch process.

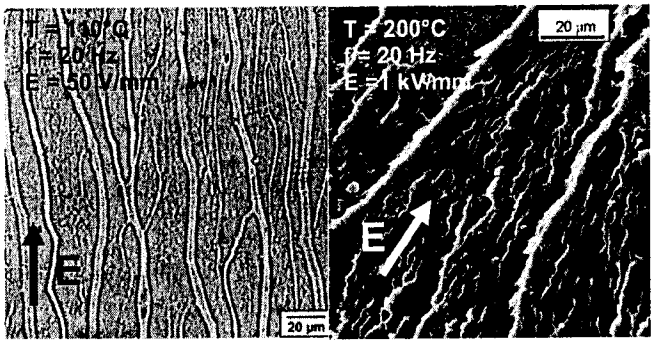


Fig.1 Electric field aligned PEM membranes of sulfonated polyetherketoneketone (SPEKK) dispersed in poly(ether imide): (a) in-plane alignment of SPEKK (1.3 meq/g); (b) through plane alignment of SPEKK (1.9 meq/g).

The objective of this proposal is to further improve the properties of the membranes reported by Weiss, and demonstrate the commercial feasibility of producing high quality membrane material in a cost effective process using novel roll-to-roll field directed alignment manufacturing procedures and equipment developed at the Univ. of Akron (UA) by Prof. Cakmak, and sulfonated polysulfone ionomers (sPSu) produced by Akron Polymer Systems (Akron, OH). Specifically, the project involves two general PEM designs: 1) blends of highly sulfonated (high IEC) polysulfone (HsPSu) with a relatively low IEC polysulfone (LsPSu) and 2) blends of electrospun HsPSu nanofibers dispersed in LsPSu. In both cases, the high IEC phase provides high proton conductivity and the low IEC phase provides mechanical stability and durability. Akron Polymer Systems will be responsible for scaling up the specialized polymers, and supplying them to The University of Akron for fabrication of pilot scale commercial materials for evaluation by PEM fuel cell system integrators. For full-scale market entry and growth, a licensing agreement for the roll-to-roll process with APS or other interested Ohio firms will be negotiated.

1. Gasa, J., R. A. Weiss and M. T. Shaw. 2008. Structured polymer electrolyte blends based on sulfonated polyetherketoneketone (SPEKK) and a poly (ether imide) (PEI), J. Membr. Sci., 320: 215-223.

OTFFCP 11-120

Letter of Intent

For FY2011 Ohio Third Frontier Fuel Cell Program

Lead Applicant: Cougar Lawn and Garden, LLC d.b.a. Cougar Outdoor Power Products (Cougar)
1515 Alum Creek Drive
Columbus, Ohio 43209
877-469-2684 (phone)
614-884-3545 (fax)

Lead Contact: Micheal "Mike" Watkins, President/CEO
614-302-2419 (phone)
mwatkins@thecougargroup.com

Proposed Project Title: Commercialization of Multi-Fuel Fuel Cell Auxiliary Power Units

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

Known Collaborators: Global Energy Innovations, Inc. (GEI)
Dominovas Energy, LLC

Proposed Project Summary:
This project seeks to leverage the expertise of Cougar, the lead applicant, and its collaborating companies, Global Energy Innovations, Inc. and Dominovas Energy, LLC to promote the goals of the Ohio Third Frontier (OTF) by advancing our fuel cell technology through phases 4 (Market Entry) and 5 (Growth and Sustainability) of the Technology Commercialization Process.

We have developed advanced fuel cell Auxiliary Power Units employing High Temperature Polymer Exchange Membrane (HTPEM) fuel cell power systems that are silent, environmentally friendly, and capable of reforming multiple fuel resources to provide multiple, reconfigurable power output channels. Our competitive advantage is the economical utilization of globally available fuels (diesel, natural gas, propane, ethanol, methanol, methane, and bio-fuels) which provide a pathway to high volume commercialization of the fuel cell power systems. Traditionally, the requirement for a nearly pure hydrogen fuel source for the PEM fuel cells combined with the lack of a hydrogen infrastructure has been, and will continue to be, a major barrier to entry on a global scale to achieve acceptance and implementation of fuel cell technology. However, our innovative technology is customer-centric and is driven by a commercialization reality that provides for the rapid deployment and sales of fuel cell power systems to markets restricted by the lack of a hydrogen infrastructure.

The current RUBICON (patented technology) series will provide for portable and on-board power generation requirements ranging from 2kW to 10kW. The system was successfully tested on multiple fuels including diesel, natural gas, hydrogen, and military grade JP8 fuel at the Sloan Kettering University Center for Fuel Cell Systems Integration. As evidenced by the purchase of a 3kW unit by Concurrent Technologies Corporation in 2010 for deployment at Robins Air Force Base for use in aircraft military tow tractors, the successfully vetted RUBICON is now ready for additional market entry in residential, commercial, emergency, and industrial applications. Our initial focus is to develop the technology for outdoor power equipment applications such as portable and stationary power generators/systems, lawn mowers, snow throwers, hand held products and other outdoor power equipment that currently utilizes fossil fuels. Portable and stationary power generation products will be Phase 1 of our commercialization project.

The challenges to market entry, growth, and sustainability are successfully addressed by confirmed clients with domestic and international end-users.

OTFFCP 11-121

8 September, 2010

Ohio Third Frontier Fuel Cell Program Fiscal Year 2011 (OTFFCP FY11)
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 OTFFCP FY11 Proposal to ODOD

Dear Ohio Department of Development Representative:

Stratum Energy System is hereby submitting this Letter of Intent to submit a proposal in response to the 2011 Ohio Third Frontier Fuel Cell Program RFP.

Prospective Lead Applicant's Name:	Stratum Energy Systems, LLC.
Prospective Lead Applicant's Address:	1791 East 40th Street, Cleveland, Ohio 44103
Contact Person:	J. Mark Daroux
Contact Person Phone Number:	216-233-1435
Contact Person E-Mail:	markdaroux@yahoo.com, mdaroux@stratumenergy.com
Proposed Project Title:	Low Cost Liquid Fuel Cell Range Extender for Electric Vehicles and Other Applications
Estimated Funds Requested:	$1,000,000
Known Collaborators:	Swift Enterprises, University of Akron, others to be determined

Sincerely,

Mark Daroux,
President
Stratum Energy Systems, LLC.

Project Summary: Low Cost Liquid Fuel Cell Range Extender for Electric Vehicles and Other Applications

One of the biggest obstacles to the widespread adoption of the electric vehicles is the limited driving range available at an affordable price. A large enough battery to give a range of much more than a hundred or so miles adds an unacceptable cost to a vehicle, and current fuel cell technology is even more expensive. This proposal addresses the problem by combining a low cost fuel cell and a lithium-ion battery pack. The battery pack provides adequate power and the fuel cell extends the affordable range while allowing for potential increases in fuel efficiency.

Stratum Energy already manufactures a 10 kWh lithium-ion polymer battery pack for application in a PHEV using an internal combustion engine. Over the last few years Stratum in partnership with Swift Enterprises has been developing a low cost fuel cell based on Swift's non-platinum catalysts, and it is to proposed to pair this fuel cell with the battery pack that could be applied to an all-electric vehicle. Swift will provide the catalyst system and the liquid fuel technology, and Stratum will develop the membrane-electrode assembly and cell manufacturing process that will allow the construction of a scaled up power pack. The University of Akron will provide the test facilities and the integrated electronics for the battery and fuel cell management systems. Other potential applications for this low cost fuel cell technology will also be explored.

OTFFCP 11-122

AMERICANTRIM

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

Lead Applicant:	American Trim, LLC 1005 W. Grand Ave. Lima, OH 45801
Contact Person:	Steve Hatkevich Director, Research & Development 419-996-4740 shatkevich@amtrim.com
Expected Collaborators:	The Ohio State University, Ohio Northern University, the Edison Materials Technology Center, the Ohio Energy & Advanced Manufacturing Center, Velocys
Proposed Project Title:	Low-cost Manufacturing System for Fuel Cell Components
Estimated Grant Funds:	$1,000,000

Description:
American Trim and it's partners will advance the state-of-the-art in low-cost manufacturing of fuel cell components from prototype to production applications. Today fuel cells are technically feasible but not economically viable. Fuel cells are limited by the high cost of sub-components. To reduce the cost and expand markets, the team will develop and commercialize low-cost manufacturing system for fuel cell components. The project team will design the components for manufacturability while maintaining functionality and quality. This approach will consider all requirements of functionality within a constraint of manufacturability which will drive costs down.

By leveraging work already completed through prior Third Frontier investments, the team is prepared to advance the technologies and transition from "Demonstrating" to "Market Entry" stage within the project period specified. With the help of the Third Frontier funding, the low-cost manufacturing system will be marketable in two different ways: as a stand-alone technology that can be marketed and as a component part manufacturing system used to produce parts internally for other manufacturers. In this way, American Trim will be positioned to add significant numbers of jobs internally and provide enabling technology that will allow additional job creation for users of the technology.

Energy Technologies, Inc.

Rugged Power ◦ Global Solutions

OTFFCP 11-123

September 10, 2010

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

Subject: 2011 OTFFCP LOI

Dear Sir or Madam,

We are very pleased to have this opportunity to submit this Letter of Intent in response to the Third Frontier Fuel Cell Program Request for Proposals.

Energy Technologies, Inc. (ETI) of Mansfield, OH, develops, manufactures, and sells products that are the standard in rugged, high-reliability power generation, power conditioning and computer peripherals for military, industrial, medical and telecommunications sectors.

We are collaborating with Energy Conversion Devices, Inc. in the development of fuel cell products for the defense industry. One of the outstanding issues is the method of producing hydrogen for use by the fuel cells in the field.

The key information requested in the RFP is provided below:

Applicant Name:	Energy Technologies, Inc.
Address:	219 Park Avenue East, Mansfield, OH 44902
Phone Number:	419.522.4444 Contact
Person:	P. D. Madden, PE
E-mail Address:	pdmadden@ruggedsystems.com

Proposed Project Title: Integration of Bio-Mass/Hydro-Carbon reformation in the Tactical Fuel Cell.
Project Type: Research, Development, and Commercialization

Sincerely,

P. D. Madden, PE
CEO/General Manager

Project Summary

The project will focus on taking the proof of concept and bench scaled demonstration Bio-Mass/Hydro-Carbon reformation hardware and demonstrating the ability of integrating a specific designed and configured Bio-Mass/Hydro-Carbon reformation module to the Tactical Fuel Cell Generator completed under TECH 08-056.

The ability to field generate directly usable hydrogen is a key component to the success of deploying a Tactical Fuel Cell Generator in "Forward Operation Base" applications. This technology approach allows for the use of solid waste from locally available raw materials and/or with any available fuel sources to produce the needed hydrogen fuel. The technology will allow the process to function without a high overhead of parasitic power from the Tactical Fuel Generator. This program will enable a cost-effective and mission support approach to the production of hydrogen without dependence on a dedicated infrastructure supply chain.

Some of the highlights of the approach are as follows:

- Direct high purity hydrogen production from variety of feedstocks/ fuels
- No CO, CO2 or other greenhouse gas by-products (green process), CO2 is sequestered as Na2CO3
- One step reaction (making reformer design simpler)
- No need for additional H2 purification processing steps [Gas shift and Pressure Swing Absorption (PSA)] required by other reforming approaches (steam reforming, autothermal reforming, partial oxidation, etc.)
- Scalable down to sizes appropriate for localized production (eliminates expensive distribution)
- Reformation of multiple fuels demonstrated
- Low temperature reaction along with low pressure makes materials of construction less expensive and results in smaller overall size

This project will also address the technology and hardware packaging to operate in a Tactical Case similar to the Tactical Case housing the Fuel Cell Generator and Nickel Metal Hydride Hydrogen storage vessels. This project will now allow for a complete the total deployable system fuel cell system to be delivered to the Forward Operating Base locations.

This program will enable a mission supported and cost-effective approach to the production and use of hydrogen in the Tactical Fuel Cell Generator and enhance the opportunity for the creation of new jobs in the state of Ohio.

DJW TECHNOLOGY, LLC

OTFFCP 11-124

September 9, 2010

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

Dear Sir/Madam:

SUBJECT: 2011 OHIO THIRD FRONTIER FUEL CELL PROGRAM LETTER OF INTENT

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

The prospective Lead Applicant's name with the address and phone number is:
DJW TECHNOLOGY, LLC
5018 Ballybridge Drive
Dublin, OH 43017-8201
Phone: 614-761-9287

The contact person with his E-mail address is:
Douglas Wheeler
E-mail: douglas.wheeler@djwtechnology.com

The proposed Project title is:
Manufacture of Fuel Cell Systems for Unmanned Aerial Vehicles and Unmanned Undersea Vehicles

The estimated Grant funds to be requested are:
$1,000,000

The known Collaborators are:
The applicant's team consists of DJW TECHNOLOGY, LLC, TreadStone Technologies, Inc., and the Naval Research Laboratory

5018 BALLYBRIDGE DRIVE, DUBLIN, OH 43017
PHONE: 614-761-9287 FAX: 860-838-9012
MOBILE: 860-614-2286
EMAIL: douglas.wheeler@djwtechnology.com

The on page summary of the proposed Project is:

DJW TECHNOLOGY, LLC has successfully consulted to the Naval Research Laboratory (NRL) in the development of a fuel cell system for an Unmanned Aerial Vehicle (UAV). The first of its kind UAV demonstration by NRL set the world durability record for fuel cell powered UAVs, over 23 hours continuous operation. For this program, the NRL received accolades from the U.S. Navy and the Department of Defense and additional funding through the Office of Naval Research. NRL has requested and will fund DJW TECHNOLOGY to participate in the design, development, and manufacture of the next generation fuel cell for UAV applications. NRL has also requested and will also fund DJW TECHNOLOGY in the design, development, and manufacture of fuel cell stacks for an Unmanned Undersea Vehicle (UUV). DJW TECHNOLOGY, LLC proposes to develop the fuel cell manufacturing and assembly facility for UAVs and UUVs in Ohio with the support of the Ohio Third Frontier Fuel Cell Program.

DJW TECHNOLOGY, LLC has teamed with TreadStone Technologies, Inc to develop the UAV and UUV fuel cell stack. TreadStone Technologies has a proprietary coating for stabilizing metal bipolar plates in PEM fuel cell systems. The use of metal bipolar plates will greatly reduce the weight of fuel cell system which will be an improvement over the initial UAV fuel cell. DJW TECHNOLOGY has identified Ohio based companies that can manufacture and process bipolar plates prior to the coating application by TreadStone Technologies. DJW TECHNOLOGY will work with Ohio based universities to design the flow fields, reactant distribution systems, and humidification system. DJW TECHNOLOGY will work with Ohio based manufacturers to design and build the manifolds, endplates, and ancillary components for the PEM fuel cell stack. The UAV and UUV fuel cell stack manufacturing facility will be established by DJW TECHNOLOGY in Ohio.

Founded in 2004, DJW TECHNOLOGY is a fuel cell and hydrogen technology company that provides analysis and evaluation of fuel cell technology, hydrogen technology, and renewable energy technology to National Renewable Energy Laboratory, the U.S. DOE, the U.S. Navy and the Hawaii Natural Energy Institute of the University of Hawaii and to private industry. Douglas Wheeler is the owner of DJW TECHNOLOGY and he has over 40 years research, development and commercialization experience specializing in the fuel cells and hydrogen technology. Douglas Wheeler was at UTC Power, LLC for over 17 years and managed the Advanced Technology Group.

Sincerely,

Douglas J Wheeler
President
DJW TECHNOLOGY, LLC

OTFFCP 11-125

Date: September 10, 2010

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

From: Chemical Engineering Dept
The University of Akron
Akron, OH 44325-3906
Contact Person: Steven S. Chuang
Phone Number: 330-972-6993
E-mail Address:schaung@uakron.edu

Proposed Project Title: Biomass Fuel Cell

Grant Funds to be requested: $850,000

Possible Collaborators: Coal Fuel Cell, Inc.

Project Description

The University of Akron Fuel Cell Laboratory has demonstrated that the direct conversion of biomass-derived carbon to electricity through a solid oxide fuel cell (SOFC) is technically feasible. To facilitate commercialization of the direct carbon fuel cell, the PI has teamed up with Coal Fuel Cell, Inc. to conduct a detailed technology/market assessment of this novel biomass fuel cell technology. Preliminary analysis shows that this novel technology can be used for both central and distributed power generation and could revolutionize the technology for electric power generation with nearly zero net emission of CO_2.

The successful implementation of this proposal will move the biomass fuel cell technology toward the mid-size scale demonstration (i.e., 135 kW) and the manufacturing of 100-300 kW DC distributed power stations. The biomass fuel cell technology is highly knowledge intensive and requires employment of highly educated workforce. The successful commercialization of this technology will increase the employment of high paid knowledge workers in Ohio.

OTFFCP 11-126

UNIVERSITY OF Cincinnati

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Daniel.Hassett@UC.Edu

September 10, 2010

The Ohio Department of Development
Technology and Innovation Division, Attention: OTFAEP
77 S. High St., 25th floor
Columbus, OH 43215

Subject: Letter of Intent for Third Frontier Fuel Cell Program (2011 OTFAEP LOI)
OTFAEP2011@development.ohio.gov

To whom it may concern:
This serves as our letter of intent to submit a proposal regarding the RFP entitled *Ohio Third Frontier Fuel Cell Program*.

Lead Applicant:	Daniel J. Hassett, Ph.D., Professor
Address:	Department of Molecular Genetics, Biochemistry and Microbiology University of Cincinnati College of Medicine, 231 Albert Sabin Way Cincinnati, OH 45267-0524
Phone:	513-558-1154
Contact Person:	Daniel J. Hassett, Ph.D., Professor Daniel.Hassett@UC.Edu
Project Title:	Establish an Ohio-Based Electrogenic Bioreactor and Microbial Fuel Cell Research and Development Institute.
Collaborators:	**Ohio Universities:** University of Cincinnati, The Ohio State University, Ohio University, Case Western Reserve University **Ohio Companies:** Pilus Energy, LLC, JTM Food Group, MeasureNet Technology, Ltd., Smith Engineering, Inc.

Estimated Dollars: The estimated financial scope of the project will be $1,000,000 in state funding requiring 36 months to achieve the proposed objectives using OTF and/or WCF support.

Project Scope: Our mission is to foster an interdisciplinary "cleantech" energy industry focused on biogas, biomass, and direct current electricity production by unifying multiple research institutions and companies within the State of Ohio, culminating in the formation of a Research and Development Institute.

Sincerely yours,

Daniel J. Hassett, Ph.D.

Daniel J. Hassett, Ph.D.
Professor

PROJECT SUMMARY

Establish an Ohio-Based Electrogenic Bioreactor and Microbial Fuel Cell Research and Development Institute

The development of Microbial Fuel Cells (MFCs) is a very promising cleantech technology that uses bacteria to produce energy in the form of direct current (DC) electricity and biogases, such as hydrogen gas and methane. A variety of wastes can be used as feedstock for the bacteria. The MFC technology is highly exciting and the goal of the proposed project is to bring together expertise on all different aspects of MFC technology in an R&D setting and to have a prototype MFC ready for commercial production that can generate power from wastes at the end of the requested three year funding period.

The lead applicant for this project, Dr. Hassett, leads a laboratory at the University of Cincinnati College of Medicine that specializes in the genetics and physiology of multiple pathogenic and nonpathogenic bacteria. Dr. Hassett is particularly interested in bacterial biofilms, a critical component of the anodic efficacy of an MFC. The proposed collective, interdisciplinary team of Ohio scientists from Ohio State University, Ohio University, and Case Western Reserve University directed by Dr. Daniel Hassett will mostly be focused on (a) enhancing the biological properties of the bacteria, (b) optimization of the engineering and fabrication aspects of novel MFCs and bioreactors in a highly integrated, transparent nature, and (c) advancing research to discover and harness new cleantech energy products already existent in biological systems. This university-wide collaboration represents a unique model for fostering a state-of-the-art Biomimicry Energy Research Institute.

To develop cleantech energy ready for commercial production the Biomimicry Energy Research Institute directed by Dr. Hassett will work in close collaboration with Pilus Energy, a Cincinnati-based company that proposes to design, prototype, and implement on-site cleantech electrogenic bioreactors with the aforementioned capacities. The Pilus bioreactor harnesses the metabolic prowess of avirulent, genetically-modified bacteria that not only reduce BOD/COD of candidate wastes, but also generate direct current (DC) electricity and H_2 from their metabolism of organic compounds. The Pilus bioreactor has been proven to generate enough energy to power a LED light.

The energy source for the MFC, waste material, and advice on wastewater treatment, management and energy recovery will be provided by the following two Ohio based companies: JTM Food Group and Smith Engineering, Inc. Expertise and support in electronic data acquisition will be provided by MeasureNet Technology, Ltd, a Cincinnati based company with a plethora of electronic data acquisition instruments.

Bringing MFC, bioreactors, and fuel cell technologies to the market will result in the creation of high-tech manufacturing jobs in Ohio in the field of green energy.