Calendar Year 2014 Innovation Platform Program

Letters of Intent Received

Proposal #	Lead App	Title	Funds Requested	Total Project Budget	Project Focus Area
14 - 301	The Ohio State University	Carbon Nanomaterials based Platform Technology	$2,000,000	$4,000,000	Advanced Materials
14 - 302		Withdrawn			
14 - 303	The Ohio State University	Energy Storage Innovation Center (ESIC) (for Multi-chemistry Applications)	$3,000,000	$6,000,000	Fuel Cells and Energy Storage
14 - 304	University of Akron	Enhanced survivability Run Flat Tires-Carbon Fiber Zero Pressure Tire	$2,000,000	$3,000,000	Advanced Materials, Agribusiness and Food Processing
14 - 305	Ohio University	The Ohio Shale Platform: Commercialization of Cost Effective Wastewater Treatment Technol	$2,000,000	$4,000,000	Shale
14 - 306	University of Akron	Akron Functional Materials Center	$3,000,000	$6,000,000	Medical Technology
14 - 307	The Ohio State University	Advanced Integration and Management of Electrical Power and Propulsion Systems	$1,500,000	$3,000,000	Aeropropulsion Power Management
14 - 308	Cleveland Clinic Foundation	Concussion Management and Prevention Program	$3,000,000	$6,000,000	Sensing and Automation Technologies, Software Applications for business and healthcare, Medical Technology
14 - 309	University of Toledo	Platform for Developing Innovative Biocomposite Products for Biomedical Applications	$2,500,000	$5,000,000	Advanced Materials, Medical Technology
14 - 310	Kent State University	Electrochromodynamic materials	$3,000,000	$6,000,000	Advanced Materials
14 - 311	National Composites Center	Recycling of End-of-Life Composites and New Application Development	$1,000,000	$2,000,000	Advanced Materials
14 - 312	University of Akron	Scalable Nanomanufacturing of Functional Films using a Roll to Roll Process	$3,000,000	$6,000,000	Advanced Materials, Fuel Cells and Energy Storage
14 - 313	Case Western Reserve University	Functionalization and Dispersion of Nanocomposites for Next Generation Electronic and Medic	$3,000,000	$6,000,000	Advanced Materials
14 - 314	The Ohio State University	Engineering Analysis Hub: An Innovative Design Platform for Rapid Product Commercializatio	$1,350,000	$2,700,000	Software Applications
14 - 315	BioHio Research Park, an Affiliate	Spray Technology Application Research & Commercialization Center	$3,000,000	$6,000,000	Agribusiness and Food Processing
14 - 316	Battelle Memorial Institute	Development and Commercialization of Complex, Software-enabled Medical Devices	$1,130,000	$7,000,000	Software Applications for business and healthcare, Medical Technology
14 - 317	University of Akron	Smart Sensor and Sensor System Design, Development, and Commercialization	$1,500,000	$3,000,000	Sensing and Automation Technologies
14 - 318	The Ohio State University	Biobased Composites Innovation Platform	$3,000,000	$6,000,000	Advanced Materials, Agribusiness and Food Processing
14 - 319	Cleveland Clinic	Endovascular Technology Innovation Center	$3,000,000	$6,000,000	Medical Technology
14 - 320	Cleveland Clinic Foundation	Gene Reprogramming Therapeutics	$3,000,000	$6,000,000	Medical Technology
14 - 321	Cleveland Clinic Foundation	Inhaled Drug Device Combinations	$3,000,000	$6,000,000	Medical Technology
14 - 322	Cleveland Clinic Foundation	Magnetic Resonance Imaging to Develop and Commercialize Translational Biomarkers for Neu	$3,000,000	$6,000,000	Medical Technology
14 - 323	Cleveland Clinic Foundation	Interactive Visual Health Record	$3,000,000	$6,000,000	Software Applications for business and healthcare
		Total State Funds Requested	***$53,980,000***		

IPP 14-301

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**The Ohio State University**
Lead Applicant Contact Information	**Name: L. James Lee**
	Title: Professor
	Phone Number: (614) 292-2408
	E-mail: lee.31@osu.edu

Project Title:	Carbon Nanomaterials based Platform Technology

Total Project Budget	$ 4,000,000	**Ohio Third Frontier Funds Requested**	$ 2,000,000

Project Focus Areas

- ☐X Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Carbon nanomaterials and nanotubes, polymers and composites
Anticipated Markets	Transportation, Building

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

   We propose an Innovation Platform based on existing unique technology capabilities at The Ohio State University (OSU) in the area of carbon nanomaterials and nanopapers with near-term commercialization potential in the transportation and building industries. Most pilot-scale equipment and facilities are available in the OSU laboratories.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

   For transportation applications, OmnovaSolutions- a leading polymer coating supplier in the US will collaborate with OSU and NIL as an industry client to develop new coating resins and technologies for enhanced surface erosion protection and EMI shielding of injection molded automotive panels. Their anticipated cash cost share is $450,000 for the 3-year funding period.

IPP 14-303

Ohio Development Services Agency | Ohio Third Frontier Innovation Creating Opportunity

John R. Kasich, Governor David Goodman, Director

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**The Ohio State University**
Lead Applicant Contact Information	**Name: Dr. Giorgio Rizzoni**
	Title: Director, Center for Automotive Research
	Phone Number: 614-688-3856
	E-mail: rizzoni.1@osu.edu

Project Title:	Energy Storage Innovation Center (ESIC) (for Multi-chemistry Applications)

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☒ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Multi-chemistry Energy Storage Applications (Advanced Pb-Acid and Li-Ion Batteries, Supercapacitors) and Advanced Control (Management, Safety, Power Conversion)
Anticipated Markets	Automotive, Industrial, Aviation, Electric Utility

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of an innovation platform.

> *"…For the purposes of this RFP, an Innovation Platform is defined as an already existing capacity that incorporates unique technology capabilities and strengths, talent, equipment, facilities, engaged industry partners, a track record of research commercialization and innovation, intellectual property and other resources in a particular technology area that collectively can serve as a vehicle for significant, industry-defined and directed opportunities through the development and commercialization of new products and innovations. To be considered a Platform Technology, there must be multiple applications to commercial products that are capable of being developed by independent Ohio for-profit companies.*

The Ohio State University – Center for Automotive Research (OSU-CAR) is the "Innovation Platform" and it is proposing a unique "Technology Platform" [Energy Storage Innovation Center (ESIC) (for Multi-chemistry Applications)] that focuses on design, validation and advanced control of multi-chemistry energy storage systems.

OSU-CAR is a powerful economic development partner to the State of Ohio and an experienced business and technology incubator with specialized skills, equipment and facilities that directly support research, product validation, and product commercialization activities in the areas of:

- Powertrains (gas, diesel, hybrid, electric, alternative fuels);
- Power electronics (traditional, alternative fuels);
- Sensors and controls (traditional alternative fuels);
- Fueling/charging systems (hybrid, electric, alternative fuels);
- Energy storage testing
- Energy storage, fuel cell, and alternative energy systems demonstration projects (mobile, stationary, grid-connected, utility)

While Ohio State performs basic research in these areas, OSU-CAR partners directly with industry to focus on pre-competitive industrial research and applied applications of those technologies to support industry commercialization activities. OSU-CAR itself is organized in to Technology Platforms and maintains its commercial relevance by establishing new Technology Platforms from existing capacity, intellectual property and other resources derived from these emerging capabilities.

The "**Technology Platform**," [Energy Storage Innovation Center (ESIC) (for Multi-chemistry Applications)], proposed in this Letter of Intent, includes unique capacity and capabilities to address the needs of Ohio-connected companies who are commercializing products that leverage multi-chemistry energy storage applications across several key industries (automotive, industrial, utility, aviation, military, marine, and more). The Technology Platform, with its current and emerging intellectual property (IP) in advanced energy storage controls, including design, testing, validation, and demonstration capabilities, is in an excellent position to act as an accelerator to the commercialization efforts of these companies.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

Committed industry clients cannot all be fully disclosed "by name" due to pending final non-disclosure, IP sharing and collaborative agreements, however, the core participants include: CAR Technologies LLC – a leading Ohio-based energy storage engineering company; several Ohio-based energy storage systems companies (both traditional and start-up), Ohio-based automotive suppliers, Ohio-based stationary energy storage systems provider, and an Ohio-based power systems company. In aggregate, the project collaborators are committed to provide a supermajority of the cash cost share contribution – some $3.0 million – and have documented Ohio Third Frontier experience successfully committing to and delivering cash cost share at this level in previous grant activities.

3. Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

The commercial products include novel multi-chemistry energy storage devices and configurations (mfg, multiple industries); battery management systems, energy storage equalization and controls (mfg); energy storage testing, component design, engineering, prototyping, and low-volume assembly (services); micro-grid integration, simulation and communication controls (mfg and services). These commercial products will address needs in the passenger vehicle, commercial and specialty vehicle, commercial/ industrial equipment, military, marine, utility, telecommunications, and aerospace markets within the 3-year timeframe of the Grant and beyond.

4. Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

The combination of the Grant-enabled investment in the "Technology Platform" by the Clients and Committed End-users and the Ohio Third Frontier and the significant resources and industry reach of the underlying "Innovation Platform" offer an excellent extension of a proven, sustainable business and technology development system for the State of Ohio. OSU-CAR has over 20 years experience developing and managing large-scale industrial consortia and bespoke projects and program to maintain the commercial relevancy and momentum of its Technology Platforms.

It is the team's expectation that existing and future demand from both Ohio-based and National organizations for access to the proposed OSU-CAR "Technology Platform" and for its "acceleration services" [design, advanced engineering, prototyping test, validation, demonstration] will provide a sustainable pipeline of industry-driven programs and industrial research that will continue to drive the development and sustainability for the Technology Platform and ultimately new technologies and IP for commercialization. IP in the areas of accelerated testing and advanced modeling for validation, warranty and durability; h/w and s/w for advanced, low-cost power control and conversion; and novel multi-chemistry architectures and systems that help Ohio-based companies bridge the substantial gaps between energy storage needs and energy storage acquisition and life-cycle costs for their products.

IPP 14-304

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**University of Akron**
Lead Applicant Contact Information	**Name: Dr Francis Loth**
	Title: Professor and F. Theodore Harrington Endowed Chair
	Phone Number: 330-972-6820
	E-mail: loth@UAkron.edu

Project Title:	Enhanced survivability Run Flat Tires-Carbon Fiber Zero Pressure Tire

Total Project Budget	$ 3000000.00	**Ohio Third Frontier Funds Requested**	$ 2000000.00

Project Focus Areas

X Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
☐ Aeropropulsion Power Management
X Agribusiness and Food Processing
☐ Fuel Cells and Energy Storage
☐ Sensing and Automation Technologies
☐ Shale
☐ Situational Awareness and Surveillance Systems
☐ Software Applications for business and healthcare
☐ Solar Photovoltaics
☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Run Flat Tire using carbon & natural fiber
Anticipated Markets	Military Tire Market

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

   Run-flat tire using carbon and natural fiber

2) Please list all committed industry clients and their anticipated cash cost share contribution.

   American Engineering Group- Received 1million funding from DOD and it will be matching

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

   AEG-Akron U has detail business plan to get into market within 3years(Detail business plan is available for review as per the request

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

   This product already in one military vehicle, military wants to expand to several compact vehicle.

Francis Loth, Ph.D.
Professor and F. Theodore Harrington Endowed Chair
Room 57 Auburn Science and Engineering Center
Department of Mechanical Engineering
The University of Akron
Akron, Ohio 44325-3903

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Loth@UAkron.edu, www.biofluids.net

Wednesday, March 12, 2014

LETTER OF INTENT

RE: Ohio Third Frontier- Innovation Platform Program (IPP)
"Enhanced Survivability Run Flat Tires - Carbon Fiber Zero Pressure Tire"

The Department of Mechanical Engineering at The University of Akron is interested in submitting a proposal for *Ohio Third Frontier Innovation Platform Program* as a joint venture partner on further development of American Engineering Group's (AEG) concept on "composite hoop run-flat variable footprint tires for military" for special commercial vehicles. We see significant potential for this concept utilizing carbon fiber and natural fibers integrated into a polymer matrix for engineering applications. These fibers could be derived utilizing on biomimicry concepts. Additionally, we see the potential for this concept to be extended to other sports cars that currently do not utilize run-flat as well as commercial utility vehicles that do not need to meet the same size requirements as passenger vehicles

Should this concept prove viable for *Ohio Third Frontier Innovation Platform Program*, we would also be interested in exploring manufacturing of the technology for fiber winding capability in Ohio. The University of Akron is interested in establishing the capability for developing and testing fiber as well as the further study on the bonding of rubber-fiber composites. AEG recently received a preliminary grant from Department of Defense. AEG is committed to the long-term commercialization of the technology and will play an important role in accomplishing that goal. AEG will contribute funding as cost resources towards testing, manufacturing and market release of this product. Currently AEG is currently in the final stages of the commercialization of run-flat tires for military vehicles.

We look forward to working with you on this important *Ohio Third Frontier Innovation Platform Project*.

Best regards,

Francis Loth, Ph.D.
Professor and F. Theodore Harrington Endowed Chair

IPP 14-305

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**Ohio University**
Lead Applicant Contact Information	**Name: Jason Trembly**
	Title: Associate Director/Assistant Professor
	Phone Number: 740-331-4921
	E-mail: trembly@ohio.edu

Project Title:	The Ohio Shale Platform: Commercialization of Cost Effective Wastewater Treatment Technologies

Total Project Budget	$ 4,000,000	**Ohio Third Frontier Funds Requested**	$ 2,000,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☒ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Waste water treatment and reuse
Anticipated Markets	Shale, agriculture, nuclear,

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

Ohio University (OHIO) possesses an existing internationally recognized Innovation Platform for the development of cost-effective shale wastewater management technology located within the Institute of Sustainable Energy and the Environment (ISEE). Specifically, OHIO supports development efforts for a number of shale related technologies for not-for-profit and commercial organizations. In addition to engaged industrial partners, OHIO has developed substantial intellectual property regarding cost-effective shale wastewater treatment techniques which are being transferred to industry partners for commercialization. The combination of OHIO's existing personnel, facilities, capabilities, and industrial partners make it well suited to develop commercial solutions/products to address the shale industry's most daunting challenges. In response to the Ohio Third Frontier's (OTF) Innovation Platform Program (IPP) request for proposal, OHIO proposes the establishment of the "The Ohio Shale Platform:

Commercialization of Cost Effective Wastewater Treatment Technologies" to ensure the near-term and long-term future of Ohio's shale industry.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

OHIO is developing a very strong industry team with the capabilities to commercialize and implement the solutions/products developed by the proposed Innovation Platform. Since agreements have not been finalized in regards to this OTF IPP opportunity industrial client names will not be provided at this time. Industrial client cash cost share for this project will be in excess of $1,000,000.

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

The major commercial product to be developed and enter the market within the 3-year timeframe of the Ohio Shale Platform is the IPSC process for wastewater treatment and reuse. The IPSC process is a flexible technology for the treatment of wastewater from shale wells which is capable of selectively removing a host of contaminants including suspended solids, dissolved solids, hydrocarbons, and normally occurring radioactive material (NORM). Under the proposed Innovation Platform Ohio will complete the final field demonstration testing necessary to license the technology for market entry which will generate additional jobs associated with the Ohio shale industry. In addition, commercialization of this technology will create additional Ohio manufacturing jobs to fabricate the IPSC Process units to be utilized within the Appalachian shale basin.

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

The proposed Ohio Shale Platform is well positioned to provide a sustainable pipeline of marketable commercial products for the Ohio shale industry due its strong industrial partners and OHIO's facilities and capabilities. During and after the initial 3-year term of the proposed program the industrial partners will have the authority to change the directive of the Ohio Shale Platform to address industry's most daunting issues to cost-effective shale development which can be addressed by OHIO's existing capabilities/facilities. The collaborative environment created by the OTF supported Ohio Shale Platform will accelerate the time necessary to develop solutions/products to industrial issues ensuring the long-term economic impact of Ohio shale

IPP 14-306

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**The University of Akron**
Lead Applicant Contact Information	**Name: Matthew L Becker, PhD**
	Title: Associate Professor of Polymer Science & Biomedical Engineering
	Phone Number: (330) 972-2834
	E-mail: becker@uakron.edu

Project Title:	Akron Functional Materials Center

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☒ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medi

Key Scientific/ Technical Fields	Surfaces and coatings, X-ray imaging, Nanofibers, Peptides,
Anticipated Markets	Construction, X-ray shielding, Anti-microbial, Surface coatings, Regenerative medicine

1) Describe the proposed technology platform.

The Akron Functional Materials Center (AFMC) was founded in 2010 through a joint initiative between The University of Akron (UA) and the Austen Bioinnovation Institute in Akron (ABIA). The AFMC is a unique Innovation Platform focused on elevating the technology readiness level and accelerating the translational potential of new polymeric materials into high-value applications across a number of commercial markets. The cooperative effort builds upon the fundamental research strengths in Polymer Science and Polymer Engineering at UA. The AFMC currently has 23 industrial members (10 from within Ohio) across multiple technology and market sectors.

The AFMC contains a suite of "resource" level characterization facilities, chemical expertise, meso-scale formulation tools, advanced imaging capabilities and fabrication technologies including electrospinning, extrusion and roll to roll processing to assist researchers and innovators with design, formulation, fabrication, optimization and characterization of polymeric materials, processes and devices. The AFMC Innovation Platform is focused on developing and using methods that are less capital intensive and more flexible with regard to materials than traditional methods. These tools and approaches are designed such that they can be incorporated easily into a wide array of development platforms and translated seamlessly to end-users and customers. These instruments and other resources comprise unique knowledge sets and technology infrastructure unlike any other in the world. The capabilities have drawn collaborators and a diverse cadre of industrial members to the AFMC from around the world. In general, using combinations of integrated fabrication and characterization tools, companies are able to rapidly optimize multi-parameter formulation and fabrication challenges which accelerate the product development timeline irrespective of the type of materials systems used. Thus, the innovation platform is available and useful to a variety of market sectors, industries and materials.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

PolyOne, Inc (Avon Lake, OH)	$600,000
Lubrizol Advanced Materials (Brecksville, OH)	$600,000
Viscus Biologics (Dayton, OH)	$300,000
SNS Nanofiber Technologies (Hudson, OH)	$300,000
Austen Bioinnovation Institute in Akron (Akron, OH)	$200,000
The University of Akron	$1,000,000

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

Radiopaque polymeric materials
Peptide-functionalized polymer nanofibers
Polymer reinforced decellularized tissue
Advanced bandages for wound care

Anti-microbial materials
Anti-fouling materials

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

The AFMC will sustain itself through its membership fees and corporate sponsored research projects from its member companies. The formulation and C&HT equipment is established and we anticipate the membership roster will continue to grow. The knowledge gained and newly developed combinatorial tools and approaches will benefit future R&D efforts of AFMC member companies and partners.

IPP 14-307

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**The Ohio State University**
Lead Applicant Contact Information	**Name: Jin Wang**
	Title: Associate Professor
	Phone Number: 614-688-4041
	E-mail: wang.1248@osu.edu

Project Title:	Advanced Integration and Management of Electrical Power and Propulsion Systems

Total Project Budget	$ 3,000,000	**Ohio Third Frontier Funds Requested**	$1,500,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☒ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Power Electronics
Anticipated Markets	Civil and military aircrafts

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

1) **Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.**

This project is based on the existing power electronics and electric machine research capabilities at The Ohio State University (OSU). The goal is to further enhance the research facility and operation to support multiple applications that include advanced integration and management of propulsion and power systems for airplanes, hybrid electric propulsion systems for Unmanned Aerial Vehicles (UAVs), power supplies and battery chargers for Shale gas drilling systems, traction drive and auxiliary power supply for hybrid and electric vehicles, as well as the interface for renewable energy sources such as wind and solar.

Power electronic converters, electric machines, and associated control systems have gradually become integral parts of all types of modern energy systems. In the last several years, related activities at OSU have received strong support from the State of Ohio. A Center for High Performance Power Electronics (CHPPE) has recently been established with the support from the Wright Project program. An earlier Wright Project at OSU for plug-in hybrid electric vehicles also has a strong power electronics component. With this project, the industry and university team hopes to ramp up the effort on UAV and Shale gas related products. The planned activities on aerial vehicles are complimentary with GE Aviation's effort on engine thermal and power management, which is in collaboration with University of Cincinnati and also supported by Ohio Third Frontier.

2) **Please list all committed industry clients and their anticipated cash cost share contribution.**

Potential industry client and expected cash cost share:

General Electric Aviation
Cost share: $600,000

3) **Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.**

<u>High power density and high temperature converter for airplane engine control:</u> There is a strong demand on advanced engine control and power system management for aerial vehicles. The planned high power density and high temperature power converter is one of the key components for the advanced control and management systems. Because of the high demand, near term products are expected.

<u>Next generation Low Pressure Spool generator:</u> with the advanced power electronics circuits and control, the next generation LP generator would become the essential part of the hybrid electric drive of UAVs. This effort will be supported by GE Aviation and IAP.

4) **Describe how the platform will provide a sustainable pipeline of technologies for commercialization.**

The platform has strong focuses on wide bandgap power device based circuits and real-time simulation of complex power electric and power system systems. For near term products, with the simulation and test capabilities, the platform can provide technical support in terms of design optimization, control strategy study, and prototype testing. For the long term, the research on new circuit topologies and associated controls will bring in upgrade of existing products as well as brand new products especially for the hybrid electric drives of UAVs.

IPP 14-308

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**Cleveland Clinic Foundation**
Lead Applicant Contact Information	**Name: Michael Wright**
	Title: Senior Innovations Officer
	Phone Number: 216-445-8247
	E-mail: wrightm6@ccf.org

Project Title:	**Concussion Management and Prevention Program**

Total Project Budget	$ 6 million	**Ohio Third Frontier Funds Requested**	$ 3 million

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☒ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☒ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☒ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Healthcare--Concussion Management & Prevention
Anticipated Markets	Sporting Goods, Military, Healthcare (Athletic Trainers, Providers), Insurance

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

The Concussion Management and Prevention Program combines multiple Cleveland Clinic product development and research activities into a comprehensive Platform for the detection, management and prevention of concussions and mild traumatic brain injuries (mTBI). The resulting technologies specifically address the existing gaps in concussion care and prevention, including building a database of quantitative impact data and corresponding injury that can be leveraged for the ongoing development of improved safety equipment to prevent future concussions/mTBI. The following Cleveland Clinic technologies are included in the Cleveland Clinic Concussion Management and Prevention Program:

- Concussion Management: Cleveland Clinic has developed tools to measure head impacts and assess cognitive function, including:

- The Intelligent Mouthguard measures in-game impact dynamics in contact sports such as football, soccer, and boxing. Data from the mouthguard is used to measure head orientation, position, velocity and acceleration of impact. The data is used to identify athletes who have experienced potential injury from head accelerations, so those athletes can be evaluated further.
- The Cleveland Clinic Concussion (C3) Assessment and Management System is used to quantify the multiple symptoms of concussions and mild traumatic brain injury (mTBI) on a single platform. The benefit of the technology is that it quantitatively assesses the combination of cognitive and motor functions, postural stability, and dynamic visual acuity.

- Concussion Prevention: Cleveland Clinic has developed new helmet designs that promise to reduce

2) Please list all committed industry clients and their anticipated cash cost share contribution.

Sportsguard Laboratories, Inc. – located in Kent, OH, specializes in custom mouthguards for athletes. Sportsguard will contribute cash cost share to support the development and commercial launch of the Intelligent Mouthguard product, including precise design to incorporate the sensors into the mouthguard chassis.

iComet Technologies, Inc. – located in Cleveland, OH, is focused on bringing the C3 product to market initially for sports applications, but subsequently for other clinical conditions. iComet will contribute cost share in the form of product testing to create a database of concussion recovery rates and establish the distribution network to roll-out C3 nationwide.

We estimate a combined cash cost share of $2.5 Million from our industry partners.

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

- Concussion management –
  - Intelligent Mouthguard for high school, and college athletes
  - C3 concussion assessment app for high school, and college athletes
  - C3 cognitive function assessment app for Parkinson's patients.

- Concussion protection –
  - Concussion protection helmets for football and military applications

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

After the first wave of concussion assessment and management products achieves initial product sales in the fall of 2013 and wide spread Market Entry in the fall of 2014, the Concussion Management and Prevention Program will continue to deliver benefits to Ohio commercial Clients. Cleveland Clinic will be in a unique position to create a database correlating measured impacts with post injury cognitive function and recovery rates. This database will be the foundation for development of future concussion management and prevention products, such as even better performing helmets for football and military applications, and more accurate concussion management tools. Also, we will look to extend our product line to youth sports, which will require adjusting parameters from our high school and college products. Considering

that there are more than 43 million youth, high school, and college athletes in the USA, and it estimated that as many as 3.8 million sports-related concussions occur each year, this is a very substantial market for our Lead Applicant and Clients to pursue.

IPP 14-309

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**University of Toledo**
Lead Applicant Contact Information	**Name: Dr. William S. Messer, Jr.**
	Title: Vice President, Research
	Phone Number: (419) 530 2844
	E-mail: william.messer@utoledo.edu

Project Title:	**Platform for Developing Innovative Biocomposite Products for Biomedical Applications**

Total Project Budget	$ 5.0M	**Ohio Third Frontier Funds Requested**	$ 2.5M

Project Focus Areas

- ☒ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☒ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Biomaterials, Orthopedics
Anticipated Markets	Biomedical applications with emphasis on orthopedics

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

Description of Proposed Platform Technology:

This proposal entitled "Platform for Developing Innovative Biocomposite Products for Biomedical Applications" is being submitted to Ohio's Third Frontier Program in response to the RFP on Innovation Platform Program (IPP). The proposal describes a platform and a path to quick commercialization of biocomposite products of significant interest to our commercial partners. The primary constituents of the biocomposites include natural bio-derived polymers, and innovative alkaline earth based phosphate cements for biomedical applications with a focus towards orthopedics. The key word "Biocomposites", the common theme in this proposal has the connotation of using bio-derived constituents intended for biomedical applications. It is expected that the commercial products to be developed under this program will prevent/delay disorders, and provide safe, cost-effective and efficient methods of treatment.

The platform involves a consortium consisting of University of Toledo, as the lead applicant and its commercial Ohio-based partners: OsteoNovus, Inc., Element Orthopedics, Inc., Innovative Plastics and Molding, Inc. The platform is based on many innovative patented/patent pending technologies developed under the auspices of the University of Toledo's (UT) successful Engineering Center for Orthopedic Research Excellence (E-CORE) and its commercial partners. As an umbrella organization, E-CORE has successfully built a highly successful internationally reputed interdisciplinary team involving the Departments of Bioengineering, Mechanical Engineering, and Chemical Engineering of the College of Engineering, and the Departments of Orthopedic Surgery and Dentistry of the College of Medicine. An important signature of E-CORE is its well-established relationships with numerous multi-national corporates such as Joimax, DePuy, Medtronic, Synthes Spine, and many others.

Clearly, the lead applicant understands the customer and market needs, as evidenced by discussions with and commitments from the Ohio-based companies, as indicated below to develop solutions to their problems. The requested budget from the IPP is $2.5M for this effort. Total committed industrial match is $1.5M. The University of Toledo will provide the rest of the cost share.

1) **Ohio-Based Industry Sponsor:** OsteoNovus, Inc, Toledo, Ohio.

Technology: Innovative alkaline earth (e.g., Ca and Mg) phosphate based cement-forming compositions (Novogro™) as the main ingredient to be fabricated into biocomposites of diverse shapes and consistencies such as injectables, putties, blocks and granules.
Distinctive features: The team is fully cognizant of the problems associated with currently available orthopedic cements and the Novogro™ range of biocomposite compositions has superior features than those from the competitors. The biocomposites consist of a specific phase of calcium phosphate such as monetite with added silica to provide strength and assist in cell growth. The manufacturing process is much simplified than the currently available ones. Furthermore, during the setting, it does not cause any exothermicity.

2) **Ohio-Based Industry Sponsor:** Element Orthopedics, Inc, Minneapolis and Toledo, Ohio.

Technology: Innovative biocomposite "Beads-on-a-String" spinal implants
Distinctive features: Surgeons have relied on the use of bone void fillers to address weak conditions and insufficiencies in bone during surgery. An implant option, which has never existed is the use of various granules, pellets or chips in specific implant configurations, pre-determined to fit and adapt in a targeted anatomical location. Using their innovation, which flexibly connects beads and pellets together using multiple individual strands of strings, it is possible to render implant geometries that have the

relevant structure. Coupling the individual strands at various locations, they are able to provide a physician with an implant capable of functionally expanding then constricting as it is filled. Element Orthopedics has pioneered and innovated, the ability to use solid beads in this flexible configuration. Upon minimally invasive injections into a fractured osteoporotic vertebral body, the beads concurrently make their own cavity, stack, pack & lock, and deliver a flowable setting agent such as bone cements using zero pressure. This ability is entirely unique, requiring the use of an injection gun, which injects implants in a controlled, specific and measured step. UT team will assist them in making these beads out of Novogro™ and other biocomposite materials on such flexible connection.

3) **Ohio-Based Industry Sponsor:** Innovative Plastics and Molding, Inc. Sylvania, Ohio.

Technology: This advanced material technology will utilize all FDA 21 CFR compliant ingredients for The FDA 21 CFR compliant cellulose fibers in a thermoplastic polyolefin matrix to blend or compound at temperatures in excess of 400F, resulting in FiberTuff biocomposites.
Distinctive features: The cellulose fibers or flour in the FibreTuff biocomposites with increased performance, such as, elongation, maintain good strength and greatly improve impact versus other types of natural fibers or biomass fillers. Consequently, molded containers for disposable packaging in hospitals could be tougher and lighter and would be an acceptable application unlike previous technologies. Furthermore, labels could possibly be printed more economically. Coatings might be applied easier with better performance and longer warranties. Finally, FiberTuff biocomposites are to be fabricated into disposable surgical instruments, containers etc. Subsequent products will primarily focus on spinal implants as replacement for polyether ether ketone (PEEK) based implants.

Commercial products that will be developed and enter the market within the 3-year time frame of the project

Product	Customer
1. Novogro™ basic biocomposite	**OsteoNovus, Inc.**
2. Novogro™ with in-situ formed macroporosity	**OsteoNovus, Inc.**
3. Innovative "Beads-on-a-String" spinal implant	**Element Orthopedics, Inc.**
4. FiberTuff biocomposites as packages	**Innovative Plastics and Molding, Inc.**
5. FiberTuff biocomposites as surgical instruments	**Innovative Plastics and Molding, Inc.**

Sustaining a pipeline of technologies for commercialization

It is anticipated that OsteoNovus will continue to generate future generation of products taking advantage of the unique features of the Novogro™ based compositions. Beyond the basic compositions, the products will be used not only as bone void fillers, but also as drug/cell/protein delivery system. Similar approaches will be applicable to beads-on-a-string implant. Future applications of FiberTuff compositions will be in developing actual implants, thus replacing PEEK as the candidate polymer.

IPP 14-310

Innovation Platform Program

2014 Request for Proposals

Letter of Intent

Lead Applicant Institution	**Kent State University**
Lead Applicant Contact Information	**Name: J.T. Gleeson**
	Title: Professor and Chairperson, Department of Physics
	Phone Number: 330-672-2246
	E-mail: jgleeson@kent.edu

Project Title:	Electrochromodynamic materials

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☒ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance System
- ☐ Software Applications for business and healthca
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgic instruments/equipment, implant devices, and regen

Key Scientific/ Technical Fields	Adaptive window control, electro-optic devices, liquid crystal light valves
Anticipated Markets	architectural windows, commercial greenhouses, vision protection

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

March 14, 2014

Ohio Development Services Agency
Office of Technology Investments
77 South High St, 25th Floor
Columbus, OH 43125

To whom it may concern,

We are pleased to submit this Letter of Intent to apply for the FY 2014 Innovation Platform Program of the Ohio Third Frontier. The project title, Electrochromodynamic Materials, refers to a proposal having Project Focus on Advanced Materials.

1) The proposed technology platform is underpinned by: i) *Electrochromodynamic (ECD) Materials,* which represents a new class of electro-optic, light-valve system that provides enhanced functionality within a single layer film, and ii) facilities and technology for constructing, testing and deploying ultra-wide format liquid crystal films (especially ECD's) for architectural use.
2) The committed industry clients are AlphaMicron Inc (cost-share contribution 0.9$M), Kent Displays Inc., (cost share contribution 0.9$M) and Flexible ITO Solutions, Inc. (cost share contribution 0.1$M) Kent State University will contribute cost share amounting to 1.1$M.
3) Commercial products that will be developed include electrically dimming and darkening windows for architectural and greenhouse use, and next-generation large format transparent conductive films for multiple flexible electronics applications.
4) Sustainable technology pipelines resulting from this platform include ultra-large format processing for flexible, electro-optic devices and multi-state smart architectural windows allowing for full opacity.

Sincerely yours

J.T. Gleeson
Professor and Chairperson

IPP 14-311

Innovation Platform Program

2014 Request for Proposals

Letter of Intent

Lead Applicant Institution	**National Composites Center**
Lead Applicant Contact Information	**Name: Lisa Novelli**
	Title: President & CEO
	Phone Number: 937-297-9450
	E-mail: lnovelli@compositecenter.org

Project Title:	Recycling of End-of-Life Composites and New Application Development

Total Project Budget	$ 2,000,000.00	**Ohio Third Frontier Funds Requested**	$ 1,000,000.00

Project Focus Areas

- ☒ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Composite material recyclability and reuse
Anticipated Markets	Aerospace (nonstructural), automotive, wind, civil, industrial, transportation

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

The use and demand of carbon fiber is growing quickly in the world. Carbon fiber is much stronger and lighter than steel and is the preferred fiber choice when used in composite applications. However, its high processing costs have resulted in limited supply and reduced its viability as a reinforcement in applications. The cost of fiber is too high to allow wide consumption across various industries. Additionally, the fibers are considered difficult for disposal.

Carbon fiber reinforced polymer (CFRP) composites are used for their unique combination of low weight, strength and rigidity. With increasing demand and limited capacity, the price of carbon fiber will continue to rise. Although there have been multiple efforts aimed at developing a true low cost carbon fiber, such a material is not yet commercially available. Recycling carbon fiber from existing CFRP products, however, may provide a viable economic solution.

As part of its lifecycle approach, Airbus is addressing ways to recycle commercial aircraft to reduce its environmental footprint. Up to 90 percent of an aircraft's weight could potentially be recycled and more than 70 percent of its components and materials reused or recovered through regulated channels.

This project will explore the reclamation of carbon fiber from composite structures, such as aircraft or automotive parts, for use in new composite applications. The investigating team is distinctively capable of conducting this program and producing successful outcomes. Using a platform technology developed by a national laboratory, recycled carbon fiber will be used to produce new CFRP composite products. Material specifications will be evaluated and different methodologies for material processing will be assessed, including high speed mixing, sheet molding compounding, and long fiber thermoplasticating. Similar preliminary trials performed in Europe have produced positive results. This project would include the importation of unique technology not yet present in the U.S.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

As we formalize our industry partners for this project during the proposal process, we anticipate increasing the number of collaborators, particularly those in Ohio, and adjusting the cost share contributions accordingly. However, we are pleased to offer the following prospective partners at this time:

- ✓ Airbus - $500,000
- ✓ Lion Apparel - $250,000 (Ohio for-profit company)
- ✓ GrafTech International - $250,000 (Ohio for-profit company)

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

Based on preliminary investigation, potential products and/or applications to be investigated or produced as a result of the program include:

- Tires (farm/transportation/sports)
- Railroad ties
- Thermal applications, such as solar industry
- Industrial work-holding
- Non-structural applications for the automotive industry
- Tools
- Protective personal equipment
- Construction applications

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

The U.S. is one of the world's largest consumers of carbon fibers. This project aims to demonstrate how lightweight recycled carbon fiber composites can be suitable for different applications using a cost-saving technology for reimpregnation and very fast demolding. The possibility to cut almost by ten the curing time of a large molded part – going from a traditional 30 minutes cycle of conventional RTM down to 3 minutes with this new process – is appealing to many companies. Additional savings would be produced through the economic realization of a low cost carbon fiber.

Low cost carbon fiber with suitable properties and technical characteristics will result in higher demand and wider application across several industries:

- Carbon/graphite industry, e.g., electrode, insulation material and specialty material
- Automotive industry, e.g., automotive parts and brakes
- Wind energy, e.g., turbine blades
- Civil engineering, e.g., concrete reinforcement, structural components
- Solar applications, e.g. insulation for furnaces, composite material for crucibles and furnace parts
- Aerospace, e.g. non-structural components

IPP 14-312

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**University of Akron**
Lead Applicant Contact Information	**Name: Miko Cakmak**
	Title: Distinguished Professor
	Phone Number: 330-972-6928
	E-mail: cakmak@uakron.edu

Project Title:	**SCALABLE NANOMANUFACTURING OF FUNCTIONAL FILMS USING A ROLL TO ROLL PROCESS**

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☒ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☒ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine)

Key Scientific/ Technical Fields	Polymer Synthesis ,Physics, Engineering, Roll to Roll Nanomanufacturing
Anticipated Markets	Energy Storage, Medical Equipment, Automotive, Aerospace, Electronics

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

1.) Describe the proposed technology platform.

The University of Akron National Polymer Innovation Center (UA-NPIC) has created and demonstrated proprietary novel manufacturing equipment and processes that use external electrical, magnetic and thermal gradient fields to enhance the through-thickness properties of engineered polymer films. During the manufacturing of traditional polymer films, they are typically subjected to shear and extensional fields that cause nano particles or phases dispersed in them to orient with their major axes in the plane of the films as a result of flow stresses. This orientation causes the in-plane properties (mechanical, optical, electrical) to be enhanced often at the expense of through-thickness properties. However, for many applications the enhancement of through-thickness properties is necessary, which is not possible using conventional flow processes.

The UA-NPIC 70 ft. manufacturing line, , employs roll-to-roll processing equipment that can be used to apply electric, magnetic, and/or thermal gradient fields to precursor films comprised of functional materials dispersed in solution or monomer form, resulting in enhancement of the through-thickness properties of the film with minimal use of the functional fillers. The external fields allow directed assembly of these dispersed phases and particles along the thickness direction leading to significant enhancement of desired physical properties.

A number of products would benefit from the processes described herein including heat spreaders (thru thickness), ultrahigh density storage systems, and membranes for batteries and fuel cells, among others. The UA-NPIC equipment will not only improve the efficiency of these products by enhancing their through-thickness properties, but reduce their manufacturing costs by minimizing the amount of functional fillers necessary to achieve the through-thickness functionality of the product.

Utilizing this R2R line we have already demonstrated manufacturing of a number of functional films. This includes capacitor films with substantially enhanced dielectric constant in the thickness direction and fuel cell membranes with 10 fold increase in proton conductivity resulting from process-induced channels of conductive phase oriented in the thickness direction.

2.) Please list all committed industry clients and their anticipated cash cost share contribution.

Clients that have committed to being a part of this program and their anticipated cash cost share are shown in Table 1.

Table 1. Client Companies/Cost Share/Products and Applications

Client	Cost Share (3 years)	Commercialization Products	Applications
PolyOne	$600,000	Specialty Polymer Resins, Coatings and Films	• Selective Control membranes for batteries, fuel cells, purification media, and biological systems • Films for touch sensors, biosensors, smart packaging, industrial controls, energy mgmt. syst., optical media, etc. • Films and coatings for permeation resistance, optical management, and insulation • Electrostatic discharge coatings and films
Laird	$420,000	**EMI Shielding Materials**	• Aerospace

Technologies		**&Products** • Board Level Shields • Electrically Conductive Elastomers • Microwave Absorbers • Shielding Gaskets **Thermal Management Products** • Thermal interface tapes & pad • Heat Sinks • Phase Change Matls.	• Automotive • Medical Equipment • Electronics Assembly
Stratum Energy Systems	$150,000	Lithium-Ion Batteries and Electrodes Motor Vehicle Fuel Cells	• Portable Electronics • Small Motorized Vehicles (carts, bikes)
Tremco	$600,000	"Smart" Roofing Material	• Construction
Blue Spark	$200,000	Flexible Printed Batteries	• Consumer goods • RFID tags • Pharmaceutical Delivery Systems • RF sensors • POS displays
Ashlawn Energy	$50,000	Vanadium Redox Flow Batteries	• Energy storage for residential, business, and utilities

3.) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

The products that will be commercialized as a result of this project will fall under two broad categories:

i) Functional materials with improved z-direction properties that enhance the operational characteristics and cost effectiveness of specialty polymeric films and products including EMI shielding, fuel cell permeation membranes, etc. Specific products and applications identified by UA clients are identified in Table 1.

ii) To produce the functional materials, a machinery fabrication company will be engaged to produce customized versions of the R2R line for specific Client needs.

4.) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

The current pilot line will remain in place at NPIC. This unit will serve as test bed to evaluate new approaches to enhancing z-direction properties, evaluate new materials and combinations, and also train operators from firms that utilize the production machinery. This sustaining effort will primarily be funded by research contracts from existing and new clients, federal grants such as the NSF GOALI program, and training revenues.

As the above research activities spawn new materials and new product applications for client companies, new commercialization activities will continue to grow.

IPP 14-313

Ohio | Third Frontier
Innovation Creating Opportunity

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**Case Western Reserve University**
Lead Applicant Contact Information	**Name: Liming Dai, Ph.D.**
	Title: Kent Hale Smith Professor
	Address: 10900 Euclid Ave Cleveland, OH 44106
	Phone Number: 216-368-4176

Project Title:	Functionalization and Dispersion of Nanocomposites for Next Generation Electronic and Medical Device Components

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☒ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative m

Key Scientific/ Technical Fields	Nanotechnology, Nanocomposite, Ceramics, Dispersion
Anticipated Markets	Electronics, Lighting, Medical Devices

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) **Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.**

In 2011, Case Western Reserve University was awarded a Department of Defense Multidisciplinary University Research Initiative (MURI) grant to bring unrivaled qualities found in one- and two-dimensional nanomaterials into three dimensions. The existing MURI technology foundation builds upon the resources of multiple universities, industries, and national labs, and established the Center of Advanced Science and Engineering for Carbon (CASE4Carbon) at CWRU that is working to produce new materials for a host of uses.

One of CASE4Carbon's unique strengths is applying synthetic and functionalization methods to the development of advanced carbon nanomaterials with well-defined, multidimensional structures for multifunctional applications, including electrochemical energy conversion and storage and optoelectronic systems. Through this technology development platform, CWRU has established a notable record of accomplishments and pioneering achievements in research and development. Leveraging the existing expertise, intellectual properties, and resources of CASE4Carbon capabilities, CWRU and its industry clients in this proposed Ohio Third Frontier project proposes to exploit innovative multi-path syntheses and assembly strategies to fabricate advanced nanocomposites that exhibit excellent thermal, optoelectronic, and mechanical properties in all three dimensions for a wide range of applications. Some of these applications include new materials for energy conversion and storage, thermal management, fire retardant products, high-performance nano/microscale integrated devices, multifunctional materials for aerospace systems, and biomedical devices.

The objective of this project is to utilize the facilities and expertise of CWRU and the CASE4Carbon center in order to create a significant economic impact for Ohio through product development and commercialization with the initial clients, and to establish a framework for lasting industry support. CWRU intends to provide industrial client partners with access to state-of-the-art facilities and expertise for the development and characterization of advanced nanocomposites. Through the unique collaboration defined by the Ohio Third Frontier Innovation Platform Program, CWRU will also help our industrial partners conduct product and market development by quickly transitioning intellectual property generated from research taking place inside the university by means of a mutually beneficial IP management strategy.

2) **Please list all committed industry clients and their anticipated cash cost share contribution.**

Case Western Reserve University intends to serve as the Lead Applicant, and proposes to host the Innovation Platform on its campus in Cleveland, Ohio. At this time, CWRU has teamed with Momentive Performance Materials in Strongsville, PolyOne Corporation in Avon Lake, and Angstron Materials in Dayton, Ohio. Additional project clients will also be selected to participate, and discussions are underway to determine the most appropriate candidates to join the proposal team. The project leadership is taking into account not only the technical compatibility of these companies' needs with the resources of the platform, but also the commercial viability and projected economic impact resulting from their participation in the project.

Client Name	Location	Anticipated Cost Share
Momentive Performance Materials	Strongsville, Ohio	$600,000
PolyOne Corporation	Avon Lake, Ohio	$600,000
Angstron Materials	Dayton, Ohio	$600,000

CWRU intends to attract further clients and end users beyond the initial team in order to expand the potential for economic development and product market entry that could result from an investment of Third Frontier funding. As Lead Applicant, CWRU acknowledges that it is ultimately responsible for maintaining the proposed cost share ratio for the duration of the project period as delineated by the policies of the Ohio Department of Development.

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

Through the proposed project, CWRU and the project team proposes to create a unique technology development and commercialization vehicle that is unrivaled in Northeast Ohio. Among the commercial products that can be developed in the course of collaboration with CWRU, the following application areas have been specifically targeted by the project team.

- Nanocomposites for Energy Applications
- Nanocomposites for Electrical Applications
- Nanocomposites for Thermal Applications (For Example: Thermally conductive resin systems for use in cooling personal computers, LED lighting systems, etc.)
- Nanocomposites for Bio Applications (For Example: Catheter formulations for use in medical applications, lead free Radiopaque compounds for minimally invasive surgery, and lead free Radiopaque compounds for use in medical equipment such as X-Ray machines and CT scanning machines, nanoparticles for biomedical imaging and targeted drug delivery)

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

A single material component often cannot meet demanding application needs. The development of composite materials possessing properties characteristic of the constituent components with synergetic effects has long been exploited as an effective approach towards advanced nanocomposite materials. With recent significant advances in nanoscience and nanotechnology, the research and development of advanced nanocomposites offers numerous opportunities for innovative product development through materials design, processing, and characterization.

As an Innovation Platform, CWRU and the CASE4Carbon center would provide the necessary facilities, equipment, and expertise to support industry clients in the technical drive to product commercialization. By building on the capabilities and capacity of CWRU's existing MURI investment in the center, industry clients will have the opportunity to develop and characterize advanced nanocomposite products using state-of-the-art tools and techniques. Support by the Third Frontier Innovation Platform Program would allow CWRU and its industry clients to drive new collaborations for unprecedented progress in the advancement of nanocomposite products for a range of commercial applications.

IPP 14-314

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**The Ohio State University**
Lead Applicant Contact Information	**Name: Dr. James Durand**
	Title: Director, Testing, Engineering and Software Development Services, Center for Automotive Research
	Phone Number: 614 688-1137
	E-mail: durand.14@osu.edu

Project Title:	Engineering Analysis Hub: An Innovative Design Platform for Rapid Product Commercialization

Total Project Budget	$ 2,700,000	**Ohio Third Frontier Funds Requested**	$ 1,350,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- **x** Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Engineering Analysis, Design
Anticipated Markets	Assisting companies to rapidly get their ideas designed, analyzed, prototyped, tested and to the manufacturing floor.

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) **Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.**

The Engineering Analysis Hub (EAH) is a technology platform consisting of a series of engineering analysis software programs, and the experienced analysts that can use them efficiently and effectively, that will greatly accelerate the design and analysis process for Ohio companies. The modern design process depends on high-end engineering analysis software to dramatically reduce the required time to bring a product to manufacturing readiness. But these sophisticated tools are expensive to purchase and maintain, and require highly trained analysts for their proper use. By establishing a Hub where this software resides, and where trained and experienced analysts are on staff, the required time for Ohio companies to bring products to market will be greatly reduced, either bringing products to the manufacturing floor that never would have made it through the design process, or dramatically accelerating the design, testing and prototyping process.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

1. Cyclone Power: $300,000
2. USRail: $300,000
3. Simple-Fill: $300,000

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

Cyclone Power: The Engineering Analysis Hub will assist Cyclone Power in getting their WHE 22, a 22 horse power waste heat steam engine, ready for manufacture. Without the assistance of this Innovation Platform, Cyclone was struggling to produce an engine that could survive endurance testing. Because of the Engineering Analysis Hub, the WHE 22 is rapidly proceeding through design and testing and should be ready for manufacture in a year. Because of the EAH, Cyclone Power decided to locate its manufacturing facilities in Lancaster Ohio. Within 3 years of the start of this grant, Cyclone expects to be building 5,000 engines a year and employing 30 workers, with plans to ramp up to 50,000 units per year in subsequent years.

USRail: The Engineering Analysis Hub will assist USRail in designing a compressed natural gas (CNG) drive system for their rail cars. When designed, EAH will prototype and test the design to verify its performance. USRail will use this prototype to secure investment funding to convert the drive systems on a number of their aging rail cars, and eventually, to convert rail cars to CNG for other customers. Within 3 years, USRail expects to be converting 50 cars a year and employing 50 workers, with plans to ramp up to 100 cars per year in subsequent years.

Simple-Fill: The Engineering Analysis Hub will assist Simple-Fill in designing a new type of gas compressor. Simple-Fill is licensing an OSU technology to compress a gas through the use of a liquid piston, an entirely new way to pressurize a substance. The EAH will provide design, analysis and testing services to dramatically reduce the time to market. With the help of the EAH, Simple-Fill expects to be producing 1000 units a year and employing 20 workers within three years of the start of the this project. Subsequently, Simple-Fill expects to produce up to 100,000 units per year and employ 200 workers.

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

A sustainable pipeline of technologies for commercialization will be created in two ways. First through the 3 companies above, additional product lines are planned that will need EAH services to bring the products to market. For example, Cyclone has several other steam engines that are in need of design assistance, and USRail would like to design NG drive systems for other customers. Secondly, there are a number of other companies that have expressed a strong interest in the design, analysis and testing services of the EAH. Each company is different, but shares the need to accelerate through the design process as made possible through the EAH. Company names include Worthington Cylinder (analysis of high pressure and cryogenic tanks), Momentive (analysis of plastic engine parts), eNow (analysis of truck mounted photovoltaic systems), and Tiano Industries (design and analysis of a new type of photovoltaic system).

IPP 14-315

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**BioHio Research Park, an Affiliate of The Ohio State University**
Lead Applicant Contact Information	**Name: Shauna R Brummet, PhD**
	Title: President & CEO
	Phone Number: 330-263-3716
	E-mail: Brummet.1@osu.edu

Project Title:	Spray Technology Application Research & Commercialization Center

Total Project Budget	$6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
☐ Aeropropulsion Power Management
X☐ Agribusiness and Food Processing
☐ Fuel Cells and Energy Storage
☐ Sensing and Automation Technologies
☐ Shale
☐ Situational Awareness and Surveillance Systems
☐ Software Applications for business and healthcare
☐ Solar Photovoltaics
☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Precision agriculture, chemical analysis, chemical formulation/micro & nanotechnology, mechanical design,
Anticipated Markets	Agriculture, paints & coatings, materials/polymers, consumer products, pharma

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

The Spray Technology Application Research & Commercialization Center (STARC Center) will be an expansion in scope and market reach based on The Ohio State University/Ohio Agricultural Research and Development Center (OARDC) Laboratory for Pest Control Application Technology (LPCAT) which was established in 1981 and currently serves as the role model interdisciplinary program and training center for pesticide application technology in the US, and has a unique blend of visiting scientists, post-doctoral researchers and students from all over the world. LPCAT has been a globally unique, dynamic, interdisciplinary research program, with international recognition for improving user, environmental, and crop safety by aiding the identification and development of efficient new crop protection methodologies and procedures for toxicant placement in agricultural and horticultural cropping systems. LPCAT has a long history of serving the agricultural industry and companies in fee for service and sponsored research programs. This program will be broadened and enhanced to become the STARC Center.

The STARC Center will have linkages with faculty members in five disciplines within the OSU College of Food, Agricultural and Environmental Sciences (CFAES). These are agronomy (including weed science), agricultural engineering, entomology, horticulture, and plant pathology. Current studies include both pure and applied research on delivery, bioavailability, and safety of plant protection products. Crops include corn, soybeans, fruits, vegetables and turf. Pest control agents include insecticides (conventional, biological, and hormonal), acaricides, fungicides, plant growth regulators, nematicides, and herbicides.

The advantages of the STARC Center program are the interdisciplinary sharing of techniques, ideas, facilities, and equipment. This integrated approach to problem solving maximizes creative potential, process comprehension, and science-based data acquisition - all within the diverse area of spray application technology. Thus, STARC Center represents a unique effort to actively link the biologist, chemist and engineer for understanding and advancement of spray technology.

Expansion of the focus to include the paints and coatings industry, materials, consumer products, and pharma will allow this established platform program to grow further, engage with other OSU colleges, and serve more industry segments including several in the OTF Project Focus Areas.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

Potential industry clients include: Helena, Dow, Monsanto, Syngenta, SJ Johnsons, Scotts, Dramm Corp, and Winfield – all have been past clients. New potential clients include Sherwin – Williams, Lubrizol, PolyOne, P&G, and others.

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

Precision agriculture – improved equipment to minimize unwanted drift of chemical applied to crops.

Lawn & garden care – improved equipment to minimize unwanted drift of chemical applied to crops.

Plant, animal and insect health products.

Paints & coatings – improved equipment, formulations.

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

The STARC Center will take advantage of the interdisciplinary sharing of techniques, ideas, facilities, and equipment. This integrated approach to problem solving maximizes creative potential, process comprehension, and science-based data acquisition - all within the diverse area of spray application technology for use in many different industries and applications. Building on existing industry relationships, analysis of market needs, collaboration with industry market leaders and scientists and academic scientists at OSU and other Ohio universities will be the basis for identification of new technologies, new problems to solve, and new market segments to address. Close working relationships with partners and customers will form the basis for our sustainable pipeline of technologies for commercialization.

IPP 14-316

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**Battelle Memorial Institute**
Lead Applicant Contact Information	**Name: Joseph Berger**
	Title: Vice President, Sales and Business Development, Commercial, Industrial & Medical Products
	Phone Number: 614-424-6404
	E-mail: bergerj@battelle.org

Project Title:	Development and Commercialization of Complex, Software-enabled Medical Devices

Total Project Budget	$7,000,000	**Ohio Third Frontier Funds Requested**	$1,130,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☒ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☒ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Software development, medical device development, electrical engineering, mechanical engineering, systems engineering, human centric design, infusion pumps, fluid flow and modeling, material science, surgical equipment,
Anticipated Markets	Emergency Medical, First Responders Military Medical, Hospital, Home Healthcare, Outpatient Surgery Centers, Nursing Homes, Complex Medical Device Development, Medical Device Manufacturing, Regulatory Consulting for Medical Devices,

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

1) Ohio has built a vibrant medical device industry and continues to invest in this technology-dependent market. Battelle has supported this growth by working with medical device companies for over 20 years to aid in proving out innovative technologies and provide expertise to assist in the development and commercialization of medical devices. The medical device market continues to introduce new and exciting products and the complexity of these products increases yearly. Many electro-mechanical medical devices rely on software to provide important features and differentiation for the clinicians and patients who use them.

   The Innovation Platform that is the focus of this proposal is to build on Battelle's existing medical device engineering capacity. Battelle has expertise in all key areas of engineering required for complex medical device development, including electrical, mechanical, human factors, systems and software that will be a focus of this platform, as well as an overall ISO-aligned systems engineering approach. Battelle's capabilities include a 75,000-sq-ft facility purpose-built for medical product development. Dedicated laboratory facilities are available for experimentation, prototype development, build, and testing. The laboratories are supported by centralized facilities, including an electronics shop, instrument laboratory, machine shops, and model building shop with equipment for rapid prototyping.

   Battelle's on-site User Research Laboratory (uLAB) is a 4,500-sq-ft facility used to conduct user research and human factors testing for our consumer, industrial, and healthcare clients. The uLAB has three labs outfitted with state-of-the-art audio and visual recording capabilities, as well as the ability to live stream video across the globe. Each laboratory is fully reconfigurable to simulate the required environment, from an active clinical exam room to a quiet living room. In the past 12 months, Battelle has conducted studies with over 1,000 subjects in the uLAB.

   By broadening and deepening this expertise, Ohio-based firms who are developing complex, software-containing medical devices will have a strong partner to support their development process. Having a collaborator like Battelle will allow these companies to build better products which can more effectively compete in the marketplace and further grow the industry in Ohio.

   Battelle will team with three commercial firms as part of this program. LifeMedix, LLC (Akron, OH) is a medical device company that has developed a prototype infusion pump. Battelle will work with LifeMedix to design and develop this device and commercialize it within the three-year window required. This device is complex and requires a broad array of engineering disciplines with support from materials experts and fluid flow modelers. All of these skillsets reside within Battelle. Software, and especially the user interface, is a key component of the LifeMedix device.

   Valtronic Technologies (Solon, OH) is a medical device contract manufacturer that will produce the infusion pump. Valtronic has significant experience with medical device manufacturing and Battelle and Valtronic have worked together previously.

   Regulatory & Quality Solutions, LLC (Cleveland, OH) is a regulatory consulting firm that will provide LifeMedix with regulatory strategy and guidance in the process of getting their device approved by the FDA. Specifically R & Q will provide:

   - Regulatory Team Leadership and Support
   - Quality Assurance Team Leadership and Support
   - Regulatory Strategies, Submissions and Registration
   - Design Quality Engineering
   - Quality Systems Development
   - Supplier Quality Leadership and Support
   - FDA and Notified Body Audit Leadership
   - Training Services (Quality System Requirements & Inspection Readiness)

Battelle will hold discussions with additional commercial firms who can provide valuable services to the Ohio medical device community to see if they would be interested in participating in our proposal. Potential other partners may include sales, marketing and distribution companies, other medical device manufacturers and possible end users of the finished medical device.

2) LifeMedix, LLC: Cash Cost Share- $500,000

   Valtronic Technologies: Cash Cost Share- $25,000

   Regulatory & Quality Solutions, LLC: Cash Cost Share- $40,000

3) The product that will be commercialized as a result of this IPP Grant is LifeMedix' STATfusion medical infusion system. The pump will serve as a platform device from which other infusion pumps targeted to specific clinical applications can be developed. In addition to the infusion pump development, two services will be enhanced to provide medical device manufacturers in Ohio with a complete infrastructure with which to develop and commercialize their products

4) Medical device companies, particularly those in start-up mode, require strong partners who can help get their products to market and turn their ideas into reality. Battelle's Medical Products group has been doing this for over 20 years. Investments made by the State of Ohio and many others have helped build a growing medical device industry in Ohio notably in Northeast Ohio. These companies are consistently developing new and more complex medical devices with correspondingly complex software requirements. This community of device companies will need reliable and capable partners to support their efforts and increase their chances of success in the marketplace. Battelle has a broad and strong engineering, material science and software development capability and the Innovative Platform proposed will help that capability to grow and support Ohio-based medical device firms in the years to come.

IPP 14-317

Ohio | Third Frontier
Innovation Creating Opportunity

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**The University of Akron**
Lead Applicant Contact Information	**Name: J. Alexis De Abreu-García**
	Title: Professor, Electrical and Computer Engineering Department
	Phone Number: (330) 972-6709
	Email: alexis4@uakron.edu

Project Title:	Smart Sensor and Sensor System Design, Development, and Commercialization

Total Project Budget	$ 3,000,000	**Ohio Third Frontier Funds Requested**	$ 1,500,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☒ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Sensors, wireless communications, energy harvesting, power electronics, health monitoring, battery management, renewable energy.
Anticipated Markets	The utilities, the automotive industry, commercial vehicles industry segment, renewable energy market, and automation.

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

Ohio | Third Frontier
Innovation Creating Opportunity

Project Title: Smart Sensor and Sensor System Design, Development, and Commercialization.

1) Describe the proposed technology platform.

The College of Engineering at the University of Akron has a unique Innovation Platform Technology in the sensors area. Through the Wright Center for Sensor Systems Technology partnership at the University of Akron (WCSSE-UA), which is part of the Center for Advanced Vehicles and Energy Systems (CAVES), researchers in the College of Engineering are in partnership with a number of for-profit companies for the development of novel sensors and sensor systems which has and continue to create jobs and lead to long-term commercial benefits. Currently, personnel from ABB, Bendix Commercial Vehicle Systems, Design Flux Technologies, EBO, Exacter, Orbital Research, Paragon Robotics, and R.W. Beckett are collaborating with WCSSE-UA personnel to shorten the time-to-market of a number of new sensors, ranging from high temperature ASICs to flow sensors to flame detention sensors to flexible embedded sensors to power line health monitoring sensors. Some of the unique technology capabilities include low power wireless sensors, networked sensors, sensors with embedded computing, virtual sensors, energy harvesting sensors, high temperature sensors, optical sensors, fluid sensors, flow sensors, stress-strain sensors, corrosion sensors, health-monitoring, and other physical sensors. These sensor technologies are widely applicable to a number of Ohio industries. Some unique facilities include a 150kW dynamometer for testing motors, generators, and power electronic drive sensors, a Cadence commercial license for ASIC development, a high temperature electronics lab for testing integrated circuits at high temperatures, environmental testing facilities, a real-time computing lab for the development of improved embedded capabilities including virtual sensors, a tribology lab for testing bearing and seal sensors, an optical strain analysis lab for developing sensors that determine the deformation of structures, a battery lab for testing battery pack monitoring sensors and management systems, a microwave lab for developing wireless communication capabilities, an alternative energy lab for developing sensors for use in green technologies, a number of corrosion facilities for developing corrosion sensors, and access to a clean room in the Timken Engineered Surfaces Center. Through these facilities, researchers in the College of Engineering have established a long term track record of helping industries in the commercialization of new products, including the creation of new technology, intellectual property, and jobs.

2) List all committed industry clients and their anticipated cash cost share contribution.

Committed industry clients to date are Bendix Commercial Vehicle Systems located in Elyria, OH, Design Flux Technologies located in Aurora, OH, and Exacter located in Columbus, OH. Over the 3 year performance period, matching funds in the amount of $1,500,000 are anticipated, as follows: Bendix - $300,000, Design Flux Technologies - $100,000, and Exacter - $345,000. The University of Akron will commit to the cost share balance.

Bendix Commercial Vehicle Systems, a member of the Knorr-Bremse Group, develops and supplies leading-edge active safety technologies, air brake charging, and control systems and components under the Bendix® brand name for medium- and heavy-duty trucks, tractors, trailers, buses, and other commercial vehicles throughout North America. Bendix, employing more than 2,000 people, delivers solutions for improved vehicle performance, safety, and overall operating cost.

Bendix Commercial Vehicle Systems, headquartered in Elyria, Ohio, has the vision to become the leading worldwide supplier of active vehicle safety systems within the commercial vehicle industry.

Design Flux Technologies (DFT) has been developing battery systems since its establishment in 2011. DFT seeks to provide complete energy management solutions that offer an unprecedented level of unity, accuracy, and scalability for a variety of on and off-grid applications.

Exacter, of Columbus, OH, provides data, actionable field intelligence, and analytics that enable grid-reliable strategies.

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

Bendix Commercial Vehicles project will collaborate with University of Akron researchers and use their facilities to develop an electronic system to monitor the health condition of the brake system in trucks and report to the central control unit. The brake sensor and associated hardware and software pieces would need to be integrated with other possible sensors used in the brake system to provide a complete sensor package.

Design Flux Technologies will collaborate with University of Akron researchers and use their facilities to develop a health monitoring system for batteries. The product will be applicable to electric and hybrid vehicles, off-road electric vehicles, as well as the utility scale energy storage systems.

Exacter will collaborate with the University of Akron researchers and use their facilities to design fixed, continuous operation grid sensors that detect and report grid faults and deteriorating grid equipment. The sensors will include fault detection algorithms to detect and report critical faults and locations in transmission and distribution lines. The platform solution addresses six specific market-driven outcomes including: low cost; self-powered; continuous operation; real time reporting over a wide area; easy installation; and rapid location of electric grid events.

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

Sensing real physical data is an ubiquitous activity. To improve competitiveness, industries are realizing that obtaining more data from their manufacturing processes will allow them to improve production efficiency by understanding how their processes are behaving. More and more sensors are being added to everyday use devices to improve their performance. There is an increasing need to place wireless sensors throughout our infrastructure to monitor the status of roads, bridges, buildings, pipelines, and the power grid. All industries are realizing that they must add sensors to their production lines and products in order to reduce energy usage and remain competitive. The sensor technology and knowledge developed through WCSSE-UA will be utilized for the sponsoring companies, but once the existing capability is built upon, other industries will then engage the university for the development of similar sensors. Through this ongoing interaction, new sensors will be created, old sensors will be repurposed, and previously developed sensors will be licensed or modified for new applications. Companies will continue to utilize and sell these new products, as well as create jobs needed in their manufacture. Researchers in the College of Engineering at the University of Akron are dedicated to the success of these sensor technologies, and to the success of the Ohio industries engaged as partners.

The benefits of working with WCSSE-UA are the immediate startup of technical resources and access to capital equipment and facilities. The partnership of the above companies with WCSSE-UA will accelerate the release of products, and put them in step with the requirements of their principal commercial partners, as applicable.

Working with WCSSE-UA provides industry partners with a substantial reduction in time-to-market and access to technical resources that would be very difficult if not impossible to reproduce.

IPP 14-318

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**OBIC Bioproducts Innovation Center, The Ohio State University**
Lead Applicant Contact Information	**Name: Dennis Hall**
	Title: Director
	Phone Number: 614-292-4188
	E-mail: hall.16@osu.edu

Project Title:	Biobased Composites Innovation Platform

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☒ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☒ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative n

Key Scientific/ Technical Fields	Natural fibers, fillers, and resins for biobased plastics and composites
Anticipated Markets	Automotive, trucking, industrial, consumer, personal care

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

OBIC Bioproducts Innovation Center

152 Howlett Hall
2001 Fyffe Ct.
Columbus, OH 43210-1066
Phone 614-292-2922
FAX 614-247-4739

Letter of Intent: Response to Questions

Project Title: Biobased Composites Innovation Platform
Lead Applicant: The Ohio State University (OBIC)
Contact: Denny Hall, Director of OBIC
(614) 292-4188
hall.16@osu.edu

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

The anchoring technology behind the OBIC Biobased Composites Innovation Platform (BCIP) is the result of a prior Ohio Third Frontier Wright Project - Commercialization of *Bio-based and Nano-tailored Composites for Industrial Application*, awarded March 2009. This breakthrough technology allows for a drop-in replacement of new composite materials that combine the benefits of superior performance, renewable content, light-weighting, improved end-of life options, and improved wear of extrusion tools and dies (reduced abrasion), all with at least 10% cost savings compared to synthetic fibers. This platform also includes biobased commodity drop-in replacements.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

For this Innovation Platform Program proposal, the BCIP will be partnering with at least three unrelated industrial collaborators to pull this technology into the market with an impressive array of products. Current collaborators include:

- Biobent Polymers, LLC, Columbus, Ohio, is anticipated to commit approximately $750k
- Rage Plastics, Hilliard, Ohio, is anticipated to commit approximately $200k
- GDC, Inc. (Wooster, Ohio facility) is anticipated to commit approximately $900K
- Engineering Mechanics Corporation of Columbus, Ohio, is anticipated to commit approximately $300K
- Other collaborators, vendors, and end users may include companies like A Schulman, Ohio Soybean Council, Team Gemini, Scotts Miracle-Gro, Radio Flyer, Barrett Fencing, Powder Coating Research Group, Crane Plastics, Omnova, TimberTech, and VinylTech

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

The grant will focus on (a) fibrillated bast-fiber composite pellets, and specific formulations for the replacement of aluminum and glass fiber reinforced structural members for light-weighting and cost savings in the automotive, trucking, consumer, and building materials markets; and (b) bio-composite resin pellets and specific formulations for industrial injection molded parts and films. A large portfolio of applications exist, and will continue to fill BCIP's new product pipeline for years to come.

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

The use of sustainable, bio-based materials in polymeric compounds is expected to grow by 30-40% per year for the next decade. The BCIP is positioned to address this large and growing industry for years to come. The Biobased Composites Innovation Platform (BCIP) is market focused, as it is driven by a large and growing cluster of Committed End Users and bio-based composites development companies. These new and emerging biobased composite technologies and processes provide a unique competitive advantage for Ohio. The proposed BCIP will link Ohio assets in advanced natural fiber technologies, and application development expertise. The funding will help make Ohio first to market with revolutionary new natural fiber and filler based composites, and provide new business for Ohio's composite manufacturers while propelling our Ohio manufacturing supply chain into the role of the world's leading suppliers of biobased composite materials, bio-based raw materials, and processing equipment.

IPP 14-319

Ohio Development Services Agency | Ohio Third Frontier Innovation Creating Opportunity

John R. Kasich, Governor David Goodman, Director

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**Cleveland Clinic**
Lead Applicant Contact Information	**Name: Karl West, MS**
	Title: Director of Medical Device Solutions, Lerner Research Center
	Phone Number: 216-445-1944
	E-mail: westk2@ccf.org

Project Title:	**Endovascular Technology Innovation Center**

Total Project Budget	$ 6.0 M	**Ohio Third Frontier Funds Requested**	$ 3.0 M

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☒ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Medical Image-Guidance Systems; Advanced 3D Computer Graphics; Computer-based Modeling and Simulation; Medical Imaging; Position Tracking Micro-Sensors; Software Application Frameworks and Object Oriented Design; Advanced Materials; Fabrication of Disposable Devices; 3D Printing; Wireless Technology
Anticipated Markets	Endovascular Devices; Cardiac Devices; Devices for additional Clinical Areas (Oncology, Urology); Training and Simulation of Surgical Procedures; Clinical Services; Surgical Equipment and Instrumentation; Imaging Systems ; Medical Software

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

The high demand for endovascular procedures by patients and physicians in the value-based healthcare system— as a less invasive means for treating cardiovascular disease— has led to a billion dollar industry and an ongoing rapid increase in new endovascular devices.

The surgeons at the Cleveland Clinic Heart and Vascular Institute (HVI) — as the world leaders in cardiovascular care — are early evaluators of new endovascular devices, lead clinical trials, and treat a high volume of patients, including highly complex cases.

At the Cleveland Clinic **Endovascular Technology Innovation Center (ETIC)**, vascular and cardiovascular surgeons from HVI work side-by-side with research engineers and scientists to identify significant limitations

in present devices or procedures, and opportunities for new innovative products and services that answer existing unmet needs. The engineers have experience in and access to equipment for Imaging, Image-Guided Navigation, Computational Bio-modeling, and Device Rapid Prototyping. As such, the **ETIC** staff can synergistically leverage this platform to accelerate development of endovascular technology from concept to clinical evaluation to commercialization in NE Ohio.

This platform has led to innovative solutions for the OR. For example, to address serious and increasing concerns over the risk of harmful radiation exposure to patients and OR clinical staff from x-ray 2-D fluoroscopy image guidance, ETIC is developing the **Intra-operative Positioning System** (**IOPS**). **IOPS** uses a non-fluoroscopic method to track the position of sensor-enabled guide wires and catheters and displays these in 3-D relative to patient-specific vasculature. IOPS has been patented, is under clinical evaluation, and will be the first product in the portfolio of a Cleveland Clinic spin-off company, IOPS Inc.

ETIC is working with for-profit companies in NE Ohio to co-develop prototype components for IOPS. These clients, as well as anticipated platform-generated products and services that will be developed in collaboration with NE Ohio companies are described below.

2) Please list all committed *industry clients* and their anticipated cash cost share contribution.

ETIC's first direct industrial client is the Cleveland Clinic (CC) spin-off company **IOPS Inc**. (cost share anticipated $130k/yr, $390k total commitment). ETIC will support the commercialization of **IOPS Inc.'s** products, including clinical studies for regulatory approval, as well as other support for new products from the technical platform.

Clinic-ready prototypes of sensor-enabled catheters are being developed at ETIC in collaboration with **Parker-Hannifin Corp**., a Northeast Ohio based manufacturing company in business alliance with CC Innovations. **Parker-Hannifin** is anticipated to provide support in the form of personnel and advanced materials (cost share anticipated $125k/yr, $375k total commitment).

A similar collaboration is underway with **Yokowo Co.,** who co-developed sensor-enabled guide wires (0.034"). **Yokowo** has an office and a technical manager located within incubator suites in the CC Innovation building (**Yokowo** anticipated cost share $100k/yr, $300k total commitment).

ImageIQ (Cleveland, Ohio), a Cleveland Clinic spin-off company, has agreed to provide discounted support for processing of intra-operative IOPS videos and fluoroscopy images from clinical studies required for regulatory approval (anticipated cost share $100k/yr, $300k total commitment).

LogiSync LLC (Avon, Ohio) has committed to manufacture electronics components for IOPS Inc. (Cost share anticipated $125k/yr, $375k total commitment), including interfaces with Northern Digital Corp. (a company presently working with ETIC).

IOPS Inc. anticipates the use of other **NE Ohio manufacturing and service companies** in its supply chain. This will include sterilization services, packaging, hardware accessories in the OR for integration with C-arm and display systems, and regulatory consultation for seeking FDA 510 (k) and CE Mark approval.

A medical software applications company in NE Ohio is anticipated to commercialize ETIC's endovascular pre-planning application and distribute cloud-based software and data for the training/simulation systems (please see below).

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

The CC spinoff company, IOPS Inc., will manufacture IOPS as a turnkey solution. Commercialization of sensor-enabled wires and catheters will provide many commercial opportunities in collaboration with Ohio companies. In the near term, position sensor-enabled catheters and guide wires will be based on the standard selective-type used in general endovascular practice. In the next stage, product streams will be based on integrating tracking sensors with a wide range of catheters and guide wire types (e.g., starting, exchange, and specialty) for commercialization as Class 2 devices. Subsequently, position sensors will be integrated with existing delivery devices for implantation of Class 3 cardiovascular devices, e.g., aortic stent grafts and aortic valves. ETIC will support clinical validation and maintain design history files towards regulatory approval for both Class 2 and 3 devices.

Prototype application software, computer graphics, and vascular models for pre- and intra-operative surgical workflow associated with these devices will be developed by ETIC and commercialized by IOPS Inc. in a regulated software development environment.

Endovascular pre-planning software tools based on pre-operative MDCT imaging are also underway at the ETIC. These provide patient-specific measurements, path planning for vascular disease, intra-luminal cut-planes, etc., in an array of accessible formats. This is anticipated to be marketed as a HIPAA compliant software application for intra-procedure use or as a core service.

The IOPS system can also be used to simulate procedures for hands-on physician training. The ETIC has printed 3-D models of patients' vasculature based on pre-operative MDCT imaging. A library of complex models has been inventoried for endovascular navigation with a modified version of IOPS. A number of NE Ohio companies would have the capacity to replicate the vascular models and other components for production of training systems.

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

The ETIC constitutes a technical platform with unique leadership and resources for innovation in NE Ohio. The development and use of non-fluoroscopy image guidance, for instance, is expected to establish new standards for lowering intra-operative x-ray fluoroscopy radiation dose to patients and clinical staff, defined by the Cleveland Clinic as the world leader in cardiovascular care. This will include integrating tracking sensors not only with wires and catheters but also with endovascular delivery and positioning systems for existing, emerging, and yet-to-be-developed implantable cardiac and vascular devices.

The image guidance software architecture at the ETIC is being developed as an object-oriented framework to support the rapid integration of new applications, virtual devices, and system features. In the cardiovascular space, IOPS could eventually be extended, for instance, to treat occlusive or aneurysmal disease in any vascular bed.

ETIC is also developing applications outside of the cardiovascular area that leverage the capabilities and on-going enhancements to IOPS. Urologists at the Cleveland Clinic are interested, for example, in applying the stenting module to ureter stenosis. Initial investigation is also underway for precise positioning of a sensor-enabled brachytherapy applicator over multiple treatment sessions (fractions). ETICs object-oriented framework is also designed to eventually support integration of software applications or modules from other NE Ohio companies, e.g., radiation planning software for brachytherapy.

ETIC will drive innovation to not only increase the benefit for patient and clinical staff but also to generate a sustainable product pipeline of virtually unlimited endovascular and other minimally invasive technologies and services for commercialization in NE Ohio.

IPP 14-320

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**The Cleveland Clinic Foundation**
Lead Applicant Contact Information	**Name: Santhosh Vadivelu Ph.D**
	Title: Senior Director
	Phone Number: (216) 445-9039
	E-mail: vadives@ccf.org

Project Title:	Gene Reprogramming Therapeutics

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☒ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Epigenetics, Cancer and Therapeutics Platform
Anticipated Markets	Cancer Therapeutics, Regenerative medicine, Genetic disorders

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

Growing number of human diseases including cancer and neurodegenerative diseases are associated with aberrant genetic programming.

Clinical translational research in cancer has gathered momentum at Cleveland Clinic and novel gene reprogramming therapeutic drugs and biomarkers for cancer have been developed at Cleveland Clinic. Cleveland Clinic has been pursing pioneering clinical research in identifying FDA approved therapeutic molecules which can be combined in a novel formulation technology to improve therapeutic efficiency in human patients.

This drug combination platform will enable development of clinically useful fixed dose drug combinations and sophisticated drug formulations. As a part of the commercialization effort, therapeutic products developed from this platform will provide

more efficient, use-friendly drug delivery formulations that decrease unwanted side effects and increase clinical effectiveness and patient compliance.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

1. Client #1 – discussions are underway and will be finalized by the time of proposal; anticipated cash cost share contribution of $1.5M.
2. Client #2 - discussions are underway and will be finalized by the time of proposal; anticipated cash cost share contribution of $1.0M.
3. Client #3 - discussions are underway and will be finalized by the time of proposal.

3) Describe the commercial products that will be developed and enter the market within the 3-year time frame of the Grant.

Fixed Dose Drug Combination Product

The first novel fixed dose drug combination product is a gene reprogramming therapeutic which allows for improving the patient safety. The objective is to develop the novel drug combination discovered at Cleveland Clinic in combination with a drug delivery formulation to address the high unmet clinical needs in cancer and genetic diseases.

Gene Biomarker Product

Follow-on product will be a gene biomarker based diagnostic product which allows for individualized tailored treatment to a patient's disease status.

The drug combination and biomarker platform opens the doors for significantly improved efficacy of FDA approved drugs and will have fewer side effects, high compliance and improved quality of life.

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

Continued Commercialization can be driven through two avenues:

- Follow-on Products in the pipeline will include a steady stream of new diagnostic and new therapeutic opportunities developed in our own clinical programs and in partnerships with pharmaceutical and biotech companies.
- The combination of effective though underutilized drugs with our drug combination platform will fuel a pipeline of highly differentiated, new therapeutic products. This unique capability of the drug combination platform will allow pharmaceutical and device partners to collaborate and develop future products outside of cancer.

IPP 14-321

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**The Cleveland Clinic Foundation**
Lead Applicant Contact Information	**Name: Santhosh Vadivelu, Ph.D**
	Title: Senior Director
	Phone Number: (216) 445-9039
	E-mail: vadives@ccf.org

Project Title:	Inhaled Drug Device Combinations

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☒ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Inhalation Device and Therapeutics for Lung Regeneration
Anticipated Markets	Asthma, COPD, Regenerative medicine, Immune disorders

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

Lung disease is a major health challenge: each year over 400,000 individuals in the US die of lung disease. Due to the limited ability of the adult lung to regenerate and the frequency of lung disease, the lung is a tissue that can especially benefit from novel drug device combination products which improve lung regeneration.

Clinical translational research in lung diseases has gathered momentum at Cleveland Clinic and novel therapeutic drugs have been developed at Cleveland Clinic. Cleveland Clinic has been pursing pioneering research in identifying therapeutic molecules which can be combined with high efficiency lung delivery devices to target novel therapeutics to the lung that will improve lung function in patients.

This drug device combination platform will enable development of clinically useful lung delivery devices and sophisticated drug formulations. As a part of the commercialization effort, products developed from this platform will provide more efficient, use-friendly drug delivery devices that decrease unwanted side effects and increase clinical effectiveness and patient compliance.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

1. Client #1 – discussions are underway and will be finalized by the time of proposal; anticipated cash cost share contribution of $1.5M.
2. Client #2 - discussions are underway and will be finalized by the time of proposal; anticipated cash cost share contribution of $1.0M.
3. Client #3 - discussions are underway and will be finalized by the time of proposal.

3) Describe the commercial products that will be developed and enter the market within the 3-year time frame of the Grant.

Drug Device Combination Delivery Product

The first novel drug device combination product is a high efficiency drug delivery device which allows for efficient and precise lung drug targeting and individualized tailored treatment to a patient's disease status. The objective is to develop the novel drug discovered at Cleveland Clinic in combination with the delivery device to address the high unmet clinical needs in lung diseases.

Drug Device Formulation Product

The drug device platform opens the doors for significantly improved efficacy of novel drugs and less systemic drug exposure which leads to fewer side effects, high compliance and improved quality of life.

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

Continued Commercialization can be driven through two avenues:

- Follow-on Products in the pipeline will include a steady stream of new drug candidates and new therapeutic opportunities developed in our own clinical programs and in partnerships with pharmaceutical and biotech companies.
- The combination of effective though underutilized drugs with our drug device delivery platform will fuel a pipeline of highly differentiated, new therapeutic products. This unique capability of the drug device combination platform will allow pharmaceutical and device partners to collaborate and develop future products outside of lung regeneration.

IPP 14-322

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**Cleveland Clinic Foundation**
Lead Applicant Contact Information	**Name: Bruce D. Trapp**
	Title: Chair, Dept. of Neurosciences, Lerner Research Institute
	Phone Number: 216-444-7177
	E-mail: trappb@ccf.org

Project Title:	Magnetic Resonance Imaging to Develop and Commercialize Translational Biomarkers for Neurological Diseases

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☐ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☒ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Imaging, Neuroscience
Anticipated Markets	Research, Drug Development, Diagnostics

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.
2) Please list all committed industry clients and their anticipated cash cost share contribution.
3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.
4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

Technology Platform

Multimodal magnetic resonance imaging (MRI) techniques have been developed to noninvasively measure structural, metabolic, hemodynamic and functional changes of the brain. These advantages have made MRI an important tool to investigate brain development and neurodegenerative disorders, including diagnosis, disease progression monitoring, and treatment efficacy evaluation. While MRI lacks the resolution to characterize the cellular mechanism of the changes in brain structures such as dendritic remodeling, cell death, synaptic pruning or myelination, recent advances in MRI technologies have provided valuable opportunities for studying structural and functional brain measures.

There have been recent findings of the multimodal MRI in the context of surrogate biomarkers to identifying the risk for Alzheimer's disease (AD) in normal cognitive (NC) adults, brain anatomical and functional alterations in amnestic mild cognitive impairment (aMCI), and AD patients. In parkinsonian patients, putamenal signal hypointensity is commonly observed in patients with atypical Parkinsonism. In demented patients, hippocampal atrophy and prolonged T2 relaxation may help identify individuals with Alzheimer's disease. Caudate and putamenal atrophy are seen in Huntington's disease and may serve as markers of disease progression. MRI is the most sensitive in vivo imaging modality for the diagnosis of Multiple Sclerosis (MS) and for monitoring the effects of MS pathology in the CNS. In vivo metrics of MS pathology provide critical endpoints to demonstrate efficacy in clinical trials of MS therapies.

Cleveland Clinic has an existing MRI-based technology platform for clinical use; however MRI is an important translational component to demonstrate that the development and reversal of brain pathology in animal models are detectable and quantifiable. Furthermore, we seek to demonstrate that behavioral changes in animal models can be predicted from in vivo MRI results. These findings could then be: 1) translated to human clinical trials, providing validated endpoints to evaluate the efficacy of therapies targeting brain dysfunction in patients with neurodegenerative diseases, and 2) translated to clinical practice, providing objective metrics predictive of functional decline. Further development of these techniques and the establishment of promising neuroimaging biomarkers can enhance our ability of early diagnoses and improve the assessment of therapeutic efficacy in neural diseases in future preclinical studies, clinical trials and clinical medicine.

Committed Industry Clients

Renovo Biosciences Inc (RBI): RBI is partnering with Cleveland Clinic to develop and commercialize novel applications using MRI described here. In addition, we already established a working relationship with RBI to conduct a pilot study using MRI. RBI will contribute $1,000,000 over 3 years as a cost share.

Renovo Neural Inc (RNI): RNI is developing small molecule drugs for neurological diseases. RNI will contribute $700,000 over 3 years as a cost share.

Commercial Products

We expect to commercialize MRI through a fee-for-service model to evaluate neurological function (treatment efficacy) in preclinical drug development and clinical trials for neurological diseases. This effort entails development of standard protocols and applications to image and analyze neural tissue in animal models and humans.

In addition, there is a significant need and demand for novel MRI based biomarkers to use as diagnostics for neurological diseases. We expect to receive significant interest from clinical centers following demonstration of its accuracy and clinical significance in diagnosing various neurological diseases.

Sustainable Pipeline

In addition to commercializing MRI through a fee-for-service model to meet the current requirements, we expect to generate a wealth of new information from the initial studies that will provide an opportunity to develop new applications and intellectual property. Furthermore, the new information about pathogenesis and prognosis of neural diseases may result in novel pathways for drug development for these diseases. In addition, the image analysis aspect provides a great opportunity for new intellectual property that can add significant perpetual licensing revenues.

IPP 14-323

Innovation Platform Program

Letter of Intent

Lead Applicant Institution	**The Cleveland Clinic Foundation**
Lead Applicant Contact Information	**Name: Joe Rich**
	Title: Director of Governance, Grants & Compliance
	Phone Number: 216-445-1594
	E-mail: richj2@ccf.org

Project Title:	Interactive Visual Health Record

Total Project Budget	$ 6,000,000	**Ohio Third Frontier Funds Requested**	$ 3,000,000

Project Focus Areas

- ☐ Advanced Materials (related to advanced polymers, ceramics, composites, carbon fibers and nanotubes, and specialty metals and alloys)
- ☐ Aeropropulsion Power Management
- ☐ Agribusiness and Food Processing
- ☐ Fuel Cells and Energy Storage
- ☐ Sensing and Automation Technologies
- ☐ Shale
- ☐ Situational Awareness and Surveillance Systems
- ☒ Software Applications for business and healthcare
- ☐ Solar Photovoltaics
- ☐ Medical Technology (relating to imaging, surgical instruments/equipment, implant devices, and regenerative medicine

Key Scientific/ Technical Fields	Electronic Medical Records, Healthcare Analytics, Meaningful Use
Anticipated Markets	Healthcare Providers, Healthcare Payers

Please answer the following questions using no more than two additional pages. The Letter of Intent should address each question in order identifying each response. Do not include any trade secret information in this Letter of Intent.

1) Describe the proposed technology platform. Please refer to the Request for Proposals Section 2.1 second paragraph for the definition of a technology platform.

   Electronic Medical Record systems are the repository of details related to the condition and care of patients for an organization which provides healthcare services. We have built a platform which enables the integration of electronic medical record systems into the traditional workflow of a healthcare provider which facilitates the more accurate and complete capture of care delivery. The platform leverages traditional patient care models and incorporates advanced data collection and reporting tools which increase the efficiency of all aspects of healthcare delivery.

   The technology platform interfaces with care providers, patients, diagnostic, therapeutic and electronic medical systems to provide a functional environment focused on value based care delivery. The platform provides the connection to the electronic medical record system using a

suite of agnostic software constructors which enable the development of reusable modules that accelerate the implementation of workflow tools. The platform sits between commercially available electronic record systems (e.g. EPIC, Cerner) and those healthcare product tools (e.g. Care Delivery Whiteboard) developed by clients of this initiative.

2) Please list all committed industry clients and their anticipated cash cost share contribution.

    1. Software Development Client with anticipated cash cost share contribution of $1M.
    2. Meaningful Use Development Client with anticipated cash cost share contribution of $1M.
    3. Healthcare Delivery Client with anticipated cash cost share contribution of $1M.

3) Describe the commercial products that will be developed and enter the market within the 3-year timeframe of the Grant.

    - Care Delivery Whiteboard – a visual tool for exploring and documenting a patient's condition and plan of care.
    - Care Delivery Analytics – a visual tool for comparative analysis and reporting of a care teams activity and performance.

4) Describe how the platform will provide a sustainable pipeline of technologies for commercialization.

The electronic medical record integration platform enables the recurrent development and commercialization of healthcare work flow products which increase healthcare delivery efficiency. The platform provides an agnostic interface to existing commercial electronic healthcare record systems and accelerates the conception and creation of products which improve the accuracy and completeness of medical records along with the more effective management of healthcare providers.

The platform will be instantiated using an application programming interface (API) to facilitate the concurrent and sustainable development of functional modules which in turn extends the capabilities and commercial viability of the platform. A community of development clients will extend the adoption of the platform through their contributions and share in the joint value of its successful commercialization.