



North Dakota
LEGENDARY

RESEARCH NORTH DAKOTA

ANNUAL REPORT 2016



FUELING ECONOMIC GROWTH WITH RESEARCH & DEVELOPMENT PARTNERSHIPS



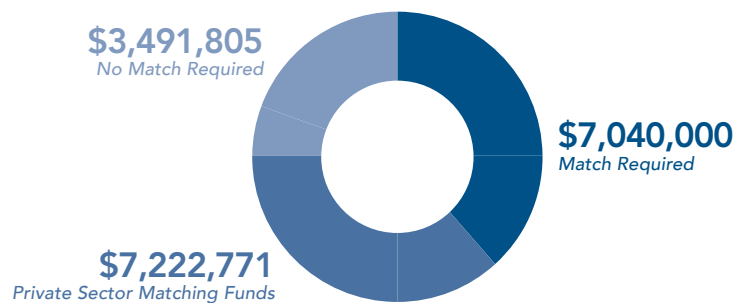
PROGRAM SUMMARY

Research North Dakota stimulates partnerships between North Dakota research universities and private sector businesses. It provides matching funds for the development and commercialization of products and processes through industry/research university projects.

RESEARCH ND INVESTMENT

State investment through June 30, 2016: \$10,531,805

Total public/private investment: \$17,794,918



FUNDS INVESTED TO DATE

Since the creation of Research North Dakota in 2013 by the State Legislature, a total of \$10.6 million in state funds have been awarded for 60 projects. Of these funds, \$5.01 million has been disbursed to Research North Dakota recipients as of June 30, 2016.

MATCHING FUNDS

As of June 30, 2016, the Research North Dakota Grant recipients have obtained over \$7.2 million of matching funds. The matching grants have a 1:1 private sector matching requirement. Research ND, Research ND BIO, Phase II Venture Grants, Phase I/II Venture Grants and Fast Track have matching requirements, while Phase I Venture Grants do not.

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COMMISSION MEMBERS

The Centers of Excellence Commission oversees the administration of the Research North Dakota grant program. Research North Dakota includes three subprograms. These subprograms are Research ND (includes Fast Track), Research ND BIO, and Venture Grants (Phases I, II and I/II).

The Centers of Excellence Commission, with assistance from the North Dakota Department of Commerce, oversees the post-award monitoring of all Centers and grant recipients. The process includes biannual interim reports and final project reports from the research universities that describe the progress that has been made toward the commercialization of the product or process that was outlined in the grant application. All private sector partners are required to provide information used for economic impact analysis for five years after the project has ended.



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C

NORTH DAKOTA ECONOMIC DEVELOPMENT FOUNDATION MEMBERS

- A. Mark Nisbet, Chairman
North Dakota Principal Manager, Xcel Energy, Fargo
- B. Tim Hennessy, Vice Chairman
Regional President, US Bank, Bismarck
- C. Jim Traynor
Regional Sales Manager, NetSuite, Fargo



D



E



F

STATE BOARD OF HIGHER EDUCATION MEMBERS

- D. Greg Stemen
Branch Manager, First Community Credit Union,
Oakes and Valley City
- E. Mike Ness
Retired School Administrator
of Hazen Public Schools, Bismarck
- F. Kevin Melicher, O.D.
Optometrist, Eyecare Associates, PC, Fargo



RESEARCH ND AWARDS

1:1 Match Required
2017-2019 Proposed Funding

Research ND funds can be used to commercialize new technologies, research and develop new products and improve existing products or processes.

VERIFY THE EFFECTIVENESS OF UAS-MOUNTED SENSORS IN FIELD CROP AND LIVESTOCK PRODUCTION MANAGEMENT

NDSU Department of Agricultural & Biosystems Engineering
Pulsar Operational Boundaries

Award to University: \$42,935 **Private-Sector Match: \$44,752** End Date: July 2016

To verify the effectiveness of UAS-mounted sensors in field crop and livestock production management.

LAW ENFORCEMENT UNMANNED AIRCRAFT SYSTEMS RESEARCH PROJECT

UND John D. Odegard School of Aerospace Sciences
AeroVironment

Award to University: \$35,466 **Private-Sector Match: \$35,550** End Date: August 2016

To study the effectiveness of AeroVironment's UAS platforms for use in law enforcement.

IMPROVED ENGINEERED COATINGS FOR AEROSPACE AND NAVAL APPLICATIONS

UND Mechanical Engineering
Technology Applications Group

Award to University: \$34,073 **Private-Sector Match: \$34,560** End Date: June 2016

To further characterize and modify Technology Applications Group's coatings for applications in additional markets.

Result: Technology Applications Group (TAG) will be using the information generated from this research to supply technical data sheets to optical manufacturers who are becoming more dependent on their Tagnite coating. This information will also assist TAG in making a stronger push into the optical and UAS fields. The company predicts additional jobs of 1-2 per year for the next 5-10 years.



STINGRAY: INTEGRATING BEYOND VISUAL LINE OF SIGHT COMMUNICATIONS CAPABILITY INTO UAS

UND UAS Center of Excellence
Rockwell Collins

Award to University: \$500,000 **Private-Sector Match: \$585,000** End Date: November 2017

To establish a beyond visual line of sight (BVLOS) test capability for civilian unmanned aircraft systems. This flight test effort will utilize the capabilities of the Northern Plains Unmanned Aircraft Systems Test Site.

EVALUATION OF THE EFFECTIVENESS OF SPORTS VISION PROGRAMS IN IMPROVING PERFORMANCE AND HEALTH IN YOUNG ATHLETES

UND Psychology
Valley Sports Vision

Award to University: \$213,399 **Private-Sector Match: \$217,490** End Date: December 2017

To evaluate the effectiveness of visual 'software' and 'hardware' training for athletes.

DESIGN AND DEVELOPMENT OF ACCELERATED DEGRADATION TEST METHODOLOGY FOR HYDRO-STATIC SYSTEM

NDSU Industrial & Manufacturing Engineering
Doosan Infracore Construction Equipment

Award to University: \$99,875 **Private-Sector Match: \$99,875** End Date: May 2017

To conduct research that will lead to an integrated and systematic process of designing accelerated degradation test methods for hydro-static and hydraulic systems, and a data analysis module to assess system reliability based on accelerated degradation data.

WIND TURBINE BLADE INSPECTION TECHNOLOGY APPLICATION

UND Tech Accelerator
EdgeData

Award to University: \$450,000 **Private-Sector Match: \$450,000** End Date: May 2017

To use UAS with high resolution cameras to inspect wind towers and turbines and develop software to convert the images into actionable data.

USING UAS IMAGERY TO IDENTIFY WEED INFESTATIONS IN CROPLAND

NDSU Agricultural & Biosystems Engineering
Sentera

Award to University: \$85,500 **Private-Sector Match: \$85,500** End Date: December 2016

To identify weed infestations using sensors on a UAS.



VALUATION OF OPTICAL SENSORS FOR DETECTION AND REMEDIATION OF CROP STRESS IN PRECISION AGRICULTURE

NDSU Agribusiness & Applied Economics
Sentera

Award to University: \$300,000 **Private-Sector Match: \$300,000** End Date: April 2018

To use GPS-enabled sensors mounted on a UAS to conduct rapid mapping of sub-field variations of crop health and provide prescriptive remedies for problem areas.

AVIATION ENTERPRISE RESOURCE PLANNING, COMMUNICATIONS AND CONTROL

NDSU Center for Nanoscale Science & Engineering
SmartC2

Award to University: \$300,000 **Private-Sector Match: \$304,068** End Date: December 2017

To research and develop improvements to light aviation management software that will integrate billing, scheduling, deployment, maintenance and other needs that are currently handled either by paper-based work or different software solutions that are not integrated.

UASs FOR BUILDING ASSESSMENT

UND Mechanical Engineering
PCL Construction

Award to University: \$145,771 **Private-Sector Match: \$159,342** End Date: May 2017

To minimize the amount of labor required to collect important construction site data using a small UAS during the construction process.

ELECTROCHEMICAL GAS-TO-LIQUID TECHNOLOGY DEVELOPMENT

UND Energy & Environmental Research Center
FuelCell Energy

Award to University: \$150,000 **Private-Sector Match: \$150,000** End Date: November 2016

To work on the development of a new electrocatalyst for direct gas-to-liquid conversion of methane gas to methanol.

DEVELOPING INTUITIVE PARKING SOFTWARE USING HIGH PERFORMANCE COMPUTING

UND Department of Computer Science
FedEx

Award to University: \$314,368 **Private-Sector Match: \$314,368** End Date: May 2017

To use high performance computing capacity and aviation management expertise to develop software with FedEx that will increase efficiencies in loading, unloading and flight operations.



CONVERSION OF VEGETABLE OILS TO WAXES, LUBRICANTS, TRANSFORMER FLUIDS, AND LOW-TOXICITY DRILLING FLUIDS

UND Energy & Environmental Research Center
Accelergy

Award to University: \$250,000 **Private-Sector Match: \$250,000** End Date: January 2017

To develop methods to convert vegetable oils to waxes, lubricants, transformer fluids, and low-toxicity drilling fluids. These products will be both environmentally friendly and produced from North Dakota products.

COOPERATIVE AIRSPACE TECHNIQUES AND VISUALIZATION (CATV) TESTING FOR ENABLING UAS OPERATIONS

UND Regional Weather Information Center
Harris

Award to University: \$300,000 **Private-Sector Match: \$313,748** End Date: December 2016

To develop techniques, devices, and methods to aid in risk and safety assessment for performing beyond visual line of sight UAS operations.

LARGE-SCALE UAS DATA COLLECTION, PROCESSING AND MANAGEMENT FOR FIELD CROP MANAGEMENT

NDSU Agricultural & Biosystems Engineering
Elbit Systems of America

Award to University: \$357,546 **Private-Sector Match: \$357,546** End Date: May 2017

To collect crop data using infrared, thermal, color and multi-spectral sensors on both large and small UAS. This data will then be compared to available satellite imagery and ground data collected using similar sensors. The analysis will be done by NDSU's Center for Computationally Assisted Science and Technology (CCAST).

UAS SENSOR PAYLOAD DEVELOPMENT FOR RESCUE OPERATIONS

NDSU Electrical & Computer Engineering
Cyclops Technologies

Award to University: \$291,784 **Private-Sector Match: \$292,864** End Date: September 2017

To miniaturize a through-the-wall sensor payload that can be operated from a small UAS.

DETERMINING CROP HARVEST READINESS USING UAV AND THERMAL INFRARED SENSORS

NDSU Research Extension Center in Carrington
IntelinAir

Award to University: \$62,291 **Private-Sector Match: \$62,291** End Date: March 2017

To use thermal infrared sensors mounted on a UAS to collect high-resolution imagery to determine the harvest readiness of crops in the field.

DEVELOPMENT OF WIRELESS ENERGY TRANSFER WITHIN THE HUMAN BODY

NDSU Electrical & Computer Engineering
Boston Scientific

Award to University: \$40,000 **Private-Sector Match: \$40,000** End Date: October 2016

To work on the development of a rechargeable, wireless pacemaker for human hearts.

POWERLINE COMPONENT FAILURE IDENTIFICATION – UAS

UND John D. Odegard School of Aerospace Sciences
Minnkota Power Cooperative and Border States Industries

Award to University: \$300,000 **Private-Sector Match: \$605,855** End Date: December 2017

To use unmanned aircraft systems as a tool to conduct aerial inspections of high voltage power lines to aid in the determination of necessary maintenance and repairs.

FAST TRACK

FAST Track is a subprogram of Research ND. Proposals must meet a compelling private sector need, be of short duration (no more than one year), and provide a compelling reason to begin immediately. These smaller grants are approved administratively and may not exceed \$50,000. The matching funds for Fast Track must be cash.

PRODUCE GREEN CONCRETE FROM FLY ASH WASTE

NDSU Civil & Environmental Engineering

Award to University: \$15,000 **Private-Sector Match: \$15,000** End Date: August 2016

To generate a green geopolymer concrete with fly ash from North Dakota coal-fired power plants and optimize the strength and cure time for construction purposes.



RESEARCH ND BIO AWARDS

1:1 Match Required

Research ND Bio has the same intent as Research ND but is limited to the development and commercialization of vaccines and antibodies for the prevention of, treatment of, or cure for cancer; virally infectious disease; or other pathogens, including bacteria, mycobacteria, fungi and parasites.

RESEARCH, DEVELOPMENT AND COMMERCIALIZATION OF PARVOONE

UND School of Medicine & Health Sciences
Avianax

Award to University: \$1,000,000 **Private-Sector Match: \$1,000,000** End Date: December 2015

To assist in the research, development and commercialization of novel therapeutic for parvovirus infection in puppies and dogs.

Result: Field trials of the K-9 Parvovirus Antibody Therapeutic Treatment showed a 90% success rate in treating parvo virus in dogs. Additional testing is underway and quality control is being monitored to ensure that the end product is consistent. Avianax anticipates launching ParvoOne in spring 2017.

RESEARCH AND DEVELOPMENT OF IMMUNOTHERAPEUTIC AND VACCINE CANDIDATES FOR PORCINE EPIDEMIC DIARRHEA VIRUS

UND School of Medicine & Health Sciences
Zyme Fast

Award to University: \$396,622 **Private-Sector Match: \$403,400** End Date: December 2016

To support the verification of target antigen proteins developed for a vaccine capable of producing PEDV neutralizing antibodies in immunized sows or egg yolk antibodies in hens. The express antigen will be isolated, purified and used for vaccine production.



STRUCTURAL CHARACTERIZATION OF CANDIDA VACCINES

UND School of Medicine & Health Sciences
NovaDigm Therapeutics

Award to University: \$45,712 **Private-Sector Match: \$45,712** End Date: August 2016

To develop and implement mass spectrometry-based methodologies to monitor lot-to-lot consistency and identify critical quality attributes (CQAs) of NovaDigm vaccine antigens related to treating Candidemia.

DEVELOPMENT OF THERAPEUTIC IG FOR INFLUENZA A: POTENTIAL IN POULTRY, CANINE, AND HUMAN MARKETS

UND School of Medicine & Health Sciences
Avianax

Award to University: \$1,000,000 **Private-Sector Match: \$1,055,850** End Date: November 2017

To develop anti-influenza A virus antibodies for the treatment of flu in poultry, dogs and humans using therapeutic goose antibodies.



RESEARCH ND VENTURE GRANTS

Match Requirement Varies Based on Phase of Award

The Research ND Venture Grant Program is designed to help move university-developed technology into the marketplace through startup or spinout companies. It provides seed grants and matching funds to facilitate startup and spinout companies' use of university technology.

PHASE I – NO MATCH REQUIRED

This grant phase is used to determine the feasibility of building a business around university developed technology.

REDUCTION OF GAS FLARING BY ADVANCED SEPARATION AND STORAGE

UND Institute for Energy Studies, Petroleum Engineering

Award to University: \$100,000 End Date: August 2015

To address the feasibility and market potential of using sorbent technology for the separation and storage of natural gas and lean gas as an alternative to flaring in the Bakken.

Result: A novel flare gas capture technology called Advanced Separation and Storage (ASSTTM) was developed in partnership with Envergen. Through this process, natural-gas-liquids (NGLs) are recovered from flare gas from the Williston Basin. Preliminary results show more than 85% of the NGLs can be recovered to give an NGL product that is more than 90% pure and a lean gas product that is more than 95% pure. The successful commercialization of this process is dependent on the price of oil.

EVALUATION OF ANTI-FOULING COATINGS FOR FRESH WATER ZEBRA MUSSELS

NDSU Center for Surface Protection

Award to University: \$99,523 End Date: September 2016

To address the feasibility and market potential of utilizing anti-fouling coatings as a means to mitigate colonization of underwater structures, such as municipal and industrial water intake pipes, by zebra mussels.



RATIONAL ANTIGEN DESIGN FOR PORCINE CIRCOVIRUS STRAIN 2 (PCV2) VACCINES AND DIAGNOSTICS

NDSU Veterinary & Microbiological Sciences

Award to University: \$99,995 End Date: June 2017

To further develop a vaccine and immunoassay for PCV2, one of the viruses involved in the Porcine Respiratory Disease Complex (PRDC).

HONING IN ON "EFFECTIVE" ANTIBODY RESPONSES TO ENHANCE PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV) PROPHYLAXIS

NDSU Veterinary & Microbiological Sciences

Award to University: \$99,965 End Date: June 2017

To further develop a vaccine and immunoassay for PRRSV, the single most important infectious cause of economic losses to the pork industry.

PROOF OF CONCEPT CLOUD CONDENSATION NUCLEUS COUNTER FOR UNMANNED AIRCRAFT SYSTEMS

UND Atmospheric Sciences

Award to University: \$99,739 End Date: May 2016

To develop a miniaturized cloud condensation nucleus counter for deployment on unmanned aircraft systems.

Result: A prototype of the CCN counter has attracted interest of two potential private sector partners. Both are in discussions with regarding the possible ongoing testing and future commercialization of the CCN counter.

DEVELOPMENT OF AN INTELLIGENT SELF-ORGANIZING ELECTRODE STIMULATION DELIVERY NETWORK

NDSU Electrical & Computer Engineering

Award to University: \$100,000 End Date: July 2015

To test a lead-less and battery-less electrode that was designed to provide electronic stimuli to the heart in cardiac resynchronization therapy (CRT).

Results: Successful testing of a lead-less and battery-less electrode that was designed at NDSU to provide electronic stimuli to the heart in cardiac resynchronization therapy (CRT) led to a collaborative effort and with Boston Scientific Corporation to test this technology in the development of wireless pacemakers for human hearts.



MATERIAL COMPOSITIONS FOR ARTIFICIAL BONE FABRICATION

NDSU Industrial & Manufacturing Engineering

Award to University: \$99,214 End Date: December 2015

To further develop the ability to replicate specific human bone using 3D printing. The project will address the feasibility and market potential of producing human bone with specific characteristics (e.g. age, gender, bone density) for use in research settings.

Result: This project resulted in the formation of a new North Dakota company, Advanced Bone Technology, Inc. Three students on the research team are the founders and officers of the company. They have secured grant funds from other sources to continue to grow the business. The President/CEO was selected as one of the 30 outstanding manufacturing engineers under the age of 30 by the Society of Manufacturing Engineers and also by Forbes Magazine as one of 2016's "30 under 30" for Manufacturing and Industry.

NANOSPHERES TO PROVIDE COMMERCIALY IMPORTANT NEW PROPERTIES TO PAINTS AND COATINGS

NDSU Coatings & Polymeric Materials

Award to University: \$100,000 End Date: December 2016

To address the feasibility and market potential of the use of nanospheres in paints and coatings to increase the anti-corrosion properties of the paint when applied to metal.

DEVELOPMENT OF GLIOMA PROGNOSIS KIT

UND School of Medicine

Award to University: \$100,000 End Date: September 2016

To develop a kit for the stratification of patients diagnosed with glioma for personalization of medical treatment.

REMOVAL AND RECOVERY OF PHOSPHATE FROM EUTROPHIC LAKES AND WASTEWATER AND USE OF RECOVERED PHOSPHATE AS A FERTILIZER

NDSU Civil & Environmental Engineering

Award to University: \$100,000 End Date: December 2016

To address the feasibility and market of potential iron cross-linked alginate beads for phosphate removal from water bodies and the subsequent use of the phosphate containing beads as a slow release fertilizer.



PUSH-BUTTON ADHESION CONTROL

NDSU Materials & Nanotechnology

Award to University: \$99,985 End Date: December 2016

To create a demonstration device for an adhesive technology that can be switched on and off with the push of a button.

DEVELOPMENT OF INHIBITORS TARGETING GAMMA-HERPES VIRUSES

NDSU Chemistry & Biochemistry

Award to University: \$100,000 End Date: June 2016

To address the feasibility and market potential of the use of inhibitor of gamma herpes viruses as a potential therapeutic agent. The Epstein-Barr virus (a gamma herpes virus) is one of the most common viruses in humans. It is the causative agent of infectious mononucleosis and is associated with several forms of cancer including Hodgkin's lymphoma, Burkitt's lymphoma and nasopharyngeal carcinoma.

SENSING EARTH ENVIRONMENT DIRECTLY (SEED SENSOR)

NDSU Mechanical Engineering

Award to University: \$99,969 End Date: December 2015

To address the feasibility and market potential of new sensor technology to directly measure the soil environment. The sensors would be deployed during planting and are produced from renewable environmentally-safe materials.

Result: SEED sensors were manufactured and run through field trials that consisted of five different soil types and three different crops. Additional field trials are underway on golf courses. A Phase II Venture grant was awarded NDSU with partner c2sensor to further develop and refine the capabilities of the SEED sensor.

NOVEL ANTI-INFLAMMATORY DRUGS FOR TREATING ALZHEIMER'S DISEASE

UND School of Medicine

Award to University: \$100,000 End Date: December 2016

To develop a safe, effective drug to treat the inflammatory conditions of Alzheimer's disease that contribute to disease progression.

DEVELOPMENT OF A MOBILE MEDICAL APPLICATION FOR THE ANALYSIS OF HAND ARTHRITIS

UND Electrical Engineering

Award to University: \$100,000 End Date: June 2017

To further develop a method to use a mobile application to measure and monitor anatomical changes to a hand relating to arthritis. Information from the mobile app would be shared with the patient's health care provider to assist with their treatment.



DEVELOPMENT OF MICRO COLD SPRAY PRINT SYSTEM

NDSU Center for Nanoscale Science & Engineering

Award to University: \$100,000 End Date: December 2016

To further develop a cold spray tool for applications such as flexible printed electronics and solar cells.

COMMERCIAL FEASIBILITY OF NOVEL RENEWABLE BASED POLYAMIDE THERMOPLASTICS

NDSU Center for Nanoscale Science & Engineering

Award to University: \$100,000 End Date: November 2016

To study the commercial feasibility of producing novel high temperature polymers based on furandicarboxylic acid (FDCA) for use as engineering thermoplastics.

NEW RENEWABLE POLYMERS FROM PLANT/VEGETABLE OILS

NDSU Coating & Polymeric Materials

Award to University: \$99,989 End Date: April 2017

To enable production of high-value and high-profit specialty polymers from vegetable oils.

A NEW DESIGN TO IMPROVE LIFE EXPECTANCY OF TOTAL ANKLE REPLACEMENT

NDSU Mechanical Engineering

Award to University: \$99,995 End Date: December 2017

To develop an improved prosthesis design that addresses the major limitations of current total ankle replacement approaches.

RADIO FREQUENCY WIRELESS POWER FOR INDUSTRIAL SENSORS

UND Electrical Engineering

Award to University: \$100,000 End Date: June 2018

To demonstrate a proof-of-concept of wirelessly powering industrial sensors through radio frequency at a distance and prototyping a power reception module system for industrial sensors.

DEVELOPMENT OF REMOTE PATIENT MONITORING SYSTEM

UND Electrical Engineering

Award to University: \$100,000 End Date: February 2017

To develop and commercialize a heart monitoring system using smartphones with no battery on the sensors side and no wire connection.



CONTINUED DEVELOPMENT OF COMMERCIALIZATION OF QUALITY CHARACTERIZATION TECHNOLOGY FOR 3D PRINTING

UND Computer Science

Award to University: \$99,954 End Date: December 2017

To develop a technology that will characterize the performance of in-process 3D printing.

TUNABLE POWER AMPLIFIER FOR SMARTPHONES

NDSU Electrical & Computer Engineering

Award to University: \$100,000 End Date: December 2017

To develop a power amplifier for mobile phones that eliminates today's key challenges of cost, size and battery power.

PRODUCTION OF MODIFIED SILICON QUANTUM DOTS FOR SENSOR APPLICATIONS

NDSU Chemistry & Biochemistry

Award to University: \$100,000 End Date: October 2016

To develop modified forms of silicon which are free of contaminants such as heavy metals and toxic nonmetals that can be used as sensors and diagnostic tools in commercial applications.

BUSINESS FEASIBILITY ASSESSMENT CENTERED ON HIGH PERFORMANCE SPIDER SILK PRODUCTION

NDSU Department of Pharmaceutics

Award to University: \$100,000 End Date: February 2017

To develop an artificial spinning device that mimics a spider's natural spinning system for the commercial production of tunable silk fibers.

SMARTSEALZ: PILOT/OPERATOR NAVIGATION AUGMENTATION AND PHYSIOLOGICAL MONITORING HEADSET

UND Electrical Engineering

Award to University: \$100,000 End Date: July 2017

To develop a modified aviation headset which will measure physiological data from the operator, and deviations in the planned route and provide warnings to the operator, based on that data, via tactile feedback.



TECHNICAL AND ECONOMIC FEASIBILITY ANALYSIS OF NEXT GENERATION VALLEY CITY STATE UNIVERSITY HEATING PLANT

UND College of Engineering & Mines – Institute for Energy Studies

Award to University: \$99,987 End Date: February 2017

To develop the technical and economic feasibility of the patented process of integrating activated carbon production within the steam generation heating plants operating at the North Dakota University System campuses.

GRAPHENE-BASED NEAR-INFRARED FLUORESCENT QUANTUM DOTS FOR BIODETECTION AND BIOIMAGING

UND Chemistry

Award to University: \$100,000 End Date: February 2017

To develop a new technique to make a series of novel graphene-based near-infrared fluorescent (NIRF) quantum dots (GQDs) for sensitive detection and imaging of a variety of biomedical samples.

ELECTROMAGNETIC INDUCIBLE DIGITAL PROTEIN EXPRESSION SWITCH OR EMID PROSWITCH

NDSU Electrical & Computer Engineering

Award to University: \$100,000 End Date: June 2017

To refine the use of radio frequency to induce gene expression which has the potential to generate profound changes in the biotech and drug delivery fields, and revolutionize medical treatment.

DEVELOPMENT OF INTELLIGENT INTEGRATED NETWORKS FOR RAPID PIPELINE DAMAGE DETECTION AND HEALTH MONITORING

NDSU Civil & Environmental Engineering

Award to University: \$100,000 End Date: June 2018

To develop a network of sensors for the effective and rapid pipeline damage detection and health monitoring.

DEVELOPMENT OF NOVEL ANTI-MICROBIAL MATERIALS FOR CLINICAL AND FOOD PROCESSING APPLICATIONS

NDSU Veterinary & Microbiological Sciences

Award to University: \$100,000 End Date: December 2017

To develop materials with biofilm inhibiting properties that can be used in multiple applications, including medical devices and food processing.



DEVELOPMENT OF NEXT GENERATION AGRICULTURAL SOIL AMENDMENTS

UND Civil & Chemical Engineering

Award to University: \$93,661 End Date: July 2017

To develop and experiment with a novel carbonaceous bio-soil amendment (CSA) from biomass (renewable) resources that will retain nutrients and act as a controlled-release form of nitrogen and phosphorus.

PHASE I/II – MATCHING FUNDS REQUIRED FOR SECOND PHASE

This grant phase is used when a university has already found a private sector partner and can work seamlessly through Phase I and Phase II. Matching funds are required for the second phase of the project.

PROCESS AND APPLICATION RESEARCH AND DEVELOPMENT FOR SOY-BASED MATERIALS FOR INDUSTRIAL APPLICATIONS

NDSU Coatings & Polymeric Materials

Award to University: \$200,000 **Private-Sector Match: \$150,000** End Date: March 2017

To scale up production of novel resins and polymers derived from plant oils and sugars for commercial use.

PHASE II – 1:1 MATCH REQUIRED

This grant phase is used to launch a startup or spinout company with technology that was proven in Phase I.

SENSING EARTH ENVIRONMENT DIRECTLY (SEED SENSOR)

NDSU Mechanical Engineering
c2sensor

Award to University: \$150,000 **Private-Sector Match: \$150,000** End Date: October 2018

To continue developing the SEED Sensor to directly monitor the soil environment. In its final form, the SEED Sensor will be the size of an acorn and developed from both bio-based and bio-inert materials.



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