

Minutes of the
CENTERS OF EXCELLENCE COMMISSION

February 2, 2016
Room 148 of NDSU Research 1
Fargo, ND

CALL TO ORDER

Mark N, Chairman, called the meeting to order at 10:00 a.m.

Commissioners Present: Mark Nisbet, Greg Stemen, Mike Ness, Tim Hennessy, Jim Traynor, Kevin Melicher

Commissioners Absent: None

Others Present: Al Anderson, Justin Dever and Christopher Kalash of the Department of Commerce; Michael Hennes of Minnkota Power Cooperative; Michael Corcoran and Jay Almlie of EERC; Yun Ji, Surojit Gupta, Nick Wilson, and Kevan Rusk of UND; Ben Braaten and Dan Ewert of NDSU, Dale Zetocha and Henry Nowak of the NDSU Research Foundation

COMMISSION BUSINESS

Opening Comments

Chairman Nisbet welcomed everyone and asked Commerce Commissioner, Al Anderson to give an overview of the budget situation. All agencies are being asked to make 4.05% budget cuts.

Approval of minutes from the October 21, 2015 and December 3, 2015 COE Commission meetings

It was moved by Ness and seconded by Hennessy to approve the minutes from the October 21, 2015 and December 3, 2015. Motion carried on a voice vote.

Consent Agenda

Kalash provided an overview of the consent agenda items:

It was moved by Melicher and seconded by Stemen to approve the Consent Agenda. Motion carried on a voice vote.

Presentations from Applicants

Powerline Component Failure Identification – UAS by Michael Corcoran, Research ND , UND

Nick Hennes, of Minnkota Power, Patrick Novak of Border States Industries

EERC proposed partnering with Minnkota Power Cooperative and Border States Industries to develop a process for using UAS to inspect high voltage power lines. The goal is to find connectors that are in danger of failing *before* they fail. By detecting these issues before failure, the expectation is that repairs can be made in a timely manner and reduce or eliminate outages that occur when connectors fail.

Using UAS will free up service crews to be doing service work rather than sending crews into the field to conduct inspections. If the project is successful, Border States will market and sell this service. Minnkota will be a user of the service. A specific aim of this project will be looking at dead-end bodies on dead-end structures to find separation in dead-end bodies.

In response to a question from Hennessy, Corcoran said we are focusing on a real problem and making steps toward next steps. The year-long project will not be the end of the process.

In response to a question from Traynor, Patrick said that the data will be analyzed by BSE and then the report will be given to Minnkota so that they can act on the information provided.

In response to a question from Traynor, Corcoran said his company will own the UASs that will be used.

In response to a question from Ness, Hennes said that Minnkota wants to solve this problem, BSE and Waypoint are interested in the IP.

In response to a question from Ness, Hennes said visual inspection and infrared, in a bucket truck, are the methods used for this inspection currently. Novak said that by collecting and cataloging this information, they should be able to make educated predictions on when parts will need replacement.

In response to a question from Melicher, Corcoran said that there are no issues with authority to fly. I have 3 companies that have 333 exemptions. All my pilots are licensed. If above we fly above 400 feet or beyond line of sight, there will be challenges. But we are not there yet.

Nisbet asked Dever to provide an update on the availability of funding for the Research ND programs. Dever stated the Commission set caps of \$2 million for Phase 1 Venture Grants and \$2 million for Phase 2 Venture Grants. The Legislature set aside \$1 million of Research ND for Research ND BIO. The rest is for Research ND. There is about \$1.3 million left in Phase 1. None of the Phase 2 funds have been awarded yet.

Commercialization of Novel Lignin Reinforced Bioplastics by Using Game Changing Additive Manufacturing Practices by Surojit Gupta, Phase 1 Venture Grant, UND

Also present: Yun Ji

Plan to design lignin based bioplastic for green manufacturing. The goal of green manufacturing is to reduce environmental waste. Lignin based materials will be compared to other materials that are currently being used in these areas.

Gupta has ties to Solidia Technologies. This company has created 50 jobs in New Jersey. PI has already made contact with companies that are interested in this research.

Lignin is the second most common biopolymer after cellulose. Lignin can improve toughness and flame resistance. It is also difficult to process it by melting. These qualities make it ideal for 3D printing and layered manufacturing. It is also biodegradable.

Our plan is to compare lignin to other materials that are being used in these areas. We have already made contact with some companies who have expressed interest in our research.

Shared samples of composites that they have already developed.

In response to a question from Hennessy, Gupta said that the competitive threat is that there are many green companies. The unique point is that no one has yet focused on lignin.

In response to a question from Nisbet, Gupta said we have lignin feedstock here in ND and that will be the advantage of using lignin in ND. The sources include waste from the paper industry, sugar beet industry, and ethanol industry. We will also create jobs in manufacturing and for students in the area of this chemistry.

In response to a question from Traynor, Gupta said that the major challenges of moving to the next phase are getting investment funds, scale up from lab scale to industrial scale, getting partners, and securing IP.

Gannet UASS - Unmanned Aviation and Submersible System (Rapid Air and Water Deployable Vehicle) by Nicholas Wilson, Phase 1 Venture Grant, UND

Also present William Semke

Proposed advancing further design capabilities of UAS. This project would take a fixed wing UAS and make it something that could be flown into the water and transform into a submersible. The name comes from the gannet, a bird that dives directly into the water at a high speed to hunt for food. This UAS would have applications in the military, intelligence/surveillance, weather forecasting, homeland security, counter narcotic, environmental disaster response and monitoring. It will have longer range than a quad copter. It will also be able to make the transition quickly, rather than submersible quad copters. DoD has funded a submersible quad copter development project.

Gannet could have gotten to the Malaysia Airlines flight 370 crash more quickly and shortened the response time. In order to have found the signal, the searchers needed to be searching underwater. The sensors will need to both work above and below the water. We plan to refine the transition process from air to water.

ComDel in Wahpeton has provided a letter of support.

In response to a question from Stemen, Wilson said that the plan is for it to also be able to go from water to air.

In response to a question from Ness, Wilson said that these would be placed strategically so that the distance is manageable.

In response to a question from Traynor, Wilson said meeting with the Air Force and/or the Navy are next steps.

In response to a question from Hennessey, Wilson said that the goal is to get the technology perfected. Things like optimum height and angle for entry into the water, or the methods of controlling buoyancy, or methods of re-launch are different types of IP that could come out of this. Semke stated that we have to think of what are the crucial technologies that we can get that IP from. Then use this to develop the product and grow it here in ND.

Presentations from Applicants (continued)

Development of Intelligent Integrated Networks for Rapid Pipelines Damage Detection and Health Monitoring by Zhibin Lin, Phase 1 Venture Grant, NDSU

A proposal to install wireless RF powered sensors on existing pipelines and embed them in newly manufactured pipe for pipelines that would send vital information about the pipeline to a UAS that would over the pipelines. The data collected from these sensors would then be analyzed to detect failures before they occur. These could take the place of "Smart Pigs." Smart pigs are monitoring devices that are run through the pipeline to detect problems. These are expensive to run, result in down time of the pipeline, and have difficulty negotiating some of the turns in a pipeline.

These sensors could provide information in a more timely and efficient manner. It would create North Dakota jobs in the manufacturing of the new pipes and sensors that could be installed on existing pipe. Also for the pilots and data analysis. Data processing will be quicker also. Sensors will be RF powered.

A representative of Midwest Industrial X-ray shared his company's perspective on this idea. They currently use smart pigs and would welcome this technology. It would raise the quality and timeliness

In response to a questions from Ness, the Midwest X-ray representative said by using a single source from this technology, we would have the ability to detect weaknesses before leaks happen. For instance, a microscopic crack will make the pipeline emit a different sound as product runs through it. Lin stated that they already have done preliminary work with the sensors. This project would take the sensors to the field.

In response to a question from Melicher, Lin said each sensor would be installed on the pipeline twenty meters apart.

In response to a question from Nisbet, Lin said we will both embed sensors in the pipe that is being manufactured and install them on existing pipelines.

Development of Wireless Energy Transfer within the Human Body by Benjmin Braaten, Research ND, NDSU

Keith Maile of Boston Scientific

A proposal to take NDSU developed technology to develop a leadless, wireless, rechargeable pacemaker that can be inserted in to the heart. Eliminating the need for the battery would make it possible to make the device smaller. Current models that have a battery last 5-7 years before the battery dies. This requires surgery to remove and replace the pacemaker. Any surgery has its potential drawbacks. By developing a device with a battery that can be wirelessly recharged (on a weekly or monthly basis) this would be far safer for the patient. This will also add to the patient's quality of life.

In response to a question from Melicher, Maile said that this product would be in direct competition with devices made by Medtronic.

In response to a question from Nisbet, patients will be told how often they will need to re-charge their pacemaker. This will be based the expected workload of the pacemaker.

In response to a question from Melicher, we are not sure if this will need a new approval from the FDA or if this can be treated as part of previous work.

Consent Agenda

The Commission reviewed the consent agenda items

It was moved by Melicher and seconded by Stemen to approve the consent agenda. The motion carried on a voice vote.

SmartSealz: Pilot/Operator Navigation Augmentation and Physiological Monitoring Headset by Kouhyar Tavakolian, Phase 1 Venture Grant, UND

A proposal to develop a headset for pilots that will collect physiological readings that it will measure both physical and mental fatigue. The headset will then provide audible and haptic feedback to the pilot based on the information is collects and analyzes. FAA rules state when pilots are fatigued. This is something that can be measured. SmartSealz will measure fatigue using sensors that will be built into the ear pads in aviation headsets. This can be applied in more than just manned aviation. Other markets could include UAS pilots, commercial trucking, train or subway.

In response to a question from Nisbet, Wilson said that the system is designed to mitigate both deviation and fatigue. Information could go to central operations control. For now, the feedback would only go to the pilot.

In response to a question from Traynor, Wilson said these seals would be installed on any headset. Ideally, we will partner with a headset manufacturer.

In response to a question from Kalash, Wilson stated that the marketing video will assist in reaching the manufacturers with this idea.

In response to a question from Ness, Tavakolian said we have already connected with private partners who have expressed interest. We still have a lot of work to do to prove the worth of this idea before a private company will be ready to invest.

Commercialization of A Low-Cost/High-Precision Clock Synchronization Method Enabling Industrial Remote Control by Jun Liu, Phase 1 Venture Grant, UND

A proposal to develop a low-cost, high-precision clock synchronization technology. This will include the development of the technology and market research. Finance requires precise time stamps. Precision manufacturing requires precision timing, especially with the use of robotics. There will also be wide applicability in the IT and telecommunication industries. The advantages to using this technology are the highest precision and lowest cost in comparison with other current solutions. This would be a pure software solution with no hardware costs.

In response to a question from Traynor, Lui said that UND owns 100% of the intellectual property rights to this technology.

Technical and Economic Feasibility Analysis of Next Generation Valley City State University Heating Plant by Steven Benson, Phase 1 Venture Grant, UND

Also present: Micheal Mann and Dan Laudal of UND and Srivats Srinvasachar of Envergenx

A proposal to use steam from the new steam plant at Valley City University to generate two types of activated carbon. This can lower the carbon footprint of the university's, provide a platform for students to work with the technology, and create a revenue stream for the university by selling the activated carbon.

Benson described the process of taking feedstock from North Dakota coal burning power plants and transforming it into activated carbon.

Conventional activated carbon can be used to purify drinking water and also in power plants. Enhanced activated carbon can be used to make super capacitors with a market value of roughly one hundred times the value of regular activated carbon. This will create a revenue stream for the university.

Benson addressed concerns of the technical reviewers.

If this is successful, there would be opportunities to do the same on other NDUS campuses.

In response to a question Ness, Benson said that the technology is in place to do the project. We have made activated carbons from lignite. We have made the other specialty carbons in the lab.

In response to a question Ness, Benson said there is funding for a new steam plant at VCSU, this system would be added on to the new boiler.

In response to a question Melicher, Benson said the ash from the boiler becomes part of the activated carbon. Srinivasachar stated that the ash actually becomes part of the activated carbon.

In response to a question Nesst, Benson said that the Lignite Energy Council is interested in this study and provided a letter of support because they are interested in other uses of lignite. We may also seek funding from them.

In response to a question Nisbet, Srinvasachar said that coal fired power plants use activated carbon to reduce mercury emissions.

Graphene-based Near-Infrared Fluorescent Quantum Dots for Biodetection and Bioimaging by Julia Zhao, Phase 1 Venture Grant, UND

The objective of this proposal is 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, including biomolecules, cellular and tissue samples. The new technique is based on a simple and cost-efficient chemical method. The distinct features of these novel GQDs are: 1) highly intense and photostable fluorescence signals, 2) low toxicity, 3) high water solubility, and 4) tunable fluorescence wavelengths. In addition

to the biomedical field, the QGDs will have broad applications in the food industry, water purification system, and the electronics industry and will be a breakthrough in material science.

A patent application has been made. We have received some interest from companies that are interested in the work we are doing. Bluestone Global Technology has requested samples for testing. HQC Bioscience, a North Dakota Company, has expressed interest and could potentially produce QGDs in Fargo.

In response to a question from Stemen, Zhao said that because we have an initial product we are hoping to have patent approval in the first half year.

Assessing the feasibility of a start up business centered on high performance spider silk production by Amanda Brooks, Phase 1 Venture Grant, NDSU

This project will assess the feasibility of a start-up business centered on high performance silk production. Current spinning techniques poorly capture parameters of natural fiber production. We hypothesize the failure is primarily due to the failure to emulate the microenvironment of the spider during spinning. Here, we propose to development an artificial spinning device that mimics the spider's natural spinning system for the commercial production of tunable silk fibers.

Spiders produce 7 different types of silk. Each type serves a certain purpose.

The proposed idea combines three different, current methods of spinning silk into one method. The three are: wet spinning, electro spinning, and microfluidic spinning. This proposal will integrate the best qualities of each into one spinning device.

The first area that they would like to use the product is in optical sutures.

In response to a question from Stemen, Brooks stated that there currently some lower grade versions of similar materials. They do the job for the type of applications that they are used for.

In response to a question from Nisbet, Brooks stated currently they are taking all the protein used from real spiders. The silk consists of 2 proteins. We will be creating one blended protein on our own from our study of that material.

In response to a question from Stemen, Brooks said there are currently some lower grade versions of similar materials. They do the job for the type of applications that they are used for.

In response to a question from Nisbet, Brooks said they are taking all the protein all from real spiders now. It consists of 2 proteins. We will be creating one blended protein on our own from our study of that material.

Commission Business

Research and Development of Immunotherapeutic and Vaccine Candidates for Porcine Epidemic Diarrhea Virus (Research ND BIO) – Change Request for timeline extension until December 31, 2016. Work started later than the projected.

It was moved by Stemen and seconded by Traynor to approve the Change Request and grant the timeline extension. The motion carried on a voice vote.

Requests to end postaward monitoring for GFAPB Realignment (Enhancement Grant) and SUNRISE BioProducts (Center of Excellence)

It was moved by Stemen and seconded by Hennessey to release both the GFAPB Realignment grant and SUNRISE from postaward monitoring. The motion carried on a voice vote.

Research, Development and Commercialization of ParvoOne (Research ND BIO) – Disbursement Request \$199,485.43 – Final Disbursement

It was moved by Melicher and seconded by Stemen approve the disbursement. The motion carried on a voice vote.

Administratively Approved Changes and Reports

Kalash updated the commission on administratively approved items including

Minor Budget Changes (<20%) for Development of a Mobile Medical Application for the Analysis of Hand Arthritis (Venture Grant Phase 1), Radio Frequency Wireless Power for Industrial Sensors, Evaluation of antifouling coatings for fresh water zebra mussels.

Initial disbursements for Developing Intuitive Parking Software with FedEx using High Performance Computing, Determining Crop Harvest Readiness Using UAV and Thermal Infrared Sensors, and New Renewable Polymers from Plant/Vegetable Oils.

Payment of invoices from Solix and the ND Attorney General's office.

Other information

Kalash updated the commission on the COE, CORE, and Research ND Fund statuses, receipt of a final report from Reduction of gas flaring by advanced separation and storage, and interim reports from Structural characterization of Candida vaccines, Law Enforcement Unmanned Aircraft Systems Research Project, Unmanned Aerial Systems for Building Assessment, Developing Intuitive Parking Software with FedEx using High Performance Computing, Cooperative Airspace Techniques and Visualization (CATV) Testing for Enabling UAS Operations, Rational antigen design for porcine circovirus strain 2 (PCV2) vaccines and diagnostics, Homing in on "effective" antibody responses to enhance PRRSV prophylaxis, Novel Anti-Inflammatory Drugs for Treating Alzheimer's Disease, Development of Micro Cold Spray Print System

Discussion and Decisions Related to Research ND Proposals

The Commission members submitted their scoring sheets and discussed the merits of the Research North Dakota proposals. Dever share the tabulated scores and shared average scores for each.

It was moved by Melicher, seconded by Ness, and carried on a roll call vote to approve the RND proposals entitled "Powerline Component Failure Identification – UAS" and "Development of Wireless Energy Transfer within the Human Body." Melicher, Ness, Stemen, Nibet, Hennessy, Traynor voted "aye." No negative votes were cast.

It was moved by Traynor, seconded by Stemen, and carried on a roll call vote to deny the Phase 1 Venture grant proposal entitled "Commercialization of A Low-Cost/High-Precision Clock Synchronization Method Enabling Industrial Remote Control" Melicher, Ness, Stemen, Nibet, Hennessy, Traynor voted "aye." No negative votes were cast.

It was moved by Traynor, seconded by Melicher, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "Assessing the feasibility of a start up business centered on high performance spider silk production" Melicher, Ness, Stemen, Nibet, Hennessy, Traynor voted "aye." No negative votes were cast.

It was moved by Melicher, seconded by Stemen, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "Graphene-based Near-Infrared Fluorescent Quantum Dots for Biodetection and Bioimaging" Melicher, Ness, Stemen, Nibet, Hennessy, Traynor voted "aye." No negative votes were cast.

It was moved by Ness, seconded by Stemen, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "Technical and Economic Feasibility Analysis of Next Generation Valley City State University Heating Plant" Melicher, Ness, Stemen, Nibet, Hennessy, Traynor voted "aye." No negative votes were cast.

It was moved by Hennessy, seconded by Traynor, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "SmartSeal: Pilot/Operator Navigation Augmentation and Physiological Monitoring Headset" Melicher, Ness, Stemen, Nibet, Hennessy, Traynor voted "aye." No negative votes were cast.

It was moved by Ness, seconded by Traynor, and carried on a roll call vote to deny the Phase 1 Venture grant proposal entitled “Development of Intelligent Integrated Networks for Rapid Pipelines Damage Detection and Health Monitoring” and encourage them to explore the idea of applying again for a Research ND grant with a partner. Melicher, Ness, Stemen, Nibet, Hennessy, Traynor voted “aye.” No negative votes were cast.

It was moved by Traynor, seconded by Melicher, and carried on a roll call vote to deny the Phase 1 Venture grant proposal entitled “Gannet UASS - Unmanned Aviation and Submersible System (Rapid Air and Water Deployable Vehicle)” Melicher, Ness, Stemen, Nibet, Hennessy, Traynor voted “aye.” No negative votes were cast.

It was moved by Stemen, seconded by Ness, and carried on a roll call vote to deny the Phase 1 Venture grant proposal entitled “Commercialization of Novel Lignin Reinforced Bioplastics by Using Game Changing Additive Manufacturing Practices” Melicher, Ness, Stemen, Nibet, Hennessy, Traynor voted “aye.” No negative votes were cast.

ADJOURNMENT

There being no further business, the meeting adjourned at 4:55 p.m.

Mark Nisbet, Chairman

Date

Christopher Kalash, Recording Secretary

Date