EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH AND RESEARCH NORTH DAKOTA
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BUDGET SECTION
SENATE CHAMBER, STATE CAPITOL
REPRESENTATIVE CHET POLLERT, CHAIRMAN

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Good afternoon, Mr. Chairman and members of the Budget Section, my name is Jolynne Tschetter and I am the Commercialization Manager for the Office of Innovation and Entrepreneurship within the North Dakota Department of Commerce.

I'm here today to report regarding the Experimental Program to Stimulate Competitive Research (EPSCoR) and Research North Dakota, including the Research North Dakota venture investment program pursuant to Section 37 of 2013 Senate Bill No. 2018

North Dakota continues to make strides in building research and development infrastructure that is having a positive impact on technology-based growth.

The U.S. Chamber of Commerce Foundation's *2013 Enterprising States* ranks North Dakota 1st in science, technology, engineering and mathematics (STEM) job growth and 5th in academic R&D intensity.

The Beacon Hill Institute Competitiveness Report ranks North Dakota at:
- 3rd in academic science and engineering R&D per $1000 GSP
- 3rd in science/engineering graduate students per 100,000 inhabitants
- 6th in science/engineering degrees per 100,000 inhabitants

ND EPSCoR and Research ND contribute to these efforts by investing in technology-based programs that align with North Dakota's targeted industry sectors including agriculture, energy, life sciences, and advanced manufacturing.

Summary of the Experimental Program to Stimulate Competitive Research

North Dakota has greatly advanced its research infrastructure with federal and state support, yielding an excellent return on investment. ND EPSCoR has over the life of the program:
- Contributed to the recruitment of over 200 new faculty researchers to the state
- Supported over 2,000 graduate and undergraduate students
- Produced 2,350 publications
- Invested in over 460 new pieces of research equipment
- Generated more than 30 patents and licenses
- Enhanced S&T opportunities for 98 companies and more than 100 students through the Students in Technology Transfer and Research (STTAR) program.
- Contributed to establishment of new high-technology businesses

Funding Status of NSF Experimental Program to Stimulate Competitve Research

ND EPSCoR's current NSF Research Infrastructure Improvement (RII) Track 1 Award ends 8/31/14. This award and state funding has contributed to these important capacity building areas:

1. enhanced research infrastructure
2. provided funding to increase faculty capacity and competitiveness;
3. expanded cyber-enabled communication, discovery and innovation;
4. broadened and diversified the STEM pipeline; and,
5. initiated university-private sector partnerships to convert research results into opportunities for ND residents.

A $6M NSF EPSCoR (Track 2) collaborative proposal with South Dakota was awarded in August 2013. $3M of this award is for North Dakota. The primary goal of this project is to establish a multi-state, multi-disciplinary research collaboration with a focus on processing lignin into renewable chemical and polymeric alternatives for petrochemicals.

A 5-yr proposal (2014-2019) totaling $20M is currently under consideration. Award announcements are expected to be announced this summer. This proposal includes:

1. Two research clusters (Regional Climate Studies and Sustainable Materials Sciences)
2. Expanded research and education programs for collaborating with ND's undergraduate institutions and tribal colleges
3. Awards to support promising initial enquiries into new research directions, especially those that broaden the impact of Regional Climate Studies (RCS) and Sustainable Materials Science (SMS)
4. High Performance Computing in support of identified scientific and engineering themes
5. Expansion of partnerships and collaborations that will foster translation of RCS and SMS research results into actionable items for North Dakota stakeholders

State funds match to the Experimental Program to Stimulate Competitive Research

ND EPSCoR activities support research, STEM education and diversity, and technology transfer programs that create economic value, jobs, and societal benefits. From 1986-2013, North Dakota has invested $46.6M in ND EPSCoR; the return has been $351M in merit-based research awards – a 7.5:1 return.

State funding is utilized to: 1) increase the state's research competitiveness; 2) provide STEM education opportunities and promote development of a diverse STEM workforce; 3) develop partnerships and collaborations, particularly with the private sector contributing to economic development in North Dakota.

Research clusters – a primary focus of EPSCoR (including EPSCoR-like programs) is building research capacity and competitiveness. For the past two biennia, funding has been applied to NSF, NASA, and DOE relevant research.

The long-term plan of supported clusters is to become competitive for additional extramural (i.e., non-EPSCoR) federal funding and for commercial partnerships. These expectations are part of the selection and evaluation criteria for choosing clusters.

NSF research themes (or "clusters') have recently included:

- SUNRISE **(SUstainable eNergy Research Infrastructure and Supporting Education)** centered at UND. SUNRISE graduated from the EPSCoR Research Infrastructure Improvement (RII) (i.e., Track-1) this past year and over the life of the project has received $30 million in additional external grants as a result of the capacity-building made possible by EPSCoR.

- **Sustainable Materials Science** (SMS) research program led by NDSU. The program will provide a transformative approach to the development of sustainable materials derived from agricultural raw materials. This program is early in its funding cycle.

- An emerging research area in **Regional Climate Studies** led by UND. This program will develop a comprehensive set of interrelated simulation suites to address climate change and weather-related phenomena with a focus on the Northern Great Plains (NGP). Because of the region's strong agricultural sector, the interrelationships of atmospheric conditions, hydrological changes and agricultural effects will be central. The studies will address the relation of changes in physical conditions to agricultural economics.

University-Private Sector Partnerships - ND EPSCoR's goals include increasing private sector partnerships, new product research, and creating technology-based start-up companies. As examples:

- The SUNRISE research cluster averaged 12 private partnerships yearly, had 14 new product investigations, and produced 1 new start-up. The SUNRISE team developed new crop oil based jet fuels with gel characteristics suitable for high altitude, low temperature conditions; and the SMS team has patents pending for new families of nylons from sunflower oil with exceptional thermal properties.
- Seed funding for Product Design Center projects (EPSCoR's program to scale up technology and to advance projects with commercial potential) led to the development of decorative coatings, the basis of a ND startup company, Elinor Coatings, in ND. Similar funding led to scale-up technology for a semiconductor material that is now licensed to Nippon Shokubai to manufacture the material for the Asian market. Another project is currently developing "smart paper" – a chip-in-paper process based on laser-enabled advanced packaging (LEAP) technology. This technology allows for embedding ultra-thin, ultra-small electronic components, including ICs, inside a sheet of a regular paper for applications such as "smart" banknotes and other products.
- In addition, the Students in Technology Transfer And Research (STTAR) program has supported more than 100 students to work in regional industries on science and technology projects.

Graduate Student Research Assistantships – Funding for this provides opportunities for students from North Dakota's baccalaureate universities and ND tribal colleges to pursue graduate degrees at North Dakota's two research universities in the areas of science, engineering and mathematics.

Over the years, students from Valley City State University, Minot State University, Dickinson State University, Mayville State University, Sitting Bull College, and Turtle Mountain Community College have received assistantships. EPSCoR also provides awards to support PhD students in the last two years of their research, as they complete their dissertations.

Undergraduate Research—The Advanced Undergraduate Research Awards (AURA) program provides support for undergraduates to participate in research during the summer and also during the academic year. There is good evidence that students who are engaged in research are more likely to stay in school and graduate in four years.

NATURE program (Nurturing American Tribal Undergraduate Research and Education program) - This is an educational outreach program, funded by both federal and state funding, and is designed to build new and strengthen existing pathways for American Indian students to pursue careers in science, technology, engineering and mathematics (STEM) fields. Participants of the program include students and faculty from all five tribal colleges in North Dakota, high schools students and teachers from the four North Dakota Indian reservations, and faculty from UND and NDSU.

New Faculty Startup – the success of building research competitiveness, and ultimately commercialization opportunities, is in large part attributable to recruiting high caliber new faculty. ND EPSCoR partners with university departments **to attract highly qualified tenure-track faculty who will be nationally competitive for grants from federal agency research programs in science, engineering, and mathematics. This program has not only impacted a number of faculty (more than 70 new awards), but it has resulted in an excellent retention rate of these positions (90% retention rate).**

Other Federal EPSCoR / EPSCoR-like programs

NASA Programs- the purpose of ND EPSCoR NASA program is to increase the NASA-relevant research infrastructure in North Dakota, which will assist ND researchers in submitting competitive grant proposals through NASA's and other regular funding programs. This is accomplished through federal and state funding through two programs: (1) Research Infrastructure Development Awards (RID); and Cooperative Agreement research awards. North Dakota has received three federal CAN research awards in the areas of: 1) Building and testing of space suits integrated with a Lunar rover and a Lunar habitat; 2) Evaluation of simulated global cloud properties; and 3) Experimental and computational investigation of low pressure turbine aerodynamics.

Department of Energy Programs – The purpose of this program is to enhance the capabilities of EPSCoR states to conduct nationally-competitive, energy-related research activities and to develop science and engineering human resources in energy-related areas to meet current and future needs. North Dakota has completed the 2nd phase of a six year, two phase, DOE EPSCoR Infrastructure Improvement Program grant. A new collaborative proposal between UND and NDSU was submitted this April with a research focus on *Physical Behavior of Materials in Hostile Energy Conversion Systems*.

Research ND Programmatic Update

The Department of Commerce was tasked to establish and administer a Research North Dakota grant program and a Research North Dakota venture grant program during the last legislative session.

- Up to $2,000,000 of the Research ND fund was designated to be used for venture grants to research universities for pursuing further commercialization of technology developed by the research university or developed jointly by the research university and a startup or spinoff business operating in North Dakota.
- $10,000,000 of the Research ND funds was designated to provide grants to a research university for research, development, and commercialization activities related to a private sector partner.
    - $4,000,000 of these funds shall be used for Research ND BIO grants to conduct research on and develop and commercialize vaccines and antibodies for the prevention of, treatment of, or cure for cancer; virally infectious diseases; or other pathogens, including bacteria, mycobacteria, fungi, and parasites.

The COE Commission approved the policies for Research ND and Research ND BIO that included numerous changes suggested by both the private sector and the universities on September 5, 2013.

The table below gives an overview of the Research ND and Research ND venture grant programs including available funds, private sector investment, project funding limits and the review procedures that have been put into place.

	Research ND			Venture Grant		
	Research	BIO	FAST Track	Phase I	Phase I/II	Phase II
Purpose	Research, development and commercialization activities related to a Private Sector Partner (PSP)			Pursue further commercialization of technology developed by the research university		
Applicant	ND Research University/PSP			ND Research University	ND Research University/PSP	
Available Funds (2013-2015)	$5,500,000	$4,000,000	$500,000	$2,000,000		
Project Funding Limits	$300,000*	$1,000,000	$50,000	$100,000	$200,000	$150,000
Private Sector Investment ($1:$1)	Yes	Yes	Yes	No	Yes	Yes
Application Review	1. Outside technical review 2. Review for ND priorities 3. COE Commission		1. Admin. Approval 2. Commission Ratification	1. Review Committee 2. COE Commission		

Applications submitted to Research ND are sent out for a third party technical review. Each proposal is scored by three independent reviewers at least one of whom has a background in business. In addition, we have developed a review for what we term North Dakota priorities.

- Is the Private Sector Partner a North Dakota company?
- Is the grant application focused on industry sectors targeted/identified in the Economic Development Foundation's current strategic plan?
- Advanced manufacturing including biotechnology, ag-biotechnology and unmanned aerial systems
- Technology-based businesses – information technology including entrepreneurial startups
- Value-added agriculture
- Energy

Does the grant application have a clearly defined direct economic impact on North Dakota?
Both the technical reviews and scores for North Dakota priorities are provided to the COE Commission prior to the applicants presenting their project to the Commission. Final decision making authority rests with the Commission.

Two funding cycles have been completed for Research ND. A summary of the number of applications and approved awards is provided below.

Program	Applications Received	Applications Funded	Total Approved Awards
Research ND	4	2	$78, 401
Research ND BIO	1	1	$1,000,000
Venture Grant	7	6	$599,222

Venture Investment Program

The Venture Investment Program is a loan up to $250,000 from the North Dakota Development Funds for startup or spinoff business that utilize technology developed at a research university or jointly developed by a research university and the private sector. The program may be accessed directly or utilized as Phase III of the Venture grant program. No spinoff or startup businesses have applied directly to the North Dakota Development Fund for funds under this program and no Venture Grant recipients have completed the first two phases of the program.

Mr. Chairman and members of the committee, thank you for allowing me the time to visit with you today. That concludes my testimony and I am happy to entertain any questions.