

# **Strengthening and Diversifying North Dakota's Economy by Investing in Research and Development**

## **History**

North Dakota's economic trajectory is directly linked to the strength of the agriculture and energy sectors. Because these sectors are cyclical, business leaders across the State support the diversification of our economy. The business executives that comprise the Valley Prosperity Partnership (VPP), which include businesses from across the State and region, have concluded that investing in university research is one of the best means of diversifying North Dakota's economy. Accordingly, in 2017 the VPP convened the leaders of UND and NDSU and expressed its view that the research enterprises at each needed to work more collaboratively and aggressively at catalyzing research activity for the sake of the State's economic opportunity and prosperity. After many months of discussion and collaborating with business leaders across the State, the effort culminated with legislation in the 2019 session to allocate 15% of the Legacy Fund's earnings for research. The proposal received strong support from private industry across North Dakota, and while it passed the Senate almost unanimously, it did not pass in the House.

This proposal is meant to address the shortcomings of the 2019 legislation and propose a modified plan that will still accomplish the desire of the business community: to strengthen and diversify our economy by investing Legacy Fund earnings or other State funds in research and development activities.

## **Background**

North Dakota is one of the few states in the nation that does not allocate appropriated dollars toward applied research and development (R & D) at its research universities. While valuable appropriated research support is provided in a limited number of targeted industry sectors (e.g. NDSU's Extension Service and UND's EERC), no discretionary support is available to allow nimble responses by the research universities to pursue applied research in a manner that could catalyze an intended return on the State's investment.

Historically, a wide variety of models for accomplishing the above have been tried and are in use throughout the country at public research universities. They have demonstrated varying results, but most have proven to have a demonstrable record of success. As a result, such initiatives have typically been maintained if not expanded.

The successful models are based on the one created in Texas during the late 1800s. Texans of the day, who were enjoying an unsure duration [at the time] for their newfound bounty of oil extraction, were interested in diversifying the State's limited economy – which was based almost exclusively on energy and agriculture. To do so, they crafted the “Permanent University Fund” (PUF), an oil extraction based permanent endowment. The PUF had very specific parameters to assure that it would go only toward opportunities to catalyze R&D productivity at the State's two research universities – the University of Texas and the Texas Agricultural & Mechanical University (what would become known today as Texas A&M).

Texas successfully insulated those resources from being misdirected by regularly allocating funds on a one-time basis but with no on-going costs or programs, directing funds to the research universities best suited to do much of the research. Funds are distributed as block grants to avoid political and bureaucratic pitfalls and allocation decisions are done at the campus level to foster intense internal competition amongst researchers in areas important to the State.

The PUF has been so successful that Texas has started several other major research stimulation programs. Ironically, most of those latter programs that experienced limited, if not wholly absent results, failed because they didn't follow the strategies proven in the original model. The PUF, however, remains an exemplary model that has been perpetuated to this day with little if any challenge in terms of its viability and success in the well over 100 years since its inception.

## **Research Funding Proposal**

The Texas PUF is an excellent framework for ND to consider in a ND-specific research proposal supported by the Legacy Fund's earnings or other State funds. The commendable definition of a "legacy fund" is and should be a resource that creates and provides an ongoing return on the investment of those funds. Doing so primarily through the State's two research universities – but with opportunities for the 9 other public universities and the private sector – would catalyze applied research in a manner that to date has been beyond their means and would overcome North Dakota's historical competitive disadvantage compared to other states.

**The proposal should include as a priority accessing matching support from federal, private sources, or sources outside of the State, with an underlying premise of discoveries leading to the creation of new and more diverse business opportunities, job growth, and ultimately, the tax base.** While meaningfully articulating a return on investment to the State could take years, our universities must strive for and articulate the potential return on investment to policy makers for the proposal to continue. Aside from the R&D outcomes would be substantial "pass through" stimulation of the State's economy, with State dollars being infused into North Dakota researchers, equipment purchases, and other indirect impacts. These objectives, collectively, amount to a legacy proposal.

*Based on PUF, but with a ND-Specific Approach* – With the motivation of business leaders across the State, this proposal has been collaboratively developed into a simple but effective proposal based, at its core, on the format and success of the Texas PUF. But key changes specific to ND have been included. This collaborative effort has been guided by business executives, research university leaders, and the State Board of Higher Education. These leaders affirm their support of this proposal.

*Key Sectors* – The goal of doing so is to enhance value-added opportunities within the State's core agriculture and energy industries, to more efficiently and effectively meet the unique healthcare needs of the State, and to enhance data management competencies increasingly essential in all fields. Moreover, expanded investments in UAS and autonomous capabilities and emerging technologies in advanced manufacturing and materials, augmented reality, robotics and automation, and alternative energy and storage technologies can all contribute to diversifying the State's economy.

*Return on Investment* – The expected return on investment of the Legacy Funds or other State funds through this proposal will be at least two-fold: (1) with some adjustments to the State's intellectual property (IP) and commercialization policies, a direct economic benefit due to commercialization of research discoveries and associated technology transfer, and (2) a positive impact on the health and well-being of all North Dakotans as the result of enhanced outcomes for economic transformation of the State's economy, thereby developing and retaining the skilled labor force needed for attraction and retention future industries.

### *Policy Specifics:*

- A) Fifteen (15.0) percent of Legacy Fund earnings or other comparable State funds will be allocated annually for use by UND, NDSU, the 9 other public universities, and the private sector. UND and NDSU will administer the funds using their existing research administration capabilities, to be augmented with additional technology transfer and commercialization expertise.
- B) Funds are to be provided as block grants for measurable benefits to be delivered – or be in the process of being delivered – by each following biennium (e.g. startups, companies attracted, companies retained, jobs created, graduates in emerging technologies, increased federal funding, increased corporate research funding, and discoveries).

- C) As a general guideline the use of funds will be as follows:
- 40% for basic or applied university research, with the expectation it will help to bring in matching federal or corporate research funds
  - 30% for university-originated research partnerships with industry
  - 30% for research that is originated by a business, private university or non-profit organization that is conducted in partnership with a NDUS university or college, where a minimum of 30% of the total project cost is contributed by the non-NDUS partner
- D) The major determinants used in ranking research proposals will be 1) the scientific or commercial merit of the proposed research, 2) the likelihood of the research to have a meaningful economic impact in North Dakota, 3) the potential for building research expertise and capacity in ND public university institutions (PUIs) and the private sector, 3) contributions to building a skilled workforce, and 4) the probability of building research collaborations between PUIs, the private sector and other research institutions.
- E) At minimum, 10% of the State-awarded amount is to be made available to fund competitively ranked research proposals submitted by any of the 9 non-research university entities within the purview of the State Board of Higher Education.
- F) On an annual basis, a Bank of North Dakota panel will conduct a *post-award* review of all funded projects and will report to the legislature on the extent to which the research funds were used as intended to benefit the State and the extent to which UND, NDSU, and the other 9 non-research universities are capturing opportunities to collaborate toward that end.
- G) Oversight of program funds will be provided as it is in large federally funded research awards, by using an Internal Advisory Committee (IAC) and an External Advisory Committee (EAC).
- The IAC will assemble and review recommendations to effectively apply this research funding at NDSU and UND. The IAC will be comprised of two UND-nominated representatives, two NDSU-nominated representatives, one 4-year-nominated representative, one 2-year-nominated representative, the chair of the SBHE Research Committee, and the Chancellor of the SBHE who will function as a non-voting IAC Chair. The IAC will meet quarterly.
  - The EAC will provide expert feedback and recommendations regarding the research direction and trajectory of research funded by these dollars. It will consist of three scientist members chosen for their expertise in areas of importance to ND, with one nominated by NDSU, one by UND, and one by the PUIs. If additional expertise is required, the EAC will employ outside consultants to provide it. The EAC will meet at least **annually**. Once appropriated, continuation of funding will be based on compliance with the goals of the initiative, demonstrable positive outcomes, and the recommendations of the EAC.
- H) This fund is to be allocated completely outside of and separate from North Dakota's higher education funding formula, which supports the ongoing missions of the State's 11 colleges and universities. It should in no way impact any of the State's colleges' or universities' base funding.
- I) This fund is designed to elevate research across the State with an expectation that, over time, it will help to increase external funding that enables innovative discovery. As a result of this investment, we anticipate additional opportunities – for example, increased federal funding, multi-university collaborations, and public-private partnerships – to be a catalyst for growth and development that diversify North Dakota's economy and ultimately serve the people of the State of North Dakota.

### **NDSU Research Examples:**

NDSU has been awarded an initial \$300,000 National Science Foundation start-up package to host a Center for Bioplastics and Biocomposites under NDSU Chair of Industrial & Manufacturing Engineering, Dr. David Grewell, and Dr. Dean Webster, NDSU Chair of Coatings and Polymeric materials. “The impact to NDSU and the region becoming a member of this program will help the university by driving additional research dollars as well as student and industry engagement,” said Webster. “We also see it as an economic driver for the State similar to the ethanol industry; we have the materials to create the products right here so we will be providing a solid reason for industry to set up operations in our area.” For more information visit:

<https://www.ndsu.edu/centers/cb2/about.html>

Title: Mechanisms that Predict Weight Trajectory after Bariatric Surgery: The Interactive Roles of Behavior and Biology

Principal Investigator: Kristine Steffen

Sponsor: National Institutes of Health

Total Award Value: \$ 956,003

### **UND Research Examples:**

Title: Dakota Cancer Collaborative on Translational Activity

Principal Investigator: Marc Basson

Total Award Value: \$23,000,000

Sponsor: National Institutes of Health (IDeA-CTR)

Period of Performance: 9/1/2018-8/31/2023

UND Today article on this award: <http://blogs.und.edu/und-today/2019/02/smhs-nets-20-3m-cancer-research-grant/>

Title: Rare Earth Element Extraction and Concentration at Pilot-Scale from North Dakota Coal Related Feedstocks

PI: Michael Mann

Government Award Value: \$4,989,255

Total Award Value: \$6,508,555 (Additional \$1,519,300 “match” from partners North Dakota Lignite Energy Council, North American Coal Corporation, Minnkota Power Cooperative, BNI Energy, Great River Energy, and Great Northern Properties)

Sponsor: US Department of Energy

Period of Performance: 10/1/2019-3/31/2022

UND Today article on this award: <http://blogs.und.edu/und-today/2019/10/rare-earth-project-has-national-security-potential/>

### **Student Research Examples:**

- Kaylee Johnson and Cassy Gilbertson, with Professor Karri Dieken, on 3D Printing K-12 Project Curriculum
- Niklas Ernst, with Dr. Luis da Vinha, on: The Unfinished Presidencies Why Incumbent Presidents Lose Their Re-Election Campaigns
- Jayme Menard with Mentor Dr. Andre Delorme, on: Evaluation of Mussel Age and Growth Rate Post-Devils Lake Outlets
- Ellen Anderson with Mentor Dr. Casey Williams, on: Percent Occurrence of Historical Sample Size of Select Stream Fishes of North Dakota
- Baylee Swenson and Jordan Bushaw with Professor Susan Pfeifer, on: The Effects of Motion Sickness in Virtual Reality Environments
- Andrei Pilipetskii, with Dr. Nicholas Meyers, on: Creating a Virtual Ensemble for Online Learners