



ENERGY

June 2017

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NDUS Envision 2030 – Energy Pillar

The 2000 North Dakota University System (NDUS) roundtable report [1] specifically referenced six cornerstones: Economic Development Connection, Education Excellence, Flexible and Responsive System, Accessible System, Funding and Rewards, and Sustaining the Vision. These cornerstones were critical to allowing NDUS to react to the tremendous Bakken oil boom that occurred in western North Dakota over the last 10 years. Although the energy landscape has changed significantly from 2000 to 2017, these same cornerstones are critical to preparing, and advancing, the workforce necessary for 2030 and beyond.

I. North Dakota Energy – Reality of Today, Direction of Tomorrow

The state of North Dakota is the sixth largest energy producer in the United States [2]. North Dakota is the second largest crude oil producer, sixth largest producer of electricity from wind, ninth largest producer of coal, tenth largest producer of ethanol, and eleventh largest producer of natural gas. We are also the third largest user of energy per capita in the United States.

The largest change in North Dakota's energy mix over the last 10 years would certainly be the tremendous growth in crude oil because of the development of the Bakken. From 2011 to 2015, job growth in oil and gas has averaged well over 20% per year, dominating all industry sectors in North Dakota [3]. The total direct employment for the oil and gas industry in 2015 was 48,369 and accounted for 24.0% of North Dakota's total private wages [4]. Wind energy has also shown tremendous growth, adding nearly 700 MW of additional capacity in 2016 alone [5]. The lignite industry, with in-state expenditures exceeding \$1 billion, directly employed 3979 people in 2014 [6].

The workforce supporting energy development and production in North Dakota will continue to grow significantly. The need for wind turbine service technicians is expected to grow annually by 7% from 2014 to 2024 [3]. The North Dakota Department of Mineral Resources estimates that, depending on the price of oil, an additional 50,000–55,000 wells will be drilled over the next 30 years [5], resulting in a significant increase in oil- and gas-related jobs. As oil and gas production grows, electricity production will also need to grow to support those energy needs.

In addition to continued Bakken oil and gas development and growth in wind energy, the state is positioned to see new and emerging opportunities brought forward in enhanced oil recovery using CO₂ and other gases, carbon capture from fossil fuel utilization, and advanced clean coal technologies.

II. Providing a Skilled Workforce

NDUS has responded well to delivering the workforce that drives North Dakota's energy sector. Numerous programs and initiatives have been launched, and grown, across many different educational areas to deliver the accountants, human resource officers, engineers, and other employees that make the energy sector successful. One example of a program that has grown significantly to meet industry needs is the University of North Dakota's (UND's) Petroleum Engineering Program, which has grown from its first class in 2010 to nearly 250 students enrolled in FY17 [7].

In developing the workforce of the future, NDUS institutions should focus, as appropriate, on the following four areas of student development:

- A. Basic skills – Provide students with the basic skills necessary in their respective discipline in a timely and financially responsible manner, realizing that the employer is best suited to present energy-specific classes to non-engineering-degree students.
- B. Critical thinking/problem solving – It is essential that today's graduates are able to think critically and problem-solve above and beyond their basic skills development. Whenever possible, development of these skills should be incorporated into program materials.
- C. Hands-on experience (mechanical sense) – Service, technician, and engineering students must focus on developing their mechanical sense in addition to their basic skills. Utilizing hands-on and mechanical training programs when appropriate would significantly help.
- D. Liberal Arts and Humanities – Future employees will also be future leaders and community members. It is essential that employees have well-rounded educations that allow them to be effective and engaged beyond their specific employment.
- E. Energy Studies Certificate Program – The workforce supporting the energy industry is comprised of individuals across a broad spectrum of disciplines. Developing a certificate program that would allow individuals from any discipline to gain a fundamental knowledge of the energy industry should be considered. A properly developed certificate program could have broad application across all University System institutions. Note: A similar program could be developed for agricultural studies as well.

III. Enhancing the Current Workforce

In addition to providing future employees for the energy sector, NDUS should also strive to support the development and advancement of existing energy sector employees. This should be accomplished by a mix of both on-site training and online training opportunities. Specific areas of workforce training and education include:

- A. Leadership training – As the workforce ages and retires, the next generation of leadership must step into place. It is essential that NDUS aid in the preparation of future leaders through classes and programs to provide leadership-quality learning. Potential topics include personnel management, project management, mentoring and coaching skills, business basics, business ethics, creating a safety culture, time management, communication, and conflict management.
- B. Advanced degrees – NDUS should continue to promote the development of distance education for existing energy sector employees to achieve advanced degrees. Providing the ability to achieve advanced degrees with little, or no, on-site requirements is preferable.
- C. Competency-based programs – Future NDUS programs should develop criteria to allow for competency-based credits. Competency-based educational credits would allow current workers to seek out advanced degrees in an easier and more advantageous way by allowing them to gain credit in areas in which they already have significant competency. Competency-based credits should be designed in a manner that allows for more rapid, and lower cost, graduation success.

IV. Developing the Students and Technology of North Dakota’s Future

As North Dakota’s energy infrastructure and development continue to evolve, new technologies and new methodologies will be essential to continued economic success. The University System should strive to develop an energy research and development program that compliments the existing energy industry, as well as supports the tremendous opportunity for future energy growth, similar to what is currently done in support of North Dakota’s agricultural industry. Emphasis should be placed on, 1) enhancing available state research and development funding, 2) growing the overall energy research expertise throughout the research staff, faculty, and endowed positions, 3) enhancing opportunities for collaboration across disciplines and institutions, and 4) fostering energy entrepreneurialism opportunities.

Specific areas of research and development focus should include:

- A. Carbon capture from fossil energy sources
- B. Carbon sequestration
- C. Enhanced oil recovery (traditional and Bakken)
- D. Shale reservoir science
- E. Interface of UAS (unmanned aerial systems) and energy
- F. Energy production from agricultural resources
- G. Energy storage in support of renewable energy
- H. Environmental footprint of energy production

V. Industry–NDUS Collaboration

North Dakota’s industry sector is an active participant in the recruitment of NDUS graduates; however, this participation could, and should, be enhanced through new and expanded programs. Industry should take an increased lead in working with the University System in the following areas:

- A. Recruitment – The development of formal and informal forums (in-person and online) should be utilized to enhance the retention of NDUS graduates into the North Dakota energy industry.
- B. Sponsored programs – Industry must take an active role in sponsoring a variety of programs and activities, including student scholarships, endowed chairs, research, and facility enhancement.
- C. Job shadowing – Where possible, short-term (up to 1 week) job shadowing opportunities should be explored to expose students to the energy industry and the great opportunities that it provides.
- D. Internships and co-ops – Providing longer-term (up to 1 year) opportunities for students to work in the energy industry before they receive their degree provides industry with lower-cost, knowledgeable workers, while providing students with paid hands-on learning opportunities.

References

- [1] A North Dakota University System for the 21st Century – The Report of the Roundtable for the North Dakota Legislative Council Interim Committee on Higher Education, May 25, 2000.
- [2] U.S. Energy Information Agency, North Dakota State Energy Profile (March 2017, based on 2014 data).
- [3] North Dakota Workforce Development Needs Assessment and Gap Analysis, January 2017.
- [4] 2015 North Dakota Oil & Gas Employment Report, Job Service North Dakota.
- [5] 2017 Spotlight on North Dakota Energy, Bismarck State College, www.energynd.com.
- [6] North Dakota Lignite Energy Industry’s Contribution to the State Economy for 2013 and Projected for 2014, Coon, Bangsund and Hodur, North Dakota State University, June 2014.
- [7] North Dakota University System 2016 Programs Enrolled, <http://www.ndus.edu/uploads/reports/153/2016-fall-programs-enrolled.pdf>.