
EMPOWER
North Dakota®
2012 Policy Updates and Recommendations

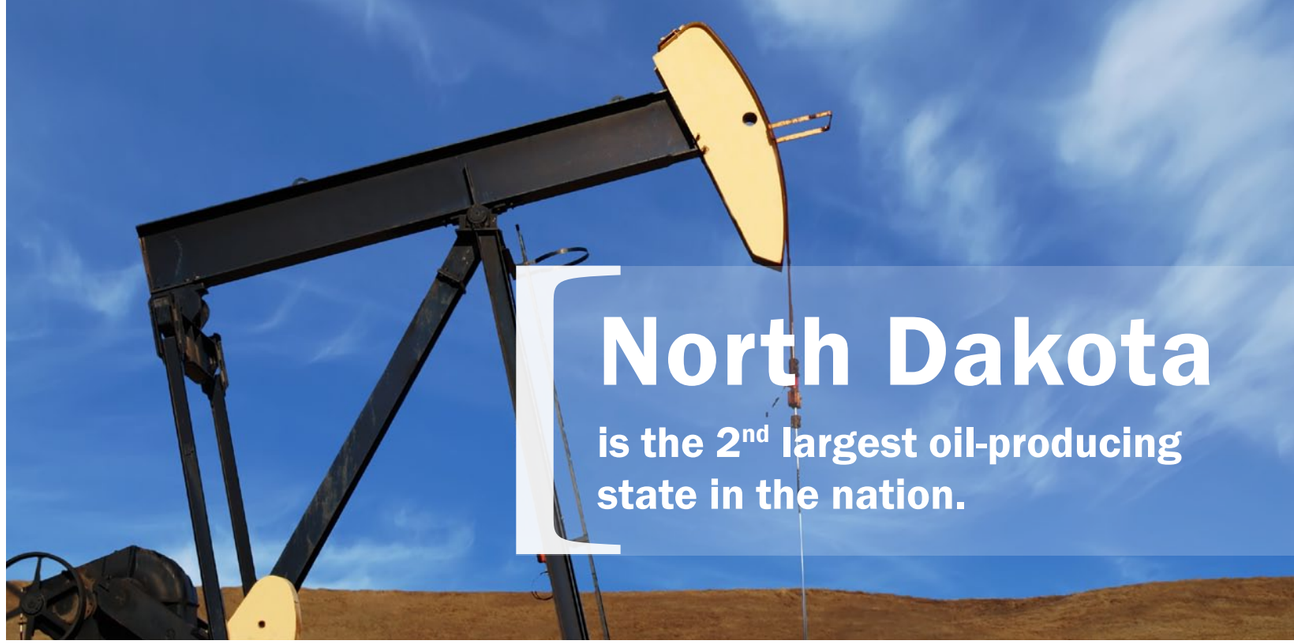
North Dakota

is one of the only states with a multi-resource energy policy, guided by the efforts of the EmPower North Dakota Commission.

This report marks the third review of this policy and provides an executive summary along with recommendations and goals.

EmPower North Dakota Report

EMPOWER POLICY UPDATES AND RECOMMENDATIONS



Executive Summary

Through the EmPower North Dakota Commission, leaders from all major energy industries in the state meet monthly with one common goal: to be critical thinkers for the development of the state's energy resources. The strategic partnerships between North Dakota's long-standing and emerging energy industries ensure that all sectors of the industry work together to meet our state and country's energy needs without government mandates.

North Dakota is proactive and aggressive in addressing energy development and serves as a model for America in fostering innovative, long-term energy development to meet our nation's growing energy demand and need for energy security in an environmentally responsible manner.

The state's diverse energy landscape celebrates many successes:

- North Dakota is the second largest oil-producing state in the nation with production of 639,000 barrels per day as of May 2012. The industry has 214 drilling rigs operating, 8,000 producing wells, employs 65,000 direct and indirect jobs, and has a $12 billion economic impact.

- The state supports 4,000 megawatts of lignite and other coal generation at seven locations providing low cost, reliable electric power to two million customers in North Dakota, South Dakota, Minnesota, Montana and Iowa. North Dakota is one of the country's top 10 coal-producing states, mining approximately 30 million tons every year since 1988, which results in an annual economic impact of $3.5 billion and 17,000 direct and indirect jobs.

- North Dakota leads the nation in the production of nine different agricultural commodities including two commodities used for liquid fuels. Several additional crops provide feedstock for successful and developing biorefining industries in North Dakota.

North Dakota DEPARTMENT OF COMMERCE

Executive Summary (continued)

- Between 2007 and 2010, North Dakota increased its energy production by 65 percent and is on track to double statewide production by 2025.
- North Dakota continues to develop a thriving ethanol industry, which contributes more than $300 million annually to the economy and supports more than 10,000 direct and indirect jobs. The state has established itself as a national leader in flex fuel pump infrastructure and has seen a 55 percent increase in flex fuel vehicles over the past two years with 65,000 currently on the road.
- By the end of 2012, natural gas processing in North Dakota will have increased 383 percent over six years. With the addition of a facility coming online later this year, there will be 17 plants processing Bakken natural gas. The state, through the Oil and Gas Research Council and their private partners, has invested more than $2 million in new technologies to capture and use natural gas at well sites.
- In 2012, North Dakota ranked tenth in the nation in installed wind energy capacity. The North Dakota Public Service Commission has permitted over 2,900 megawatts of wind generation.
- The state's only oil refinery has expanded by 20 percent or 10,000 barrels per day. In addition, three new refineries were announced and are at various stages of planning, permitting and construction.

Future Vision

North Dakota stands at the threshold of a future where energy development in all sectors has the potential to not only grow, but also develop new economies based on secondary, value-added industries related to energy resources. In order to move forward, the state needs to address several key areas crucial to the expansion of energy production and extraction. North Dakota needs to work with the industry to begin exploring ways to capture opportunities to develop raw resources into new products, including petrochemicals, plastics, nanofibers, manufactured products or materials yet to be discovered.

During 2011-2012, the EmPower North Dakota Commission identified four critical components for continuing to grow energy production and new energy-related industries:

1. **Infrastructure** – Adequate and maintained infrastructure is the foundation for continuing existing development and expanding into new areas.
2. **Research and Development** – Research and development serves as the bridge for industry to move from ideas to new development.
3. **Workforce** – As the energy industry expands, the workforce must be available to meet the demands. Without adequate workforce development, expansion is not possible.
4. **Regulatory Environment** –A regulatory environment, at both the federal and state levels, that encourages economic growth while ensuring environmentally-responsible development of natural resources is essential.

EmPower ND Commission Members

In 2007, the North Dakota Legislature formalized energy policy and created the 16-member EmPower Commission which includes representatives from across the energy industry. Their insights provide the substance for this updated EmPower North Dakota Comprehensive State Energy Policy.

Al Anderson
North Dakota Department of Commerce, chairman

Ron Day
Tesoro, refining or gas-processing

Terry Goerger
farmer, agriculture

Eric Mack
Archer Daniels Midland, biodiesel

Ron Ness
North Dakota Petroleum Council, oil and gas

Dale Niezwaag
Basin Electric Power Cooperative, generation and transmission electric cooperatives

Mark Nisbet
Xcel Energy, wind

Mike Rud
North Dakota Petroleum Marketers Association, petroleum marketers

Randy Schneider
North Dakota Ethanol Producers Association, ethanol

Andrea Stomberg
Montana-Dakota Utilities Co., investor-owned utilities

David Straley
North American Coal Corporation, lignite coal

Sandi Tabor
Lignite Energy Council, transmission

John Weeda
Great River Energy, biomass

Chuck MacFarlane
Otter Tail Power Company, ex officio

Dave Schmitz
ALLETE/Minnesota Power, ex officio

Unpictured

John DiDonato
NextEra Energy, Inc., ex officio

Commission Recommendations

INFRASTRUCTURE

Adequate infrastructure is key to the efficient and effective development of North Dakota's energy resources. Energy infrastructure (i.e., water pipelines, roads, oil and natural gas pipelines, railroads, electric transmission lines, power generation and housing) is critical to the continued growth of the state's energy resources. While most current infrastructure needs are related to oil and gas development in western North Dakota, all energy sectors benefit from the same kinds of infrastructure support throughout the state. Infrastructure provides the backbone for North Dakota's energy industry to export products to the rest of the nation, and perhaps the world. In addition, it is critical to the growth of communities, the minimization of development impacts, and enhanced public safety.

The 2011 Legislative Assembly began the process of meeting the needs of cities and counties in oil country by appropriating $1.2 billion for roads, housing and associated safety issues. While this represented a good start, the state recognized that the infrastructure need was greater than the appropriation. Through a series of meetings spearheaded by Governor Dalrymple to encourage

Transportation and housing were two key infrastructure issues identified as critical to maintaining North Dakota's quality of life.

a dialogue between state agencies and local officials representing 14 western North Dakota cities, state officials gathered detailed information cataloging critical infrastructure shortfalls. The EmPower North Dakota Commission received reports from the North Dakota Department of Commerce staff regarding the results of the initiative. Of the many concerns raised by local leaders, two key infrastructure issues were identified as critical to maintaining North Dakota's quality of life: transportation and housing. In order to meet the transportation and housing needs of western North Dakota, the state needs to make a long-term commitment of capital to address the acute infrastructure shortfalls related to the significant growth of oil and gas production, processing and transportation facilities.

Transportation

Transportation infrastructure development includes construction and upgrading of roads and bridges on state, county and township systems.

In 2011, western North Dakota experienced a 25 percent increase in vehicle miles traveled.

As oil and gas activities continue to grow, the toll of wear-and-tear on transportation infrastructure will increase.

While the western part of the state is feeling the greatest impacts, the state recognizes that other areas are also facing considerable transportation infrastructure demands that impact energy development. In portions of central and eastern North Dakota, flooding has destroyed roads necessary for the transportation of crops used for biofuels and ethanol. To address issues in these areas, investment in roadways has increased tremendously over the past five years, growing from approximately $250 million in 2007 to $590 million in 2011. In addition, the Upper Great Plains Transportation Institute partnered with the North Dakota Department of Transportation to conduct studies that assess statewide transportation infrastructure development needs for all state roads, including counties and townships.

Housing

Housing is needed on both a temporary and a long-term basis. Well-planned temporary housing eases demand on local housing and provides safe and secure living for temporary workforce supporting oil development and existing industry. The state should facilitate discussions between logistic companies and local governments to ensure that concerns are addressed, and to encourage the continued build-out of temporary housing. From a long-term perspective, local financial institutions have indicated a need for guarantees before providing financing to developers and homebuyers. Information on anticipated population growth is needed to determine the appropriate level and type of housing that should be constructed.

New methods to provide adequate funding to address these critical areas must be designed. Without a new approach, local governments and communities will continue to fall behind and development will be impacted. Concerns related to environmental issues like increased dust from trucks, proper storage of waste water, and others, must also be addressed. Challenges also exist in the construction of necessary infrastructure as landowners become reluctant to grant easements on their property.

Transmission

Other areas of concern involve a lack of transmission infrastructure, both pipelines to move oil and natural gas products and transmission lines to move electricity, throughout the Bakken area. Studies to address transmission, as well as other concerns ranging from transportation models and housing needs to airport and local community planning efforts, will continue to assist in providing needed information to guide decisions in addressing these challenges.

In light of the issues facing infrastructure related to energy development in the state, the Commission recommends the State of North Dakota:

- Develop a new formula to provide adequate funding for local government investment in construction of infrastructure necessary to address significant funding shortfalls for roads, wastewater treatment facilities, water supply facilities, and other needs normally funded by local government entities.
- Provide oil impact grant funds for regional or local community development and infrastructure planning in the Bakken area.
- Remove the sunset on the Housing Incentive Fund, expand program funding, and consider broadening the application to provide alternate or direct funding source.
- Provide funding to the North Dakota Housing Finance Agency for the Down Payment Assistance and Construction Loan Guarantee Programs and provide guarantees to local lenders for incentives to borrowers who have participated in “financial counseling programs.”
- Promote the importance of temporary workforce housing.
- Promote the long-term benefits and reduced impacts for providing easements on property for energy infrastructure. This could include:
  - Encouraging energy companies to focus on the importance of ongoing positive landowner relations and ensuring reclamation efforts are satisfactory to the landowner.
  - Encouraging landowners and energy companies to use the North Dakota Agriculture Department’s mediation service to reach mutual agreement on terms of the easement.

- Study existing water systems throughout the state and take action to provide expansion of capacity to meet growing community and commercial needs.
- Coordinate with the U.S. Corps of Engineers to increase access to Lake Sakakawea for industry and community needs to alleviate pressure on other water sources, reduce local truck traffic and improve road safety.
- Maintain a comprehensive long-range forecast for energy production and supply across all sectors, specifically looking at needed infrastructure to support growth.
- Monitor the railroad capacity within North Dakota to ensure there is adequate ability to export all commodities to market.

WORKFORCE

North Dakota’s strong economic growth and traditionally low unemployment rate has created an urgent need for additional workforce. According to Job Service North Dakota, the state is predicting 26,000 job openings by fall 2012. About 35 percent of these positions, or roughly 9,000 jobs, will be energy related. As the state’s demand for workers continues to grow, there needs to be greater focus on training and retaining our youth, as well as promoting opportunities to attract workers from outside the state.

According to Job Service North Dakota, the state is predicting 26,000 job openings by fall 2012. About 35 percent of these positions, or roughly 9,000 jobs, will be energy related.

One of the challenges impacting the energy industry’s ability to attract qualified employees is the lack of general knowledge about the tremendous opportunities for young people in the energy industry. In fact, many of the high-demand positions in several energy sectors rely heavily on skills in science, technology, engineering and mathematics (STEM). Incorporating STEM courses at an earlier age and educating career counselors and parents about high-demand careers will facilitate the long-term growth of the energy workforce talent pool. To improve the overall situation, curriculum at the K-12 levels should incorporate more information about North Dakota’s natural resources and energy production to increase youth knowledge and interest in energy careers.

The current workforce landscape has many vocational or technical degree openings that can provide well paying, life-long careers (i.e., welders, lineman, electricians, boilermakers and mechanics). A majority of the current energy-related workforce needs could be filled by individuals with vocational or technical skills. To take advantage of this opportunity, however, students have to know that two-year technical and vocational career paths exist. The State of North Dakota and energy industry need to strengthen existing partnerships to create new avenues to educate students of all ages about the wide variety of vocational and technical degree openings. In addition, adequate funding must be available for these important educational programs that support energy-related careers.

WORKFORCE (continued)

Also supporting the industry is TrainND, which provides customized training programs, such as commercial driver license (CDL) and safety training, and employee development initiatives across the state. These training programs have been effective in giving North Dakota businesses an edge to better compete on a local, national and international level. Continued support for programs such as TrainND and Operation Intern, which match youth with businesses also help support long-term workforce growth in North Dakota, is critical.

To meet the state's current demand, North Dakota must grow workforce within its borders, and also seek out-of-state workers and students to fill high-demand careers. North Dakota companies and industry organizations must continue to promote jobs through strategies such as out-of-state job fairs and energy career awareness programs.

The energy industry looks to the Governor's Workforce Development Council and Job Service North Dakota to better identify energy workforce needs and how North Dakota can maximize resources to meet those needs into the future.

These efforts will ensure that Governor Dalrymple, the Legislature and industry have needed information to continue to support energy as an economic leader in the state.

As workforce needs continue to grow, the funding sources that support infrastructure and community development must be enhanced. Companies and private investors are working to address housing shortages throughout the state by providing crew camps, apartments, and single- and multi-family homes. Many of the state's new families have unique financial needs. The Housing Incentive Fund, administered by the North Dakota Housing Finance Agency, is working to meet the need for affordable housing, but enhancements are necessary.

In light of the issues facing workforce related to energy development in the state, the Commission recommends the State of North Dakota:

- Increase efforts to educate North Dakota's youth, as early as grades 4-5, about North Dakota's natural resources by developing curriculum to encourage interest in energy careers.

WORKFORCE (continued)

- Encourage and enable the energy industry to collaborate with the North Dakota University System, Governor's Workforce Development Council, Job Service North Dakota and other agencies to:
  - Fund enhancements to Job Service North Dakota's systems and data collection processes to provide analytical data related to workforce skills and employment to better identify energy industry needs.
  - Develop and enhance core curriculum related to high-demand energy industry careers.
  - Encourage industry interaction with teachers and guidance counselors to grow youth knowledge and interest in energy careers and to better retain youth for high-demand career options.
  - Provide greater accessibility to career and technical education programs, especially through adequate training facilities.
    - Examples of the above include, but are not limited to:
      - science, technology, engineering and mathematics (STEM) education
      - original equipment manufacturer (OEM) supported programs
      - commercial driver license (CDL) training sites
      - emergency medical services
      - technical trades/internships
      - energy careers

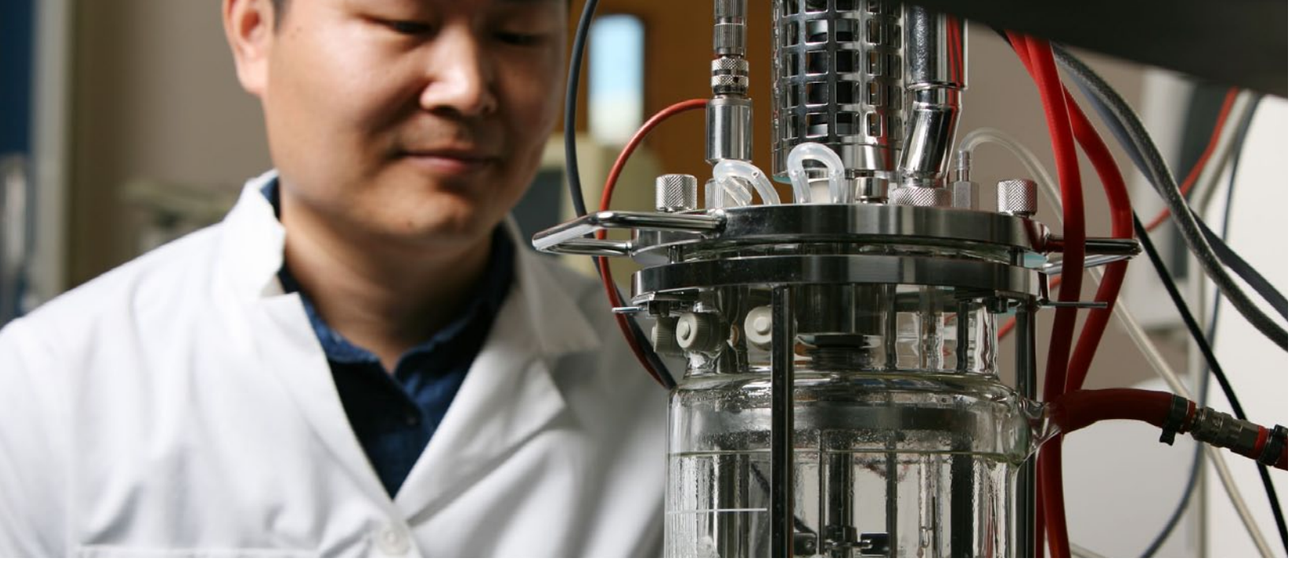
- Support legislation which recognizes the role distance learning will play in the future of education and improve access to technology for students using distance learning programs.

RESEARCH AND DEVELOPMENT

For decades North Dakota has recognized the importance of energy research and development (R&D) in creating a vibrant energy industry. The state has been a leader in fostering R&D partnerships between private industry, higher education and research facilities. Understanding the synergies between renewable and traditional energy resources is important.

Through existing R&D programs, the state has the potential to allow R&D to undertake a new role in ensuring the future prosperity of North Dakota's vast energy resources.

For traditional fuels, like lignite, oil and natural gas, R&D provides a road map for the development of new technologies that will provide fewer emissions and cleaner energy in the exploration stage or in the energy conversion process. For instance, lignite R&D projects are examining new ways to lower mercury, nitrogen oxide and sulfur dioxide emissions. The lignite R&D program is also exploring new ways to beneficially use carbon dioxide and to understand the intricacies of carbon capture and storage. Approximately $8 million is available each biennium to fund the lignite R&D program. The funding is derived from two cents per ton R&D tax, a dedicated percentage of the Coal Trust Fund and for a limited time a portion of the Coal Conversion Tax. A portion of this funding is also used by the North Dakota Transmission Authority to work on transmission issues which can limit energy development opportunities in the state.



RESEARCH AND DEVELOPMENT (continued)

New technologies for the oil and gas industry have allowed the capture of products located thousands of feet below the surface using techniques that were only dreams a few years ago. The oil and gas R&D program has focused on several projects, including salt water injection sites, evaluation of shallow biogenic gas systems in eastern North Dakota, and the recycling of water. Funding for the oil and gas R&D program is appropriated indirectly from the oil and gas production taxes at $4 million per biennium. A portion of this funding is used for the Pipeline Authority and its continued work to reduce transportation issues that limit the export of oil and gas.

A commitment must be made to invest in the future at a designated level which will actually encourage research projects to move into the development and commercialization stages.

Unlike the other R&D programs, a permanent funding source for the renewable program has not been identified. The renewable R&D program received $1.5 million from the state's general fund for the 2011-2013 biennium. This represented a 50 percent cut in funding from the 2009–2011 funding level. This creates a situation where the North Dakota Industrial Commission/ Renewable Research Council cannot commit to funding longer-term research projects due to the uncertainty of future appropriations. A commitment must be made to invest in the future at a designated level which will actually encourage research projects to move into the development and commercialization stages.

The renewable R&D program is opening doors to new markets by partnering with agriculture to create new fuels. This program has supported the development of:

- A wind turbine technician training program, projects related to the growth of ethanol, and demonstration of the commercial potential of technology to produce materials and fuel from biomass feedstock.
- The promotion of co-product utilization for livestock feed, human food products, and industrial use technologies. Co-firing biofuels with lignite will provide new opportunities for both the lignite industry and the agriculture community.
- Developing cost-effective wind, solar and geothermal energy will bolster North Dakota's claim of being the energy leader in the nation.

Finally, research and development will play a critical role in understanding the potential of value-added processing and manufacturing to our energy industry. North Dakota sits on the threshold of a dynamic future that includes a secondary manufacturing market based upon the growth of the state's energy resources.

Similar to the tremendous growth witnessed in value-added agriculture, the opportunity exists for North Dakota to become a leader in value-added manufacturing related to oil and gas development.

In light of the issues facing R&D related to energy development in the state, the Commission recommends the State of North Dakota:

- Allocate a portion of the Resource Trust Fund and set a target funding level for the renewable R&D program of $3 million to enable planning for the future and to encourage the development of renewable resources, including ideas on how to foster cooperative efforts with traditional fuels.
- Continue to support existing R&D programs which will ensure the development and implementation of new technologies to promote new growth for all energy resources.
- Coordinate with private industry to identify the steps necessary to create a viable chemical industry related to energy resources.
  - Fund a study to evaluate value-added market opportunities for energy resources.
  - Increase funding to the oil and gas research program by $1 million to explore opportunities related to value-added processing of natural gas.

FEDERAL REGULATORY ASSESSMENT

Current EmPower North Dakota Commission goals and policy statements reflect concerns regarding the existing federal regulatory climate that often fails to provide for reasonable, responsible and cost-effective regulations over many facets of the energy industry. The Commission's goals and policies can be summarized as stated below:

The federal government should provide a fair and responsible regulatory environment based on sound science and the capacity of current technology to ensure future energy development. Federal regulations must be cost-effective and include sufficient lead time for industry to adapt to new statutory requirements affecting production or products. Federal regulations must be structured in ways to minimize placing new barriers on investment and development.

The current federal regulatory environment incorporates a "one-size-fits-all" policy that fails to take into account the unique nature of each state. North Dakota should encourage federal agencies to recognize unique environmental issues and to work with the state to develop regulations that make sense.

Understanding the economic impact of federal regulations on the state's economy is also important. The energy industry can serve as a valuable ally in helping the state identify and analyze the impact of federal regulations on the citizens of North Dakota, as well as the energy industry. Simply understanding the impact of federal regulations, however, is only one part of the equation. Providing input to federal regulators on particularly onerous proposed regulations is a crucial part of the overall strategy to protect the state's interest. Equally important are communications with the North Dakota Congressional delegation on federal regulations of importance to the state.

North Dakota also must recognize the additional burdens new regulations place on state regulatory agencies. Appropriate regulatory programs are a necessary part of ensuring that North Dakota can maintain its clean environment in conjunction with a healthy business environment. Staff and resources for state regulatory agencies need to expand to manage federal regulatory requirements and to ensure North Dakota retains primacy over these regulatory programs.

FEDERAL REGULATORY ASSESSMENT (continued)

In light of the issues facing federal regulatory assessment related to energy development in the state, the Commission recommends the State of North Dakota:

- Encourage federal agencies to recognize environmental issues unique to North Dakota and work with the agencies to develop regulations that make sense for the state and its companies.
  - Establish new venues for state and federal regulatory agencies to collaborate on federal rulemaking efforts in ways that address individual state issues.
- Use the EmPower North Dakota Commission to better understand the economic impact of federal regulatory proposals on North Dakota.
  - Comment on proposed federal regulations with significant potential impact on the state's economy and engage the North Dakota Congressional delegation to actively challenge the implementation of final regulations posing a threat to North Dakota's economy.
- Recognize the additional burdens new energy developments are placing on state regulatory agencies and provide adequate funding and staffing levels for North Dakota Department of Health, North Dakota Department of Mineral Resources, North Dakota Public Service Commission, and the North Dakota State Water Commission to ensure that each will be able to properly manage their respective programs.

Appropriate regulatory programs are a necessary part of ensuring that North Dakota can maintain its clean environment in conjunction with a healthy business environment.

Energy Sector Updates

BIODIESEL
North Dakota biodiesel production uses about 65 percent of the state's canola production, or about 700,000 acres worth of canola.

BIOMASS
Researchers at North Dakota State University continue to research the development of hybridized biomass in pellet form for use in manufacturing processes. Biocomposite pellets could replace up to 40 percent of petroleum-based plastics used in manufacturing.

ENERGY EFFICIENCY
North Dakotans received 3,800 rebates (at $150 each) for ENERGY STAR refrigerators, and will save approximately 2 million kilowatt hours annually.

ETHANOL
The ethanol industry contributes more than $300 million annually to the state's economy and supports more than 10,000 jobs.

LIGNITE
North Dakota is one of the country's top 10 coal-producing states, mining approximately 30 million tons every year since 1988.

NATURAL GAS
As of 2010, North Dakota is the eighteenth largest natural gas producing state in the nation.

OIL
North Dakota's oil industry generates more than $12 billion of economic activity and supports 35,000 direct workers and more than 65,000 indirect jobs across all sectors of the economy.

PETROLEUM MARKETING
Over 500 million gallons of diesel fuel are being used annual in oil activity, in comparison to annual consumption across the state of 1 billion gallons.

SOLAR, GEOTHERMAL, HYDROGEN & HYDRO POWER
Several electric cooperatives offer a program to help ranchers install solar powered stock pond watering pumps in rural areas where it is uneconomical to construct electric transmission lines. As an example, Verendrye Electric Cooperative has provided support for over 300 solar pumps and avoided building about 300 miles of distribution line, saving about $30,000 per mile.

TRANSMISSION
During the last two years, over 587 miles of high-voltage transmission lines representing over $670 million in capital investment have been constructed, are under construction or are in the planning stages for future construction.

WIND
Since 2010, the North Dakota Public Service Commission has approved wind projects with total investments estimated at $930 million.

BIODIESEL

Biodiesel is a clean burning alternative fuel produced from renewable domestic resources that can help narrow the energy supply and demand gap. In North Dakota, biodiesel is primarily produced from canola oil feedstock, but can be made from any vegetable oil as well as from animal fats or used frying oils from restaurants and/or food manufacturing plants. The biodiesel industry is still in the defining stages of development in the United States. The volatile U.S. Biodiesel Blenders Credit has made it difficult for smaller plants to stay in business over the past few years. Currently, there is one biodiesel production facility operating in North Dakota, ADM Velva. Limited demand for biodiesel from within the state of North Dakota will limit the possibility of any new production plants in the state.

Highlights include:

- North Dakota biodiesel production uses about 65 percent of the states' canola production, or about 700,000 acres worth of canola.
- Minnesota and Canadian mandates are creating a demand pull for North Dakota produced biodiesel.
- The ADM Velva plant brings jobs and new tax base into the area.
- The North Dakota State Research Center in Minot has been operating a field plot tractor, fueled by B100 canola biodiesel for 8 years with no mechanical issues.
- Since the canola biodiesel plant was built, North Dakota canola farmers have enjoyed historically high canola seed prices.
- State funding through the Centers of Excellence initiative has fostered a partnership between North Dakota State University and Monsanto to increase acreage and oil content of canola. The release of this new canola line in the near future will expand acreage and yields, increasing the available feedstock for biodiesel production in North Dakota.
- Investments in the Renewable Energy Development Fund have enabled the Energy and Environmental Research Center to develop a bio-based diesel with traits identical to petroleum-based diesel. This has enabled the development of a demonstration plant hosted by Tesoro and allows Tesoro to consider placing this renewable fuel directly in its pipeline for export. The Biofuels PACE Program remains available as a financing incentive for new biofuel production facilities in North Dakota.

Each bushel of canola can produce 2.9 gallons of biodiesel.

BIOMASS

North Dakota's biomass industry has potential for significant contribution to the state's economy as it evolves. Both North Dakota State University and the Energy and Environmental Research Center, University of North Dakota, have numerous projects underway for utilization of biomass. These projects include a wide variety of uses from gasification technology to nanofibers. In addition, there are industry efforts underway to use crop residues and wood waste for ethanol or other energy applications. Commercial application is yet to be achieved as the state works to grow support for biomass as a viable industry in North Dakota.

Highlights include:

- Research sponsors and North Dakota State University continue to work actively toward finalizing a business plan and developing the first energy beet to ethanol commercial installation. Energy beet field trials are being conducted at five regional locations across North Dakota in an effort to study productivity and sustainability. Beet and juice storage studies are also being conducted.
- North Dakota State University has also developed the biomaterials used in the "bio-boom," a hybrid of 20 to 30 percent renewable biomaterials, flax fiber and fiberglass used in a crop sprayer manufactured by AGCO Corporation.
- Great River Energy continues development of Dakota Spirit Ag Energy at Spiritwood, with the intent of adding cellulosic ethanol production once the backbone conventional ethanol facility is in operation. Biomass byproducts have potential for additional energy production.
- North Dakota State University Researchers are collaborating with several companies, including Composite Innovations Centre in Winnipeg, Manitoba. The research studies renewable biomaterials – everything from canola, soybeans, flax and more – in combination with petroleum-based polymers and plastics for an array of products.
- Researchers at North Dakota State University continued to research the development of hybridized biomass in pellet form for use in manufacturing processes. Biocomposite pellets could replace up to 40 percent of petroleum-based plastics used in manufacturing.

ENERGY EFFICIENCY

Energy efficiency continues to be a high priority in public buildings around the state and in North Dakota homes. Over 11,000 energy efficiency and renewable energy rebates were given out to North Dakota residents and businesses resulting in $3.4 million in energy cost savings.

Highlights include:

- The Agricultural and Biosystems Engineering Department and NDSU Extension Service provided education and technical assistance on energy efficiency and conservation through programs such as Home Energy 101, home builders educational seminars, 4-H leader training on the importance of home energy, and energy savings opportunities related to grain drying.
- Energy conservation efforts helped weatherize almost 3,500 homes for low-income individuals across North Dakota.
- North Dakotan's received 3,800 rebates (at $150 each) for ENERGY STAR refrigerators, and will save approximately 2 million kilowatt hours annually.
- Approximately 164 local government buildings across the state have been retrofitted through the Energy Efficiency and Conservation Block Grant annually saving over $1.1 million.

Over $900,000 annually will be saved from the implementation of energy savings measures in 19 North Dakota state facilities such as the State Capitol, North Dakota State School of Science and University of North Dakota.

- In 2010, ND Switch launched a statewide effort asking North Dakotans to make small energy use changes that collectively create a big impact. A variety of resources is available at www.NDSwitch.com.
- The state building code now encompasses the 2009 International Energy Conservation Code and the International Residential Code energy efficiency requirements.
- To date across North Dakota, over 1,130 ground source heat pump systems have been installed in both residential and commercial buildings.

ETHANOL

The ethanol industry contributes more than $300 million annually to the state's economy and supports more than 10,000 jobs. North Dakota's ethanol plants employ nearly 200 workers directly in positions such as chemists, engineers, accountants, managers and support staff. The average annual wage for an ethanol plant employee in North Dakota is approximately $64,000.

Highlights include:

- North Dakota's ethanol industry has the capacity to produce:
  - 400 million gallons of ethanol, more than 10 times the amount produced in 2005.
  - 1.3 million tons of dry distillers grains, a high-value livestock feed.
  - 6 million gallons of corn oil, used in the biodiesel industry.

The ethanol industry contributes more than $300 million annually to the state's economy and supports more than 10,000 jobs.

- Each North Dakota ethanol plant is located in a community with a population of less than 2,500 and contributes an average of 49 jobs and an average annual payroll of $3.3 million to the community.
- North Dakota ethanol plants use approximately 140 million bushels of corn annually with more than 80 percent of the corn purchased from North Dakota farmers. Forty to sixty percent of North Dakota's total corn production annually is purchased by North Dakota ethanol plants.
- Approximately six percent (24 million gallons) of the 400 million gallons of ethanol produced annually in North Dakota is blended with gasoline and sold within the state.
- North Dakota is a national leader in the establishment of flex fuel pumps. As of June 2012, the state has 223 ethanol flex fuel pumps applied for or installed in 46 communities. The state also has 65,000 flex fuel vehicles, a 55 percent increase since 2010.
- A biorefinery is under development near Jamestown, North Dakota. The development will occur in two phases with Phase I consisting of a 65-million gallon per year conventional dry mill ethanol plant and Phase II adding a 10-million gallon per year cellulosic bolt-on facility.

LIGNITE

North Dakota's lignite industry is an innovative and vital part of the state's economy with a $3 billion economic impact. The state supports 4,000 megawatts of lignite and other coal generation at seven locations providing low cost, reliable electric power to two million customers in North Dakota, South Dakota, Minnesota, Montana and Iowa. North Dakota is one of the country's top 10 coal-producing states, mining approximately 30 million tons every year since 1988.

Nearly 80 percent of the lignite coal mined annually is used to generate electricity; about 13 percent is used to make synthetic natural gas that is delivered to 400,000 homes and businesses in the eastern United States; and seven percent is used to produce fertilizer products containing anhydrous ammonia and ammonium sulfate.

Highlights include:

- The 99 megawatts Spiritwood Station near Jamestown was commissioned in 2011. Fuel processed through the DryFine© lignite refining system at Great River Energy's Coal Creek Station was successfully demonstrated at Spiritwood in late 2011. The environmental controls designed in the plant were demonstrated to meet all current and known future regulations. The plant is currently awaiting completion of the adjacent steam host to allow the plant to generate with the economics of a combined heat and power plant as designed.

Nearly 80 percent of the lignite coal mined annually is used to generate electricity.

- The Great Plains Synfuels Plant (Synfuels Plant), owned by Dakota Gasification Company (Dakota Gas), is the only commercial-scale coal gasification plant in the U.S. manufacturing natural gas. Average daily production of natural gas is about 153 million cubic feet, the majority of which is used in the eastern United States.
- The Synfuels Plant supplies carbon dioxide to the world's largest carbon capture and storage project in the world in Saskatchewan, Canada, for use in enhanced oil recovery. Dakota Gas currently captures between 2.5 and 3 million metric tons of carbon dioxide (CO_2) per year.
- Dakota Gas exports about 152 million cubic feet per day of CO_2 to Canada – about 50 percent of the CO_2 produced when running at full rates. As of 2012, Dakota Gas has captured almost 22 million metric tons of carbon dioxide.
- Through 2012, more than 22,000 acres of mined land in North Dakota have gone through final bond release, equivalent to about 35 square miles.
  - A portion of reclaimed land becomes devoted to public use such as Harmony Lake which is now used for hunting, fishing, photography, birding, canoeing, boating, and other outdoor activities.
  - Basin Electric Power Cooperative's Glenharold mine received its final bond release in 2012. Over its 30 year productive life the mine won three national awards for its reclamation work.
- Currently, the Lignite Research Council is participating in 15 research and development projects worth approximately $170 million. Many of these projects focus on ways to reduce, capture and store CO_2.

NATURAL GAS

North Dakota produced 155 billion cubic feet of natural gas, processed 97 billion cubic feet of natural gas and paid $9.6 million in production taxes in 2011. Natural gas gathered and captured in North Dakota heats over two million homes in the U.S. Over the past three years, North Dakota's natural gas industry has worked hard to connect more than 2,100 new wells to gas plants.

There are 16 natural gas processing plants operating in western North Dakota. The oil and gas industry is investing nearly $3 billion in infrastructure to capture natural gas, and four additional new or expanded plants are planned to come online by 2013, a 389 percent increase in natural gas processing capacity. These plants will create hundreds of high-paying jobs in rural communities.

Highlights include:

- Natural gas liquids present many opportunities for value-added energy. Research and studies exploring these possibilities provide great opportunities for expansion of the economic benefits beyond the oil-producing region.
- As of 2010, North Dakota is the eighteenth largest natural gas producing state.
- The North Dakota Industrial Commission, through the Oil and Gas Research Program in partnership with private parties, has invested more than $2 million in research for new technologies to capture and use natural gas at well sites. The results are intended to encourage and promote the use of new technologies that have a positive economic and environmental impact on oil and gas exploration. Examples include:
  - An $873,300 grant awarded to Bakken Express, LLC to use toward a $3 million natural gas capture initiative.
  - A $750,000 grant awarded to Energy & Environmental Research Center to use toward a $1.9 million natural gas capture initiative.
  - A $375,000 grant awarded to Blaise Energy, Inc. to use toward a $7.475 million natural gas capture initiative.

Natural gas gathered and captured in North Dakota heats over two million homes in the U.S.

OIL

North Dakota's oil industry generates more than $12 billion of economic activity and supports 35,000 direct workers and more than 65,000 indirect jobs across all sectors of the economy. The necessary job skills continue to broaden as industry moves from the exploration phase towards the development phase.

As more new wells begin producing, more technical, permanent jobs will result. The average annual wage for an oil industry employee in North Dakota in 2011 was approximately $89,020, which is 117.5 percent above the statewide average wage of $40,914.

Highlights include:

- North Dakota is the second largest oil producing state in the U.S.
- In 2011, North Dakota produced 153 million barrels of oil, a 35 percent increase over 2010 and a 233 percent increase over 2007.
- In May 2012, there were 8,000 wells producing 639,000 barrels of oil per day. The average well produced approximately 72 barrels of oil per day.
- The oil and gas industry reported $3.556 billion in taxable sales and purchases in 2011, and $1,296.1 million in oil extraction and gross production tax revenues.
- In 2011, the oil industry paid $134 million in royalties and lease bonuses to the North Dakota Lands and Minerals Trust Fund. An additional $212 million of royalties, bonuses and oil extraction tax revenues were received by the Common Schools Trust Fund and the other 12 permanent trust funds managed for the North Dakota Board of University and School Lands.
- Oil production on the Three Affiliated Tribes has grown from virtually zero production in 2007 to nearly 108,000 barrels of oil per day in 2012. In April 2012, there were 616 wells producing representing 20 percent of the state's daily oil production.

PETROLEUM MARKETING

North Dakota petroleum marketers are dedicated to providing quality product, great customer service and continue to be community supporters. Consumer demand always has and always will dictate what a petroleum retailer offers at the pump.

The unprecedented economic growth in the state has been very good for the retail petroleum industry. One of the major challenges amidst all the prosperity has been finding adequate supplies of diesel fuel and workforce availability, and these concerns have increased with continued oil development. Over 500 million gallons of diesel fuel are being used annual in oil activity, in comparison to annual consumption across the state of 1 billion.

Highlights include:

- There are roughly 500 petroleum marketers in North Dakota. These operations deal in every aspect of refined petroleum and renewable fuel products ranging from wholesale and supply to the numerous retail outlets scattered across the state.
- In 2011, retail petroleum dealers sold about 750 million gallons of taxable gasoline in the state as well as close to one billion gallons of taxable diesel fuel. This figure does not take into account the 325 million gallons of diesel fuel sold for non-highway use vital to agricultural, industrial and energy sectors within the state.
- North Dakota petroleum marketers continue to support research and development of renewable fuels as viable sources of alternate energy. Over the course of the last four years, nearly 200 ethanol blender pumps have been installed across the state. About 55 percent of all gasoline sold in the state now contains some blend of ethanol.

In 2011, retail petroleum dealers sold about 750 million gallons of taxable gasoline in the state as well as close to one billion gallons of taxable diesel fuel.

REFINING

Several new refinery projects are being evaluated. They are diesel topping plants of 20,000 barrels per day near Trenton (Dakota Oil Processing) and Dickinson (MDU Resources Group, Inc. and Calumet Specialty Products, LLC) and one of 15,000 barrels per day near Makoti (Mandan, Hidatsa, and Arikara (MHA) Nation). North Dakota's only operational facility, the Tesoro Mandan refinery, has increased its crude processing capabilities by approximately 20 percent (60,000 barrels per day to 70,000).

Highlights include:

- The additional processing capacity will result in approximately 4,000 barrels per day of additional diesel product volume.
- The refinery currently has 254 full time employees and routinely has 50 to 60 contact employees working at the facility each day.
- The refinery provides motor fuels product to North Dakota, Montana, South Dakota, Minnesota and Wisconsin.
- The refinery currently processes 100 percent Williston Basin Crude and over 90 percent of the crude processed is from North Dakota wells.

The Tesoro Mandan refinery contributes approximately $2 million in property taxes to Morton County.

SOLAR, GEOTHERMAL, HYDROGEN & HYDRO POWER

North Dakota has invested in research for hydrogen, solar and geothermal applications. This includes $2.5 million for a Centers of Excellence project at the Energy & Environmental Research Center's National Center for Hydrogen Technology, which is attracting hydrogen-based business to the state; funding for research at University of North Dakota for commercial application of geothermal; and funding for solar energy research at North Dakota State University.

Highlights include:

- Several electric cooperatives offer a program to help ranchers install solar powered stock pond watering pumps in rural areas where it is uneconomical to construct electric transmission lines. As an example, Verendrye Electric Cooperative has provided support for over 300 solar pumps and avoided building about 300 miles of distribution line at a savings of about $30,000 per mile.
- The Geothermal Laboratory at the University of North Dakota is conducting a geothermal power demonstration project in North Dakota in collaboration with the U.S. Department of Energy, Continental Resources, Inc., Slope Electric Cooperative and Access Energy, LLC. The objective of the project is to demonstrate and test the technical and economic feasibility of generating electricity from non-conventional, low-temperature geothermal resources using Organic Rankine Cycle (ORC) technology.
- The Garrison Dam, on the Missouri River with a capacity of 583 megawatts, is North Dakota's fifth largest plant in electricity generation capacity.

TRANSMISSION

The development of new transmission in North Dakota continues to grow as companies construct lines to connect wind farms to the electric grid and to handle new load growth. At the same time a number of initiatives to study the impact of renewable resources on existing transmission systems identified new lines for the future, such as the Midwest Independent System Operator (MISO) multi-value projects (MVP lines) which were approved by the MISO board of directors in December 2011. These MVP lines will provide additional reliability to the MISO system as well as improving the North Dakota Export Constraint. In addition, the CapX 2020 program continued on its path to build five major transmission lines, three of which are important for the export of energy from North Dakota.

Highlights include:

- North Dakota Transmission Authority conducted a study of the impact of oil and gas development in the Williston Basin on electric load growth and transmission infrastructure.
- Basin Electric Power Cooperative, Inc. announced plans to construct 200 miles of 345 kV line from the Antelope Valley Station to a substation located near Tioga.
- Minnkota Power Cooperative, Inc. began construction of 260 miles of 345 kV line to transport energy from the Milton R. Young station to the Grand Forks area.
- The CapX 2020 project energized the first segment of the St. Cloud to Fargo 345 kV transmission line.
- Great River Energy announced plans to rebuild 80 miles of 230 kV line between Grand Forks and Devils Lake.
- MISO approved 17 multi-value projects, including transmission from North Dakota to eastern energy markets with an estimated capital investment of over $5.2 billion.

During the last two years, over 587 miles of high-voltage transmission lines representing over $670 million in capital investment have been constructed, are under construction or are in the planning stages for future construction.

WIND

Over the last few years many of the region's utilities completed construction of wind facilities to comply either with renewable portfolio standards in states surrounding North Dakota or to meet internal policies related to diverse energy portfolio standards. During the last year, however, the wind industry in North Dakota found itself in a state of transition. Driven in part by the economic slowdown caused by the 2008 recession and the resulting decrease in demand for electricity, the construction of new facilities also slowed down, with several projects stalled.

More than 800 wind turbines are operating in 20 North Dakota counties.

Adding to the challenges for the industry was the failure of Congress to extend the production tax credit beyond December 2012. In spite of these issues, the capacity of the wind industry grew during the last year.

Highlights include:

- Since 2010, the North Dakota Public Service Commission has approved wind projects with total investments estimated at $930 million.
- In the last two years, installed wind capacity in the state has grown by over 250 megawatts with an additional 210 megawatts under construction in early 2012.
- North Dakota ranked tenth in the nation in capacity in 2012. The North Dakota Public Service Commission has permitted 2,900 megawatts of wind generation.
- When construction is complete the Bison Wind facility, owned by Minnesota Power., will provide over 290 megawatts of wind energy.

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