SPOTLIGHT ON

NORTH DAKOTA ENERGY

2024 ANNUAL REPORT

ENERGYND
great plains energy corridor

BISMARCK STATE COLLEGE | North Dakota's Polytechnic Institution

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ENERGYND
great plains energy corridor

The Great Plains Energy Corridor, housed at Bismarck State College's National Energy Center of Excellence, works with partners in government, education, and the private sector to promote and enhance North Dakota's energy development.

Together we provide information, education, outreach programs, and special events on a wide range of energy topics.

www.energyND.com

ABBREVIATIONS

BCF - Billion cubic feet
BPD - Barrels per day
DDG - Dried distillers grains
kV - Kilovolt
KW - Kilowatt
KWh - Kilowatt-hour
MCF - 1,000 cubic feet
MMCF - Million cubic feet
MW - Megawatt
MWh - Megawatt-hour

Cover photo: Mandan Refinery, courtesy of Marathon Petroleum

EDITOR'S COMMENTS

Welcome to the 2024 edition of the Great Plains Energy Corridor's Spotlight on North Dakota Energy! This report provides a comprehensive overview of our state's energy sector, capturing a year that included some remarkable milestones.

Here's a look at some of the highlights.

Alicia Uhde
Dean, Automation, Energy and Advanced Technologies, Bismarck State College

5 BILLIONS BARRELS

In February 2024, North Dakota exceeded production of 5 billion barrels of oil from the Bakken and Three Forks formation. This achievement underscores the state's role as a leading energy producer, driven by advancements in drilling technology, strong industry investment, and the rich reserves of the Bakken shale.

INNOVATION IN CARBON CAPTURE

Basin Electric's Great Plains CO2 Sequestration Project went into service in February 2024, becoming the first project in the nation to use both enhanced oil recovery and geologic storage.

In October, the U.S. Department of Energy (DOE) awarded critical funding to support Minnkota Power Cooperative's Project Tundra, one of the world's largest carbon capture projects. This funding allows the company to begin project development and stakeholder engagement. The DOE also allocated funds to advance the construction of a large-scale geologic carbon storage facility.

Dakota Gasification Company had a record-breaking year in fertilizer production, surpassing its carbon dioxide (CO2) sequestration target by 38%. The facility also achieved its first year ever without a scheduled turnaround in ammonia and urea production.

These milestones position us at the forefront of carbon management technologies, showcasing our state's ability to balance energy production with environmental responsibility.

HELMS RETIRES

Lynn Helms' retirement in June marked the end of an era in North Dakota's energy industry. Helms retired after nearly 30 years with the ND Department of Mineral Resources. He became director of the ND Industrial Commission Oil & Gas Division in 1998, and took over as DMR director when it was formed in 2005.

Under his guidance, North Dakota's daily oil production surged from 99,000 to 1.2 million barrels. As Sen. Kevin Cramer noted, Helms was a "spectacular regulator who understood our state's crucial economic role." Congratulations on your retirement, Lynn.

REFLECTING ON 2024

These achievements reveal more than statistical success. They reflect our state's resilience, ingenuity, and commitment to responsible, innovative energy production.

I would like to thank Andrea Blessum, who assisted with gathering data as well as writing and designing this document. Thank you to our industry partners and the EmPower North Dakota Commission for helping us provide up-to-date information. And thank you for your continued readership!

Photo of Garrison Dam, courtesy of Kris Oyen, U.S. Army Corps of Engineers

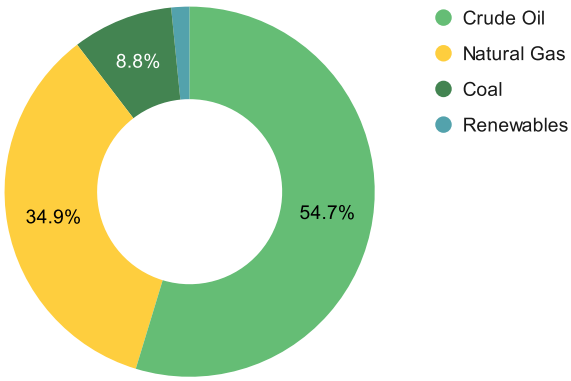
A VIEW FROM ABOVE

North Dakota is an energy powerhouse, ranking eighth nationally for total energy production.

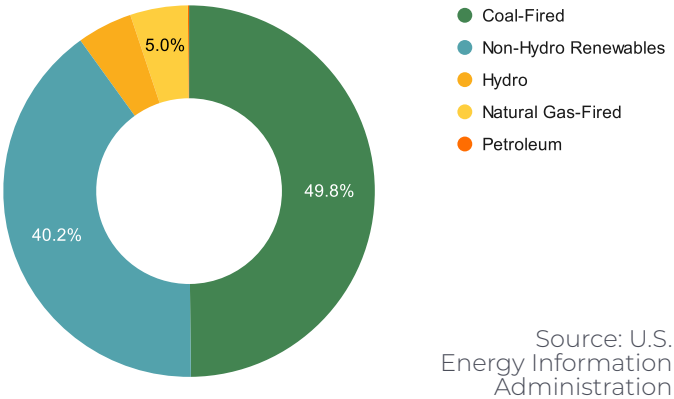
From coal and natural gas to oil, hydroelectric power, and renewable energy, the state's diverse energy mix plays a vital role in fueling the region and supporting the nation's energy independence.

North Dakota produces electricity from a wide variety of sources, including coal baseload power plants, hydroelectric turbines, wind turbines, natural gas and fuel oil peaking plants, heat recovery units, and solar power. Additionally, geothermal generation is being explored in western North Dakota.

ND TOTAL ENERGY PRODUCTION



ND ELECTRICITY GENERATION



Source: U.S. Energy Information Administration

As of December 2024, North Dakota had the lowest-cost electricity for residential and commercial use, according to chooseenergy.com. The highest cost for residential electricity in the U.S. was Hawaii at 42.34 cents/KWh for residential and 39.29 cents/KWh for commercial.

	RANKING	RESIDENTIAL	COMMERCIAL
NORTH DAKOTA	1 (lowest)	10.21 ¢/KWh	7.18 ¢/KWh
HAWAII	50 (highest)	42.34 ¢/KWh	38.29 ¢/KWh
NATIONAL AVERAGE		16.26 ¢/KWh	12.76 ¢/KWh

Source: chooseenergy.com

Electricity is a unique commodity. It must be produced and consumed at the same time. Unlike other goods, it cannot be stored at scale on a regional or commercial level. The electricity that powers our homes, businesses, hospitals, and schools is generated on demand, every second of every day. As demand fluctuates by the hour, the season, or in response to sudden events, our energy system must be flexible, responsive, and resilient.

North Dakota is uniquely positioned to meet these challenges. With a balanced portfolio of traditional baseload power from coal and natural gas, combined with growing generation from wind and hydro, the state has built a diverse energy system that can respond to extreme weather events, shifting demand, and regional stress. Where some states may struggle during heat waves or polar vortexes, North Dakota's diversified electric grid provides stability—not just for North Dakotans, but for the broader region.

As the nation transitions to a lower-carbon future, North Dakota demonstrates that energy reliability and sustainability don't have to be at odds. The state's approach shows how investing in energy diversity—paired with grid planning and innovation—can build a system as resilient as the communities it serves.

GENERATION

Power plants can be classified as dispatchable or intermittent. Dispatchable power plants are designed to increase or decrease generation as required by the dispatcher. These include hydroelectric, coal-based and natural gas-fired generators. North Dakota does not have any nuclear power plants.

The plants fueled with natural gas are capable of rapid starts and can quickly achieve full generating capacity (fast ramping). They typically run a small percentage of the time. Intermittent plants are typically comprised of renewable energy sources, such as wind or solar, and operate when the resource is available.

While solar generation capacity has increased in North Dakota, there arn't any utility-scale installations at this time. Wind is abundant in North Dakota and the state continues to grow its generation fleet.

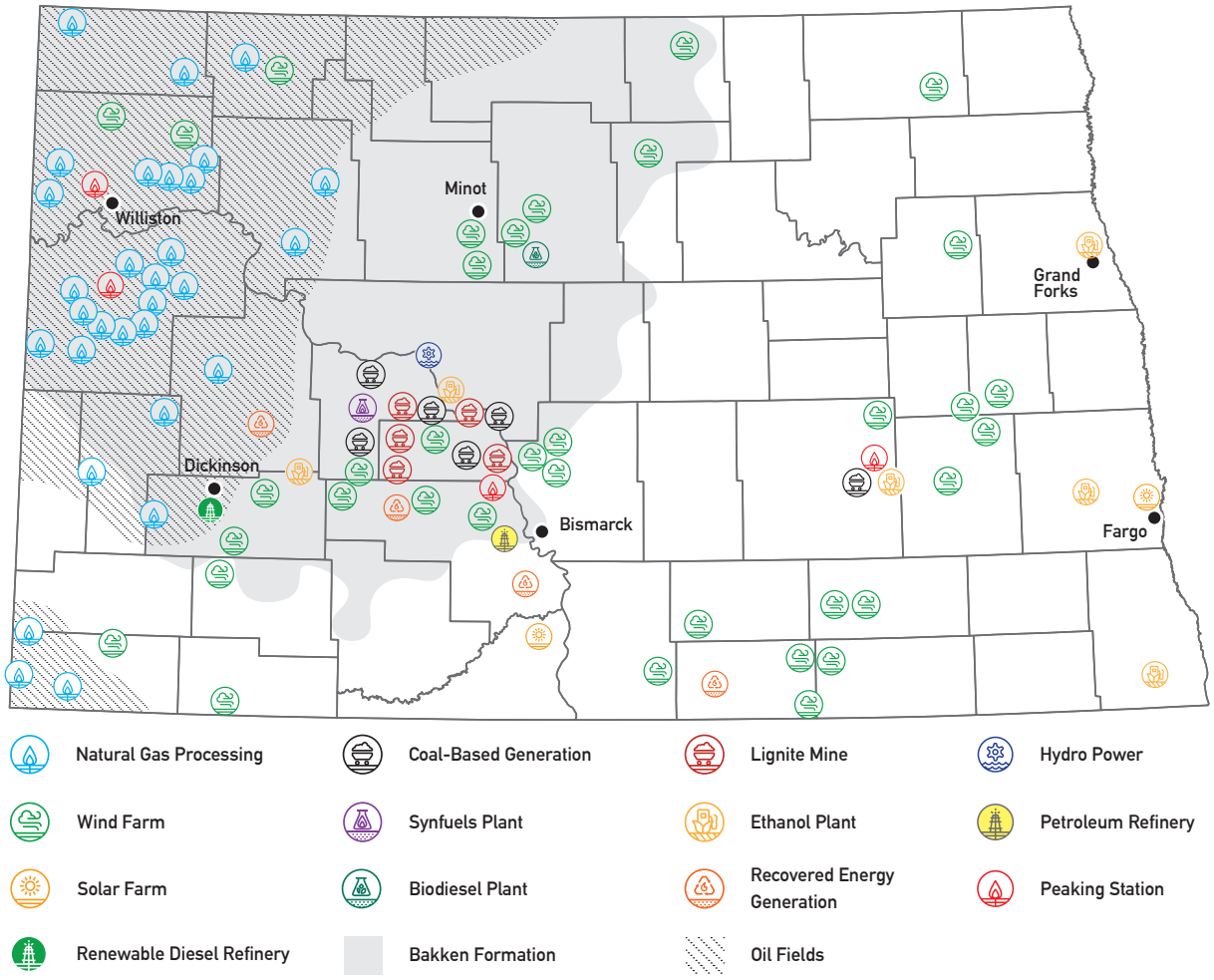
It makes no difference how electricity is produced. It's all the same product; it just comes from different sources.

Every establishment that uses electricity is connected or "hard wired" to a power generation source through the electric grid. That source may be around the corner, down the block, or hundreds of miles away.

All generating sources are interconnected through a power pool and a regional transmission operator (RTO). There are two power pools that operate in North Dakota: the Southwest Power Pool (SPP) and Midcontinent Independent System Operator (MISO). These power pools connect generating sources from many utilities, so if one source can't produce electricity, the other sources can "cover" for the source that isn't producing. The RTOs also operate the wholesale power market to purchase power from less expensive sources (when available) to maintain the lowest cost to utilities.

Electricity must be produced instantly, 24 hours a day, 7 days a week, 365 days a year, regardless of the weather and despite ever-changing demands.

NORTH DAKOTA'S ENERGY SITES



Map courtesy of Bismarck State College's National Energy Center of Excellence

Photo of The Coteau Properties Company's Freedom Mine, courtesy of Lignite Energy Council

MINING

North Dakota has the second-largest known reserves of lignite in the world—behind only Australia—with an estimated 26.5 billion tons of recoverable resources.

North Dakota lignite mines produced 23.96 million tons in 2024. It is estimated that the state's reserves would last more than 800 years at the current rate of consumption.

Nearly 80% of lignite is used to generate electricity. The other 20% is used to make fertilizers, synthetic natural gas, and other products at the Great Plains Synfuels Plant.

There are also two leonardite mines in North Dakota—the American Colloid Mine near Scranton and the Leonardite Products Mine near Williston. Leonardite is a highly oxidized form of lignite that is used as a soil amendment and by the oil industry as a drilling additive. Both mines have a processing plant associated with them.

Lignite coal and commercial leonardite are taxed at a flat rate of $0.375/ton by the State of North Dakota. An additional two-cent-per-ton tax is levied for the Lignite Research Fund.

The lignite industry contributed more than $104.7 million in revenue to state and local entities in 2024.

MINE	ANNUAL PRODUCTION	LOCATION	FACILITIES SERVED	OWNER/OPERATOR
Freedom Mine	11.38M tons	8 miles NW of Beulah	Antelope Valley Station and Great Plains Synfuels Plant, Beulah; Leland Olds Station, Stanton	The Coteau Properties Company*
Beulah Mine**	In final reclamation	5 miles SW of Beulah	Heskett Station, Mandan (decommissioned in 2022)	Dakota Westmoreland Corporation
Center Mine	4.1M tons	4 miles SE of Center	Milton R. Young Station, Center	BNI Coal Ltd.
Falkirk Mine	6.3M tons	Underwood	Coal Creek Station, Underwood; Spiritwood Station, Spiritwood	Falkirk Mining Company*
Coyote Creek Mine	2.2M tons	5 miles S of Beulah	Coyote Station, Beulah	Coyote Creek Mining Company*

*Owned by North American Coal Corporation.
**Beulah Mine ceased production in March 2022 when Heskett Station was retired.

RECLAMATION

North Dakota lignite mines practice contemporaneous reclamation, which means simultaneously mining and reclaiming land.

Mining companies typically have three years to reclaim mined land by grading and respreading the soil and seeding the land. After that, mines keep reclaimed land under performance bond for at least 10 years to prove reclaimed land is as productive as it was before mining.

Between 1,500 and 2,000 acres of land are disturbed by coal mining and reclaimed each year. Mining companies spend an average of $30,000 to reclaim one acre of land, but costs can be as high as $60,000/acre.

More than 30,000 acres of permitted land in the state have gone through final bond release—the equivalent of about 46 square miles.

The Falkirk Mine was the nation's first surface coal mine to operate a survey drone for reclamation. Pre-mining surveys are used to plan for water management and to determine elevation and placement of topsoil and subsoil.

Drones provide an innovative way to retrieve topographical maps of large areas. Time is saved in the field because the drone surveys around 400 acres per 50-minute flight. The data is downloaded to a computer and can be interpreted in a few hours.

Photo by Tyler Freuer, 2019, North American Coal Corporation, Coyote Creek Mine, Beulah

COAL-BASED GENERATION

Historically, all of North Dakota's coal-based power plants have been owned by consumer-owned or investor-owned utilities.

In 2022, Rainbow Energy purchased Coal Creek Station from Great River Energy, becoming the state's first independent coal-based power producer and diversifying the state's coal-based generation market.

As an independent power producer, Rainbow Energy does not have defined ratepayers or a service territory like other utilities.

North Dakota is **one of only four states** that has never violated any federal ambient air quality standard, and is one of only 18 states that are considered clean air states that continuously meet all of the U.S. EPA's federal ambient air quality standards.

North Dakota's lignite industry generated **$5.49 billion in gross business volume** in 2024.

The lignite industry supports nearly **12,000 direct and secondary jobs.**

North Dakota's power plants have **invested around $2 billion in technology** to reduce emissions and increase efficiencies. These investments account for 20% to 30% of a power plant's costs.

One megawatt-hour (MWh) is enough electricity to serve more than 800 homes with an hour's worth of power.

COAL-BASED PLANT	OPERATING COMPANY	CAPACITY (MW)
Coal Creek Station	Rainbow Energy Center, LLC	1,146
Antelope Valley Station	Basin Electric Power Cooperative	900
Milton R. Young Station	Minnkota Power Cooperative	705
Leland Olds Station	Basin Electric Power Cooperative	660
Coyote Station	Otter Tail Power Company	427
Spiritwood Station*	Great River Energy	99
Total		**3,937**

*Spiritwood Station is a combined heat and power plant. Its primary product is steam, which is sold to the Dakota Spirit Ethanol biorefinery at Spiritwood Energy Park near Jamestown. The plant also produces some electricity for the regional grid.

GAS-FIRED GENERATING PLANTS

Peaking plants provide power generation companies with rapid response to regional “peaks” to meet the demand for electricity.

The additional generating capacity these smaller facilities provide can be used in extreme weather conditions when demand for electricity exceeds the capacity of baseload facilities. They are also used to provide power when other resources are not available.

They can be powered up from stand-by status to full load very quickly and, in most cases, are operated from a remote site. In North Dakota, peaking plants are fueled by either natural gas or fuel oil.

Basin Electric Power Cooperative operates two natural gas-fired peaking stations to help provide electrical stability in western North Dakota.

- Lonesome Creek Station, located west of Watford City, has six, 45-MW units, with a total generating capacity of 270 MW. Lonesome Creek started commercial operation in 2013.
- Pioneer Generation Station, located northwest of Williston, has three 45-MW units and twelve 9.3-MW units.

Basin Electric is pursuing its largest single-site electric generation project since the 1980s: Pioneer Generation Station Phase IV. The cooperative is constructing 580 MW of natural gas generation near the existing Pioneer Generation Station with a total investment of $805 million.

The project includes two 235-MW simple-cycle combustion turbines, six reciprocating engines totaling 110 MW, and 15 miles of 345-kilovolt (kV) transmission, all to be in service in 2025. Once all units are online, Pioneer Generation Station will have a total generating capacity of 825 MW.

Montana-Dakota Utilities has two 88-MW natural gas-fired combustion turbines—Heskett 3 and Heskett 4—near Mandan.

Otter Tail Power Company has two fuel oil combustion turbines in Jamestown with a total capacity of 41 MW.

Photo of Blue Flint CO2 Facility near Underwood, courtesy of Harvestone Low Carbon Partners

CO2 CAPTURE AND STORAGE

North Dakota is leading the way in carbon capture and storage, leveraging its unique geology, advanced energy infrastructure, and forward-thinking policy to turn carbon challenges into economic opportunities.

With some of the most ideal subsurface formations in the world for permanent CO2 storage, the state is home to groundbreaking projects that capture carbon emissions from power plants, ethanol facilities, and industrial sources—and safely store them underground.

GREAT PLAINS CO2 SEQUESTRATION

Basin Electric's Great Plains CO2 Sequestration Project went into service in February 2024. The Great Plains Synfuels Plant captures and sequesters CO2 via a permanent geologic storage reservoir near the facility.

The project hit a milestone in August 2024 of 1 million metric tons of total injection since the project began.

Prior to implementation, the Synfuels Plant captured approximately 2 million metric tons of the plant's CO2 emissions and piped them to Saskatchewan for use in enhanced oil recovery. It's the nation's first project using both enhanced oil recovery and geologic storage.

PROJECT TUNDRA

Project Tundra is an initiative led by Minnkota Power Cooperative to build one of the world's largest carbon capture projects at its coal-based Milton R. Young Station near Center. Minnkota proposes to capture about 4 million metric tons of CO2 annually, stored safely and permanently in deep geologic formations approximately one mile underground near the power plant site.

Project Tundra has access to the two largest fully permitted CO2 storage facilities in the U.S. In total, the project can store up to 222 million tons of CO2 in geologic formations near the Young Station over a 20-year period.

The project secured two U.S. Department of Energy funding awards in 2024 and is currently in advanced development stages.

BLUE FLINT ETHANOL

Harvestone Low Carbon Partners' Blue Flint Ethanol facility near Underwood went into service in October 2023, capturing and storing up to 220,000 metric tons of CO2 annually.

RED TRAIL ENERGY ETHANOL, NOW OPERATED BY GEVO

Red Trail Energy Ethanol Plant, located near Richardton, North Dakota, began operations in June 2022 as the first commercial-scale CO_2 capture and storage project in the state. The facility captures and stores up to 180,000 metric tons of CO_2 annually. On February 3, 2025, Gevo acquired Red Trail Energy, including its ethanol plant, carbon capture and sequestration assets, and associated pore space. The acquisition, originally announced in September 2024, was approved by Red Trail Energy's equity holders in December.

DID YOU KNOW?

North Dakota is **one of just three states** to receive the U.S. Environmental Protection Agency's Class VI underground injection control authority.

WIND

North Dakota has more than 4,447 megawatts (MW) of wind energy capacity installed throughout the state, consisting of approximately 2,230 wind turbines.

On average, wind turbines across the U.S. produced 33.8% of their maximum possible energy output in 2022. In comparison, wind projects in North Dakota typically perform better, generating between 40% and 50% of their maximum capacity. This higher capacity factor indicates that North Dakota's wind resources are stronger or more consistent, allowing wind turbines to produce more electricity relative to their potential.

North Dakota ranks 10th for installed wind capacity as of 2023, getting 35% of its net electricity generation from wind resources. This puts North Dakota ahead of most of the countries in the world for percentage of electricity from wind generation.

RECENT PROJECTS

NextEra's Oliver Wind IV, 200 MW, went into service in 2024 in Oliver County.

Otter Tail Power received site permits from the North Dakota Public Service Commission to upgrade and refurbish wind turbines at the Ashtabula, Ashtabula III, Langdon, and Luverne Wind Energy Centers.

Upgrades were completed at the first wind energy center in 2024 and upgrades at the remaining three are expected to be completed in 2025. Once completed, the capacity of the wind projects will increase by 40 MW.

The economic impact of wind energy development in North Dakota in 2024 included $24.4 million in state and local taxes and $22.1 million in income to landowners. The industry provides 4,000-5,000 permanent direct jobs in the state.

FEDERAL TAX CREDITS

Federal tax credits in recent years, primarily the Production Tax Credit (PTC) and the Investment Tax Credit (ITC), have helped lower the cost of building and operating wind energy projects.

Under the 2018 PTC, developers could receive a credit of 2.4 cents per kWh from utility-scale wind turbines during a project's first 10 years of operation. The credit was adjusted to 2.5 cents per kWh for inflation. The Tax Extender and Disaster Relief Act of 2019 provided a short extension at the 60% level for one more year.

The Inflation Reduction Act (IRA), which became law in 2022, replaces the wind PTC beginning in 2025 with technology-neutral credits for low-carbon electric generation which is expected to phase out in 2032, or when U.S. power sector greenhouse gas emissions decline to 25% of 2022 levels, whichever is later.

$24.4M

STATE AND LOCAL TAXES

$22.1

INCOME TO LANDOWNERS

4-5K

PERMANENT, DIRECT JOBS

WIND PROJECT	COUNTY	OWNER COMPANY	POWER PURCHASER	MW
Ashtabula Wind I (2008), II (2009)	Barnes, Griggs and Steele counties	NextEra	Minnkota Power, Great River Energy	316.5
Ashtabula Wind III (2010)	Barnes County	Otter Tail Power Company		62.4
Ashtabula Wind Farm (2008)	Barnes County	Otter Tail Power Company		48.0
Aurora Wind Project (2021)	Williams County	ENEL Green Power		300.0
Baldwin Wind Energy Center (2010)	Burleigh County	NextEra		102.40
Bison Wind 1 (2012, 81.8 MW), 2 & 3 (2013, 210 MW) and 4 (2015, 204.8 MW)	Oliver, Mercer, Morton counties	ALLETE, Inc. (MN Power)		496.6
Border Winds (2016)	Rolette, Towner counties	Northern States Power		150.0
Brady Wind Energy Center I (2016, 150 MW), II (2016, 150 MW)	Hettinger, Stark counties	NextEra		300.0
Cedar Hills Project (2010)	Bowman County	Montana-Dakota Utilities		19.50
Courtenay Wind (2016)	Stutsman County	Northern States Power		200.5
Emmons-Logan Wind Energy Center (2019)	Emmons, Logan counties	NextEra		200
Foxtail Wind Energy (2019)	Dickey County	Northern States Power		150.0
Glen Ullin Energy Center (2019)	Mercer, Morton counties	ALLETE Clean Energy	Northern States Power Company	100.0
Lake Region (2013)	Ramsey County	Lake Region State College		1.6
Langdon Wind (2007, 118.5 MW) & expansion (2008, 40.5 MW)	Cavalier County	NextEra		158.5
Langdon Wind Energy Center (2007)	Cavalier County	Otter Tail Power Company		40.5
Lindahl Wind Project (2017)	Williams County	ENEL Green Power		150.0
Luverne Wind Farm (2009)	Griggs, Steele counties	Otter Tail Power Company		49.5
Merricourt Wind (2020)	McIntosh, Dickey counties	Otter Tail Power Company		150.0
Minot Wind Project (2002, 2.6 MW; decommis 2022), 2 (2009, 4.5 MW)	Ward County	Basin Electric		4.5
ND Wind I Energy Center (40.5 MW), II (21 MW)	LaMoure County	NextEra	Basin Electric, Otter Tail	61.5
New Frontier Project (2018)	McHenry County	Meadowlark Wind 1, LLC (Capital Power)		99.0
Northern Divide Wind (2020)	Burke County	NextEra		200.0
Oliver County Wind I (2006, 50.6 MW), II (2007, 48 MW), III (2017, 100 MW), IV (2024, 200 MW)	Oliver, Morton counties	NextEra	Verizon Communications, Inc. (150 MW)	398.6
Petersberg Wind Project (2002)	Nelson County	Minnkota Power		0.9
Prairie Winds Project (2009)	Ward County	Basin Electric		115.5
Rugby Wind Farm (2009)	Pierce County	Iberdrola, Inc.		149.1
Sunflower Wind Project (2016)	Stark, Morton counties	Infinity Wind		104.0
Tatanka Wind Farm (2008, 90 MW in ND, 180 MW in SD)	Dickey, McIntosh counties	Acciona		90.0
Thunder Spirit (2015, 107.5 MW), expansion (2018, 48 MW)	Adams County	Montana-Dakota Utilities		155.5
Valley City Wind Project (2002)	Barnes County	Minnkota Power		0.9
Velva Wind Project (2005)	McHenry County	Acciona	Northern States Power Company	12.0
Wilton Wind Energy I (2006, 49.5 MW), II (2009, 49.5 MW)	Burleigh County	NextEra	Basin Electric (49.5 MW)	99.0
Six small projects	Various ND locations	Non-utility owners		1.12
TOTAL				**4,487.62**

Photo of Blue Jay Solar in Jamestown, courtesy of Otter Tail Power Company

SOLAR

Solar energy technology is based on two main types—photovoltaics (PV), which is the most common way of producing solar electricity in North Dakota, and concentrated solar power (CSP).

CSP typically uses mirrors to concentrate the sun's rays and create heat that, in turn, drives a heat or steam engine. PV power uses the sun's rays to create direct current electricity.

Otter Tail Power Company announced in December 2024 it had signed an agreement with Flickertail Solar Project, LLC to buy the development assets of a 295-MW solar generation facility under development near Wahpeton. The project is expected to be complete in 2028.

SOLAR PROJECTS ACROSS THE STATE

The USDA Northern Great Plains Research Laboratory in Mandan installed a 50-kW solar array to explore the impact of solar panels on forage and livestock production to help improve economic efficiency for Northern Plains producers.

Blue Jay Solar is a unique partnership between Otter Tail Power and Jamestown High School and is located on the school's property. At almost 40 kW in size, this small solar project began generating energy in June 2020. It includes 104 solar panels on approximately half an acre. It generated 55.25 MWh of electricity in 2024.

Bismarck State College has an 8-kW PV solar array on campus composed of both crystalline and thin panel solar systems so students have the opportunity to study both.

Cass County Electric Cooperative, (CCEC) Fargo, installed a 102-kW solar array in 2016, called Prairie Sun Community Solar. It was the first community solar project in the state and consists of 324 solar panels located on land owned by the City of Fargo. CCEC members can lease the panels.

HYDROELECTRIC

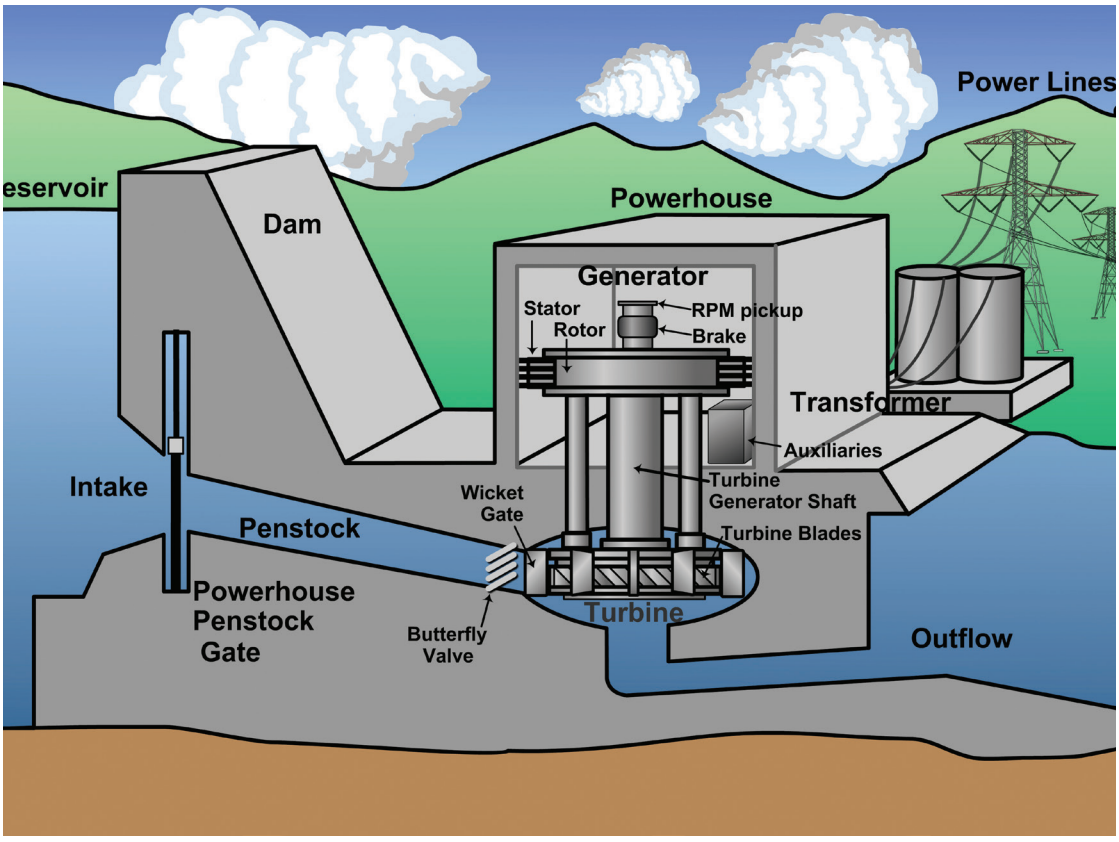
Garrison Dam, North Dakota's only source of hydroelectric power, is operated by the U.S. Army Corps of Engineers—Omaha District.

- Garrison Dam has five turbines with a total installed capacity of 583 MW.
- The first unit began operating in January 1956.
- The dam produces an average of 2.6 million MWh of electricity each year.
- Lake Sakakawea, which was created by the Garrison Dam, is the third largest reservoir in the U.S. by volume.

The electricity from Garrison Dam is marketed by the Western Area Power Administration (WAPA). Customers in North Dakota include municipal utilities, Native American tribes, state agencies, educational institutions, irrigation districts and rural water users, and electric power cooperatives.

Much of the electrical power generated at Garrison Dam serves customers in North Dakota and customers in the states of Minnesota, Iowa, Montana, South Dakota and Nebraska.

WAPA is one of four power marketing administrations within the U.S. Department of Energy whose role is to market and transmit electricity from multi-use water projects.



This graphic shows how a hydropower electric generating plant works. Image courtesy of Bismarck State College's National Energy Center of Excellence.

ELECTRIC VEHICLES

According to the ND Department of Transportation, there were 1,255 EVs and 912 plug-in hybrid vehicles registered in North Dakota as of December 2024. There are 135 charging stations in the state.

North Dakota will receive roughly $25.9 million from the National Electric Vehicle Infrastructure (NEVI) Formula Program through FY 2026.

NDDOT has developed a federally mandated statewide EV Infrastructure Plan. It was completed in 2023 and provides an analysis of the future of electric vehicles. The Plan is a federal requirement to obtain NEVI Formula Program funding. The Federal NEVI Program is intended to create a network of EV fast chargers across the country to support long distance travel. For North Dakota, the first phase of the program will build chargers along I-94 and I-29, with the later phase focused on building chargers statewide.

Charging stations generally come in four levels. Charging speed depends on several factors, including kilowatts per hour, connection type and battery type.

The majority of chargers (Level 1 and Level 2) throughout North Dakota are designed to recharge an electric vehicle in 12-14 hours. There are also Level 3 chargers that can recharge batteries in about two hours, and Tesla-specific chargers.

1,255
ELECTRIC VEHICLES

912
PLUG-IN HYBRIDS

135
CHARGING STATIONS

RECOVERED ENERGY

Recovered energy generation (REG), also known as heat-recovery generation or waste heat energy, is a process of capturing the heat from hot exhaust to drive a turbine and create electricity.

There are four REG sites in North Dakota. Basin Electric Power Cooperative purchases the electricity from three sites near Manning, St. Anthony, and Zeeland (5.5 MW each); and Montana-Dakota Utilities owns one site near Glen Ullin (5.3 MW).

The sites produce electricity using exhaust from compressor stations on the Northern Border Pipeline. The Northern Border Pipeline is a natural gas transportation system of 1,398 miles that links the Midwest with reserves in Canada.

A subsidiary of Ormat Technologies developed the recovered energy generation. This is the first use of this technology on a natural gas pipeline in the U.S.

Photo of steel-lattice transmission structure near Bismarck, courtesy of Western Area Power Administration

TRANSMISSION & DISTRIBUTION

North Dakota's electric transmission network plays a critical role in grid reliability, grid resilience, and market economics for developing electric generation.

Investor-owned utilities were responsible for North Dakota's initial transmission development, followed by federal development of transmission lines, which are now operated by WAPA.

In the 1960s, electric generation and transmission cooperatives began developing both generation and transmission assets.

Combined, North Dakota's generation and transmission infrastructure is part of a complex system that delivers more than 200,000 MW of electricity across 100,000 miles of transmission lines. Distribution utilities then deliver that power to homes and businesses in all or part of 20 states.

TRANSMISSION VS. DISTRIBUTION: WHAT'S THE DIFFERENCE?

Transmission lines begin at the source of power generation, like a power plant, and carry large volumes of high-voltage electricity over long distances.

Transmission of electricity is more efficient at higher voltages like 115 kV, 230 kV, and 345 kV, which are typical voltages in North Dakota.

Distribution lines carry lower-voltage electricity from local substations to residential and commercial customers. High-voltage transmission lines bring power from a generation source to a substation, and distribution lines carry the power out of the substation to nearby homes and businesses.

KEEPING UP WITH DEMAND

Transmission capacity requirements have changed because of the change in generation locations—from the mine mouth coal facilities to gas generation in western North Dakota to wind generation across the state.

North Dakota saw several major transmission projects in the works in 2024. Basin Electric's Roundup to Kummer Ridge 345-kV transmission project in western North Dakota was energized in December 2024. The 35-mile line connects two existing substations and enhances the region's transmission load serving capability.

AC VS. DC: TRANSMISSION LINE EVOLUTION

DC was the standard in the early years of electrification in the U.S., but it is difficult to convert to higher or lower voltages to meet different demands. Alternating current, or AC, on the other hand, can be converted to different voltages using a transformer. AC

ACTIVE T&D PROJECTS

TRANSMISSION OWNER	VOLTAGE	LOCATION	MILES OF BUILD	TARGET COMMISSIONING DATE
Basin Electric	345 kV	Leland Olds Station – Tande	161	2026
Basin Electric	230 kV	Wheelock to Saskatchewan Power	53	2027
Basin Electric	230 kV	Tande to Saskatchewan Power	59	2027
MDU/Otter Tail Power	345 kV	Jamestown to Ellendale	100	2028
MN Power ALLETE	DC	HVDC Modernization Project (new converts on the Center and Duluth ends of the existing DC line; increasing capacity from 550 MW to 900 MW to potentially 1,500 MW	465	2029
GRID UNITED/MN Power ALLETE	525 kV DC	St. Anthony and Center, ND – Colstrip, MT	400	2032

T&D PROJECTS IN THE PLANNING STAGE

TRANSMISSION OWNER	VOLTAGE	LOCATION	MILES OF BUILD	TARGET COMMISSIONING DATE
Great River Energy/Otter Tail Power/Minnesota Power	345 kV	Maple River to Cuyuna	166	2033
Otter Tail Power/Xcel	345 kV	Big Stone South to Hankinson to Bison (Fargo)	150	2034

reverses direction periodically, hence its name. We use AC electricity in our homes and businesses. Direct current, or DC, moves in a constant, single direction.

GROWING USE OF DC FOR LONG-DISTANCE TRANSMISSION

AC's wave-like motion makes it efficient to distribute, so AC comprises the majority of transmission infrastructure. AC transmission lines in North Dakota range from 41.6 kV to 345 kV.

High-voltage DC transmission lines are becoming more common for long-distance, point-to-point delivery. DC lines require a converter station at each end to convert the power from AC current to DC current and back to AC at the termination point.

Converter stations are expensive to build, but DC line construction is less expensive than AC line construction. The lines are much more efficient than AC transmission of an equivalent amount over an equal distance, meaning less electricity is lost as it moves along the line. The higher efficiency makes up for the expense of building the converters if the distance is more than around 300 miles.

DC TRANSMISSION IN ND

There are two DC transmission lines operating in North Dakota:

- A 400-kV DC line carries electricity from Rainbow Energy's Coal Creek Station near Underwood to a delivery point in Minnesota.
- A 250-kV DC line, owned by Minnesota Power ALLETE, originates at the Milton R. Young Station in Center and terminates near Duluth, MN.

Minnesota Power ALLETE is modernizing the converters on both ends of its line, increasing carrying capacity from 550 MW to 900 MW with potential to increase to 1,500 MW.

Grid United is partnering with Minnesota Power ALLETE, NorthWestern Energy, and Berkshire Hathaway Energy to construct the North Plains Connector, a 525-kV HVDC line (3,000 MW capacity) from Colstrip, MT, to St. Anthony and Center, ND, connecting the West to both Midcontinent Independent System Operator, or MISO, and Southwest Power Pool, known as SPP.

DID YOU KNOW?

Accurate and regular load forecasts are a crucial part of planning for developing long-range transmission line projects.

THE RISE OF REGIONAL TRANSMISSION ORGANIZATIONS AND ENERGY MARKETS

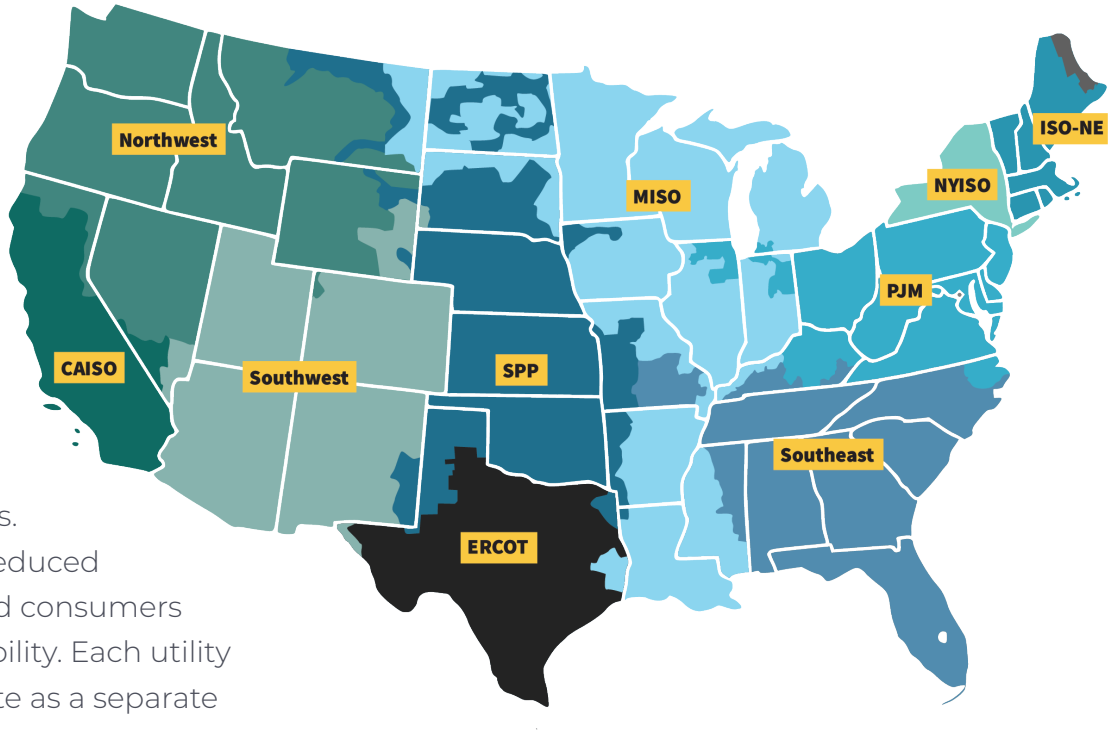
In the early days of electrification, each utility served its own geographic area and generated enough energy to serve just its customers.

Individual utilities had to either generate excess capacity to handle peak demand—or face the risk of not having enough electricity to meet peak demands. It was risky and inefficient.

Over time, utilities began sharing resources. They created interconnected systems, established purchase agreements, and shared the power they generated to better meet the needs of their collective customers. This collaboration reduced costs for utilities and consumers and improved reliability. Each utility continued to operate as a separate system.

Eventually, these interconnected systems evolved into regional transmission organizations, or RTOs, formed by neighboring utilities working with a common operator to control each of their systems. In a full RTO with an energy market, the RTO operator dispatches energy generation from the various generator units to meet the needs of all utilities' customers. This larger collaborative effort further enhanced reliability and cost-effectiveness.

Today, RTOs are the dominant form of energy transmission and dispatch in the U.S. RTOs ensure the transportation of power is open and transparent to all parties. They are usually independent, nonprofit entities that lead and manage short- and long-range transmission plans and strategy for the region to ensure a cost-effective, reliable, and secure grid.



RTOs IN ND

Two RTOs operate in North Dakota: MISO and SPP. North Dakota's generation, transmission, and utility companies allow MISO or SPP to control their generation dispatch and transmission. The utilities retain ownership, operation, and maintenance of their generation and transmission facilities.

Map source: Federal Energy Regulatory Commission

OIL & GAS PRODUCTION

In 2024, North Dakota surpassed 5 billion barrels of oil produced since oil was discovered in 1951 near Tioga.

This achievement underscores the state's position as a leading energy producer, driven by advancements in drilling technology, strong industry investment, and the rich reserves of the Bakken shale.

North Dakota also set a record for the number of wells producing in 2024: 19,334 in October.

The Bakken formation is now considered "mature" by industry, meaning many of the operators in the state are dedicated to producing their acreage on a consistent and steady pace but that radical growth in production is less likely. Many of the new investments will be in value-added industries to capture by-products from the oil and gas production.

North Dakota remains the third-largest oil producer in the nation behind Texas and New Mexico.

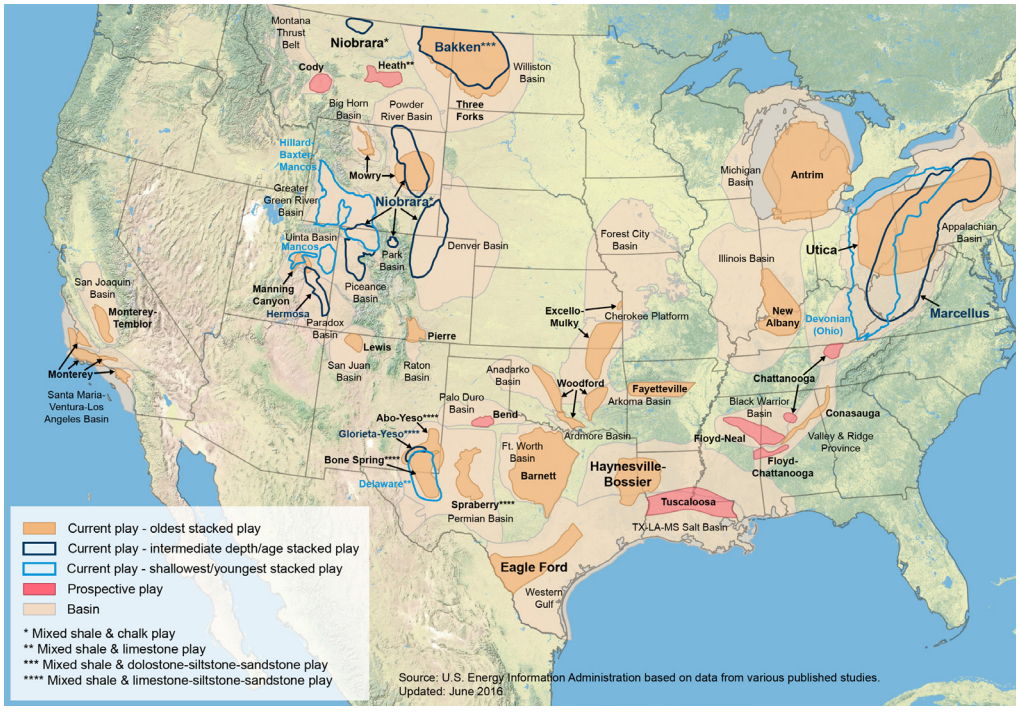
The state's drilling rig count has stalled in the high 30s. An all-time high of 218 rigs was recorded in May 2012.

About 89% of producing wells are now unconventional Bakken and Three Fork wells. About 13% are production from Legacy conventional pools.

Leasing activity for new drilling sites is extremely low in North Dakota. Any activity consists of renewals and top leases in the Bakken-Three Forks area. Focus as prices recover will be less about adding new wells and more about completing wells that have been sitting waiting for frac crews.

Drilled but uncompleted (DUC) wells is more cost efficient for some operators at this time.

A typical North Dakota Bakken well will produce for more than 30 years. However, favorable economic conditions, enhanced oil recovery efforts, and other factors can extend the life of the well.



This map shows shale plays across the lower 48 states. Source: U.S. Energy Information Administration

Based on an average oil price of $50 per barrel, the average Bakken well:

- Produces approximately 1,170,683 barrels of oil.
- Generates about $31 million net profit.
- Pays approximately $5,083,579 in taxes.
  - $2,796,340 gross production taxes
  - $2,094,794 extraction tax
  - $192,445 sales tax
- Pays royalties of $9,487,516 to mineral owners.
- Pays salaries and wages of $2,128,669.
- Pays operating expenses of $1,900,977.
- Costs $7,072,184 to drill and complete.

A well is moved to inactive status after three months of no production. Once the well hasn't produced for 12 consecutive months, it goes into an abandoned status, and the producer is given six months to return the well to production or plug and reclaim the site.

North Dakota requires a plugging and reclamation procedure to be submitted and approved by the North Dakota Industrial Commission for each well site. Once approved, the process involves placing combinations of cement plugs and mechanical plugs at strategic depths in the well. Oil and Gas Division field inspectors witness the placement of plugs and cement in the well. Once the well has been plugged, the casing is cut off three to four feet below the surface and a steel plate is welded on top, ending the life of the well.

	AVERAGE ND OIL PRICE	GAS PRODUCTION	OIL PRODUCTION	WELLS PERMITTED	WELLS PRODUCING
DECEMBER 2024	$64.99	104,616,219 MCF or 3,374,717 MCF/day	36,759,083 barrels or 1,225,303 barrels/day	87	19,207
DECEMBER 2023	$69.64	109,264,074 MCF or 3,524,648 MCF/day	32,951,684 barrels or 1,097,716 barrels/day	57	18,753
RECORD	$126.75 (June 2008)	3,582,821 MCF/day in December 2023	1,519,037 barrels/day in November 2019	370 in October 2012	19,334 in October 2024

Source: ND Department of Mineral Resources

ENHANCED OIL RECOVERY AND THE BAKKEN FORMATION

With continued technological advancements and favorable market conditions, experts predict the Bakken could yield 5 to 8 billion barrels over the next 30 to 50 years.

Achieving this potential, however, depends on securing adequate carbon dioxide supplies for enhanced oil recovery, which could significantly increase recovery rates. Without EOR, as much as 90% of the remaining oil in the Bakken may go untapped.

SHALE ENERGY TECHNOLOGY

Technological advances including horizontal drilling and hydraulic fracturing have made it economically possible to drill for oil in the Bakken Formation. The Bakken shale play was previously undeveloped because conventional drilling methods were not able to access the trapped oil and gas.

Shale oil refers to hydrocarbons that are trapped in shale rock formations. Shale is extracted as a solid. Traditional oil, or crude oil, is a naturally occurring, liquid petroleum that is extracted from underground reservoirs.

Horizontal drilling allows operators to drill more wells from a single location, using up to 90% less surface area to access more oil and gas resources.

Hydraulic fracturing, or fracking, involves pumping a specially blended liquid into a well under high pressure, creating fractures in the underground rock to enable the recovery of oil and natural gas. More than 98% of the liquid is a water and sand mixture. The remainder comprises various chemical additives dependent on well conditions that limit bacteria and corrosion and increase efficiency.

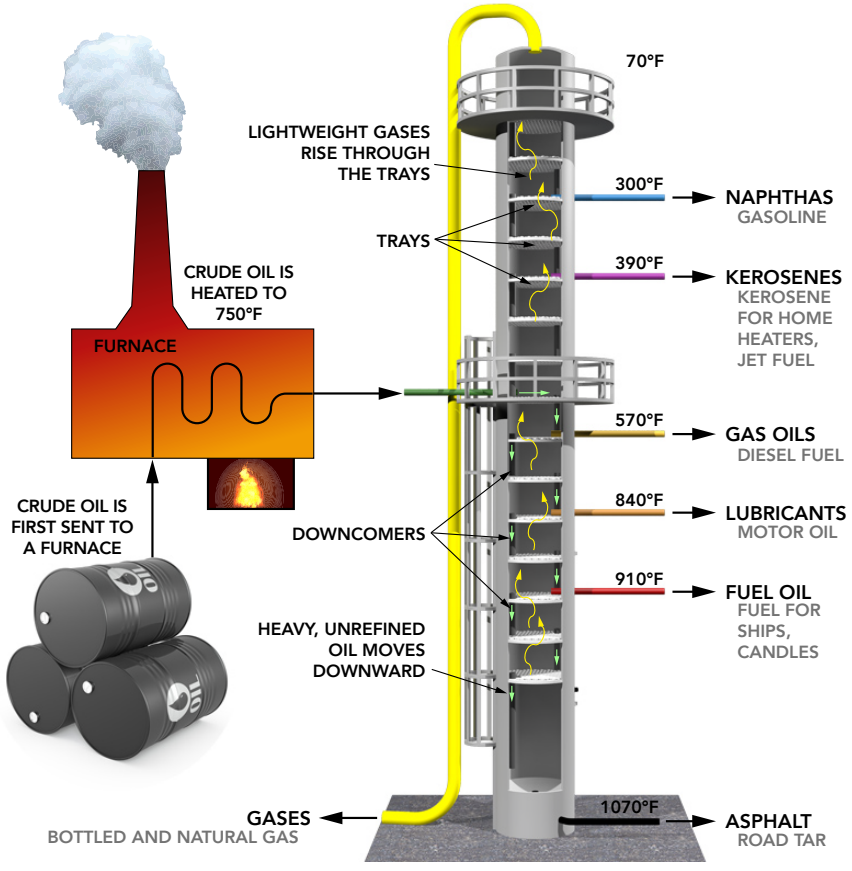
The state of North Dakota requires disclosure of the additives that companies use via FracFocus.org, a website that provides public access to reported chemicals used in fracking and information on the fracking process.

REFINING

North Dakota is home to two refineries, one that processes crude oil and another that processes renewable feedstock.

The crude oil refinery in Mandan, owned by Marathon Petroleum Corporation (MPC) since 2018, began operations in 1954. It's the largest refinery in the state and employs around 310 people. Previous owners include Amoco, BP, Tesoro, and Andeavor.

MPC processes Williston Basin crude oil from North Dakota into gasoline, diesel fuel, jet fuel, heavy fuel oils, and liquefied petroleum gas. Products are trucked and railed from Mandan and also shipped east via pipeline to eastern North Dakota and Minnesota. The refinery's capacity is 75,500 BPD.



PIPELINES

The U.S. has the largest network of pipelines in the world, with 30,000 miles of gathering and transmission pipelines in North Dakota. North Dakota's pipelines gather and transmit commodities, including around eight out of every 10 barrels of crude oil produced in the state.

North Dakota's transmission pipelines carry three types of products:

- Crude oil: 18 pipelines.
- Natural gas: Nine pipelines.
- Carbon dioxide: Two pipelines.

MARKET GROWTH

Bakken natural gas has a high content of natural gas liquids (NGL), such as ethane, propane, butane, and natural gasoline. Updated forecast calculations from the North Dakota Pipeline Authority estimate a potential of 1.2-1.4 million barrels per day (BPD) of NGL production from North Dakota in the coming decades.

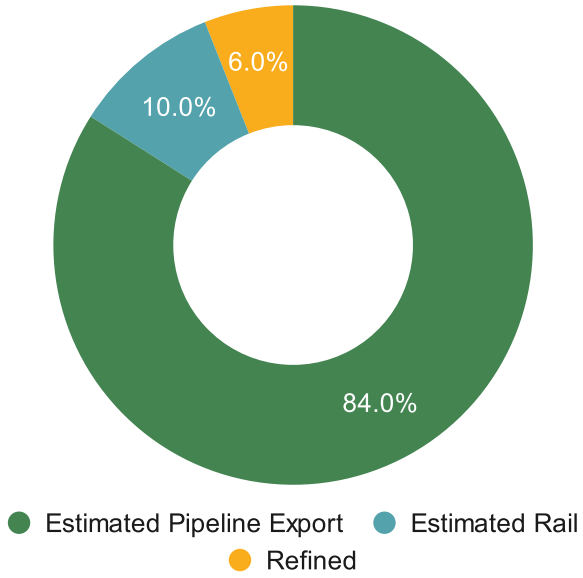
For comparison's sake, it would take about 500 truckloads or 140 rail cars a day to transport 100,000 BPD.

Several pipeline expansion projects have been proposed or are in the planning stages in North Dakota.

SAFETY

Pipelines remain the safest mode of energy transportation, according to the U.S. Department of Transportation, with more than 99.99% of all petroleum and natural gas products safely reaching their destinations.

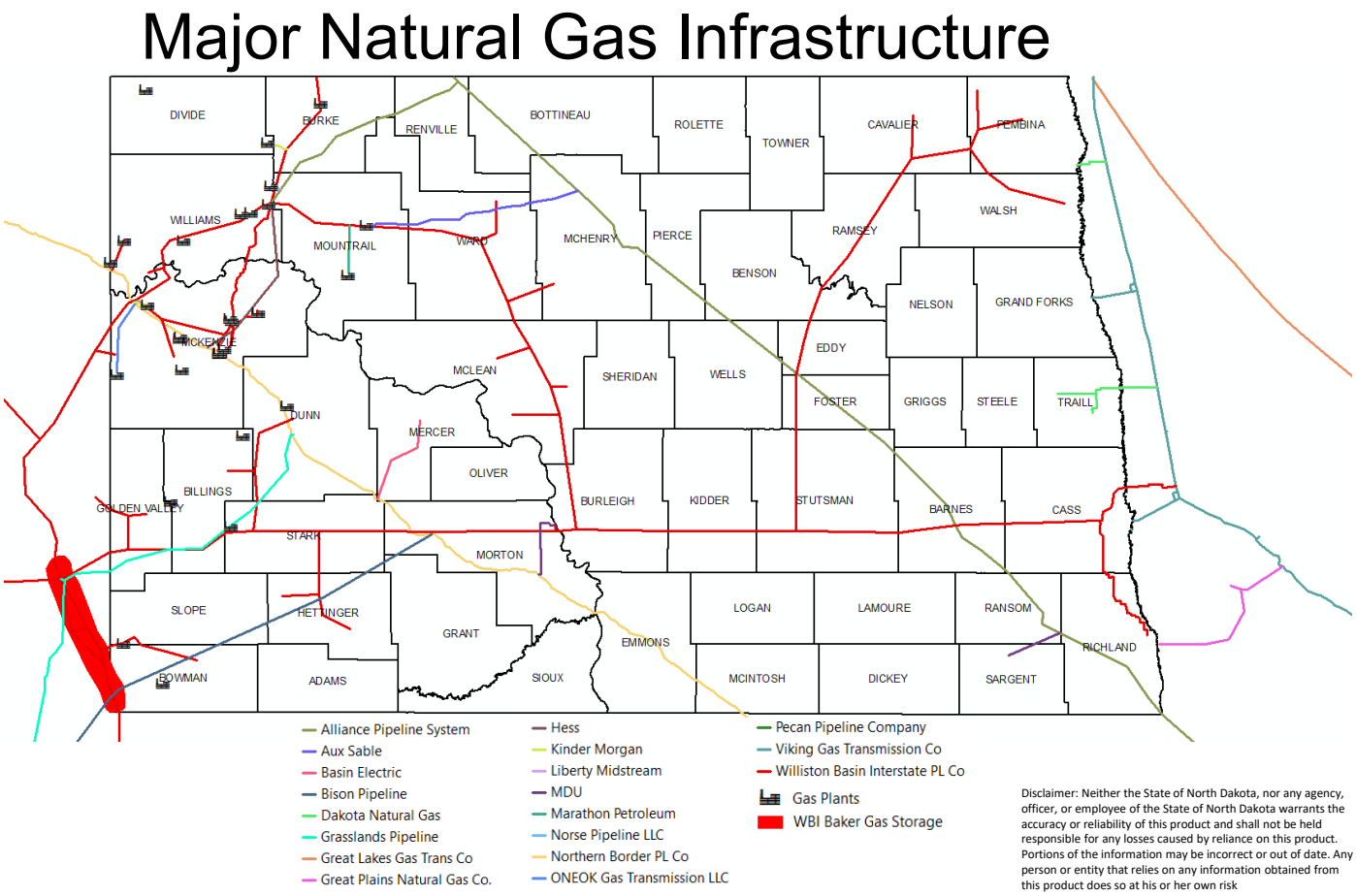
WILLISTON BASIN CRUDE OIL TRANSPORTATION



Source: ND Pipeline Authority

RECLAMATION

During pipeline construction, topsoil and subsoil are removed and stockpiled nearby. After pipeline installation, the topsoil and subsoil are returned to the site, and the land is returned to its preconstruction contours and production. This includes getting land into condition for crop production or grazing, or working with wildlife groups to plant native grasses or other vegetation for wildlife forage or habitat.



Map courtesy of North Dakota Pipeline Authority

Scan the QR code on the left to see the most up-to-date maps of all North Dakota's pipelines at northdakotapipelines.com/maps

PETROLEUM MARKETING/PROPANE

According to the ND Petroleum Marketers Association, there are more than 400 petroleum marketers in North Dakota. The list includes around 700 service station dealers, convenience stores, and truck stops.

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 2024, retail petroleum dealers sold 432,259039 gallons of taxable gasoline in the state, as well as 673,580,898 gallons of taxable special fuels other than propane (mostly diesel). North Dakota petroleum

marketers continue to support research and development of renewable fuels as viable sources of alternate energy.

North Dakota petroleum marketers also supply another fuel critical to the state—propane. Propane is a domestic fuel, serving to fortify national and energy security. Propane supplies have grown dramatically in recent years because of the numerous oil shale plays in the U.S.

Propane serves a variety of residential, commercial, and industrial needs. It is used as the prime heating source in 13% of homes in North Dakota. In 2024, the state's propane marketers sold more than 134.8 million gallons of propane.

673.6M

GALLONS OF TAXABLE SPECIAL FUELS

Sold in 2024

434.9M

GALLONS OF TAXABLE GASOLINE

Sold in 2024

134.8M

GALLONS OF PROPANE

Sold in 2024

SYNTHETIC NATURAL GAS

The Dakota Gasification Company's Great Plains Synfuels Plant, north of Beulah, is

the only commercial-scale coal gasification plant in the U.S. that was originally designed to manufacture synthetic natural gas from lignite coal. It has a daily capacity of 170 MMCF of natural gas, which is shipped via the Northern Border Pipeline to market.

Since the inception of the plant, there have been great strides to produce commercial products that displace synthetic natural gas and refine co-products that are marketed throughout the U.S. and worldwide, including fertilizers and petrochemicals.

The plant uses about 18,000 tons of lignite coal each day, supplied via the Freedom Mine. In early 2024, the Synfuels Plant began capturing additional CO2 for permanent sequestration via the Great Plains Carbon Sequestration Project.

The project includes the 6.8-mile Dakota Carbon Pipeline and an injection well located on reclaimed land owned by the Coteau Properties Company. CO2 is injected more than a mile below the surface formation.

The Synfuels plant also has the capability to produce up to 64 million gallons of diesel exhaust fluid a year as well as up to 200 tons/day of food-grade liquid carbon dioxide.

In addition to natural gas, these products include urea (agricultural fertilizer, cresylic acid, phenol, tar oil, ammonium sulfate (agricultural fertilizer), anhydrous ammonia (agricultural fertilizer), carbon dioxide and liquefied carbon dioxide, krypton/xenon gases, nitrogen, naphtha, and diesel exhaust fluid.

NATURAL GAS PROCESSING

The North Dakota Pipeline Authority's natural gas forecast estimates North Dakota could be producing 5-6 billion cubic feet (BCF) of natural gas each day in the mid-2030s. As of December 2024, natural gas production was roughly 3.4 BCF/day.

North Dakota currently has 33 natural gas processing plants operating in western North Dakota, with many expansion projects being planned or under construction.

In September 2024 the ND Public Service Commission approved plans for the construction of a $3.2 billion gas-to-liquids plant near Trenton in Williams County. The plant is anticipated to convert 240 MMCF/day of natural gas to 24,000 barrels of liquid hydrocarbon products. Construction is expected to begin in 2026.

Since 2010, natural gas processing capacity in North Dakota has grown nearly 775%, increasing from 491 MMCFD to 4,277 MMCFD in 2024.

Both U.S. and world crude oil inventories are improving. The U.S. strategic petroleum reserve grew slightly in 2024 over 2023. The price of natural gas delivered to the Northern Border at Watford City remained low in 2024. The current oil-to-gas price ratio is 16.6 to 1.

GAS CAPTURE

North Dakota has made great strides in capturing the natural gas co-produced with oil, transforming what was once an ongoing challenge into a success story.

The state's record high flared percent was 36% in September 2011. As of December 2024, 6% of the natural gas produced in North Dakota was being flared. As gas volumes continue to grow, the state maintains a strong percentage of gas capture.

The statewide gas flared volume increased to 193.4 MMCF in December 2024 compared to the year prior.

- Statewide gas capture decreased 1% to 94%. Bakken gas capture decreased slightly to 95%.
- The North Dakota Industrial Commission's natural gas capture goal is 91%.

94%

STATEWIDE GAS CAPTURE

According to the ND Department of Mineral Resources, private industry has invested more than $20 billion in additional natural gas gathering and processing infrastructure to reduce flaring, and another $10-$15 billion will be needed in the coming years. Additional capacity is being planned to meet growing natural gas production in the near future.

QUICK FACTS

- U.S. natural gas storage is 11% above the five-year average.
- The state's first liquefied natural gas (LNG) plant is near Tioga. LNG is natural gas that has been converted to a liquid form for easier storage and transportation.

NATURAL GAS FACILITY	OWNER COMPANY	COUNTY	CAPACITY (MMCFD)
Arrow	Crestwood/ETP	McKenzie	150
Badlands	Kinder Morgan	Bowman	40
Badlands	Targa Resources	McKenzie	90
Bear Creek	ONEOK	Dunn	130
Bear Creek II	ONEOK	Dunn	200
Belfield	MPLX	Stark	35
County Line	Crestwood/ETP	Williams	30
Demicks Lake	ONEOK	McKenzie	200
Demicks Lake II	ONEOK	McKenzie	200
Demicks Lake III	ONEOK	McKenzie	200
DeWitt	USG Midstream Bakken	Divide	3
Garden Creek I	ONEOK	McKenzie	120
Garden Creek II	ONEOK	McKenzie	120
Garden Creek III	ONEOK	McKenzie	120
Grasslands	ONEOK	McKenzie	90
Hay Butte	Caliber Midstream	McKenzie	10
Lignite	Steel Reef	Burke	6
Little Knife	Petro Hunt	Billings	27
LM4	Targa/Hess JV	McKenzie	200
Lonesome Creek	ONEOK	McKenzie	280
Norse	Kinder Morgan	Divide	25
Prairie Rose	Aux Sable – Chicago, IL	Mountrail	126*
Ray	Chord Energy	Williams	25
Ray	XTO – Nesson	Williams	100
Red Wing Creek	True Oil	McKenzie	15
Robinson Lake	MPLX	Mountrail	150
Roosevelt	Kinder Morgan	McKenzie	200
Spring Brook	1804 Ltd	Williams	70
Stateline I	ONEOK	Williams	120
Stateline II	ONEOK	Williams	120
Tioga	Hess	Williams	415
Watford City	Kinder Morgan	McKenzie	90
Wild Basin	Oasis	McKenzie	320
	Outrigger Energy II	Williams	270
TOTAL			**4,297**

*Aux Sable facility has the capacity to transport and process up to 110 MMCFD of ND natural gas at its Chicago facility.

Photo of Dickinson Renewable Diesel Facility, courtesy of Marathon Petroleum

RENEWABLE DIESEL

Renewable diesel is a fuel made from fats and oils, such as soybean oil or canola oil, and is processed to be chemically the same as petroleum diesel. It is not refined from crude oil. It meets specification for petroleum in the U.S. and Europe.

Renewable diesel can be used as a replacement fuel or can be blended into petroleum diesel at any level, making it different from biodiesel, which can only be blended at rates between 2% and 20% of diesel fuel by volume.

In January 2023, U.S. production capacity of renewable diesel and other biofuels reached 3 billion gallons per year, surpassing U.S. biodiesel production capacity for the first time.

RENEWABLE FACILITIES IN ND

The Green Bison Soybean Processing plant in Spiritwood opened in September 2023. Asa joint venture between ADM (75% owner) and Marathon Petroleum (25% owner), it is North Dakota's first dedicated soybean crushing plant and refinery.

The plant provides an important tie between the energy and agriculture industries. It creates 600 million pounds of refined soybean oil per year, fueling the production of renewable diesel. It's expected to generate 1.28 million tons of soybean meal, supporting animal agriculture production in the region.

As of Jan. 1, 2024, the U.S. Energy Information Administration reported 22 domestic plants in 13 states with capacity of 4.3 billion gallons per year of renewable diesel and other biofuels. North Dakota has the only renewable diesel refinery in a three-state region.

Marathon Petroleum purchased its Dickinson Renewable Diesel Facility in 2018 from Andeavor.

Constructed by WBI Energy near Dickinson and originally known as Dakota Prairie Refining, the facility was the first greenfield diesel refinery to be built in the U.S. since the late 1970s. It came online in May 2015 and was purchased by Andeavor in 2016.

In late 2020, the facility was converted to produce renewable diesel fuel from soy oil and other organically derived feedstocks.

In 2021, it became a 100% renewable facility by reaching its design production capacity of 184 million gallons a year. Around 105 employees work at the facility.

ETHANOL

North Dakota's ethanol industry contributes $1.7 billion in economic activity each year to the state's economy. State and local taxes contribute $8.5 million annually. The industry employs nearly 1,200 workers directly and indirectly in rural communities across the state.

North Dakota ethanol plants process approximately 50% of the state's annual corn production (160-180 million bushels) into high-quality fuel and valuable co-products, including corn oil and distillers grains. The plants have a combined annual production capacity of more than 550 million gallons.

One-third of every bushel of grain used for ethanol production returns to the animal feed market in the form of dried distillers grains (DDGs). Nearly 1.4 million tons of DDGs are produced in the state annually.

North Dakota's ethanol industry is a national leader in efforts to decrease its carbon footprint and that of other industries as well. Corn-ethanol's carbon footprint is currently a third less than gasoline and continues to decrease with increased carbon-conscious efforts from corn growers and ethanol plants, such as carbon sequestration and storage projects.

Approximately 10% of the ethanol produced annually in North Dakota is blended with gasoline and sold within the state. The remaining 90% is shipped primarily to the East and West coasts and Canada. In a modern ethanol facility, one bushel of corn produces three gallons of ethanol, 15 pounds of livestock feed (DDGs), 18 pounds of carbon dioxide, and up to one pound of corn oil.

Unleaded 88 (E15) is approved for use in all 2001 and newer cars and light-duty vehicles, as well as flex-fuel vehicles. These vehicles make up more than 96% of the light- duty vehicles on the road today.

North Dakota is a national leader in the installation of flex-fuel blender pumps, which allow most vehicle owners the option of a 15% ethanol blend, and higher percentage ethanol blends for owners/operators of flex-fuel vehicles. State fleet vehicles are authorized to use E15 when cost effective and available. There are more than 40 locations statewide that offer E15-E85 fuel blends, with nearly 25 of those locations offering E15 fuel specifically. Nearly all retail gasoline dealers offer E10 fuel.

WHAT IS BIOMASS / BIODIESEL?

Biomass includes all plant and animal matter, such as wood waste, energy crops and crop residues. Harvested biomass can be used to generate various forms of energy. Ethanol is made from biomass.

Biodiesel is a domestically produced, renewable fuel that can be manufactured from new and used vegetable oils, animal fats, and recycled restaurant grease.

Biodiesel's physical properties are similar to those of petroleum diesel, but with reduced greenhouse gas emissions and air pollutants. North Dakota's only biodiesel production facility near Velva has the potential to produce 85 million gallons of biodiesel per year. The facility is currently producing biodiesel with canola oil provided by an adjacent crushing plant. Because of low in-state use, most of the produced biodiesel is shipped to other states or Canada.

Field research is being conducted at the USDA Northern Great Plains Research Laboratory in Mandan to explore the potential of using other crop residue to produce jet fuel.

Photo of Dakota Spirit Ethanol Plant near Spiritwood., courtesy of Harvestone Low Carbon Partners

ETHANOL PLANT	LOCATION	EMPLOY-EES	ETHANOL CAPACITY (MILLION GALLONS)	CORN USED (MILLION BUSHELS)	DDG (TONS)	CORN OIL (MILLION BUSHELS)
Harvestone Low Carbon Partners - Blue Flint Ethanol	Underwood	43	75	25	200,000	3.2
Guardian Energy Hankinson	Hankinson	52	154	52	360,000	7.8
Red Trail Energy, LLC	Richardton	48	64	23	180,000	2.8
Tharaldson Ethanol*	Casselton	82	175	58	324,000	9
Harvestone Low Carbon Partners - Dakota Spirit	Spiritwood	40	85	27	200,000	4.2
BI Biorefinery**	Grand Forks	-	-	-	-	-
Totals		**265**	**553**	**185**	**1,264,000**	**27**

* Tharaldson Ethanol also produces 100,000 tons annually of high-protein feed.
** The BI Biorefinery did not operate in 2023 or 2024.

ENERGY RESEARCH

The University of North Dakota's Energy & Environmental Research Center (EERC) has been at the forefront of energy innovation for decades, advancing practical solutions to the world's energy and environmental challenges.

With a history rooted in energy research since the 1950s, the EERC has evolved into a globally recognized leader in applied energy science, collaborating with government, industry, and academic partners to drive technological advancements that enhance energy production while minimizing environmental impact.

HEARTLAND HYDROGEN HUB

The EERC is leading the Heartland Hydrogen Hub (HH2H), a multi-state initiative focused on commercial development of hydrogen-energy supply chains, and creating energy jobs across the region. The U.S. Department of Energy (DOE) has designated HH2H as one of seven regional hydrogen hubs nationwide, awarding up to $925 million in funding to advance hydrogen production, infrastructure, and utilization. This initiative represents a major step toward integrating hydrogen as a key component of the region's energy economy.

ADVANCING CARBON CAPTURE AND UTILIZATION

The EERC is actively engaged in carbon management solutions for the power generation and industrial sectors. Building on its leadership in carbon capture, utilization, and storage (CCUS), the EERC now leads a FEED (front-end engineering design) study for a full-scale post-combustion CO2 capture system at Coal Creek Station. This project aims to capture 95% of CO2 emissions from the 1200-MW power plant. The EERC works closely with the Lignite Energy Council, Minnkota Power Cooperative, Dakota Gasification Company, and other industry stakeholders to develop innovative carbon capture solutions tailored to North Dakota's energy sector.

The EERC is working with North Dakota's oil and gas sector to advance the deployment of CO2 for enhanced oil recovery in the Bakken.

STATE ENERGY RESEARCH CENTER

As North Dakota's State Energy Research Center (SERC), the EERC is dedicated to advancing energy research that benefits the state's economy and environment. SERC's initiatives include projects on methane emissions reduction, direct air capture, hydrogen production, and the development of advanced carbon materials.

Additionally, SERC supports workforce development through Energy Hawks, an immersive, multidisciplinary internship program where students collaborate with EERC researchers on real-world energy challenges.

COLLABORATIVE RESEARCH INITIATIVES

The EERC leads several other major initiatives, including:

- Intelligent Pipeline Integrity Program (iPIPE): An industry-led consortium focused on emerging technologies to

detect, prevent, and eliminate leaks from underground pipelines. iPIPE was recognized by the American Petroleum Institute with its Industry Innovation Award and industry partners, including Energy Transfer, South Bow, Enbridge, Hess, MPLX, ONEOK, and TC Energy.

- Plains C02 Reduction (PCOR) Partnership: Established in 2003, this initiative addresses regional capture, transport, utilization, and storage challenges for large-scale CCUS deployment. It is supported by DOE, the North Dakota Industrial Commission, and industry partners.
- Bakken Production Optimization Program (BPOP): Focused on improving Bakken oil recovery while reducing environmental impacts, research findings have led to increased well productivity, decreased infrastructure demands, and enhanced operational efficiency for North Dakota's oil and gas sector.

Through these and other initiatives, the EERC remains at the forefront of developing practical, sustainable solutions to global energy challenges, reinforcing its role as a trusted leader in North Dakota's energy future.

Photo courtesy of EERC

Photo courtesy of Kari Suedel, EERC

FINANCIAL IMPACT

On average, oil and gas taxes generate more than half of North Dakota's total tax revenue.

- Corporate and individual income tax collections decreased in 2024 compared to 2023.
- Taxable sales and purchases grew slightly in 2024 compared to 2023.
- In 2024, North Dakota crude oil prices peaked in April at $79 per barrel and ended the year just under $64 in December.

As natural gas production is projected to rise due to increasing gas-to-oil ratios, attracting new businesses that sustainably add value to this resource will be critical for the state's long-term economic health.

LEGACY FUND

The Legacy Fund, established in 2010 as the state's "nest egg," is funded by 30% of the state's oil and gas taxes. As of December 31, 2024, the Legacy Fund's value was $12.0 billion. Since the fund's inception, lifetime distributions total $1.8 billion.

Legislators can spend the principal of the fund with a two-thirds majority vote in each house. There is an additional limitation restricting any expenditure of Legacy Fund principal to a maximum of 15% in any biennium.

CAREERS IN ENERGY

The ND Department of Mineral Resources estimates that, depending on the pace it takes for the price of oil to rebound, an additional 40,000-45,000 wells will be drilled over the next 30 years or so.

The state could see a peak of about 87,000 oil-related jobs near 2030, with about 70,000 of those jobs being long term.

Job Service North Dakota (JSND) data (Quarterly Census of Employment & Wages 2023) shows that in 2023 an estimated 23,198 workers were in direct or support positions for the industries of oil and gas extraction, coal mining, support activities for mining, utilities, and pipeline transportation, with an estimated annual average wage of approximately $130,547.

These statistics do not reflect employment or wages in ancillary businesses or industries working in the energy field, such as trucking, construction, engineering, manufacturing, and repair services.

The unemployment rate in the state was 2.5% as of December 2024, compared to 2.2% in December 2023.

JOB OPENINGS

There continue to be numerous job opportunities in the state. Data from JSND's Online Job Openings Report showed a total of 13,156 openings in December 2024. The two occupational groups most closely associated with opportunities in the oil patch— construction and extraction, and transportation and material moving— accounted for 1,056 of those openings statewide.

These figures reflect a year-over-year increase in total openings across the state and a year-over-year increase in the 17 oil and gas producing counties. The 17 oil and gas producing counties saw an increase of 8.8% in total job openings over the year and a 20.1% decrease over the past five years.

13,156
JOB OPENINGS
As of December 2024

$130,547
AVERAGE ANNUAL
Estimated Wage for Direct and Support Positions

87,000
ANTICIPATED
Peak In Oil-Related Jobs Near 2030

BUILDING TALENT FOR THE ENERGY SECTOR

Bismarck State College (BSC), North Dakota's Polytechnic Institution, has been training the current and future energy workforce since 1970. BSC offers certificate, associate, and bachelor degree options across 13 disciplines—from facility operations and technical roles to supervisory and management careers.

ENERGY PROGRAMS

Programs include industrial operations, mechanical systems, instrumentation, automation, robotics, and energy service technologies. These programs support careers in traditional power stations, wind and solar facilities, electrical transmission and distribution, linework, system operations, petroleum production, oil and gas processing, refining, ethanol and biofuels, and water and wastewater technology.

BSC's hands-on, high-skill programs are grounded in the principles of STEAM (Science, Technology, Engineering, Arts, and Math), preparing learners to solve complex technical, economic, and community challenges.

- Approximately 800 students are enrolled in BSC energy programs—on campus or online—each semester, using world-class lab equipment and simulations, and real-time lab sessions.
- In 2024, 290 students earned a degree or certificate through BSC's National Energy Center of Excellence (NECE) programs.
- Of the graduates who responded to a BSC Career Services survey, 100% were employed, continuing their education, or serving in the armed forces. Reported salaries ranged from $26 to $40+ per hour.
- The NECE provides customized training for regional, national, and international energy companies to support certification requirements, onboard new hires, and supplement internal training programs.
- In FY24, BSC delivered non-credit training to 445 individuals representing 85 companies, and hosted 143 training events.

Additional higher education contributions to North Dakota's energy workforce include:

- The Harold Hamm School of Geology and Geological Engineering at the University of North Dakota(UND) provides education and research in

800
ENROLLED
In Energy Programs Each Semester

290
EARNED
A BSC NECE Degree or Certificate In 2024

100%
EMPLOYED
Or Continuing Their Education or Serving In the Armed Forces

Photo courtesy of Bismarck State College

petroleum geology and related fields.

- Lake Region State College (LRSC) in Devils Lake offers a Wind Energy Technician program utilizing a 1.6 MW wind turbine near campus.
- North Dakota State University in Fargo offers degrees in engineering, geology, agriculture, and other fields aligned with energy careers.
- Other state institutions—Williston State College (WSC), Minot State University, and North Dakota State College of Science (NDSCS)—offer additional energy-related degree programs.

ENERGY HAWKS

Energy Hawks is a premier research program that helps students better understand North Dakota's energy landscape and explore future energy challenges and opportunities.

Established in 2018, UND's Energy Hawks is a group of graduate and undergraduate students from diverse disciplines focused on adding value to North Dakota's energy industry.

Through research, interviews, and travel across the state, students analyze the opportunities and challenges facing the energy sector and develop initiatives for further research and consideration.

TRAINND

TrainND, a partnership among BSC, WSC, LRSC, and NDSCS, works with businesses to deliver customized training in oil and gas operations, lease operations, well servicing, wind energy, welding, and more.

EERC

EERC at UND is a global leader in energy and environmental innovation. The EERC employs a multidisciplinary team of 200 engineers, scientists, and support staff. It mentors students and conducts research on coal utilization, carbon management, oil and gas, alternative fuels, renewable energy, and energy-water systems.

In partnership with the energy industry, ND Industrial Commission, the State Historical Society of North Dakota, and BSC's Great Plains Energy Corridor, energy curriculum was developed for 4th and 8th grade North Dakota Studies courses. The two-week curriculum is available online at www.ndstudies.gov.

BISMARCK STATE COLLEGE | North Dakota's Polytechnic Institution

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NORTH DAKOTA'S NATIONAL ENERGY RANKINGS

- **#3** CRUDE OIL PRODUCTION
- **#6** WIND PRODUCTION
- **#7** COAL PRODUCTION
- **#8** TOTAL ENERGY PRODUCTION
- **#9** NATURAL GAS PRODUCTION
- **TOP 10** ETHANOL PRODUCTION CAPACITY
- **#33** TOTAL NET ELECTRICITY GENERATION

Sources: U.S. Energy Information Administration, American Wind Energy Assoc., Renewable Fuels Assoc.