INDUSTRIAL COMMISSION OF NORTH DAKOTA
NORTH DAKOTA PIPELINE AUTHORITY



# North Dakota's Natural Gas Production Jumps But Infrastructure Lags

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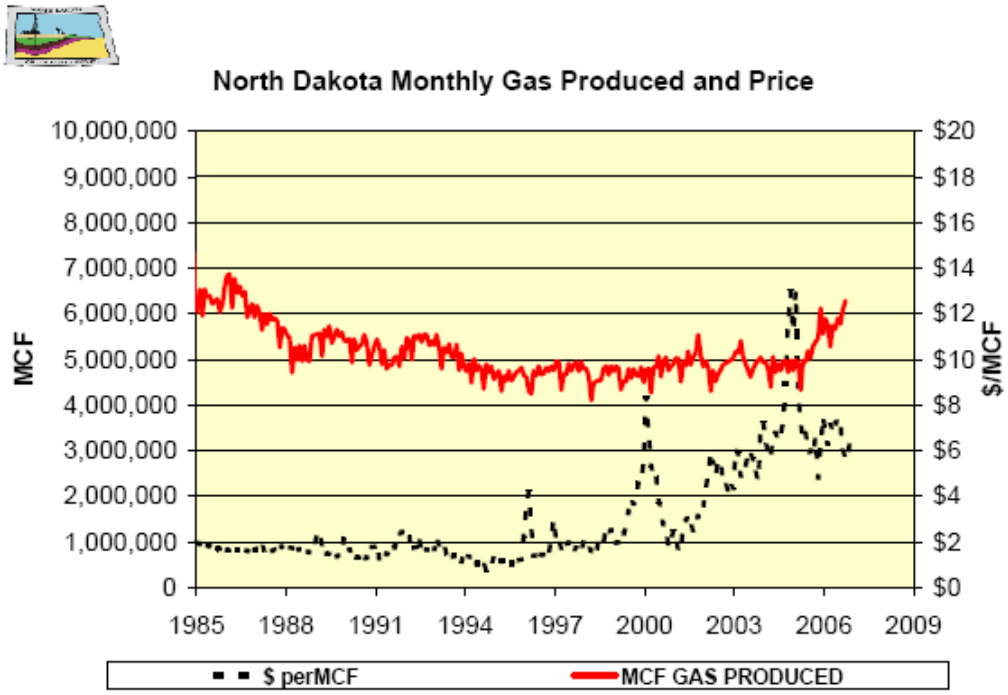
Good News! Natural gas production in North Dakota is on the rise. According to Department of Mineral Resources Oil and Gas Division statistics, production levels are rising and, if the current Bakken play continues as expected, gas associated with that oil production might exceed the record levels of the 1980s - perhaps reaching 75 billion cubic feet (bcf) in 2007. That's enough gas to heat all 200,000 North Dakota single family homes for five years. Driven by the surge in drilling activity and thanks in part to incentives passed by the 2007 Legislature, industry is expanding existing gas processing plants, constructing new processing plants and gathering lines, and pipeline companies are preparing their facilities to accept more gas.




That's not to say there are no challenges. In order to get this gas to market the infrastructure must be in place to bring it from new producing areas to where the interstate pipelines are located and then process it. Sometimes that distance is short – perhaps only a few miles away, other times it can be great. The cost of constructing pipelines is also reaching record levels. According to industry representatives, pipeline construction costs now exceed $50,000 per inch diameter per mile of length. And a nationwide pipeline industry expansion has put a squeeze on availability of pipeline contractors and steel pipe.

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The timely acquisition of rights-of-way and regulatory permits continues to be critical to industry. North Dakota has a relatively short construction season. Permit delays of even a couple months might mean the difference between being able to construct facilities in the summer or in winter when construction conditions can be extremely challenging and expensive.

The need for electrical service is also an important factor. Much of the new development is in areas previously not served by any utility. New construction and upgrading of existing electric transmission and distribution lines to serve processing plants, compressor stations, or other facilities can take a year to get in place. The North Dakota Industrial Commission, through the Oil and Gas Research Council and the North Dakota Transmission Authority, recently provided partial funding for a study of electric infrastructure needs in the western part of the state. That study estimated North Dakota's oilfields will provide over 400 megawatts of new demand over the next 10 years.

Because most of North Dakota's natural gas production is associated with oil production, it is typical to first flare the gas produced with the oil. The Industrial Commission's Oil and Gas Division is charged with creating and administering North Dakota's rules pertaining to the flaring of natural gas. Typically companies are allowed to flare gas for a period of time in order to stabilize the oil production. This delay is intended to provide time to prove up the natural gas supply and evaluate options for its use. A company needs to drill enough wells to substantiate the quality and quantity of the natural gas resource. They need to perform market analysis of the viability of collecting and processing the gas, and finally they need to consider methods of getting that gas to an interstate pipeline for final delivery to market. All these steps can take time so the rules provide some flexibility to companies by allowing extended flaring when certain conditions are met. The rules seem to be working well, allowing for extensions when justified, but also providing incentive to companies to end flaring as soon as practical.

**Background**

Natural gas is found in naturally occurring underground deposits. It is a gaseous substance comprised mostly of methane ($CH_4$) with lesser amounts of other hydrocarbons along with inert ingredients like nitrogen or carbon dioxide. When a rich natural gas stream contains significant amounts of heavier hydrocarbons, it is often referred to as being "wet." This means the methane stream also contains free hydrocarbon liquids such as propane or butane.

Natural gas is found in deposits where it may be produced by itself, or in association with crude oil. North Dakota has production of gas from both sources. In 2006, North Dakota produced about 16.4 billion cubic feet of gas from gas wells and 46.4 billion cubic feet in conjunction with oil production, for a total of about 62.8 billion cubic feet.

In addition to naturally occurring production, synthetic natural gas is produced by the Dakota Gasification Company (DGC) near Beulah. At DGC, lignite coal is converted by gasification into a methane-based natural gas product which is shipped by proprietary pipeline to the Northern Border pipeline. DGC produces about 54 billion cubic feet of synthetic natural gas annually. A recently announced new gasification plant proposed for the South Heart area may increase the amount of synthetic natural gas produced in North Dakota.

**Regulatory Jurisdiction**
There are both state and federal regulations which govern natural gas pipelines and facilities. Jurisdiction is typically determined by function and location. Depending on the situation, there could be times when both federal and state requirements apply.

Interstate pipelines (crossing state lines) are regulated by the Federal Energy Regulatory Commission (FERC). The FERC has jurisdiction over both the rates charged for services and over pipeline construction. Responsibility for pipeline safety falls under the Federal Department of Transportation (DOT). If the interstate facility meets the requirements of state siting laws it also needs approval of the appropriate state regulatory body.

Intrastate transportation pipelines (located completely within a state's border) usually are regulated by a state regulatory entity. They are responsible for rates, construction approvals, and pipeline safety requirements. In North Dakota, the Public Service Commission is the state entity responsible for gas facility construction and operation. If a proposed facility meets the requirements of North Dakota's Siting Act, or if the pipeline company's operation meets the definition of a common carrier, the Public Service Commission has jurisdiction. Such jurisdiction may include: the need for the project, route approval, construction approval, rates and terms of service, and pipeline safety requirements.

In rural areas, proprietary gas gathering pipelines (company-owned low pressure field lines between wells and collection sites) are not regulated by either the state or federal government.

**Gathering & Processing**
Once produced from a well, natural gas must be gathered in a pipeline network. It cannot be stored in tanks or shipped by truck like oil. If the well is a gas well only, it can be turned off until a gathering system is in place. However if the well is an oil well, it is necessary to flow the gas in order to produce the oil. This associated gas is typically burned onsite in special pits (flared) while the well is brought on line and oil production stabilized. Once the gas gathering system is in place to collect the gas, the flaring can end.

Produced gas quality has a critical affect on its marketability. Natural impurities and contaminants must be removed. If the gas contains too much inert material, its heating value will be too low and it won't burn properly in your home. If the gas is "wet," or laden with hydrocarbon liquids such as propane, butane, or natural gasolines, they must be separated from the natural gas stream. These liquid hydrocarbons are known as natural gas condensates or natural gas liquids (NGLs). After processing, the separated liquids are typically shipped by rail or truck tankers to distribution terminals in North Dakota. Where large quantities of NGLs are produced they are typically shipped by pipeline. An example is Kinder Morgan's Cochin pipeline that passes through North Dakota delivering liquid propane from Canada to terminals in Indiana.

Several companies are constructing new gas processing plants in North Dakota in order to treat new gas production and process NGLs. Many existing gas processing plants are expanding their facilities to handle additional gas volume.

## 2007 Existing Natural Gas Processing Plants

| Owner Company | Location | County | 2006 Plant Capacity | Planned Expansion in 2007 | 2008 Plant Capacity |
|---|---|---|---|---|---|
| Bear Paw / OneOK | Lignite | Burke | 6 mmcfd | - | 6 mmcfd |
| Bear Paw / OneOK | Grasslands | McKenzie | 63 mmcfd | $30 million | 100 mmcfd |
| Bear Paw / OneOK | Marmarth | Slope | 7.5 mmcfd | - | 7.5 mmcfd |
| Hess | Tioga | Williams | 110 mmcfd | $4 million | 120 mmcfd |
| Petro Hunt | Little Knife | Billings | 32 mmcfd | - | 32 mmcfd |
| Hiland Partners | Marmarth | Bowman | 4 mmcfd | $20 million | 40 mmcfd |
| True Oil | Red Wing Creek | McKenzie | 4 mmcfd | - | 4 mmcfd |
| Sterling Energy | Ambrose | Divide | 0.5 mmcfd | - | 0.5 mmcfd |

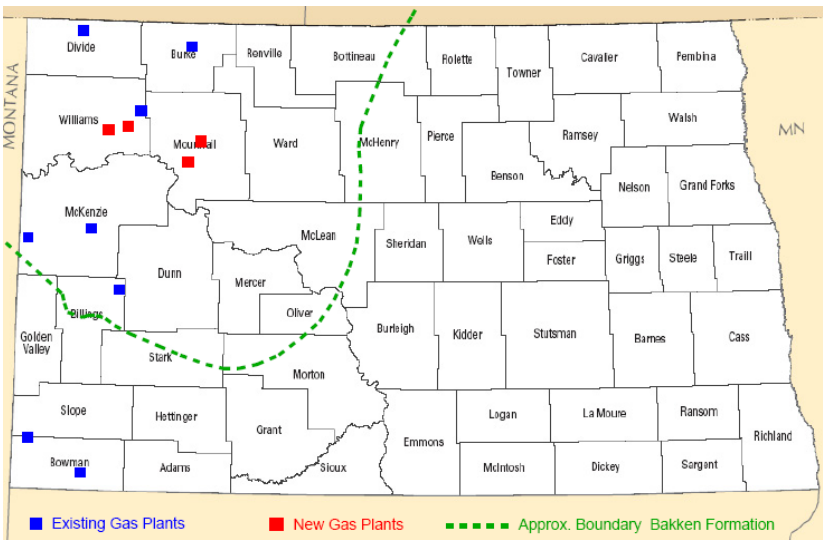
## New Gas Plants Under Construction

| Owner Company | Location | County | Plant Capacity | Estimated Cost |
|---|---|---|---|---|
| EOG Resources | Stanley | Mountrail | 20 mmcfd | $41 million |
| Whiting Oil & Gas | Ray | Mountrail | 12 mmcfd | $24 million |
| Whiting Oil & Gas | Parshall | Williams | 10 mmcfd | $11 million |
| Nesson Gas Services | Ray | Williams | 10 mmcfd | $20 million |

EOG's plant at Stanley was originally designed for 3 million cubic feet per day, but favorable exploration activities have caused them to expand the plant capacity to 20 million cubic feet per day. These new plants are expected to come on line in 2008.

**The Bakken Play**

The Bakken formation has become the target of much of North Dakota's drilling activity and the gas associated with that oil production often contains a significant quantity of NGLs. Prior to the Bakken play, most of North Dakota's gas gathering and processing was concentrated in the extreme western parts of the state and many companies have extensive gathering lines as well as several processing plants there. The Bakken formation extends farther east than the previous infrastructure development. That means there are currently

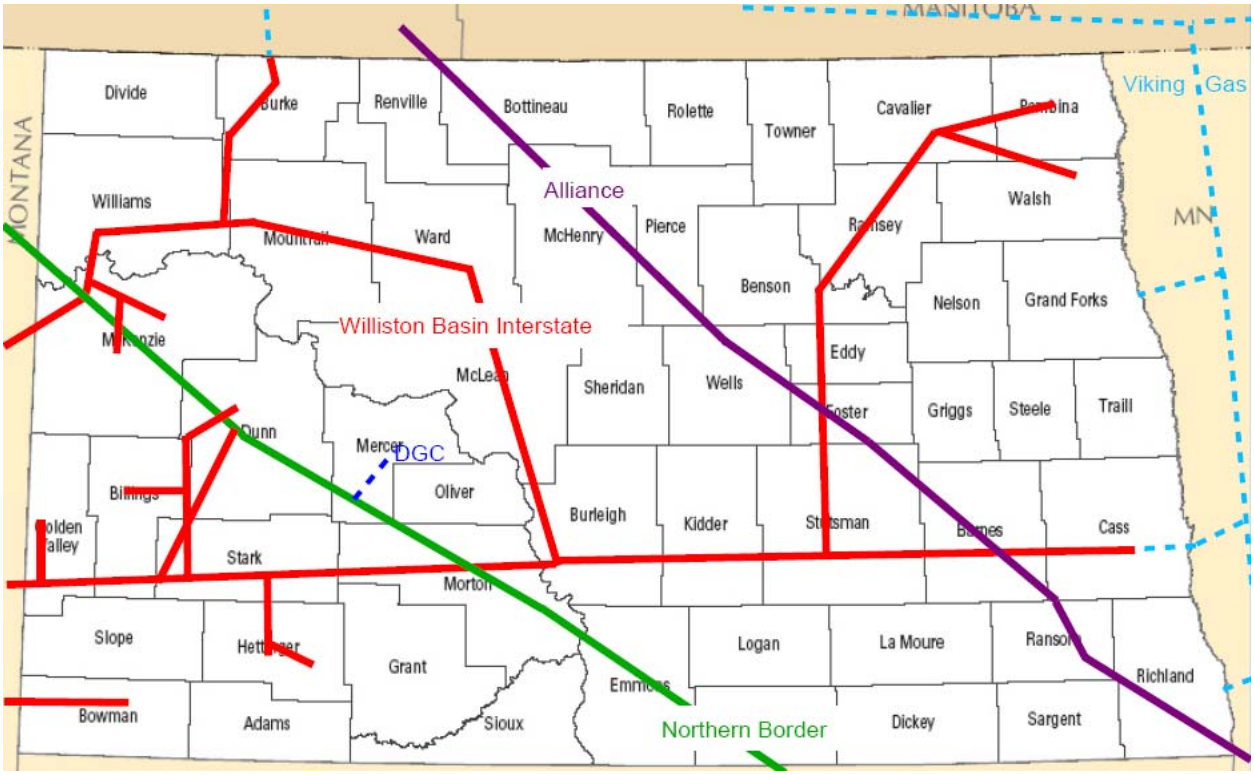


inadequate gathering and processing facilities to serve the new supply areas. As production increases to economic levels it will drive the construction of additional gathering facilities and new process plants. That has started to happen in the Ray and Stanley areas.

**Interstate Transportation**

Once gathered and processed, natural gas needs to be delivered to a pipeline company for shipment to customers, whether those customers are in North Dakota or elsewhere. This is the job of the interstate gas pipeline companies.

Presently there are two interstate natural gas pipelines which take North Dakota's market-ready production and deliver it to the national pipeline grid. They are: Williston Basin Interstate Pipeline Company (Williston Basin) shown in red, and Northern Border Pipeline Company (Northern Border), shown in green.




**North Dakota's Natural Gas Pipelines**

In order to get natural gas into an interstate pipeline several things must happen. First, a physical connection to it is required. These are known as receipt points and can cost hundreds of thousands of dollars to install. Next, the gas quality has to meet the transporting company's minimum quality specifications. That is the function of the processing plants discussed above. Finally, the gas must be compressed in order to enter the pipeline. Interstate pipeline companies typically operate their pipelines at very high pressures in order to move large quantities of gas. Because gathering or processing pressures are typically low, the pressure needs to be boosted by the use of large industrial compressors. Those compressors cost millions of dollars and often

must be made to fit a specific application. In addition to their high cost, they can take months to procure.

The Alliance Pipeline, shown in purple, crosses the state transporting both natural gas and natural gas liquids in the same stream. Currently, the Alliance Pipeline does not receive or deliver gas to customers in North Dakota. They are considering projects within the state and that pipeline might be a good fit for certain North Dakota production. Delivery of wet natural gas to Alliance could preclude the need to build an NGL extraction plant.

Viking Gas Transmission, shown in light blue, delivers gas from their Minnesota pipeline facilities to local distribution companies that serve the Fargo-Grand Forks area and Wahpeton. Much of Viking's supply comes from Canada.

The DGC plant near Beulah sends its synthetic natural gas to Northern Border via its own proprietary pipeline which is shown in dark blue.

**Storage**

Once produced, gathered, and treated, natural gas is ready for market. Depending on location and time of year, the gas may not be needed immediately. This creates a need for gas storage- a place to hold it until such time as it is needed. Storage capacity is very important to distribution companies, who use it to serve customers under heavy load conditions, and to transportation companies, who use it for operational balancing on their systems. Most natural gas storage facilities in the U.S. are owned by the interstate pipeline companies and leased by their customers.

Natural gas can be stored a few different ways. Depleted natural gas or oil producing formations are often used. Where available and geologically feasible, underground salt caverns can serve as a large natural tank providing quick deliverability. Natural gas also can be liquefied (LNG) and stored or shipped in special tanks.

There are presently no natural gas storage facilities in North Dakota. Williston Basin owns and operates a large storage facility in southeastern Montana where natural gas is stored in a depleted natural gas formation.

While North Dakota doesn't currently have any operating storage areas, the potential does exist. The Lodgepole and Winnipegosis formations seem to have the appropriate geologic characteristics that could make natural gas storage an option in North Dakota. This might provide an opportunity for someone to develop a storage project.

**Stranded Gas**

Stranded gas is the term used to describe gas that is left unconnected for some reason. A producing area might contain gas that is of such poor quality, or is in such low quantity, or perhaps located too far from gathering facilities to make connection economically practical. In order to produce the oil from those areas, flaring would normally need to continue. There might be possible uses for such gas. Equipment is available that can utilize poorer quality gas to fuel a small turbine or reciprocating engine generator. The electricity produced could then be used

locally or put on the electric grid for use elsewhere. An example of a location where low Btu gas is being used to power a generator is at the Fargo landfill.

**Conclusion**

North Dakota is a net exporter of natural gas. In 2006 the state produced about 64 bcf. In 2007 that production may reach 75 bcf. About 54 bcf of synthetic gas is also produced here. Meanwhile consumption runs about 53 bcf per year.

The Northern Border pipeline has the capacity to move significant quantities of North Dakota production out of the state. The challenge is to get the gas to their pipeline. The Williston Basin pipeline system is closer to many production areas including the new ones, but their existing pipeline in the Tioga-Minot area is nearly full. They have recognized this need and are currently soliciting customer interest in an expansion of their facilities. Williston Basin reports the results of their solicitation are very encouraging. With binding shipper commitments, they could have those facilities in place by November 2008. Furthermore if production grows as some expect, even more capacity could be added relatively quickly.

Export capacity on the interstate pipelines is available. What are currently lacking are sufficient gathering pipelines and processing plants. The North Dakota Pipeline Authority has been proactively working with area producers, processors, gatherers, and interstate pipeline companies to focus attention on these needs.

The State of North Dakota needs to do what it can to encourage and support the construction of natural gas gathering pipelines and processing plants. Some suggestions are:

- Consider legislation to extend the gas facility sales tax exemption to oil wells with associated gas production.
- Consider legislation that would allow construction of gathering pipelines within existing road rights-of-way.
- Track gas production reported to the Oil and Gas Division to aid planning where natural gas infrastructure is needed.
- Work with federal and state agencies to streamline pipeline permit and regulatory processes.
- Educate the public to the value and necessity of pipelines in providing them with safe and secure energy.
- Work to maintain present EPA air quality standards for gas facilities.
- Obtain federal tax exempt status for NDPA bonds issued for pipeline construction.

## Some Typical Natural Gas Units Of Equivalency

One Cubic Foot (1 Cf) = 1,030 Btu

100 Cubic Feet (1 Ccf) = 1 therm (approximately)

1,000 Cubic Feet (1 Mcf) = 1,030,000 Btu (approximately 1 MmBtu)

1,000 Cubic Feet = 1 Dekatherm (10 Therms)

1 Million Cubic Feet (1 Mmcf) = 1,030,000 Btu

1 Billion Cubic Feet (1 Bcf) = 1.03 Trillion Btu

1 Trillion cubic feet (1 Tcf) = 1.03 Quadrillion Btu

An average U.S. home will use 213 cubic feet of natural gas each day.

In 2004, the average U.S. home consumed about 77,900 cubic feet of natural gas (77.9 million Btu)