North Dakota Pipeline Authority

Annual Report
July 1, 2016 – June 30, 2017

Industrial Commission of North Dakota
Governor Doug Burgum, Chairman
Attorney General Wayne Stenehjem
Agriculture Commissioner Doug Goehring
North Dakota Pipeline Authority
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Overview

At the request of the North Dakota Industrial Commission, the Sixtieth Legislature passed House Bill 1128 authorizing the North Dakota Pipeline Authority. It was signed into law on April 11, 2007. The statutory mission of the Pipeline Authority is “to diversify and expand the North Dakota economy by facilitating development of pipeline facilities to support the production, transportation, and utilization of North Dakota energy-related commodities, thereby increasing employment, stimulating economic activity, augmenting sources of tax revenue, fostering economic stability and improving the State’s economy”. As established by the Legislature, the Pipeline Authority is a builder of last resort, meaning private business would have the first opportunity to invest in and/or build additional needed pipeline infrastructure.

By law, the Pipeline Authority membership is comprised of the members of the North Dakota Industrial Commission. Upon the recommendation of the Oil and Gas Research Council, the Industrial Commission authorized the expenditure of up to $200,400 during the 2015-2017 biennium for the Pipeline Authority with funding being made available from the Oil and Gas Research Fund. On August 1, 2008 the Industrial Commission named Justin J. Kringstad, an engineering consultant, to serve as Director of the North Dakota Pipeline Authority. The North Dakota Pipeline Authority Director works closely with Lynn Helms, Department of Mineral Resources Director, Ron Ness, North Dakota Petroleum Council President and Karlene Fine, Industrial Commission Executive Director. The Pipeline Authority has no other staff and receives no direct General Fund appropriation. The Pipeline Authority Director reports to the Industrial Commission and the Oil and Gas Research Council on a regular basis.

Statutory Authority

Statutory authority for the Pipeline Authority is found in Chapter 54-17.7 of the North Dakota Century Code (N.D.C.C.). Section 54-17.7-04 N.D.C.C. delineates the powers of the Pipeline Authority including: 1) making grants or loans or to borrow money; 2) to issue up to $800 million in revenue bonds; 3) enter into lease-sale contracts; 4) own, purchase, lease, rent and dispose of pipeline facilities or the right to capacity in any pipeline system or systems within or without the State of North Dakota; 5) enter into contracts to construct, maintain and operate pipeline facilities; 6) investigate, plan, prioritize and propose transportation corridors; and 7) participate in regional pipeline organizations.

Before the Pipeline Authority may exercise its power to construct pipeline facilities, it must follow a process defined by statute to ensure public participation and comment. In particular, the Pipeline
Authority must publish a notice describing the need for the pipeline project. Entities interested in constructing the facilities or furnishing services to satisfy the identified needs have 180 days to respond by filing a notice of intent. If the Pipeline Authority receives a notice of intent from an interested entity, it may not exercise its powers to construct unless the Pipeline Authority makes a finding that doing so would be in the public interest. In making such a finding, the Pipeline Authority shall consider the economic impact to the state, economic feasibility, technical performance, reliability, past performance, and the likelihood of successful completion and ongoing operation.

North Dakota Pipeline Regulatory Programs

The Pipeline Authority does not serve in any capacity as a regulatory agency for the pipeline industry. North Dakota’s pipeline industry is regulated by several state and federal agencies. Roles of each regulatory entity are complex and the Pipeline Authority urges all interested parties to please contact the agencies below for more information on their jurisdiction of the pipeline industry.

- North Dakota Department of Emergency Services
- North Dakota Department of Health-Water
- North Dakota Public Service Commission
- North Dakota Industrial Commission-Department of Mineral Resources-Oil and Gas Division
- Environmental Protection Agency
- Federal Energy Regulatory Commission
- U.S. Department of Transportation-Pipeline and Hazardous Materials Safety Administration-Office of Pipeline Safety

Summary of Activities

After bottoming out in the second quarter of 2016, petroleum related activity in North Dakota began gradually increasing throughout the 2016-2017 timeframe. Despite the relatively low level of activity, the midstream industry continued to position itself to meet current production levels, and continue to plan for further expansion when activity levels increase. More efficient drilling rigs and advances in drilling and completion techniques allowed North Dakota oil production to remain at historically high levels. During the past year, the Pipeline Authority has been fully engaged in continuing efforts to convert production and development information into oil and natural gas transportation solutions. Working alongside industry to produce crude oil and natural gas production forecasts to quantify future pipeline needs and time frames continues to be one of the principal tasks of the Pipeline Authority. Pipeline companies are conservative by nature and these forecasting exercises proved to be very beneficial in providing the confidence needed to move forward with expansion project planning.

During the fiscal year the Pipeline Authority contacted, met with, and shared information with numerous interested parties, including the following:
In addition, the Pipeline Authority worked with a number of state and federal agencies to gather information and provide expertise on pipeline issues. Those agencies and entities included:

- North Dakota Public Service Commission
- North Dakota Transmission Authority
- North Dakota Oil and Gas Division
- North Dakota Governor’s Office
- North Dakota Department of Trust Lands
- North Dakota State University
- Bank of North Dakota
- US Energy Information Administration
- North Dakota Oil & Gas Research Program
- MHA Energy
- North Dakota Office of Management and Budget
- North Dakota Department of Commerce
- Energy and Environmental Research Center
- North Dakota Department of Transportation
- Federal Railroad Administration
- North Dakota Tax Department
- Wyoming Pipeline Authority
- EmPower North Dakota Commission
- North Dakota State Water Commission
- Upper Great Plains Transportation Institute
- Federal Transportation Safety Administration
The Director of the Pipeline Authority also worked with the following trade associations/groups:

- North Dakota Petroleum Council
- North Dakota Petroleum Marketers Association
- North Dakota Association of Counties
- NW Landowners Association
- Utilities Technology Council
- National Association of Royalty Owners

As noted above, the Pipeline Authority has been facilitating discussions between governmental agencies and companies interested in expanding North Dakota’s midstream infrastructure.

In addition, the Director of the Pipeline Authority provided information to citizens and news media on issues related to pipelines.

**2017 Legislative Session**

The 2017 legislative session did not make any modifications to the Pipeline Authority statute. Four bills were passed that directly impact or relate to the pipeline industry and/or the Pipeline Authority. A brief bill summary is below.

HB 1144: Bill modifies the Public Service Commission’s gas and liquid energy conversion, gas and liquid transmission facility siting statute.

SB 2013: During the 2017-18 interim, the Tax Department, in consultation with the Board of University and School Lands, the Industrial Commission, and other state agencies as necessary, shall study the valuation of oil and gas as used to determine mineral royalty payments and tax liability.

HCR 3011: A concurrent resolution extending appreciation to the President of the United States for expediting the approval of the easement required for the completion of the Dakota Access Pipeline.

HCR 3027: A concurrent resolution directing the Legislative Management to consider studying the estimated fiscal impact to the state of refracturing existing oil wells.

**Crude Oil and Natural Gas Production Forecasting**

The Pipeline Authority continued to develop and maintain crude oil and natural gas production forecasts for North Dakota and the United States portion of the Williston Basin. These forecasts are widely used
throughout both public and private organizations. Two assumption scenarios are forecasted for the purpose of communicating the production impacts of different price and activity levels. Figure 1 is a long term oil production forecast for North Dakota. Figure 2 shows a longer term natural gas production forecast using the two different activity scenarios for North Dakota.

Figure 1. Long term crude oil production forecast for North Dakota

Figure 2. North Dakota natural gas production forecast
Natural Gas Liquids

The Pipeline Authority continued to focus considerable attention in 2016-2017 to the topic of natural gas liquids (NGLs). Natural gas produced from the Bakken and Three Forks Formations is very high in NGLs such as ethane, propane, and butane. Forecast models created by the Pipeline Authority were updated to better understand the production potential and required transportation infrastructure going forward.

The forecast in Figure 3 shows two potential production cases based on different activity level assumptions. In either case, a significant shortfall of gross pipeline capacity occurs in the next 1-3 years. Further complicating the situation is the fact that not all NGL pipelines can handle the same types of NGL products and natural gas plants around the region produce either purity products or unfractionated product, known as Y-grade.

There are several options going forward to address the growing volume of NGLs in North Dakota. One option would be to build, expand, or repurpose existing pipeline systems. A second option would be the development of value added industries that would use NGL products as feedstock. One potential use for NGLs is enhanced oil recovery (EOR) in the Williston Basin as fields continue to mature. The use of NGLs as a working EOR fluid is still in the research phase.

Figure 3. Forecasted North Dakota NGL production and transportation options
State Rail Plan

The North Dakota Department of Transportation, along with its partners, is continuing its work to update the previous 2007 North Dakota State Rail Plan.

Along with the hired consultant agency, Parsons Brinckerhoff, the Department of Transportation partnered with the following agencies to conduct the study:

- North Dakota Public Service Commission
- North Dakota Department of Commerce
- North Dakota Department of Emergency Services
- North Dakota Pipeline Authority
- Upper Great Plains Transportation Institute

The updated North Dakota State Rail Plan is focused on the following key areas:

- Ensuring safe rail transportation
- Providing consistently reliable, diverse Class I, short line and passenger rail service
- Rail service expansion and economic development opportunities
- Funding future rail improvements
- Understanding and defining the role of the State of North Dakota in rail transportation

The final State Rail Plan report is scheduled to be released in late 2017.

Natural Gas Flaring

While not a regulatory agency, the Pipeline Authority does play a very active role in helping the state reduce the amount of flared natural gas. The Pipeline Authority continually monitors and reports flaring statistics and provides analysis on current and future developments to industry participants, regulators, policy makers, and the public.

Several significant actions were taken by the ND Industrial Commission in recent years that have had a positive impact on reducing natural gas flaring. The first was the requirement for operating companies to submit a natural gas capture plan to the Oil & Gas Division to outline how produced natural gas would be sold or utilized on location. The second action was an Industrial Commission order on July 1, 2014 that provided flaring reduction targets to the year 2020 and provided a means of enforcement at the Oil & Gas Division through the use of production and permitting restrictions.

In September 2015, the Industrial Commission revised the 2014 natural gas capture targets for Bakken and Three Forks production as follows:
- 74% Capture – Q4 2014
- 77% Capture – Q1 2015
- 80% Capture – Q2 2016
- 85% Capture – Q4 2016
- 88% Capture – Q4 2018
- 91-93% Capture – Q4 2020

The natural gas capture rate for Bakken production was 89% in June 2017, exceeding the required target of 85%. In order for the industry to continue to meet or exceed gas capture targets, additional investments in gas gathering and processing will be required.

**Industry and Public Communications Activities**

**Pipeline Publication**
During the 2016-2017 fiscal year, three *Pipeline Publication* newsletters were created in order to keep interested parties updated on midstream activities in the region. All three newsletters can be found in Appendix A. In addition to the newsletters, the Pipeline Authority used monthly reports, website content, press conferences, and presentations to share updates on production and transportation dynamics in the Williston Basin (additional details below).

**Pipeline Authority Websites**
In an effort to provide industry and public users with the most timely and complete set of information, the Pipeline Authority continues to update the agency websites as new information becomes available. The websites allow the Pipeline Authority to provide users with current Williston Basin oil production data, maps, news, publications, basic pipeline information, pipeline safety information, and links to pipeline mapping systems.

**Monthly Updates**
During the 2016-2017 fiscal year, the Pipeline Authority produced monthly transportation and production reports to allow interested parties a quick view of how much crude oil and natural gas was produced each month and how each commodity was shipped and/or processed. Information contained in the reports is presented during monthly media events in conjunction with the ND Oil & Gas Division. Monthly reports are placed on the Pipeline Authority website and an email distribution list has been created to circulate the update to interested parties.

**North Dakota Drilling Economics**
In order to assist the midstream industry in understanding current and future petroleum activity levels, the Pipeline Authority routinely publishes information exploring the economics of drilling in North Dakota’s Bakken/Three Forks Formations. The research takes a detailed look at where drilling in North Dakota has been most successful in the past and then predicts where drilling may be concentrated during periods of fluctuating oil prices.
Figure 4 was generated during the drilling economics research to represent the expected after tax rate of return at three different drilling and completion costs. While assuming $45/bbl at the wellhead, it was discovered that wells drilled in North Dakota would not consistently receive a 10%-20% rate of return until they were producing at least an average of 700 barrels of oil per day during the well’s peak production month. Maps were also generated to show where the locations of the wells in Figure 4 are located.

![Figure 4. North Dakota drilling economics summary (Assumes $45/bbl at the wellhead)](image)

**Pipeline Presentations**

The Pipeline Authority has had the opportunity to make presentations at a variety of industry and public events during the past fiscal year. Presentation topics were typically focused on North Dakota’s transportation dynamics and did contain additional material on drilling economics and production techniques. Slides from many of the major events are placed on the Pipeline Authority website as content is updated.
Bakken Refracs

During the first half of 2017, the Pipeline Authority conducted research to determine what data exists on refracs in the state. Over 180 wells were identified as being refraced over the last several years.

The data revealed the following points of interest:

- Typical wells targeted for refrac were between three and five years old and utilized completion techniques now considered outdated.
- Almost half of the refraced wells were in Dunn County.
- On average, the production of the well after the refrac was higher than the original well performance.
- There were examples found where the refraced wells did not perform significantly better after refracing.
- The Pipeline Authority has identified almost 2,000 wells drilled between 2007-2011 that are positioned to be potential refrac candidates in the near future.
- None of the wells examined by the Pipeline Authority were refraced more than one time, a practice that does occur outside of North Dakota.

Details of the refrac work can be found on the “Presentations” page of the Pipeline Authority website.

Williston Basin Pipeline Infrastructure

For reference, a series of North Dakota pipeline maps can be found in Appendix B

Crude Oil Pipelines, Refining, and Rail Transportation

Enbridge Pipelines North Dakota: Having completed several expansion projects over the past number of years, Enbridge now has the capacity to move 355,000 BOPD on its pipeline system to Clearbrook, MN. Enbridge completed their work to expand north bound capacity of 145,000 BOPD in early 2013 for the larger scale “Bakken Expansion Project”. Oil using the northbound route navigates the Enbridge Saskatchewan system to an interconnect with the Enbridge Mainline at Cromer, MB. Once on the Mainline system, the Williston Basin oil quickly reenters the United States and meets east bound Enbridge oil at Clearbrook, MN.

Enbridge’s plans to construct the 225,000 BOPD “Sandpiper” system were deferred during the third quarter of 2016 due to unexpected market conditions in the near term planning horizon. Enbridge plans to monitor market conditions and will reevaluate the Sandpiper project in the future.

Bridger, Belle Fourche, and Butte Pipelines: Bridger and Belle Fourche Pipelines operate as intra-basin pipeline systems moving oil to several pipeline interconnects or rail facilities in the Williston Basin. One
such pipeline interconnect is with the Butte Pipeline near Baker, MT. The Butte Pipeline currently has the capacity to move 260,000 BOPD to Guernsey, WY. In Guernsey, WY, the oil is transported to Wood River, IL on the Platte Pipeline, Cushing, OK on the White Cliffs Pipeline, or loaded into rail cars for further transport.

**BakkenLink:** After announcing plans in 2010 to offer a pipeline system connecting the Williston Basin to the Keystone XL Pipeline in Eastern Montana, BakkenLink has altered their current project scope. Now in service, the BakkenLink system collects crude oil from various locations along its route south of Lake Sakakawea and delivers the oil to a unit train rail facility located near Fryburg, ND. In late 2015, Tesoro Corporation purchased the BakkenLink pipeline and rail facility from Great Northern Midstream.

**Energy Transfer Partners:** In early 2014, Energy Transfer Partners (ETP) held an open season to solicit interest in a new 30” pipeline from North Dakota to Patoka, IL. In June 2014, ETP announced that they had secured sufficient shipper support to move forward with the project. The “Dakota Access” pipeline collects oil north and south of Lake Sakakawea and has the ability to transport up to 520,000 BOPD. If additional interest exists, the pipeline could be expanded to carry up to 570,000 BOPD. The project began construction in May 2016 and was placed into commercial service on June 1, 2017.

**Plains All American Pipeline:** In November 2010, Plains All American Pipeline (Plains) announced plans to construct a new 103 mile, 12 inch, pipeline from Trenton, ND to an interconnect with the existing Wascana Pipeline at the United States-Canada border in northeast Montana. The “Bakken North” pipeline went into service in May 2014, with an initial capacity of 40,000 BOPD, expandable to 75,000 BOPD.

**TransCanada Bakken Marketlink:** On September 13, 2010, TransCanada launched a successful open season for Bakken producers interested in accessing TransCanada’s proposed Keystone XL pipeline project in eastern Montana. The proposed 100,000 BOPD interconnect would be located near Baker, MT and would require new pumps and tanks to accommodate the Bakken oil. Third party shippers would be necessary to move the crude to the Baker, MT facility from North Dakota.

In November 2015, President Obama announced that the Keystone XL Pipeline was not in the national interest of the United States and that a required Presidential Permit would not be granted. In March 2017, President Trump reversed the White House decision and granted the Presidential Permit to TransCanada for the Keystone XL Pipeline. An updated timeline for the Keystone XL Pipeline and Bakken Marketlink has not been made public.

**TransCanada Upland Pipeline:** In February 2015, TransCanada announced plans to construct a 20” pipeline connecting North Dakota to the proposed Energy East project. In October 2017, TransCanada announced that they would no longer be pursuing the Energy East project.

The Upland Pipeline was expected to be in service in 2020 with an initial capacity of 220,000 BOPD, expandable to 300,000 BOPD. The proposed TransCanada Energy East project would have used a
combination of repurposed natural gas pipeline and new construction to move 1,100,000 BOPD to eastern Canada. North Dakota crude oil not processed in eastern Canada could have become waterborne for further shipment to coastal refining centers.

**Tesoro Mandan Refinery:** Expanded by 10,000 BOPD in 2012, Tesoro operates a 68,000 BOPD refinery in Mandan, ND. The refinery receives its light sweet feedstock though a network of pipelines in the Williston Basin operated by Tesoro High Plains Co. Products generated at the refinery are distributed directly from a truck rack at the facility or through the NuStar North Pipeline to Eastern North Dakota and Minnesota.

On August 1, 2017, Tesoro Corporation changed its name to Andeavor.

**Tesoro Dakota Prairie Refinery:** In late June 2016, Tesoro Corporation purchased the Dakota Prairie Refinery from MDU Resources Group and Calumet Specialty Products Partners. The Dakota Prairie Refinery, began processing 20,000 BOPD at its facility just west of Dickinson, ND in May 2015. The “diesel topping” refinery produces around 7,000 BPD of diesel fuel for consumption, while the remaining product is transported for further processing or use.

On August 1, 2017, Tesoro Corporation changed its name to Andeavor.

*A map of North Dakota crude oil gathering systems can be found in Appendix C*

**Rail Loading Facilities:** The transportation of crude oil by rail car has played a key role in moving growing volumes of crude oil from the Williston Basin to markets around the United States and Canada. Figure 5 shows the estimated Williston Basin market share percentages for rail, pipeline, and local refining. Figure 6 shows the estimated volume of oil moved by rail out of North Dakota. Maps, capacities, and additional information on the various facilities can be found on the Pipeline Authority websites.

A clear industry shift from rail to pipeline transportation can be identified in Figures 5 & 6. The shift since 2014 can be attributed to several factors including increased pipeline capacity, decreased market spread between domestic and world oil prices, and decreased overall oil production. The Pipeline Authority estimates fifteen of the twenty-plus rail facilities are still active, albeit at decreased volumes.

The future of crude by rail utilization in North Dakota will be driven by oil production volumes, market pricing, pipeline capacity, and regulatory oversight.

*A map of North Dakota oil rail loading facilities can be found in Appendix D*
Figure 5. Estimated oil transportation by mode

Figure 6. Estimated outbound crude oil rail shipments.
Natural Gas Pipelines

Alliance Pipeline: The Alliance Pipeline is a high pressure, large diameter natural gas pipeline that originates in British Colombia, Canada and terminates at the Aux Sable gas processing plant near Chicago, IL. The Alliance Pipeline transports “dense gas” or gas that still contains high BTU natural gas liquids, such as propane and butane. In February 2010, the Alliance Pipeline began transporting rich natural gas from North Dakota via a new interconnect with the Prairie Rose Pipeline near Bantry, ND (See Aux Sable below). The 36 inch diameter United States portion of the pipeline has a certified capacity of 1.513 billion cubic feet per day (BCFD). The Alliance Pipeline has one North Dakota delivery point in Hankinson.

In response to growing natural gas production, Alliance Pipeline announced plans on June 22, 2011, to construct a new, 80 mile, natural gas pipeline from the Hess Gas Plant in Tioga, ND to an interconnection point near Sherwood, ND. Commissioned in late 2013, the “Tioga Lateral Pipeline” has the ability to deliver liquids rich, high BTU, natural gas to Chicago, IL for further processing and transportation. The Tioga Lateral has the capacity to transport up to 126 MMCFD.

Northern Border: The Northern Border Pipeline, owned by TC Pipelines and ONEOK Partners, is a 1,249 mile pipeline originating at the Port of Morgan in Montana and terminating near North Hayden, Indiana. The pipeline has a system receipt capacity of 2.37 BCFD, a large portion of which is supplied with Canadian natural gas through a receipt point with the Foothills Pipeline at the Port of Morgan. The 42 inch diameter Northern Border Pipeline receives gas deliveries at a total of 16 receipt points in the Williston Basin with thirteen of those points for North Dakota gas supply.

WBI Energy Transmission: Formerly known as Williston Basin Interstate Pipeline Co., WBI Energy Transmission operates more than 3,700 miles of natural gas transmission pipelines throughout North Dakota, Montana, Wyoming, and South Dakota. This network of pipelines plays a vital role in North Dakota’s natural gas industry. It contains twelve interconnecting points with other regional pipelines and can also deliver natural gas to local distribution companies or natural gas storage fields. WBI continues to make system upgrades in western North Dakota in order to meet growing customer demand. In June 2016, WBI announced an open season to connect the eastern North Dakota portion of the system with the Viking Pipeline in western Minnesota. This expansion does not directly support North Dakota gas production volumes, but rather would serve to provide additional gas volumes to consuming markets in eastern North Dakota.

Aux Sable: In June 2011, Aux Sable announced the acquisition of the Prairie Rose Pipeline and condensate recovery facility near Stanley, ND. Originally constructed by Pecan Pipeline, the 75 mile, 12 inch system went into service February 2010 and has the capability to transport over 100 MMCFD of unprocessed natural gas from Mountrail County to an interconnect with the Alliance Pipeline near Bantry, ND.
**Bison Pipeline:** TransCanada placed the 302 mile, 30 inch Bison Pipeline into service in early 2011. The pipeline was built to connect natural gas production in the Powder River Basin of Wyoming to the Northern Border Pipeline in Morton County North Dakota. The pipeline has an initial capacity of 407 MMCFD and could be expanded to 1 BCFD.

**Natural Gas Liquids Pipelines**

**ONEOK Bakken NGL Pipeline:** On July 26, 2010, ONEOK Partners announced plans to construct a new 12 inch natural gas liquids pipeline capable of moving 60,000 BPD from existing and planned facilities in the Williston Basin to an interconnect with the Overland Pass Pipeline near Cheyenne, WY. The “Bakken NGL Pipeline” was built to address the high volumes of natural gas liquids that are extracted from the rich Bakken gas during processing. The pipeline operates as a Y-grade system, with product fractionation taking place in Bushton, KS. ONEOK announced completion of the pipeline in April 2013 and an expanded capacity of 135,000 BPD in September 2014.

**Vantage Pipeline:** On July 15, 2010, Mistral Energy announced a new 430 mile liquid ethane pipeline from Tioga, ND to Empress, AB. With an initial capacity of 40,000 BPD, the new “Vantage Pipeline” was built to address the high concentration of ethane found in North Dakota’s natural gas. Placed into service Q2 2014 in conjunction with the Hess Tioga Gas Plant Expansion, the pipeline was constructed of 10 inch pipe. In September 2014, Pembina Pipeline Corporation purchased the Vantage Pipeline from Mistral Midstream.

On February 10, 2015, Pembina Pipeline announced that the Vantage ethane pipeline would expand to connect to ONEOK’s Stateline plants with 50 miles of 8” pipeline. The $85 million system expansion also included taking the existing mainline capacity from 40,000 bpd to 65,000 bpd. Ethane deliveries from the ONEOK Stateline plants to Vantage began in May 2017.

**Carbon Dioxide Pipelines**

North Dakota continues to have only one carbon dioxide pipeline in service. The Dakota Gasification Company’s, 12-14 inch, 205 mile pipeline went into service in 2000 and transports roughly 150 MMCFD of carbon dioxide to oilfields near Weyburn, SK.

The Pipeline Authority continues to work with interested parties on the development of new carbon dioxide pipelines for capture and sequestration, as well as enhanced oil recovery operations. The Pipeline Authority is an active member of the Plains CO₂ Reduction Partnership through the Energy and Environmental Research Center in Grand Forks, ND.
New or Expanding Natural Gas Plants

Due to the vast footprint of the Bakken resource, natural gas gathering and processing operators in North Dakota have faced difficult challenges in the past to keep pace with faster, more efficient drilling and completion techniques. Despite the daunting task, industry is rising up to reap the great economic reward contained in the rich Bakken gas.

North Dakota currently has twenty-eight natural gas processing/conditioning plants operating, with the capability to process roughly 2.1 BCFD. Two additional new or expanded plants are expected in 2017-2018 and will add 130 MMCFD of processing capacity (Figure 7). Two gas plants have been suspended until market conditions justify their construction. A detailed breakdown of the existing and proposed facilities can be found on the Pipeline Authority website.

Figure 7. North Dakota natural gas processing plant intake capacity, gas production, gas forecast, and NDIC capture targets.
Planned Activities

Over the past year, the Pipeline Authority has continued to experience great success by working with industry to quantify future crude oil and natural gas production in order to provide the assurance needed to move forward with various expansion projects. The forecasted petroleum production levels have been modified to reflect the current low price environment and will require continuous updating and review over the next year as technology advances and market prices fluctuate. The Pipeline Authority will continue to utilize new and existing development information to gain a deeper understanding of the crude oil, natural gas, natural gas liquids, and carbon dioxide pipeline needs in Williston Basin.

Industry and public information distribution will continue with the use of newsletters, presentations, monthly updates, and agency websites. The Pipeline Authority will continue to conduct information presentations to public audiences, legislative groups, and industry representatives at various events throughout the coming year.
APPENDIX A

North Dakota Pipeline Authority’s *Pipeline Publication* Newsletter
NORTH DAKOTA — Production Numbers

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The Pipeline Authority reports a breakdown of natural gas flaring in North Dakota. Flaring is broken into two different categories based on why the gas is being flared at a particular well. The first category, shown in blue below, is flaring from wells that simply do not have a pipeline connection. The second category, shown in orange, is flaring from wells that do have a gas gathering pipeline connection. However, these pipelines do not have the ability to collect all the natural gas being produced.

As with all petroleum related topics, natural gas capture in the state has been evolving. Overall, natural gas flaring in North Dakota has been decreasing and is currently below the gas capture requirements of the North Dakota Industrial Commission. Early in the reporting sequence, flaring was almost equally distributed between wells that had and did not have a pipeline connection. As gas gathering infrastructure continued to be built to new and existing well pads, the percentage of gas flaring from unconnected wells has been greatly reduced. Along with building new pipeline to unconnected areas, the gathering industry is placing an emphasis on enhancing existing assets to reduce the volume of gas flaring from locations connected to pipeline systems.
VALLEY EXPANSION PROJECT UPDATE

On September 7, 2016, WBI Transmission announced plans to proceed with the Valley Expansion Pipeline Project in Eastern North Dakota and Western Minnesota. The 38 mile, 16 inch, natural gas pipeline project would connect WBI Transmission’s existing system near Mapleton, ND to the Viking Pipeline in Western Minnesota. The pipeline system is not intended to support natural gas production in Western North Dakota, but rather plays an important role to support growth and boost supply security for consumers in Eastern North Dakota. The project was successfully supported by shipper commitments obtained during an open season that ran from June 13, 2016 to July 15, 2016. The $55-$60 million project is designed to carry 40 million cubic feet of gas per day and expected to be in service in early 2018.

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A common industry term related to natural gas processing and transportation is “y-grade” or “y-grade liquids.” The term “y-grade” refers to a mixture of natural gas liquids (ethane, propane, butane, natural gasoline) exiting a processing plant that is not immediately separated into pure, marketable products. Many of the newer natural gas processing plants in North Dakota are only capable of generating y-grade output, requiring further transportation to fractionating (separating) facilities around the US.

Estimated Williston Basin Oil Transportation

July 2016 estimates
WINTER CHALLENGES FOR NATURAL GAS GATHERING

Temperatures and snowfall has moderated recently from the harsh winter storm events between Thanksgiving and the New Year. The winter storms of 2016-2017 made just about every outdoor activity more challenging and the work of gathering natural gas from the wellhead to a processing plant was no exception.

At first glance, it may seem that buried natural gas gathering pipelines should be immune to a harsh North Dakota winter. To the contrary, cold temperatures and poor road conditions can prove to be challenging for gas gathering operators.

In its raw form, Bakken natural gas is very high in natural gas liquids (NGLs). Cold ground temperatures can chill the natural gas stream and cause NGL’s to condense and pool in low sections of a pipeline. This pooling of NGL’s restricts the pipeline’s ability to operate at full capacity. As a result of increased NGL condensing in colder months, North Dakota’s gas gathering companies have scheduled more frequent “pigging” operations to clear the lines of accumulated NGL’s. These routine pigging operations are disrupted when road conditions prohibit safe travel of personnel and trucks carrying NGL’s away from pig launching and retrieving facilities.
HOW DO ND HOMES RECEIVE NATURAL GAS?

Many people do not put much thought into how the natural gas for heating their homes got to their furnace. Even less thought is given to where that natural gas was produced.

North Dakotans heating their homes and businesses with natural gas are typically served by a Local Distribution Company or LDC. LDCs receive the natural gas supply from a larger, high pressure, interstate natural gas pipeline system (see map). These interstate pipelines connect the field gas processing plants (green squares) with the LDCs.

Three major natural gas pipeline systems, WBI Transmission, Northern Border, and Viking, are responsible for transporting natural gas to community LDCs. A fourth major natural gas pipeline, the Alliance Pipeline, moves gas from Western Canada and North Dakota to the Chicago area for further processing.

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A LOOK AT REFRACS IN NORTH DAKOTA

The process of recompleting, or refracing, an existing Bakken – Three Forks well may be the next big step to increase oil and gas recovery rates in the state. A refrac is the practice of hydraulic fracturing an existing well that has already been hydraulically fractured at some earlier time period. Refracs are not new to the industry, as there is significant experience over the last decades around the world. However, due to the relatively young nature of Bakken development, the technique has had limited testing in the region.

During the first half of 2017, the Pipeline Authority conducted research to determine what data exists on refracs in the state. Just over 140 wells were identified as being refraced over the last several years.

The data revealed the following points of interest:

- Typical wells targeted for refrac were between four and five years old and utilized completion techniques now considered outdated.
- Almost half of the refraced wells were in Dunn County.
- On average, the production of the well after the refrac was higher than the original well performance.
- There were examples found where the refraced wells did not perform significantly better after refracing.
- The Pipeline Authority has identified almost 2,000 wells drilled between 2007-2011 that are positioned to be potential refrac candidates in the near future.
- Of the wells examined, none were refraced more than once, a practice that is not uncommon outside of North Dakota.
ECONOMICS OF REFRACS

The Pipeline Authority performed a high level exercise to try and determine the economics of refracing using incremental oil and gas production as the guide. As seen in the sample refrac production chart (front page), the orange colored production can be considered incremental production due to the refrac operation around month 68. In this example, the well is estimated to have 250,000+ barrels of incremental oil production from the refrac. The bar chart is a guide created to understand the economics of refracing in a $40/bbl (wellhead) price environment. The economics were run using 100,000-600,000 barrels of incremental production and refrac costs of $2-$4 million.
APPENDIX B

North Dakota Pipeline Maps
North Dakota Crude Oil Pipelines

Disclaimer: Neither the State of North Dakota, nor any agency, officer, or employee of the State of North Dakota warrants the accuracy or reliability of this product and shall not be held responsible for any losses caused by reliance on this product. Portions of the information may be incorrect or out of date. Any person or entity that relies on any information obtained from this product does so at his or her own risk.
North Dakota CO₂ Pipeline

Dakota Gas North Dakota CO

- Dakota Gas Pipeline
APPENDIX C

North Dakota Crude Oil Gathering Map
Active Oil Wells By Transport Type

Legend
- B Both
- P Pipeline
- T Truck

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Map Data Date: 3/1/2017
Map Update Date: 9/13/2017
APPENDIX E

North Dakota Gas Processing and Transportation Map