



June 30, 2020

Mr. Steve Kaul  
Executive Secretary  
North Dakota Public Service Commission  
State Capitol Building  
600 E. Boulevard Ave. Dept. 408  
Bismarck, ND 58505-0480

Dear Mr. Kaul:

Re: Dakota Gasification Ten-Year Plan

Enclosed please find ten copies of Dakota Gasification Company's Ten-Year Plan in accordance with NDCC 49-22-04. Notice of the filing of this plan is given to the state agencies and officers as denoted on the attached Service List pursuant to Articles 69-06-01-05 and 69-06-02-02 of the North Dakota Administrative Code.

Sincerely,

Dale Johnson (Jun 30, 2020 10:48 CDT)

Dale A. Johnson  
Sr. Vice President & COO

/sw  
Enclosures

cc: Ms. Shana Brost, Mercer County Auditor  
Service List (without Enclosure)

1 **PU-20-310** Filed: 7/2/2020 Pages: 8  
**2020 Ten Year Plan**

Dakota Gasification Company

Dale Johnson, Sr. VP & COO





**DAKOTA GASIFICATION COMPANY  
NORTH DAKOTA TEN-YEAR PLAN**

June 30, 2020

Submitted to the North Dakota Public Service Commission  
pursuant to

North Dakota Century Code Section 49-22-04

## EXISTING ENERGY CONVERSION FACILITIES

The Great Plains Synfuels Plant (**Synfuels Plant**), owned and operated by Dakota Gasification Company (**Dakota**), a wholly-owned subsidiary of Basin Electric Power Cooperative (**Basin Electric**), is located approximately eight miles northwest of Beulah, North Dakota. The Synfuels Plant uses technology developed by the Lurgi corporation of Germany to convert lignite coal into synthetic natural gas (**SNG**). The Synfuels Plant is presently capable of producing up to 170 million cubic feet of SNG per day. In addition to producing SNG, the Synfuels Plant presently also produces and sells twelve other products: urea, anhydrous ammonia, diesel exhaust fluid (**DEF**), carbon dioxide (gas), carbon dioxide (liquid), tar oil, ammonium sulfate, crude cresylic acid, krypton-xenon, liquid nitrogen, naphtha, and phenol.

Coal gasification involves a process which combines carbon and hydrogen from the lignite coal under high pressure with steam and oxygen to produce methane. The first step in the Lurgi gasification process is the screening of approximately 32,000 tons of lignite per day into a top size of two-inch diameter pieces. During this "sizing" process, approximately 13,200 tons of lignite "fines" per day are screened out. These fines are particles of lignite that are too small to gasify. The fines are sold to Basin Electric for use in generating electricity. The other 19,000 tons of sized lignite per day are delivered to the Synfuels Plant and are used as feedstock for the plant's gasifiers.

The gasifiers are cylindrical pressure vessels 40 feet high and have an inside diameter of 13 feet. The Synfuels Plant has 14 gasifiers. Sized lignite enters the tops of these gasifiers forming tall beds of lignite. Steam and oxygen (produced on site) are fed into the bottom of the lignite beds causing intense combustion (2,200°F). The resulting hot gases break down the molecular bonds in the lignite and steam, releasing compounds of carbon, hydrogen, nitrogen, sulfur and other substances to form a raw gas. This raw gas is then cooled causing tars, oils, phenol, ammonia and some water vapor to condense into liquids. These liquids are then processed separately from the main gas stream.

Shift conversion, or hydrogen enrichment, is the next step in the process. The raw gas now contains about 2-1/4 parts hydrogen to one part carbon monoxide. To increase the ratio to 3:1 (the minimum needed for methanation) some of the raw gas is passed through catalytic reactors. These reactors convert part of the carbon monoxide and water to hydrogen and carbon dioxide. The raw gas now contains the proper mix of hydrogen and carbon monoxide for SNG production; but first, acid gas and organic impurities must be removed in the Rectisol unit. In the Rectisol unit (the last step before methanation), the raw gas passes through a wash of cold methanol (-95°F) which removes sulfur compounds, naphtha and most of the carbon dioxide.

Methanation takes place by passing the clean gas over beds of a nickel catalyst causing carbon monoxide and most of the remaining carbon dioxide to react with the free hydrogen to form methane. Final cleanup removes traces of carbon monoxide and readies gas for compression into pipeline quality SNG.

Coordination Efforts. Adjacent to the Synfuels Plant is the Antelope Valley Station (**AVS**), an electric generating station which is part of a regional power supply system operated by Basin Electric. The Synfuels Plant and AVS share certain common facilities including water supply, water treatment, coal handling, rail and electrical transmission. Lignite for both plants is delivered from the nearby Freedom Mine, operated by The Coteau Properties Company (**Coteau**), a subsidiary of The North American Coal Corporation. Most mining equipment is owned or leased by Dakota Coal Company (another subsidiary of Basin Electric) and is either leased or subleased to Coteau. Dakota Coal Company was incorporated in 1988 and was organized to supply lignite coal to AVS and the Synfuels Plant.

No Planned Removal or Construction. Dakota has no plan to remove any of its existing energy conversion facilities from service or add facilities during the ten-year period.

## EXISTING TRANSMISSION PIPELINES FACILITIES

The water supply for the Synfuels Plant is provided by a 42-inch diameter steel-lined pipe owned by Basin Electric, which is approximately nine miles in length. This water pipeline also supplies water for Basin Electric's AVS which is located adjacent to the Synfuels Plant. The raw water line runs directly south from an intake structure and pumping station located on Lake Sakakawea to AVS. In turn, AVS processes a portion of the water through cold lime softening and transports the softened water to the Synfuels Plant. The line has a maximum operating pressure of 160 psi gauge and a flow rate of 30,000 gpm. The pipeline was constructed with a minimum cover of seven feet.

Pipeline transmission facilities owned by Dakota include its 34-mile, 24-inch diameter Class A carbon steel pipeline extending from the tailgate of the Synfuels Plant, running southwest to an interconnection at the Hebron Tap where it interconnects with the Northern Border Pipeline. The Northern Border Pipeline transports the SNG along with large quantities of Canadian and Bakken natural gas to Ventura and Harper, Iowa and North Hayden, Indiana where it reaches an interconnection to a network of pipeline systems serving customers throughout the United States.

There are two metering stations on the Synfuels Plant to Hebron Tap pipeline, one of them at the Synfuels Plant and the other at the Hebron Tap. These metering stations measure the quantity of SNG transported and analyze SNG quality. Maximum design operating pressure of this pipeline is 1,440 psi. The pipeline is capable of transporting considerably more than 170 million standard cubic feet of SNG per day produced by the Synfuels Plant as it was designed to transport SNG for a coal gasification plant twice the size of the present facility. There is a mid-valve on the pipeline that automatically closes in the event of sudden depressurization. The pipeline first transported SNG on July 28, 1984. The pipeline was constructed with a minimum cover of four feet.

The SNG is compressed by two separate two-stage Allis-Chalmers compressors. In December 1991, Dakota installed two new turbine drivers from Mitsubishi International Corporation in order to have sufficient horsepower to deliver the Synfuels Plant's production into the Northern Border Pipeline system. These turbines are 12,500 hp, 13,700 rpm drivers driven by 1,150 psi steam.

Design chemical composition of the SNG entering the pipeline is 95.33 percent methane, 3.8 percent hydrogen, .32 percent carbon dioxide, .26 percent nitrogen, .21 percent argon, 84 ppm water and 7 ppm carbon monoxide containing a heating value of about 968 Btu's per standard cubic foot (dry basis).

This pipeline is regulated under Code of Federal Regulation Title 49, Part 192 (regulations promulgated pursuant to the Natural Gas Pipeline Safety Act of 1968). Reports are monitored by the Office of Pipeline Safety, an agency of the United States Department of Transportation.

In July 1997, Dakota entered into a contract with PanCanadian Resources, which changed its name to Cenovus Energy (**Cenovus**) and has since sold its interest to Whitecap Energy (**Whitecap**) on behalf of the Weyburn Unit pursuant to which Dakota constructed and operates a carbon dioxide pipeline from the Synfuels Plant to the U.S./Canadian border including a compressor station at the Synfuels Plant. The contract initially allowed for purchase up to 95 million standard cubic feet per day (**MMSCF/D**) of carbon dioxide and deliveries commenced in 2001. In May 2005, Dakota signed a contract with Apache Canada Ltd, which subsequently sold its interest to Cardinal Energy, of Weyburn, Saskatchewan to supply their Midale Unit with up to 25 MMSCF/D of carbon dioxide. Dakota and Cenovus were parties to a second sales arrangement calling for the delivery of up to 30 MMSCF/D of carbon dioxide. These additional deliveries required the installation of a third

compressor at the Synfuels Plant and a Booster Pump at Tioga, ND. This second Cenovus contract has since expired. At full production, the Synfuels Plant produces 210 MMSCF/D of carbon dioxide. The pipeline, with sufficient compression, is capable of transporting the entire 210 MMSCF/D output to Tioga and up to 165 MMSCF/D from Tioga to the Canadian border. Dakota continues to investigate the opportunity to sell the remaining carbon dioxide for enhanced oil recovery in the Williston Basin region, or inject the carbon dioxide into Class VI wells for permanent sequestration. These options would require installation of lateral pipelines branching from Dakota's facility or from the existing pipeline.

The carbon dioxide pipeline proceeds in a westerly direction from the Synfuels Plant to a point near Killdeer, North Dakota where it turns north, goes under the Little Missouri River and Lake Sakakawea and crosses the United States/Canadian border north of Crosby, North Dakota. The pipeline traverses the major production areas of the northern portion of the Williston Basin. Carbon dioxide is economically available to oil production companies operating in that area. In addition, a connection was placed near Killdeer, North Dakota where the pipeline turns northward which would enable future expansion of the carbon dioxide pipeline south to the oil fields in the Dickinson, North Dakota area and/or into Montana. The pipeline is approximately 167 miles in length. An interconnecting pipeline in Saskatchewan, Canada owned by Dakota's Canadian subsidiary, Souris Valley Pipeline Limited (**SVPL**), is approximately 38 miles in length.

A compressor facility located within the Synfuels Plant boosts the carbon dioxide stream pressure to approximately 2,700 psig to ensure delivery to the oil fields at Weyburn and Midale at a minimum pressure of 2,200 psig. The carbon dioxide is transported in a super critical dense phase which reacts like a liquid. From the Synfuels Plant to Tioga, the pipe has a diameter of 14 inches with a wall thickness of 0.375 inches. From Tioga to the Canadian border, the pipe has a 12-inch diameter and a wall thickness of 0.375 inches. Mainline pipe was constructed using Grade X70 high frequency electric resistance welded steel pipe. Road and railroad crossings were constructed using Grade X65 SMLS pipe. Pipe for the Little Missouri and Lake Sakakawea was also Grade X65 SMLS pipe with Abrasion Resistant coating. All pipe and field joints were coated with a fusion-bonded epoxy to an average thickness of 16 mills. All field welds were radiographed. The gas stream transported contains a minimum of 94 percent carbon dioxide by volume, and contains less than two percent by volume of hydrogen sulfide, less than two percent by volume nitrogen and less than two percent by volume of methane. This pipeline and associated facilities were designed and constructed and are operated and maintained in accordance with the requirements of the U.S. Department of Transportation, Pipeline Safety Regulations Code of Federal Regulations Title 49, Part 195, Transportation of Hazardous Liquids by Pipeline.

The entire carbon dioxide pipeline system (including the SVPL pipeline in Saskatchewan) is operated remotely from Dakota's operations center at the Synfuels Plant by means of a microwave-based radio communication system.

In 2014, Dakota constructed a synthetic natural gas pipeline to transport synthetic natural gas from Dakota's Synfuels Plant plant site to the adjacent AVS plant site. Dakota owns, operates, and maintains this pipeline.

No Planned Removal or Construction. Dakota has no current plan to remove any of its existing transmission pipeline facilities from service or add facilities during the ten-year period. However, Dakota is evaluating any opportunities that could be available through Section 45Q of the Internal Revenue Code with respect to the balance of carbon dioxide produced by the Synfuels Plant which is not being sold to the Canadian oil fields.

## ENVIRONMENTAL

Dakota has acquired all of the environmental permits that are required for the construction and/or operation of the Synfuels Plant, including those for the 1,100 ton/day urea production facility that began operation in 2018.

The various active environmental permits issued by the Department of Environmental Quality include the air pollution control permits, deep well injection permits, solid waste disposal permits, hazardous waste storage permits, storm water pollution prevention permits and a Title V Permit to Operate.

Within this ten-year period, Dakota intends to expand the ash disposal landfill adjacent to the current site.

## PROJECTED DEMAND FOR SERVICES

In February 2018, Dakota completed a 1,100 ton/day urea production facility adjacent to the Synfuels Plant. A diesel exhaust fluid (**DEF**) production facility was constructed as part of this facility. Urea and demineralized water are used to manufacture DEF. Dakota began construction during the summer of 2014. This project also included the construction of additional rail load-out facilities. The feedstock for the urea plant includes both anhydrous ammonia and the relatively pure carbon dioxide produced by Dakota's ammonia plant. The urea and DEF produced by Dakota is delivered by both rail and truck. As part of the urea construction project, a carbon dioxide liquefaction and storage facility was also constructed. In June of 2020 Dakota began selling up to 100 Tons per day of food grade liquid carbon dioxide. Liquid CO<sub>2</sub> is being shipped via truck.

Dakota continues to research and develop potential product lines including, most recently argon extraction from the existing air separation unit. This project would be located within the current plant boundaries and the product would be shipped primarily via truck or rail.

Additionally, Dakota is considering a relatively small project on the existing site to upgrade a naphtha-type stream blended with the existing naphtha product to form a saleable chemical feedstock or gasoline additive. This product would be shipped via rail in place of the existing naphtha product.

**Dakota Gasification Company  
2020 North Dakota Ten Year Plan  
Service List - Notice of Filing**

North Dakota Aeronautics Commission  
P.O. Box 5020  
Bismarck, ND 58502-5020

North Dakota Office of Attorney General  
State Capitol Building Dept 125  
600 East Boulevard Avenue  
Bismarck, ND 58505

North Dakota Department of Agriculture  
State Capitol Building Dept 602  
600 East Boulevard Avenue  
Bismarck, ND 58505-0020

North Dakota Department of Health  
State Capitol Building 2nd Floor Judicial Wing  
600 East Boulevard Avenue  
Bismarck, ND 58505-0200

North Dakota Department of Human Services  
State Capitol Judicial Wing Dept 325  
600 East Boulevard Avenue  
Bismarck, ND 58505-0250

North Dakota Department of Labor and Human  
Rights  
600 East Boulevard Avenue Dept 406  
Bismarck, ND 58505-0340

North Dakota Department of Career &  
Technical Education  
State Capitol Building, 15th Floor Dept 270  
600 East Boulevard Avenue  
Bismarck, ND 58505-0610

North Dakota Department of Commerce  
1600 East Century Avenue, Suite 2  
PO Box 2057  
Bismarck, ND 58503

Energy Infrastructure and Impact Office  
North Dakota Department of Trust Lands  
1707 North 9th Street  
P.O. Box 5523  
Bismarck, ND 58506-5523

North Dakota Game & Fish Department  
100 North Bismarck Expressway  
Bismarck, ND 58501-5095

Job Service of North Dakota  
P.O. Box 5507  
Bismarck, ND 58506-5507

North Dakota Department of Trust Lands  
1707 North 9th Street  
PO Box 5523  
Bismarck, ND 58506-5523

North Dakota Parks & Recreation Department  
1600 East Century Avenue, Suite 3  
P.O. Box 5594  
Bismarck, ND 58505-5594

ND State Soil Conservation Committee  
c/o NDSU Extension Service  
2718 Gateway Avenue, Suite 304  
Bismarck, ND 58503

North Dakota State Water Commission  
900 East Boulevard Avenue Dept 770  
Bismarck, ND 58502-0850

United States Department of Defense  
1400 Defense Pentagon  
Washington, DC 20301-1400 United States

Fish and Wildlife Service  
North Dakota Field Office  
3425 Miriam Avenue  
Bismarck, ND 58501-7926

United States Army Corps of Engineers  
North Dakota Regulatory Office  
1513 South 12th Street  
Bismarck, ND 58504

Federal Aviation Administration  
United States Department of Transportation  
800 Independence Avenue SW  
Washington, DC 20591

North Dakota Transmission Authority  
c/o North Dakota Industrial Commission  
State Capitol, 14th Floor  
600 East Boulevard Avenue Dept. 405  
Bismarck, ND 58505-0840

North Dakota Industrial Commission  
State Capitol Building, 14th Floor Dept 405  
600 E Boulevard Avenue  
Bismarck, ND 58505-0840

Office of Governor  
State Capitol Building  
600 East Boulevard Avenue  
Bismarck, ND 58505-0100

North Dakota Department of Transportation  
608 East Boulevard Avenue  
Bismarck, ND 58505-0700

State Historical Society of North Dakota  
Heritage Center  
612 East Boulevard Avenue  
Bismarck, ND 58505-0830

Indian Affairs Commission  
1st Floor Judicial Wing Rm 117  
600 East Boulevard Avenue  
Bismarck, ND 58505-0300

North Dakota Pipeline Authority  
c/o North Dakota Industrial Commission  
State Capitol 14th Floor  
600 East Boulevard Avenue Dept. 405  
Bismarck, ND 58505-0840