



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

June 24, 2014

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 to synthetic natural gas (**SNG**). The Synfuels Plant is presently capable of producing up to 170 million cubic feet of SNG per day and up to 56 billion cubic feet per year. In addition to producing SNG, the Synfuels Plant presently produces and sells nine other products: carbon dioxide, anhydrous ammonia, tar oil, ammonium sulfate, crude cresylic acid, krypton-xenon, liquid nitrogen, naphtha and phenol.

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.

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 crushing and screening of approximately 32,000 tons of lignite per day into a top size of two-inch diameter pieces. During this "sizing" process, approximately 13,500 tons of lignite "fines" per day are screened out. These fines are particles of lignite too small to gasify. The fines are sold to Basin Electric for use in generating electricity. The other 18,300 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 with 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.

Dakota has no plans to remove any of its facilities from service 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 the two plant sites. The line was designed and constructed to be used as a joint facility for both AVS and 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 mostly Canadian natural gas to Ventura, Iowa, 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, now Cenovus Energy (**Cenovus**), 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. Cenovus initially contracted to purchase up to 95 MMSCF/D of carbon dioxide and deliveries commenced in 2001. In May 2005, Dakota signed a contract with Apache Canada Ltd of Weyburn, Saskatchewan to supply their Midale Unit with 25 MMSCF/D of carbon dioxide. Dakota and Cenovus entered into a second sales arrangement also starting in 2005 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. Dakota currently has under consideration the utilization of this pipeline to transport additional carbon dioxide to one or more customers in the Williston Basin oil producing area of western North Dakota. If one of these sales goes forward, either Dakota or the customer would need to build a lateral pipeline to connect with Dakota's carbon dioxide pipeline. At full production, the Synfuels Plant produces 240 MMSCF/D of carbon dioxide. The pipeline, with sufficient compression, is capable of transporting the entire 240 MMSCF/D output to Tioga and up to 165 MMSCF/D from Tioga to the Canadian border.

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 2700 psig to ensure delivery to the oil field in Weyburn at a minimum of 2200 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% carbon dioxide by volume, and contains less than 2% by volume of hydrogen sulfide (H₂S), less than 2% by volume nitrogen and less than 2% 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 (CFR) 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.

ENVIRONMENTAL

Dakota has acquired all of the environmental permits that are required for the construction and/or operation of the Synfuels Plant. Construction permits applied for and issued during the last twelve month period include Permits to Construct (**PTC**) from the North Dakota Department of Health (**Health Department**) for an 1100 ton/day urea plant; the permit also includes a diesel exhaust fluid manufacturing unit and a liquid CO₂ compression facility. Dakota has also received a PTC for a modification to the Synfuels Plant's superheaters in order to allow them to burn both gas and liquid fuels.

The various active environmental permits issued by the Health Department include the air pollution control permits, deepwell injection permits, solid waste disposal permits, hazardous waste storage permits and a Title V Permit to Operate.

PROJECTED DEMAND FOR SERVICES

Dakota has completed construction of its Clean Cooling Water Project. This project eliminated the use of dirty cooling water in the plant's cooling water exchangers. A new, closed-loop clean water system replaced the dirty water in the plant exchangers. The heat accumulated in the clean cooling water is removed in 14 plate heat exchangers (**PHE**). The heat will be transferred to the dirty cooling water where it will be rejected in the existing cooling tower. This system should allow the plant to operate 2-3 years without having to take downtime for a scheduled maintenance turnaround to clean the heat exchangers. The original dirty cooling water system required the Synfuels Plant to take a yearly turnaround to clean sediment out of the plant cooling water exchangers.

Dakota finalized construction of a second 30,000 ton ammonia storage tank. This tank provides more product availability for the agricultural customers when there is a large surge in demand during the spring and fall application seasons.

Dakota received a Siting Permit from the Public Service Commission for an SNG pipeline between the Synfuels Plant and AVS so as to provide AVS with SNG for start-up in lieu of the fuel oil that AVS has historically used for start-up, which will result in significantly reduced particulate emissions during the start-up process. This pipeline was completed during the AVS spring 2014 outage.

In April 2014, Dakota received a PTC from the Health Department to build a 1100 ton per day urea production facility. A diesel exhaust fluid (**DEF**) production facility will be constructed as part of this facility. Urea and demineralized water are used to manufacture DEF. Dakota expects to commence construction during the summer of 2014. This project will also include the construction of additional rail load-out facilities and rail tracks for storing additional rail cars. The feedstock for the urea plant will include both anhydrous ammonia and relatively pure carbon dioxide produced by Dakota's ammonia plant. Dakota anticipates it will discontinue transporting anhydrous ammonia by rail when the urea plant is completed.

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