

Coal Creek Station

An Energy Park



Photo taken summer 2010 looking southwest

- The **Falkirk Mine** supplies lignite coal to Coal Creek Station.
- **Coal Creek Station** uses lignite to generate electricity—which is sent via a direct current transmission line to serve our customers in Minnesota and Wisconsin. Water from the Missouri River is also used in the process. In late 2009, Coal Creek Station started processing and using dried and refined lignite—called DryFine™—that will increase efficiencies and reduce emissions.
- Great River Energy sends steam to **Blue Flint Ethanol** to use in the production of ethanol, corn oil and distillers grains. **Coal Creek Drying & Storage** is located adjacent to Blue Flint Ethanol and dries corn from the fall harvest.
- **Headwaters Resources** markets fly ash from Coal Creek Station. The primary use of fly ash is to replace a portion of cement when making concrete.
- Great River Energy will market a dried and refined lignite product called DryFine that will first be used by **Spiritwood Station**, a combined heat and power plant under construction near Jamestown, N. Dak. Spiritwood Station is scheduled to be operational late fall 2014.
- The **Dakota Missouri Valley Western Railroad** and **U.S. Highway 83**—a four-lane highway located three miles from the plant—are used to transport products to and from the energy park.



Coal Creek Station Plant Site

- A. **Coal Creek Station:** Unit 1 is on the right (or west) and Unit 2 is on the left (or east).
- B. **Converter Station:** This is where electricity is converted from alternating current to direct current & sent on a high voltage direct current transmission line to Minnesota.
- C. **Cooling Towers:** Used as part of the process to provide cooling water to certain plant components.
- D. **DryFining:** Improves the quality of lignite. Major retrofit of the power plant completed in 2009.
- E. **Emissions Controls:** Scrubber building where sulfur dioxide is removed from the flue gas stream.
- F. **Coal Conveyor Belt:** Coal is transported via coal conveyor belts from the Falkirk Mine to the power plant.
- G. **Coal Storage:** Coal Creek Station has back-up storage supplies, if needed.
- H. **Blue Flint Ethanol:** A 60 million gallon per year ethanol plant that uses process and waste steam from Coal Creek Station.
- I. **Coal load out for Spiritwood Station:** Coal Creek Station will process and ship about 610,000 tons of DryFine™ to Spiritwood Station annually.
- J. **Ponds:** Use to store “scrubber sludge” and some fly ash that is not marketable.
- K. **Water Storage:** Water is stored here after being piped in from the Missouri River, seven miles south.
- L. **Fly Ash Dome:** Fly ash is stored in a dome in the winter, when construction season is slow, in order to preserve its marketability.

The Electricity Generation Process

“The Simple Version”



A look inside the boiler at Coal Creek Station.

Lignite is transported to the power plant via a conveyor belt from the Falkirk Mine. Water is piped from the Missouri River, seven miles south, to a storage pond on the northwest part of the plant site. The lignite is refined, and then sent to the pulverizers where it is crushed to the consistency of powder. From there it is blown into the boiler where it instantly ignites at temperatures of 2,000+ degrees Fahrenheit. The boiler is made up of thick steam tubes that contain water. The water is heated as it flows through the tubes. At the top of the boiler, it enters a steam drum where it is pressurized and turns to steam. From there, the steam is superheated—to 1,005 degrees and at 2,620 pounds per square inch—and sent to the turbines. The high pressure steam drives the turbines to power the generators.

Coal Creek Station Facts

Location: Underwood, N.D.

Generating capability: 1,129 megawatts

Start of operation: Unit 1—1979; Unit 2—1980

Plant site: 3,370 acres

Lignite consumption: Up to 950 tons per hour; 7.5 million tons per year

Water source: Missouri River

Water consumption: Up to 14,300 gallons per minute; 15,000 acre feet per year maximum

Steam generators (boilers): Produce 3.7 million pounds of steam per hour

Furnace size: 96' x 43' x 205'

Height of steam generator building: 295 feet

Chimney height: 650 feet

Turbine/generators: General Electric tandem compound reheat turbines with double-flow low-pressure sections; 18 stages; 3,600 rpm. Generator is 22,000 volts. Stator and rotor weigh 500 tons.

Electricity: Delivered via a high voltage direct current transmission line (436 miles).

Cooling towers: Three cooling towers, each 42 feet high and 225 feet in diameter, equipped with eight fans with 28-foot diameter.

Electrostatic precipitators: Remove more than 99.5 percent of fly ash

Flue gas desulphurization (scrubbers): Wet lime countercurrent spray towers remove 95 percent of SO₂ from 75 percent of the gas.

DryFining™ system: In 2009, Coal Creek Station installed a coal refining system that reduces the moisture and refines lignite using waste heat from the plant. As a result of the moisture reduction and refining, efficiency and emissions performance are improved.

Architect/engineer: Black & Veatch



Welcome!

We are eager to host your tour of Coal Creek Station on your visit to North Dakota. Our experienced tour guides will take you through the plant, and provide information that will give you a better understanding on how your electricity is generated. Thank you for taking the time to visit.

John Weeda, director, North Dakota generation

Tour stops—What you will see

First floor:

- Maintenance shop
- Pulverizers
- Bottom of boiler

Third Floor:

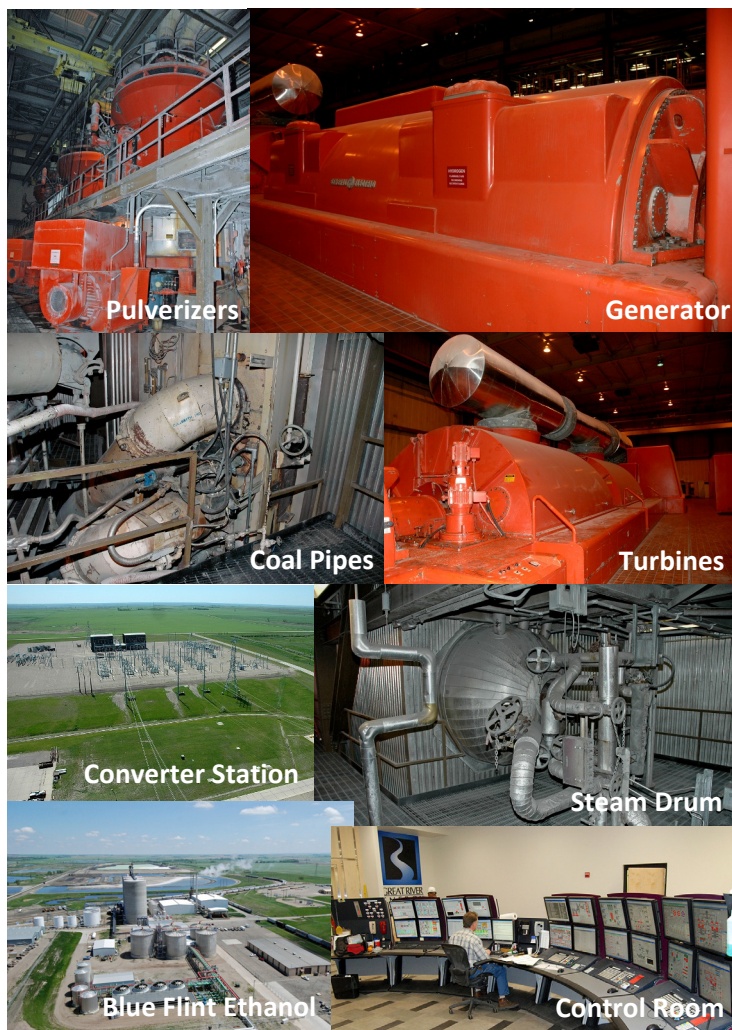
- Control room
- Turbines / generators
- Steam pipe to Blue Flint Ethanol

Eighth Floor:

- Boiler
- Coal piping
- Coal bunkers

21st Floor:

- Steam drum
- Top of boiler
- Steam pipes (superheat & reheat)
- Outside view—cooling towers, river water storage pond, coal conveyors, fly ash storage & loadout, emission control equipment, stacks, waste disposal ponds



Contact for information: If you would like more information after you get home, please contact:

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