

Cardinal Plant



How We Generate Electricity

Coal arrives at the station by truck, rail or barge and is stored in the coal yard. Conveyor belts carry the coal into the plant where pulverizers grind the coal into a fine, talcum powder-like consistency. The powdered coal is injected into the steam generators where it burns at high temperatures, turning water that circulates there into steam.

The steam is then directed into the turbines, where it turns blades, much like wind turning a windmill. The spinning turbine drives a generator that produces electricity. Exhaust steam from the turbine is condensed in the condenser and returned to the steam generator to start the process again.

Electricity is generated the instant a customer needs it. Cardinal's generators produce electricity at 23,000 volts to 25,000 volts. Transformers outside the plant step up the voltage to 138,000 volts and 345,000 volts so that it can be transmitted efficiently to customers' homes and businesses.

Cardinal Station occupies a unique place in the history of electric power generation. It represents the first-ever alliance of an investor-owned electric utility – American Electric Power and a member-owned electric utility, Buckeye Power, Inc., to construct and operate a power station to serve both their consumers. Buckeye Power is an organization of 25 rural electric cooperatives.

AEP owns Cardinal Unit 1 and placed it in commercial operations in late 1967. Unit 2 was placed in commercial operation later that same year and is owned by Buckeye Power. Each unit has generating capacity of 600 megawatts (MW).

Unit 3, also owned by Buckeye Power, began operation in 1977 and has a generating capacity of 630 MW. AEP operates the facility on behalf of all owners.

Cardinal Plant is named after the cardinal, the state bird of Ohio.

Quick Facts About Cardinal Station

- Location: Along the Ohio River just south of Brilliant, Ohio
- Capacity: 1,830 MW total
- Stack height: Unit 1 & 2- 1,000 feet
- Unit 3 cooling tower dimensions: Height- 423 feet, diameter at base – 384 feet
- Unit 3 cooling tower capacity: 16.8 million gallons per hour
- Average annual coal use: 5.2 million tons
- Coal yard storage capacity: 1.3 million tons
- Average daily coal use: 15,800 tons
- Approved employee complement: 310

American Electric Power owns nearly 38,000 megawatts of generating capacity in the United States and is the nation's largest electricity generator. AEP is also one of the largest electric utilities in the United States, with more than 5 million customers linked to AEP's 11-state electricity transmission and distribution grid. The company is based in Columbus, Ohio.



Buckeye Power is a member-owned generation and transmission cooperative supplying power and energy to the electric distribution cooperatives in Ohio. The cooperatives' certified service territory covers nearly 40 percent of the land area in the state and encompasses 77 of Ohio's 88 counties. The companies serve more than 360,000 homes, farms, businesses and industries.



Buckeye Power, Inc.
Your Touchstone Energy® Cooperative

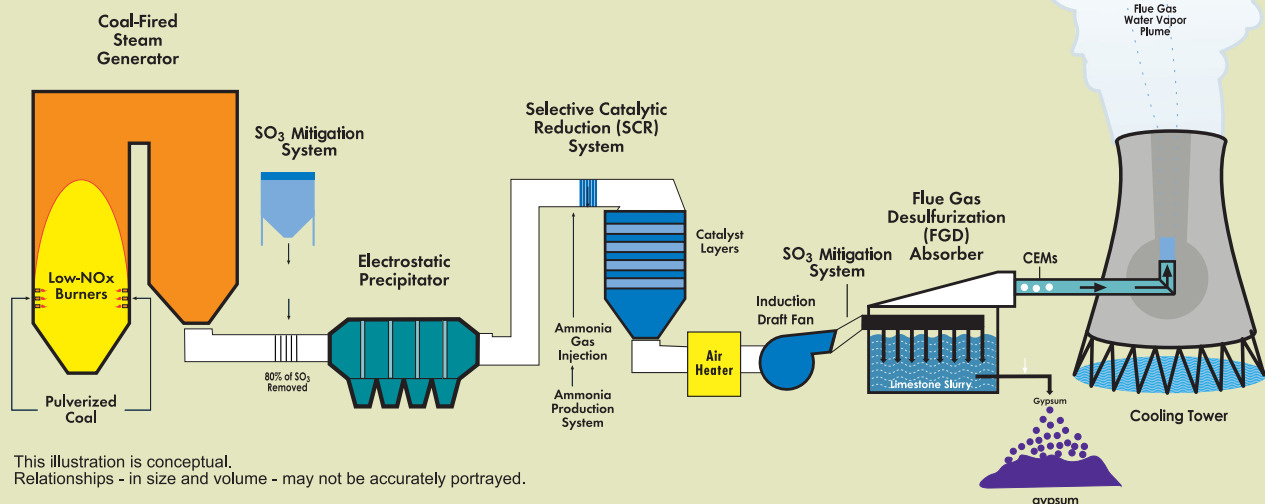
Protecting The Environment

Cardinal Plant employees take great pride in providing electricity while protecting air and water quality and recycling other materials. The plant provides power at prices to customers below the national average. Plant workers maintain an outstanding record of public and work safety.

- Low-NOx burners reduce nitrogen oxide (NOx) emissions by up to 60 percent. Low- NOx burners control the way coal is burned to reduce the formation of NOx, a precursor to ozone.
- Selective catalytic reduction (SCR) systems operate on all three units to reduce NOx by up to 90 percent. Ammonia injected into the units' exhaust gases causes a chemical reaction as the gases pass over a catalyst, converting the NOx to harmless nitrogen and water. The ammonia is manufactured on site as needed through a unique process that converts urea – which is commonly used as fertilizer – into ammonia.
- Electrostatic precipitators remove more than 99 percent of all fly ash particles produced by coal combustion. In precipitators, fly ash from burning coal passes through electrically-charged plates, which pull the ash particles out of the exhaust gas stream.
- The ash can be marketed for use in land reclamation, in concrete and lightweight aggregate and in the production of paints, plastics and other products.
- Effective in early 2012, flue gas desulfurization (FGD) or scrubbers are operational on all three units. FGD systems use a limestone-water slurry to remove more than 95 percent of the sulfur dioxide (SO₂) that results from coal combustion. The resulting product is gypsum, which is used in the manufacture of dry wall or can be safely managed in a landfill.

- Cardinal Station uses an automated system to continuously monitor stack gas emissions. This highly accurate system helps ensure compliance with clean air requirements for SO₂, NOx and carbon dioxide emissions and opacity.
- The Unit 3 cooling tower provides the plant with a closed cycle cooling system. The plant uses water from the Ohio River to cool the steam back into water so that it can be reused in the power generation process. The closed system also means that heated water is not discharged back into the river where it could disrupt the natural aquatic life, and minimizes the total amount of water used.
- Effective in early 2012, the exhaust gases from Unit 3 will be discharged through the cooling tower rather than through a separate stack. This technology has been widely used in Europe over the past 20 years, but this is its first installation in the U.S.
- Cardinal Station supports enhanced wildlife habitat certified by the Wildlife Habitat Council.
- Cardinal Operating Company is an active member of the Three Rivers Response Council. Through cooperative efforts as a mutual aid organization, members have strengthened abilities to prevent, prepare for and respond to oil and chemical spills along the navigable waters of the Allegheny, Monongahela and Ohio rivers.

Unit 3 Cardinal Station Emission Control Systems



This illustration is conceptual. Relationships - in size and volume - may not be accurately portrayed.