

How Electricity is Produced at Buckeye Power's Coal-fired Cardinal Unit 3

Buckeye Power Inc.'s Cardinal Station Unit 3 burns coal to produce electricity. The plant, which incorporates state-of-the-art technology, is located near Brilliant, Ohio, on the Ohio River.

While the many plant operating systems are complex in design, the basic concepts of power generation are relatively simple:

Pulverized coal is blown into the boiler with a stream of hot air where it ignites and burns. Highly purified water is pumped into the boiler and heated as it flows through the tubes lining the inside of the boiler.

This high-quality water flashes into steam. The force of the high-energy steam contacts fan-like blades inside the turbine, which turn a shaft coupled to the generator. Steam enters the turbine's high-pressure section at 1,000 degrees Fahrenheit and at a pressure of 3,600 pounds per square inch.

Electricity is produced by the motion between the magnetic field on the generator's rotating shaft and the windings on the stationary stator. Electricity is produced at 26,000 volts and then stepped up through a transformer to 345,000 volts for efficient transmission over high-voltage power lines.

Low-pressure steam leaves the low-pressure turbine section and enters the condenser. Steam inside the condenser is transformed back into boiler feed water as it passes over a network of 31,000 three-quarter-inch diameter tubes. The vapor's heat is transferred to the water circulating inside the condenser tubes.

Circulating water, now warm from the heat transfer, is pumped to a cooling tower where it drops through a gridwork that breaks it into a mist.

The cooling tower's hyperbolic shape creates a natural draft for the air entering through the base. As the warmer water tumbles through the tower it is cooled by the rising air and is then pumped back to the condenser.

Buckeye's power plant must produce electricity in an environmentally sensitive climate characterized by strict and enforceable performance standards. Buckeye has invested more than \$1 billion in environmental protection equipments for its two units at Cardinal.

Among these controls are electrostatic precipitators, selective catalytic reduction (SCR) systems and flue gas desulfurization (FGD).

