

We Energies' generating system



COAL

Pleasant Prairie Power Plant

Pleasant Prairie Power Plant (P4) is the largest generating plant in Wisconsin, designed specifically to burn low-sulfur, Western coal. It uses towers to cool the condenser water that converts turbine exhaust steam back to water for reuse. P4 is the first power plant in Wisconsin to be retrofitted with an advanced Air Quality Control System (AQCS) to reduce nitrogen oxide and sulfur dioxide emissions.



Location:

This plant occupies more than 425 acres of land in the village of Pleasant Prairie, Wis., five miles west of Lake Michigan.

Type of Plant:

Coal-based. Typically operates 24 hours a day as a base-load plant.

Initial Cost:

\$753 million

Units:

2 steam

Year in Service:

Unit 1: 1980

Unit 2: 1985

Net Generating Capacity:

605 megawatts per unit

Total Net Generating Capacity:

1,210 megawatts

Pleasant Prairie Power Plant

Contribution to Total System Electric

Energy Production Capability:

33 percent

Voltage:

Generator: 24,000
Step Up Transformer: 345,000

Fuel:

Low-sulfur pulverized coal; fuel oil or natural gas for boiler start-up. Re-burning carbon rich fly ash and bottom ash from other company plants and landfill storage areas.

Coal Handling:

Transportation: Unit train (137 coal cars per train)
Source: Wyoming Powder River Basin
Storage: 1.4 million-ton capacity coal pile;
1,600 tons of coal in each of 10 silos within plant.

Preparation: 10 pulverizers crush coal at 80 tons per hour each.

Average Coal Use:

13,000-13,600 tons daily

Air Quality Control System (AQCS):

Retrofit of an advanced AQCS was installed for \$325 million. The AQCS consists of SCR and WFGD emission control components as noted below.

Selective Catalytic Reduction (SCR):

SCR emission controls were added to both generating units (Unit 2 in 2003 and Unit 1 in 2006) to reduce emissions of nitrogen oxides (NO_x) by 85 to 90 percent.

Wet Flue Gas Desulfurization (WFGD):

WFGD emission controls were added to both generating units (Unit 1 in 2006 and Unit 2 in 2007) and have reduced sulfur dioxide (SO₂) emissions by 90 percent.

Boilers:

One per turbine generator.

Type: Suspension (suspended by 130-ton "I" beams)
Height: 20 stories
Furnace temperature: 2,000 degrees Fahrenheit
Steam temperature: 955 degrees Fahrenheit
Steam pressure: 1,990 pounds per square inch

Ash Handling:

More than 99.7 percent of fly ash is removed by electrostatic precipitators. More than four tons of bottom ash are removed per hour by a hydraulic removal system. All of the ash produced is recycled. The fly ash is sold to produce high-quality concrete, and the bottom ash is used in construction fill applications.

Chimney:

One 450-ft chimney for both units that contains separate flues for each unit. The chimney discharges a water vapor plume as a result of the new emission reduction controls.

Cooling System:

200,000 gallons of water, pumped continuously between turbine generator condensers and cooling towers, are used every minute for each unit to convert the exhaust steam from the turbine back into water for reuse.

The circular, mechanical draft towers, 300 feet in diameter and 75 ft. tall (one per unit), cool the water used for this conversion. This is accomplished by thirteen 200-horsepower fans drawing air through the sides of the towers to cool the water for reuse in the condensers. Water from Lake Michigan is used to replace the 3,000 to 4,000 gallons of water lost every minute through evaporation from each tower during the cooling process. Water vapor from this evaporative cooling can be seen rising from the cooling towers.