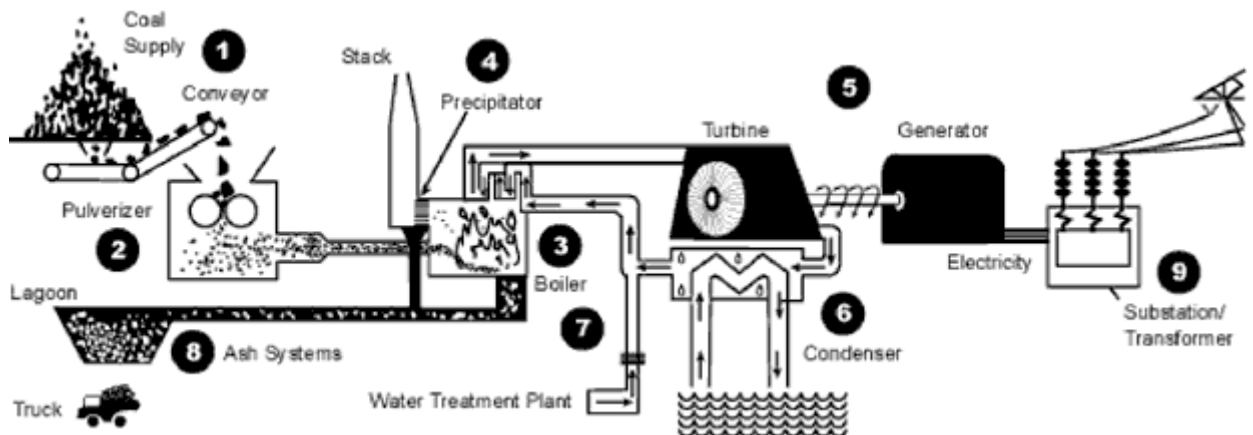


# How a Coal-fired Power Plant works



## 1. Coal Supply

- Coal from the coal mine is delivered to the coal hopper, where it is crushed to less than 5 cm in size.
- The coal is processed and delivered by a conveyor belt to the generating plant.

## 2. Pulverizer

- The coal is then pulverized, or crushed, to a fine powder, mixed with air and blown into the boiler for combustion.

## 3. Boiler

- The coal / air mixture ignites instantly in the boiler.
- Thousands of m<sup>3</sup> of demineralized water are pumped through tubes inside the boiler.
- Intense heat from the burning coal turns the demineralized water in the boiler tubes into steam, which spins the turbine to create electricity.

## 4. Precipitator & Flue Gas Stack

- Burning coal produces carbon dioxide (CO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>).
- These flue gases exit boiler via flue gas stack.
- Bottom ash, which is made of coarse fragments that fall to the bottom of the boiler, is removed.
- Fly ash, which is very light, exits the boiler along with the flue gases.

- An electrostatic precipitator removes more than 99.5% of fly ash before the flue gases are dispersed into the atmosphere.

## 5. Steam Turbine & Generator

- Demineralized water in the boiler tubes picks up heat from hot gases and turns into steam.
- The high-pressure steam from the boiler passes into the steam turbine.
- Once the steam hits the steam turbine blades, it causes the turbine to spin rapidly.
- The spinning steam turbine drives electric generator, which is producing electric current.

## 6. Condensers and the cooling water system

- Cooling water is drawn into the plant and circulated through condensers, which cools steam discharged from the turbine.
- Steam from the turbine also passes through the condensers in separate pipes from cooling water.
- The cold water is warmed by the steam, which condenses back into pure water and circulates back to the boiler to begin the process of generating electricity again.
- Cooling water, now warm from the heat exchange in the condensers, is released from the plant.

## 7. Water treatment plant: water purification

- To reduce corrosion, water must be purified for use in the boiler tubes.
- Other wastewater systems within the plant collect water used to clean pipes and other equipment, and sludge from the water purification process and other processes.
- Waste water is pumped out of the plant and into the holding ponds.

## 8. Precipitator, Ash systems

- Ash that builds up on the precipitator's plates is vibrated off and collected in large hoppers or bins.
- Fly ash and bottom ash are removed from the plants and hauled to disposal sites or ash lagoons.

- Depending on the market demand, fly ash produced from the plant may be sold to the cement industry for construction.

## **9. Substation, transformer, transmission lines**

- Once the electricity is generated, transformers increase the voltage so it can be carried across the transmission lines.
- Once electricity is delivered to substations in cities and towns, the voltage flowing into the distribution lines is reduced, and then reduced again to distribute electricity to customers.