

*INSIDE THE*  
**NAVAJO  
GENERATING  
STATION**



# "TOUR THE POWER PLANT"

Navajo Generating Station includes three, 750 megawatt (MW) coal-fired generating units with a total generating capability of 2,250 MW.

The major components of these generating units are:

- **Boiler**, a combination furnace/steam producer
- **Turbine**, a steam-driven rotary engine
- **Generator**, a rotating mechanical device that produces electricity

Coal is burned to heat water in the boiler, until it produces steam. The steam moves through pipes to a turbine, causing it to rotate. That in turn drives the generator, thereby producing electricity.

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The process begins with coal, the fuel that keeps the plant running.

Coal is brought to NGS by rail from the Kayenta mine about 78 miles away, and stored in a **coal yard ①**. The coal then is moved by **conveyors ②** to the storage **silos ③**.

From the silos, coal moves through a series of steps that reduce it in size and texture. In the final step, seven **pulverizers ④** use large metal rolls to grind the coal into a fine powder so that it will create a more intense heat when burned.

**Primary air fans ⑤** blow coal powder through a series of pipes and nozzles into the **boiler ⑥**.

In the boiler, coal powder is mixed with air to allow combustion and is burned. This air is supplied by **forced draft fans ⑦** and is heated in the **air preheater ⑧** prior to entering the boiler.

The air preheater is an efficiency device that recovers heat from the exhaust gas to heat the incoming boiler air.

**Induced draft fans ⑨** draw exhaust gases out of the boiler, sending it through **precipitators ⑩** and **scrubbers ⑪**, which improve air quality by removing pollutants. The scrubbing process uses limestone to remove sulfur dioxide from the gases, resulting in cleaner air for the vicinity around the power plant.

Precipitators use 50 kilovolts of direct current to collect **fly ash ⑫**, a byproduct of the combustion process from the boilers exhaust gas. Fly ash is an extremely fine powder similar in texture to talcum powder. A portion is placed into 50-ton [44.64-metric ton] dump trucks for disposal, with the remainder sold to concrete companies.

The **bottom ash hopper ⑬**, a water-filled trough in the bottom of the boiler, catches bottom ash from the combustion process. An ash removal system keeps the hopper clean.

The water and steam cycle begins at the **hotwell ⑭**. Water is pumped through **demineralizer spheres ⑮**, where purification takes place. Each demineralizer sphere is a metal ball full of resin beads that help capture impurities.

The **boiler feed booster pumps ⑯** then boost water pressure up to 500 pounds [228.6 kg] before sending it to the **boiler feed pumps ⑰**, which provide water to the boiler. During the water cycle, water is preheated in a series of **feedwater heaters ⑱**.

An **auxiliary turbine ⑲** – actually a miniature steam-driven turbine – drives the boiler feed pumps.

Water enters the boiler at the **economizer** section ⑳ and circulates through the boiler, where it is heated until it becomes steam.

Steam exits the **superheater ㉑** section at about 1,000° F [538° C] and 3,500 lbs. [24.13 MPa] pressure, and then enters the **main turbine ㉒**, driving the huge shaft that drives the generator.

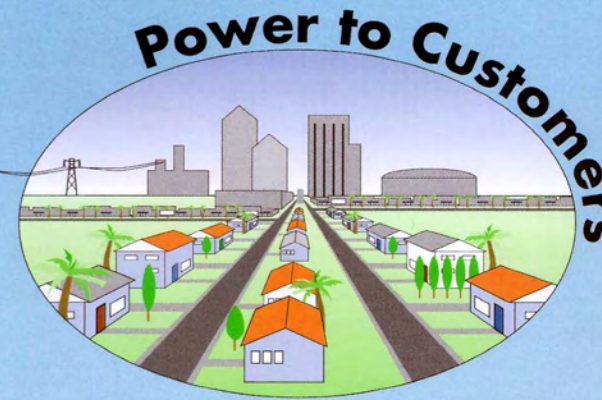
The **generator ㉓** – linked to the turbine – is a rotating electromagnet surrounded by a large coil of wires, which produces electricity.

When steam leaves the turbine, it moves into the **condenser ㉔**, where it is cooled by water from the **cooling towers ㉕**, condensed to water and collected in the hotwell, beginning the cycle all over again.

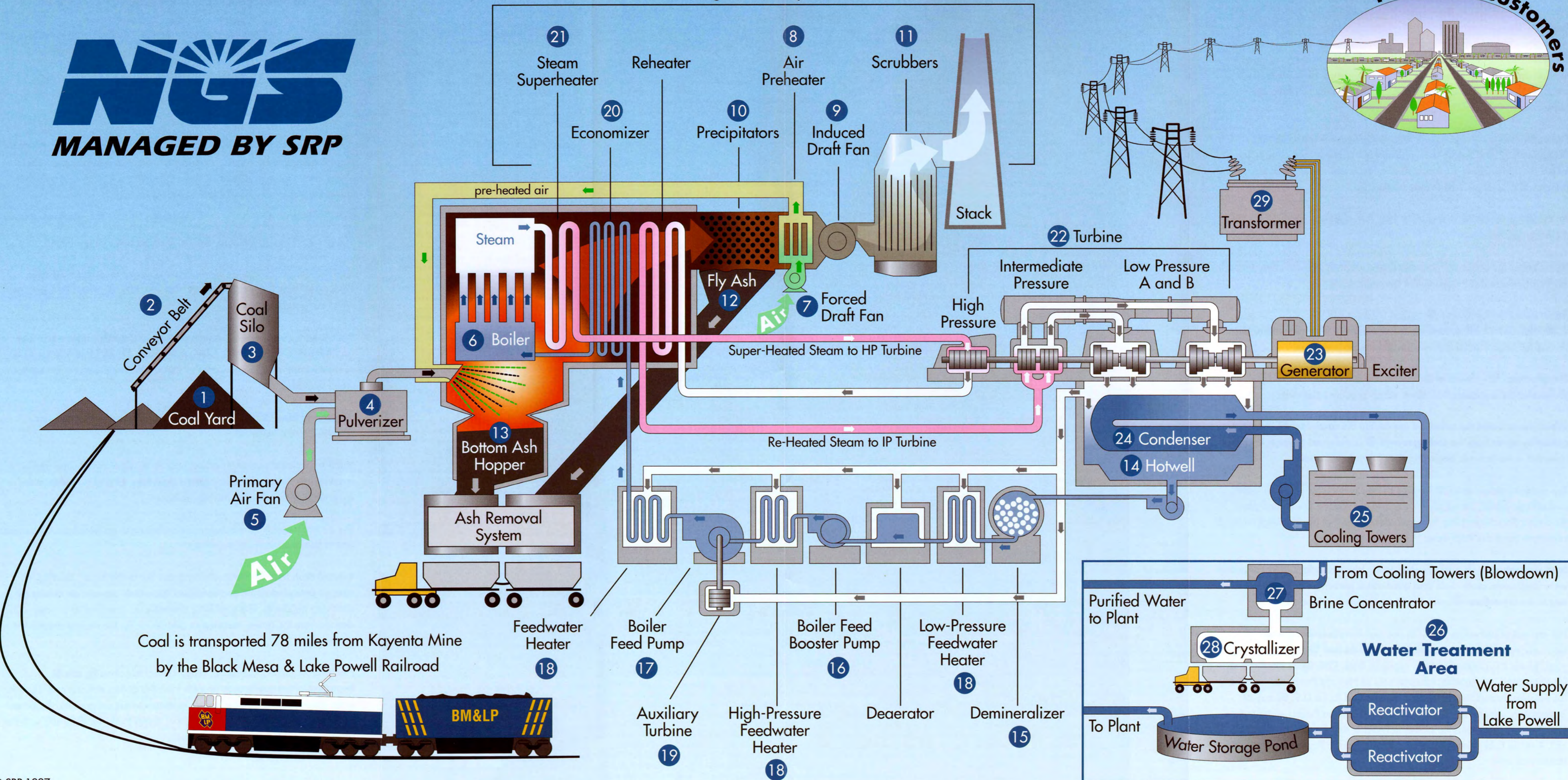
The **water treatment area ㉖** consists of reactivators, for purifying water, and storage ponds, for supplying water to the cooling towers and plant processes. Reactivators are huge water softeners that use chemical reaction to remove hardness from water.

**Brine concentrators ㉗** purify cooling tower blowdown for use in the boiler water and steam cycle. Salts and other solids generated by this process are sent to the **crystallizer ㉘**, which compacts them for disposal.

The process of delivering power to our customers culminates when electricity moves from the generator and **transformer ㉙** to the transmission yard, where it is diverted to three separate lines. One sends electricity to Las Vegas and Los Angeles, for customers of Nevada Power Co. and the Los Angeles Department of Water & Power, and to the U.S. Bureau of Reclamation, which uses it to power Central Arizona Project water pumps. The other two lines send the power to Phoenix and Tucson, for customers of SRP, Arizona Public Service Co. and Tucson Electric Power Co. SRP is the station manager.



## Regeneration System



Coal is transported 78 miles from Kayenta Mine by the Black Mesa & Lake Powell Railroad

