Welcome to

Kendal Power Station

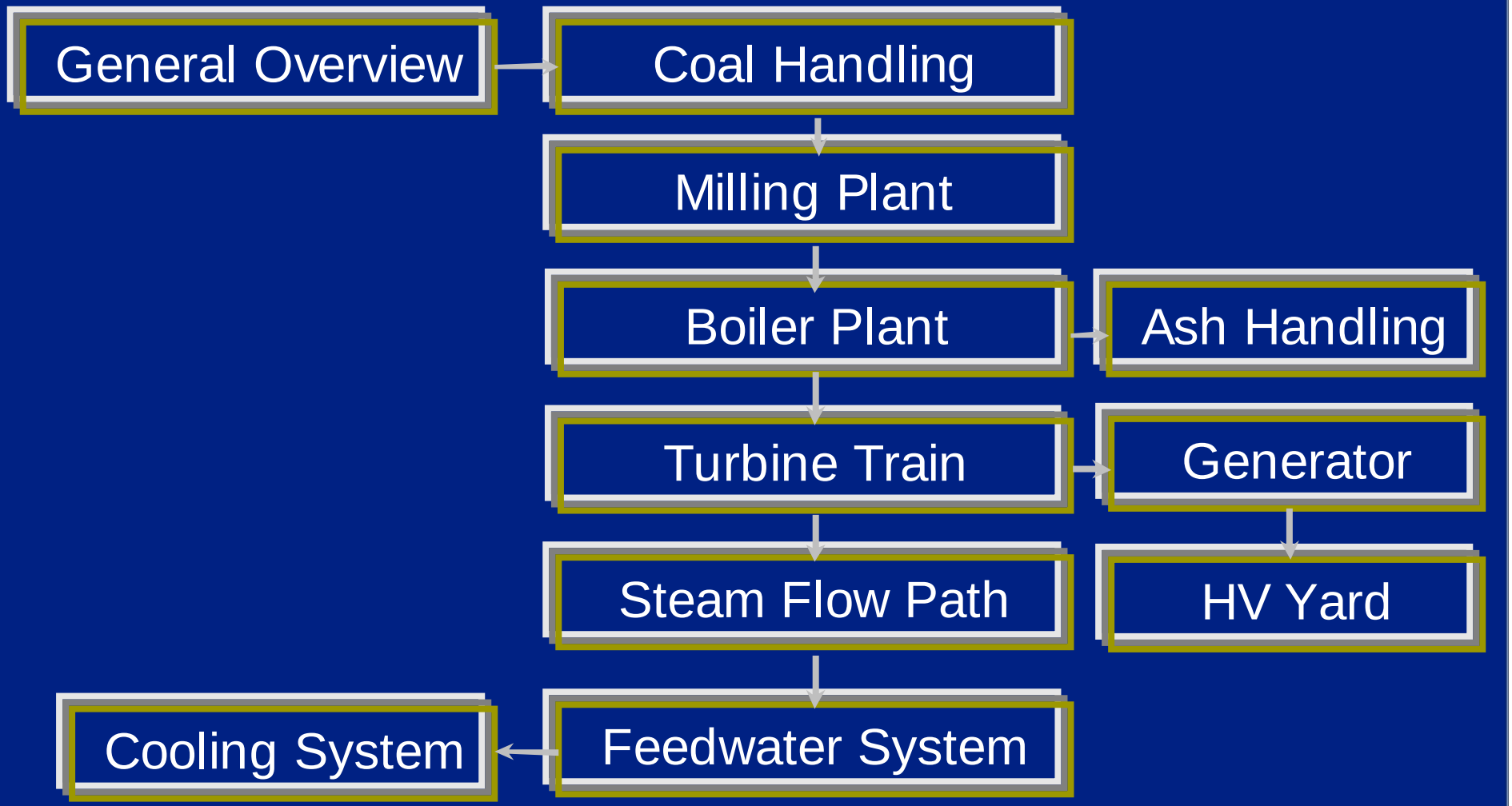


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Technical Overview of the power station



Scope



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Kendal Overview

- World's largest indirect dry-cooled power station
- Six 686 MW generation units (729 MW max)
- Construction from 1982 to 1993
- Located 100 km from Johannesburg, RSA
- 95% less water consumption than wet-cooled stations
- Overall cycle efficiency: 35.5%



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Coal Characteristics

- Calorific Value (CV):
  17.5 to 21 MJ/kg
- Abrasiveness: 300 mg Fe
- Volatile content: 21.5 %
- Ash content: 32 to 40%
- Inherent moisture: 3.3%





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Coal Handling: Stockyard

- Coal supplied by Khutala Colliery and Imports
- Underground and open pit
- Delivery up to 75 000 tons/day (16 million tons/year)
- Average stock: 1.7 million tons (40 days)
- Seasonal pile capacity: 3 million tons
- Two Stacker(3’800t/h)/Reclaimers (2’800t/h) used for coal storage and retrieval





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Coal Handling: Terrace Coal

- 20 terrace coal conveyors
- Three 1000 ton terrace bins
- 1050 tons/hour capacity dual incline conveyors for every two units
- Up to 55 000 tons handled per day
- Seven conveyor belts per unit
- Five 1000 ton mill bunkers per unit



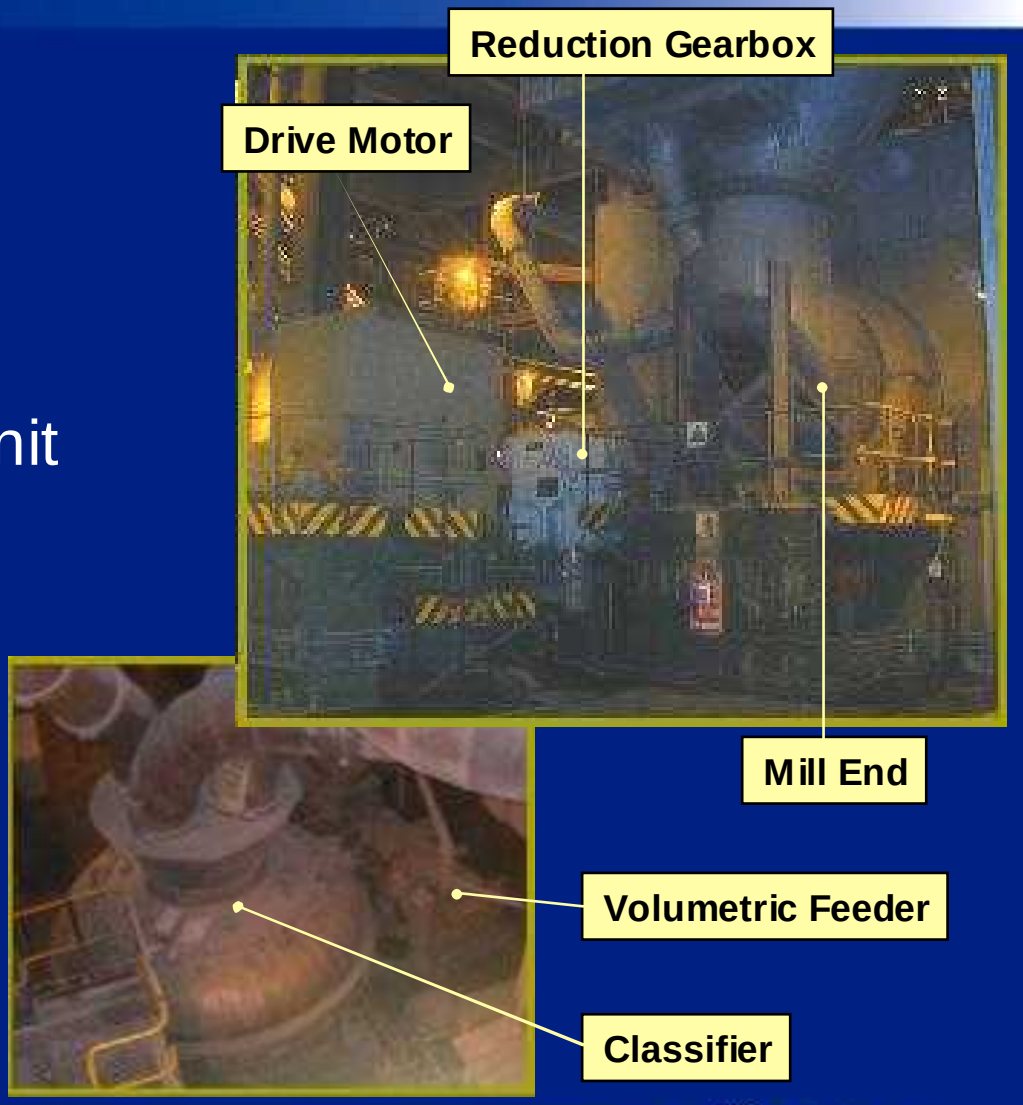


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Milling Plant

- Kennedy Van Saun: Double-ended tube ball mills
- Five 1.6 MW mills per unit
- Mill rated output:

  103 tons/hour
- Two 100 % volumetric feeders per mill
- Two cyclone classifiers per mill



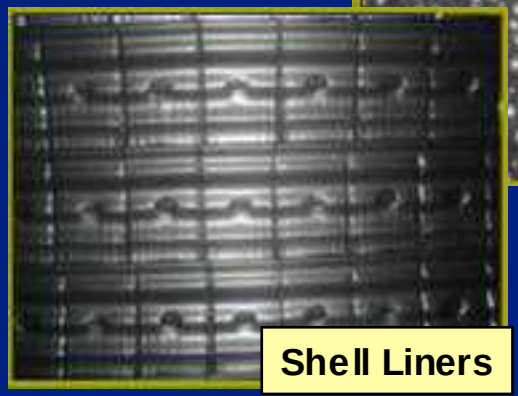
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Milling Plant

- Coal milled from 35 mm to 300 µm
- Mill liners protect the shell and assist with the grinding process
- Each mill is charged with 83 tons of steel balls:
  Initially 50 mm diameter
- Three mills:
  40 to 100 % unit load
- Four mills:
  60 to 108 % unit load
- Unique on-load half mill (single ended) firing conversion capability







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Coal quality impact

- Impact of coal quality on the boilers: erosion and slagging.





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Coal quality impact

- Impact of coal quality on the boilers: erosion and slagging.





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Coal quality impact

- Impact of coal quality on the boilers: erosion and slagging.





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Coal quality impact

- Impact of coal quality on the boilers: erosion and slagging.

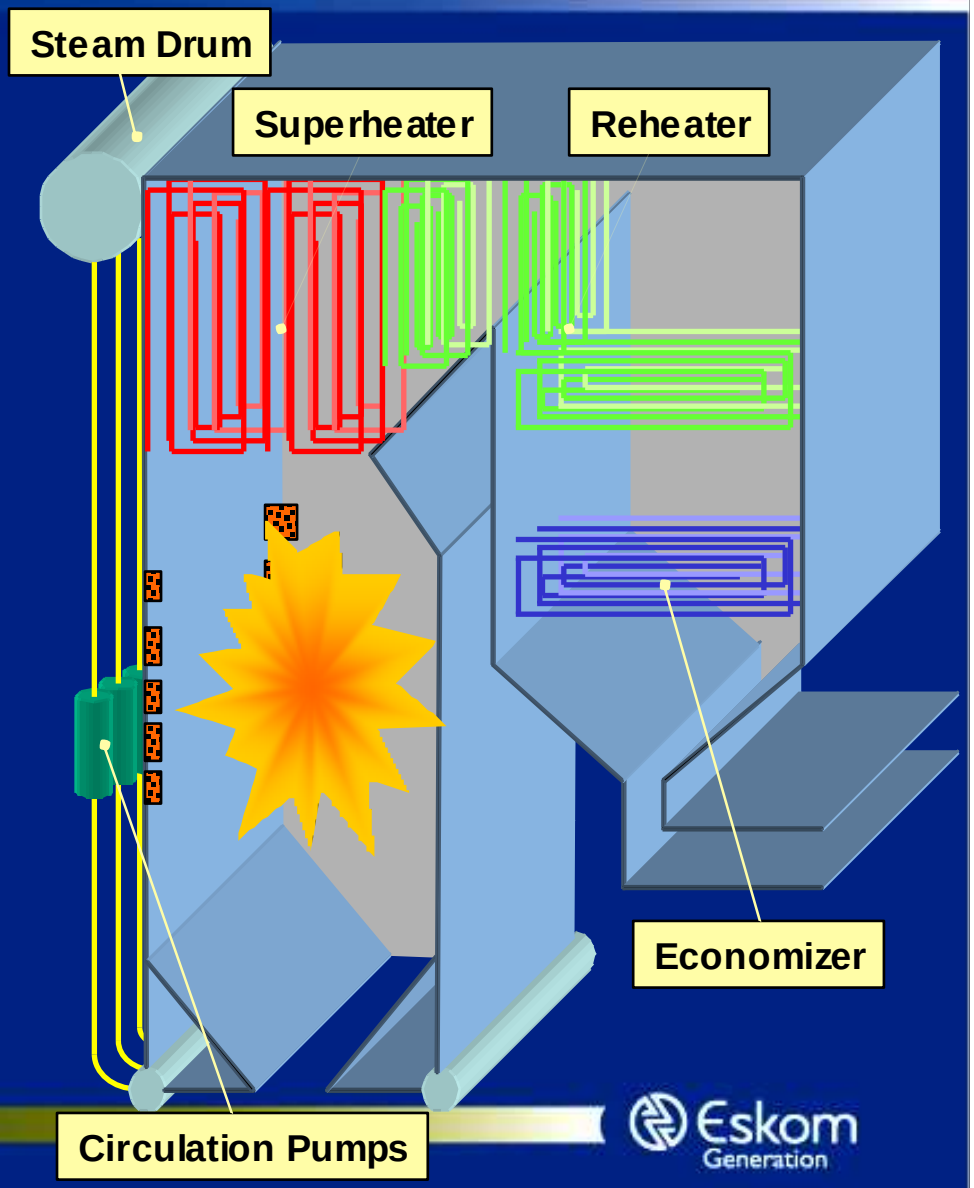




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Boiler Plant

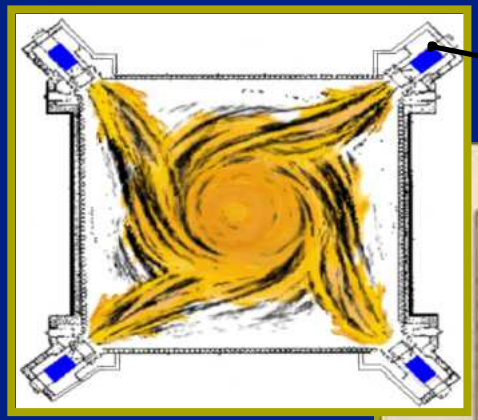
- Combustion Engineering: Forced circulation two-pass drum type
- Design pressure: 19.28 MPa
- Maximum steam flow: 577 kg/s
- Superheated steam temperature: 540 ^{o}C
- Boiler efficiency: 92.35 %
- Induced draught fans
- Regenerative primary and secondary air heaters
- 100% HP and LP bypass ability

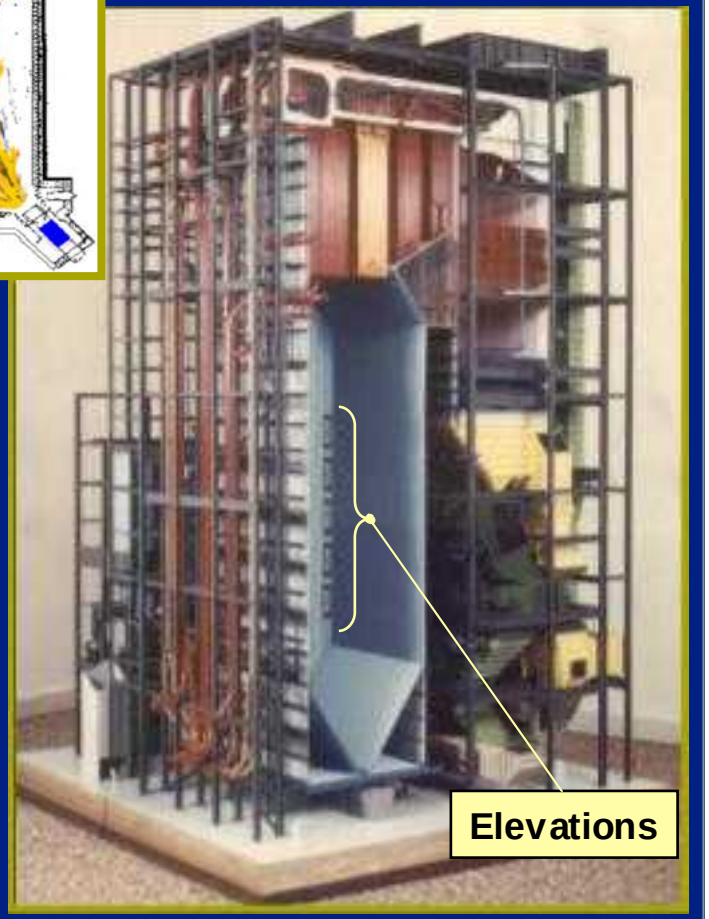


Boiler Furnace

- Tangentially fired at 5 elevations
- Eight burners per elevation
- Swirling fireball
- 4 adjustable wind boxes with oil guns per elevation
- Oil guns used for start up
- Coal consumption:

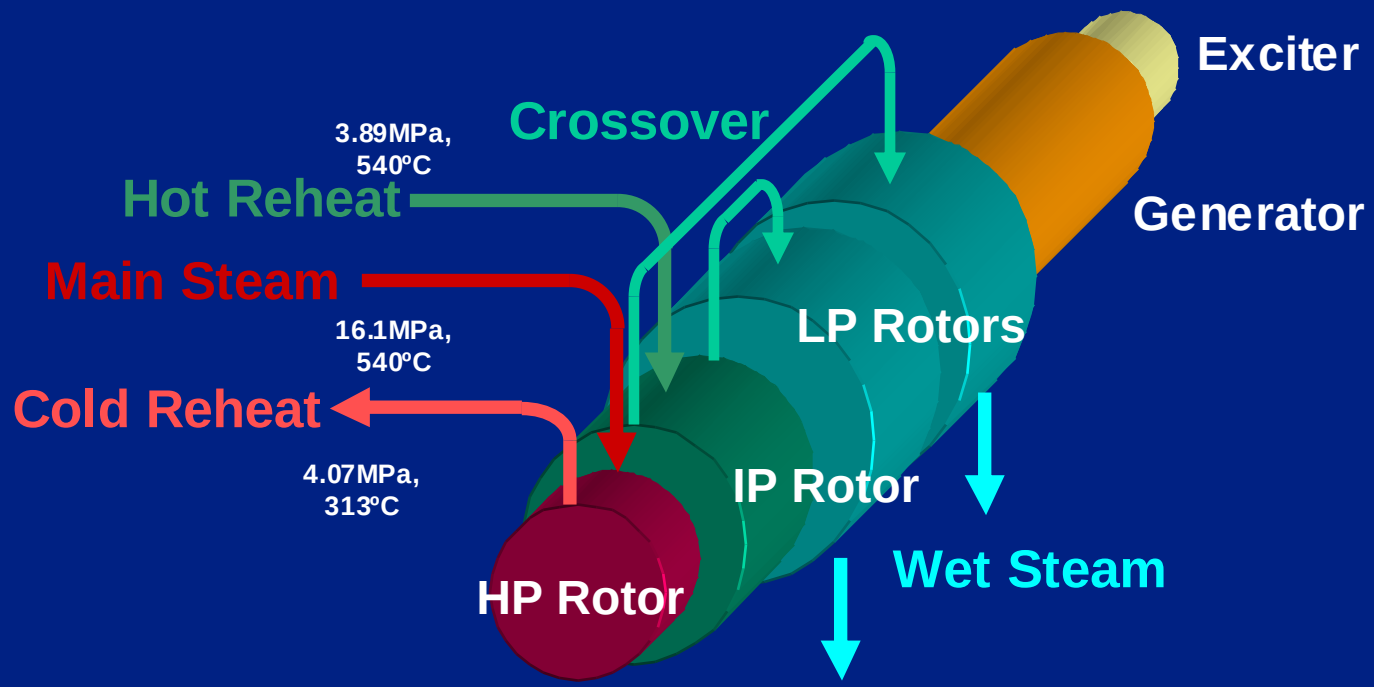
  Up to 350 tons/hour
- Forced draught fans supply primary and secondary combustion air





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Steam Flow Path



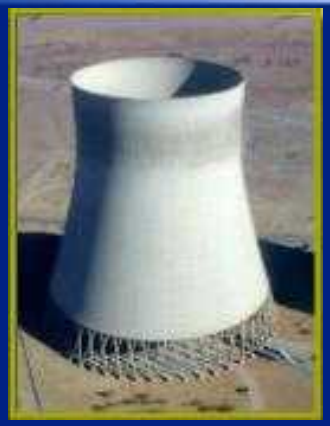
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Main Cooling System

- One natural draught dry-cooling tower per unit
- Closed system with demineralized water and nitrogen blanketing
- Cooling water flow:

  40 000 m^3/hour
- Water duct diameter: 3.1 m
- Total tubing per cooling tower: 1980 km
- Tower height: 165 m
- Tower base diameter: 165 m



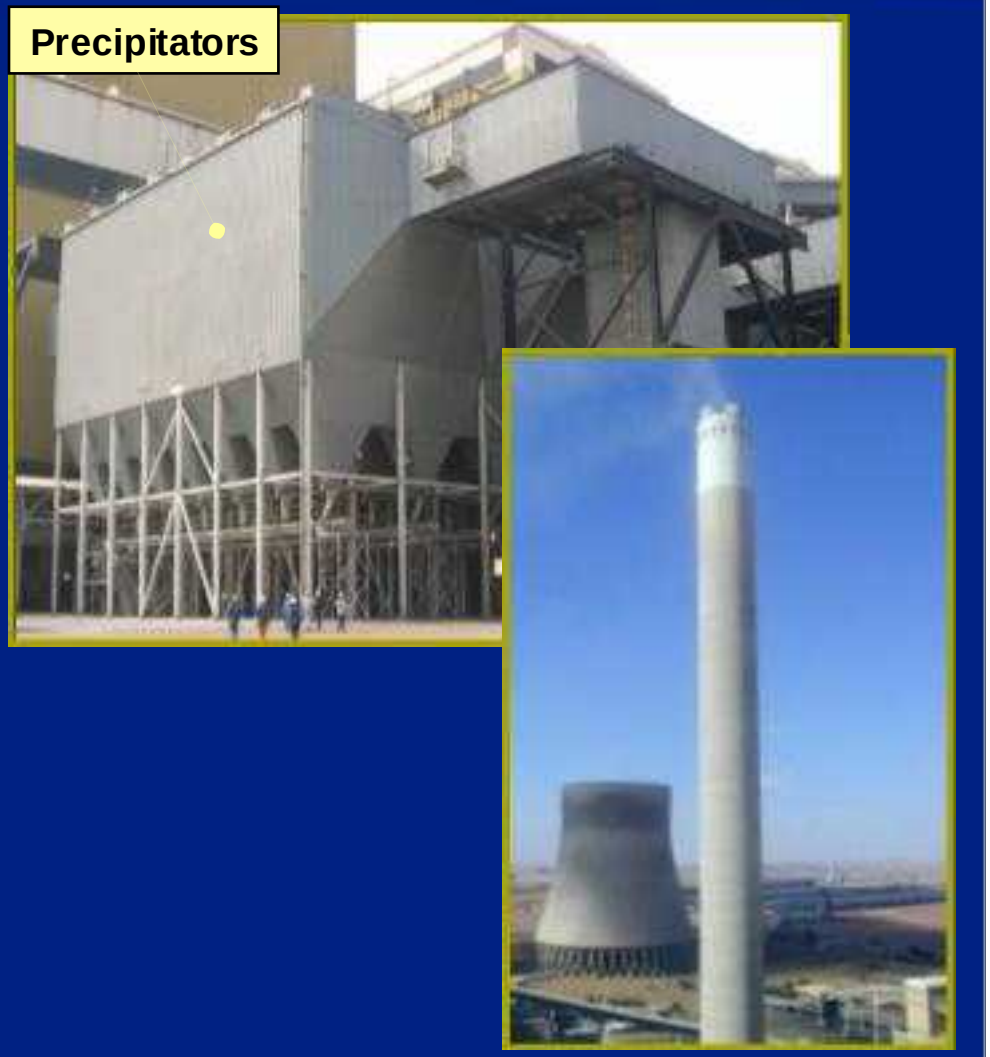




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Precipitators

- Fly ash removed by 2 trains of 7 electrostatic fields
- Advanced Precipitator Management System (PMS)
- SO_3 injection upstream of the precipitators
- Efficiency: 99.8%
- Typical emission: 30 mg/m^3
- Fly ash collected in hoppers
- Two flue stacks (275 m high) with three separate flues each



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Ash Handling

- 109 tons/hour ash production at full load
- Coarse ash at the bottom of the boiler is removed by a drag link type Submerged Scraper Conveyor (SSC)
- Sicon conveyors transport coarse ash
- Fly ash from precipitators conditioned with 15% moisture
- Fly / coarse ash ratio: 10:1



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Ash Handling

- Ash transported by overland conveyors to ash dump
- Ash handled by moveable Stacker and Spreader
- Ash dump capacity:

  50 years ash production at 6 million tons/year
- Ash dump continuously rehabilitated using 1 m top soil covering and vegetation



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Auxiliary Cooling System

- Two open systems, east and west of station
- 3 forced draught wet-cooling towers
- Indirect cooling by means of heat exchangers
- Interconnected closed loop cooling system
- Cooling of auxiliary systems eg: H_2 Plant, compressors, generator oil radiators





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Gas Turbines

Two gas turbines:

- John Brown Engineering: Diesel fueled
- National Grid blackout emergency startup system
- Rated output: 36 MW (@ 25 ºC)
- 17 stage compressor (x2)
- 2 stage turbine (x2)



Gas turbines
=
Black Start Facility

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Coal quality

- Energy content (CV)
- Scaling potential
- Moisture
- Abrasiveness
- Ash
- On-line Analysers



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Conclusion



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