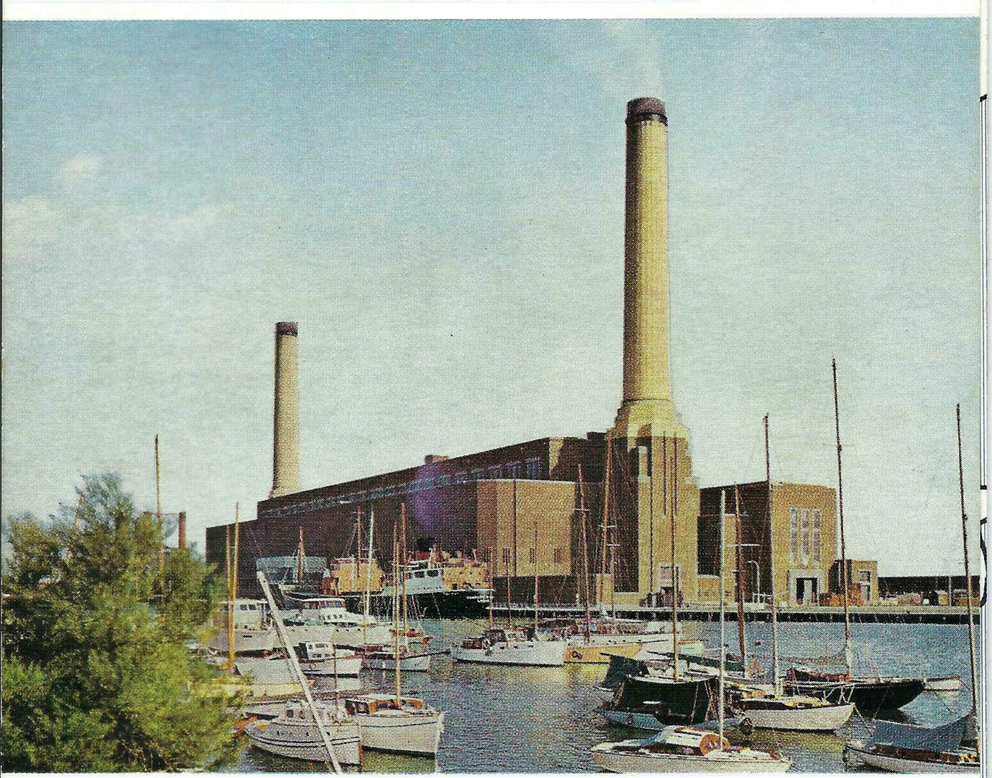
BRIGHTON



C·E·G·B

HISTORICAL

The Brighton undertaking is among the oldest in the country with a continuous existence to the present time. As early as 27th February, 1882 a permanent supply was inaugurated by the Hammond Electric Light and Power Company whose plant was housed in Gloucester Road, near the Railway Goods Yard. Their Brighton property and interests were purchased in 1885 by the Brighton Electric Light Company Ltd. which in 1887 became the Brighton and Hove Electric Light Company.

In 1883 Brighton Corporation became interested and taking advantage of the Electric Lighting Act of 1882 obtained a provisional order authorising them to supply electricity within the borough. The order was not exercised for some years but in 1890 the Corporation acquired a site for a Power Station in North Road. This station officially opened on 14th September 1891. It had four Willans Goolden generating sets, two with a capacity of 45 kW and two of 120 kW. A battery was provided to maintain supply when the engines were shut down in the early hours of the morning. Steam at 150 lb./square inch was supplied by three Lancashire boilers. In 1894 the Corporation bought out the old Brighton and Hove Electric Light Company.

By 1904 the capacity at North Road had increased to 5,935 kW and it was decided to build a new plant at Southwick where the eastern arm of Shoreham Harbour offered ample cooling water and the ability to use seaborne coal. In June 1906 the first part of the station was opened with a capacity of 5,470 kW. Extensions and modifications through the years raised this figure to 190 MW by 1946. In the early 1940's the need for a large modern power station to provide electricity for the south east area became apparent and the Southwick site was selected by the Central Electricity Board.

In 1946 a direction was issued to Brighton Corporation to proceed with the construction of a new station containing six 52.5 MW sets. The first pile was driven on 25th November 1947. On 1st April 1948 the Electricity Supply Industry was nationalised and responsibility for the site was taken over by the South Eastern Division of the British Electricity Authority. When consent for the second section was issued on 26th June 1950 it had been decided that the capacity of the last two sets should be increased to 60 MW. The first machine was commissioned in December 1952 and the last in September 1958. Sets 1 to 4 were uprated to 55.5 MW giving the station a capacity of 342 MW.

CIVIL WORKS

The strata of the site consist of gravel and sand and a lignite formation known locally as "Stromboli" which was found generally on the site at about 35 to 50 ft. below the surface level; beneath this is a load-bearing layer of clay and chalk.

The basement floor is supported on groups of reinforced concrete piles which go down to varying depths of 35 to 50 ft. each designed to carry loads of 60 to 70 tons. Difficulties were encountered in penetrating the "Stromboli" owing to its resilience during pile-driving; in one instance 10,000 blows using a 2½ to 3 ton ram were required to penetrate this stratum. About 6,000 piles were driven for the complete building.

About 15 million bricks were used in the complete structure. The silver grey and bronze facing bricks were obtained from the High Broom Brick and Tile Company of Tunbridge Wells. They were specially selected by the architect to blend with the natural tones of the surrounding beach.

Unloading berth and main coal store.

The Turbine Room, including loading bays, is 850 ft. long, 60 ft. wide and 81 ft. 6 in. high.

The Boiler House, including workshops, is 900 ft. long, 100 ft. wide and 115 ft. high.

The Chimneys are 350 ft. high with an inside diameter of 32 ft. at base and 24 ft. at the top.

The Cable Tunnel under Shoreham Harbour is 90 ft. below ground and the internal diameter is 10 ft.

SHOREHAM HARBOUR

At the project stage of "B" Station it was clear that the existing Harbour would not be able to cope with the traffic that would be needed to carry the 850,000 tons of coal per annum required for both "A" and "B" Stations. At first it was considered that the Harbour should be improved to accommodate vessels up to 2,650 tons but after further consideration it was decided to amend the plans to admit vessels up to 4,500 tons. Agreement was reached with the Harbour Trustees and the work of enlarging and improving the Harbour was authorised by the Shoreham Harbour Act 1949. This work, carried out by Sir Wm. Halcrow and Partners on behalf of the Central Electricity Authority, was begun on 1st January 1954 and completed in 1957. The ability of Shoreham to accept larger vessels has led to its rapid development as a general cargo port in recent years.

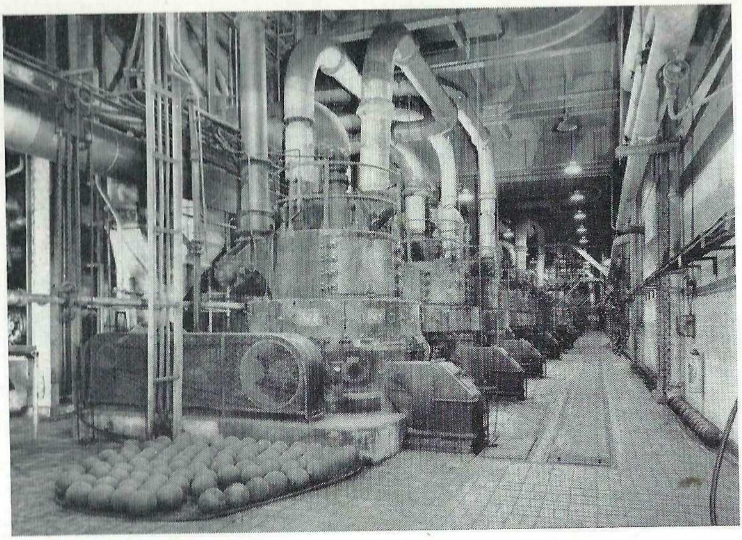
COLLIERS

Four colliers of 3,400 tons capacity were built by the C.E.G.B. for regular use to Shoreham. All are 340 ft. long, 44 ft. in beam with a loaded draught of 18 ft. and have a service speed of 11 knots.

They are named *James Rowan, Sir John Snell, Charles H. Merz* and *Sir William Walker* after prominent persons in the Electricity Supply Industry.

The average voyage time from the Tyne to Shoreham is about 36 hours (3 tides) and the discharge of a 3,400 ton vessel can normally be carried out in 9½ hours, i.e. under favourable conditions a ship can be "turned round" in a tide. Each of these vessels makes about 55 round trips in a year.

A fifth collier, the *Sir Johnstone Wright,* of 4,200 tons was built for use on spring tides to Shoreham, otherwise to stations on the Thames estuary. In addition, ships chartered from other sources are used to supplement C.E.G.B. vessels.



P.F. Mills. Spare Grinding balls in foreground.

COAL PLANT

Two coal unloaders and one Kangaroo crane each rated at 300 tons/hour unload the colliers and weigh the coal before loading conveyors to transport it to the boiler bunkers or stocking-out yard. Stocking-out and reclaiming coal is carried out by bulldozers capable of handling the quantities required for both stations. Loading rates up to 500 tons/hour from a distance of 200 ft. are attainable by the machines.

STEAM RAISING PLANT

There are eleven single drum, water tube boilers each with an evaporative capacity of 320,000 lbs/hour with feed water at a temperature of 196°C (385°F) at the economiser inlet. The steam conditions at the superheater outlet are 950 lbs/sq. inch and 496°C (925°F). All boilers have natural circulation, but some differ in tube arrangement and in some the tubes forming the furnace walls are covered with cast iron Bailey blocks.

The superheaters are of the horizontal and pendant type and means of regulating the steam outlet temperature are provided by either a spray or tubular type attemperator placed between the primary and secondary superheater.

Coal from the bunkers passes through weighing machines to the pulverising plant, consisting of three medium speed, ring-ball mills, incorporating constant speed classifiers for each boiler. From each mill, pulverised coal is delivered to the burners by a primary air fan.

The draught plant comprises two forced draught fans, two induced draught fans and two rotary type air heaters which supply preheated air to the mills and boiler furnace. Dust is extracted by mechanical plant followed by electrostatic precipitators.

TURBO-ALTERNATOR FEED HEATING AND CONDENSING PLANT

The six turbo-alternators are arranged longitudinally in the turbine house. Four, having a capacity of 55.5 MW are of the three cylinder type with single flow H.P. cylinder, single flow I.P. and double flow L.P. cylinder with the alternators air cooled. The last two turbo-alternators have a capacity of 60 MW and are of a two cylinder type with single flow H.P. cylinder and single/double flow I.P. combined with quadruple flow L.P. cylinder.

The steam conditions at the H.P. turbine stop valve are 900 lbs/sq. in. and 482°C (900°F).

The generators operate at 3,000 RPM and the two 60 MW sets are cooled by hydrogen at a pressure of 0.5 lbs/sq. inch. The rated terminal voltage is 11.8 kV at a power factor of 0.8. Main and pilot exciters are direct-driven from the generator shaft.

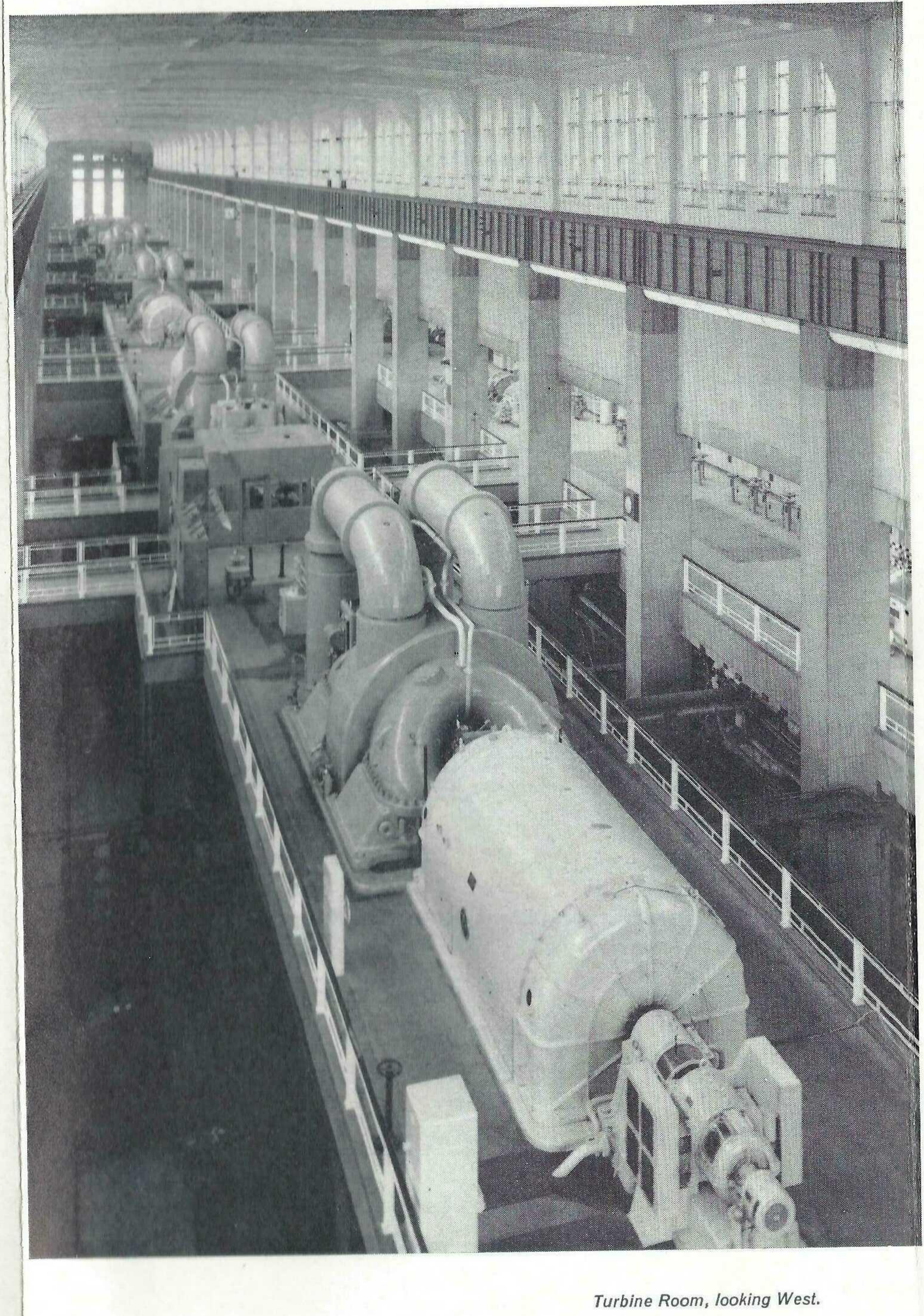
The condensers are twin shell, two flow, surface type designed to maintain a vacuum of 29″ Hg when supplied with 45,000 galls/min. of cooling water at 15°C and condensing 340,000 lb. of steam per hour. Two 100% duty, three stage, steam jet air ejectors extract air from the condenser.

Two 100% duty extraction pumps deliver condensate to the three L.P. stages of feed heating from which it passes to a de-aerator. The condensate then discharges to a de-aerator extraction pump before passing to the main boiler feed pump and three high pressure feed heating stages.

CIRCULATING WATER SYSTEM

The "B" Station requires approximately 280,000 galls/ minute of the sea water for condenser cooling under full load conditions.

This is normally pumped from the tidal side of the harbour locks and discharged, after use, to sea. It can, however, be diverted into the eastern (locked) arm of the harbour and this is done in order to maintain the level required by the Harbour-master in this section, i.e. to make up losses including water used for locking operations.



Turbine Room, looking West.

CONTROL ROOM

The control room is on the centre line of the station and contains the main 132 kV and 33 kV control panels for operating switchgear at two substations situated at Southern Cross and Fishersgate. All main switching and synchronising of the six generators is carried out on individual control desks, as is the switching of 3.3 kV auxiliary supplies.

ASH AND DUST PLANT

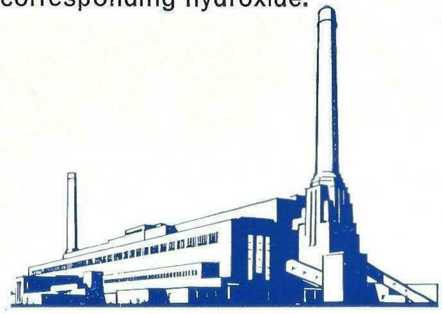
Ash from the boilers is washed by high pressure water jets to a central collecting pit whence it is removed by grabbing crane to a storage and drainage hopper. After draining, the ash is conveyed to a disposal point where lorries are loaded to take it from the station.

The dust handling plant is designed to remove flue dust accumulating in the collecting hoppers of the economisers in the mechanical grit arrestors and electrostatic precipitators of the eleven boilers, and from the base of the two chimneys. The plant consists of hydrovactors creating a vacuum in a pipeline which transfers the dust from the hoppers to central collecting bins capable of holding 2,100 tons. The dry dust is then fed by rotary feeders to four double shaft mixers where it is conditioned or wetted before disposal by lorry to brick manufacturers, road builders or waste ground for levelling. Dry dust can be loaded direct to tanker lorries for use in concrete manufacturing. With the station generating on full load, approximately 305 tons dust and 66 tons ash are disposed of daily.

WATER TREATMENT PLANT

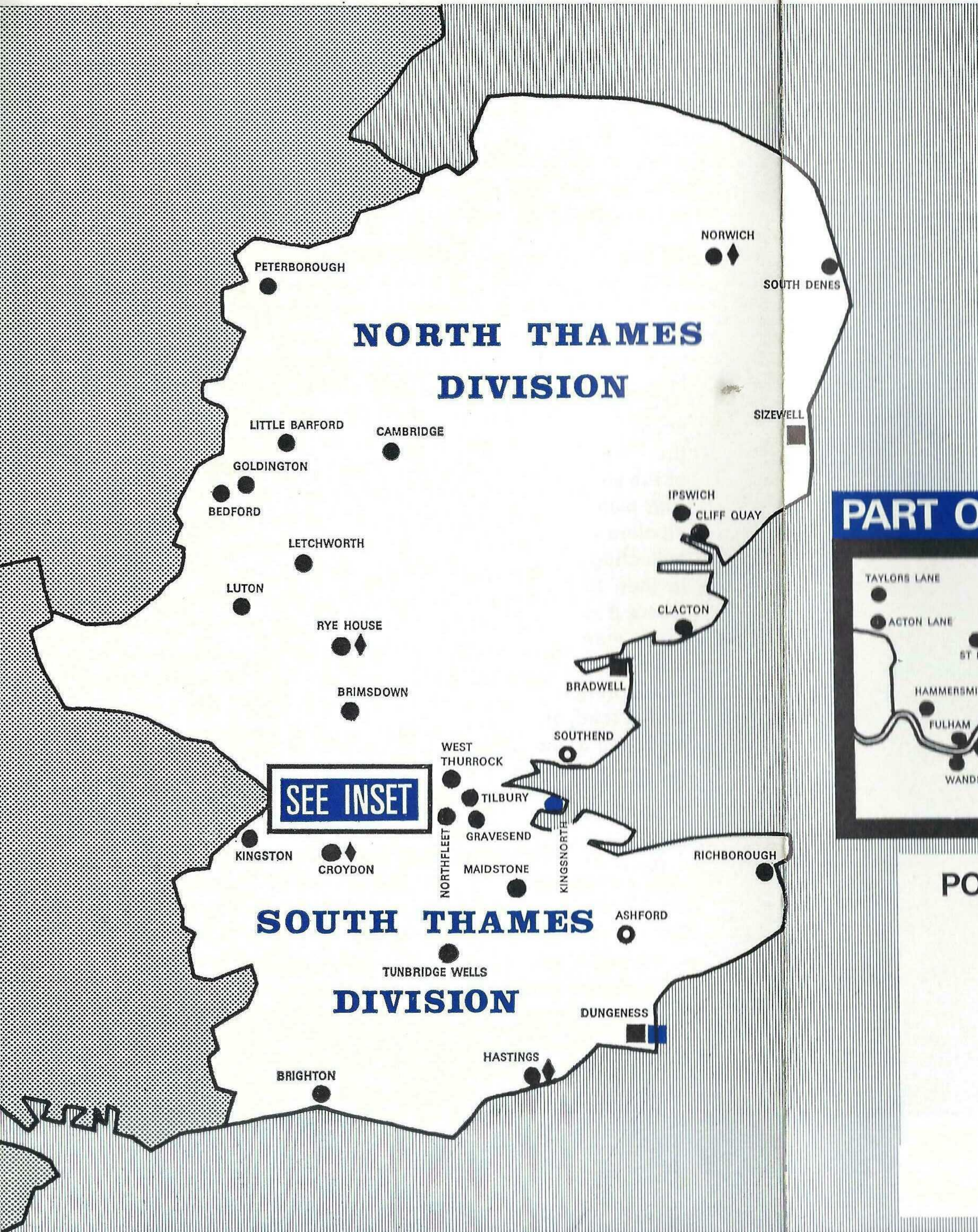
A demineralisation plant is installed to produce high quality make-up water from the town main supply.

Raw water is fed in series through the first two treatment units which turn all the dissolved mineral salts into their corresponding acids, which are then absorbed. A degasifier tower scrubs out the carbon dioxide with a stream of air and a final unit removes the silica and is capable of converting any neutral salts to the corresponding hydroxide.

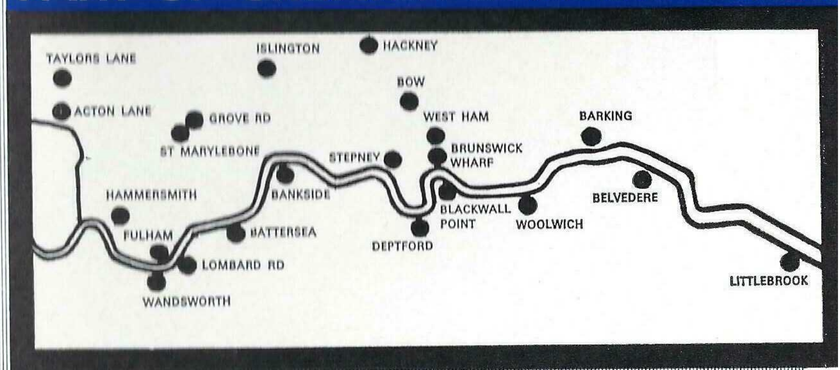


MAP OF THE

SOUTH EASTERN REGION



PART OF GREATER LONDON AREA



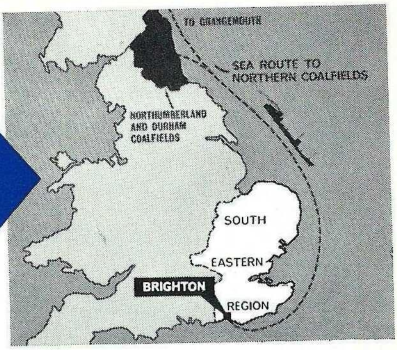
POWER STATIONS OPERATING

- ■ NUCLEAR
- ● CONVENTIONAL
- ○ DIESEL
- ♦ GAS TURBINE

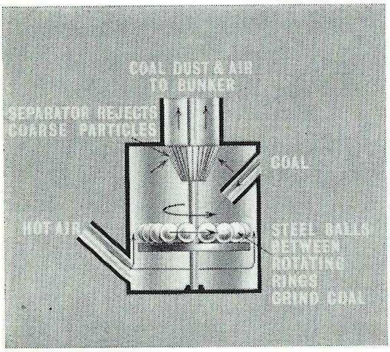
POWER STATIONS UNDER CONSTRUCTION

- ■ NUCLEAR
- ● CONVENTIONAL

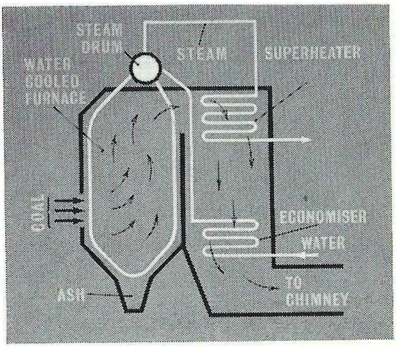
ELECTRICAL POWER FROM COAL



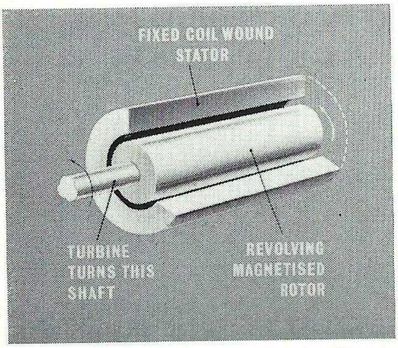
Northern coalfields provide the fuel for Brighton and sea transport ensures a constant supply to one of the largest stations on the South Coast



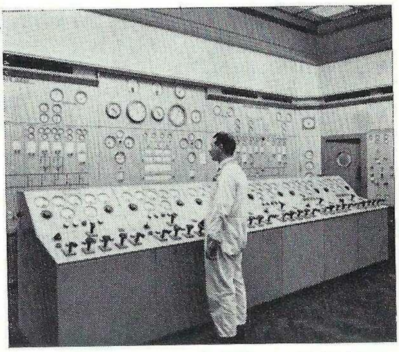
Revolving steel ball-mills grind the coal to a fine powder which, driven by an air blast, burns in the boiler furnaces.



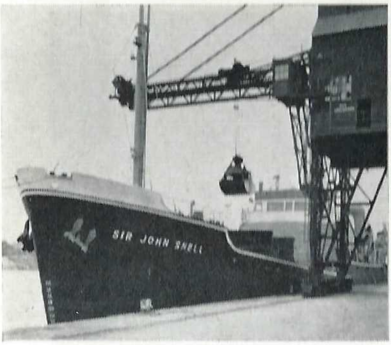
In the steel tubes that line the furnaces water is converted into high-pressure superheated steam that supplies the turbines.



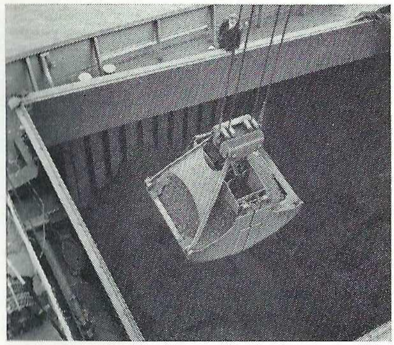
The generator consists of a magnetised rotor that revolves within a fixed stator, in the windings of which an electric current is produced.



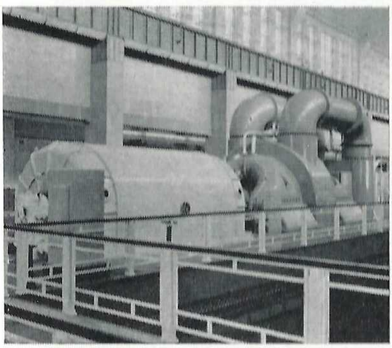
All generators are operated from a control room where instruments indicate station output and local grid conditions.



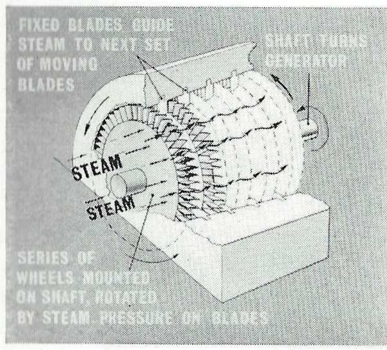
Colliers bring many thousands of tons of coal each week to the Station Wharf.



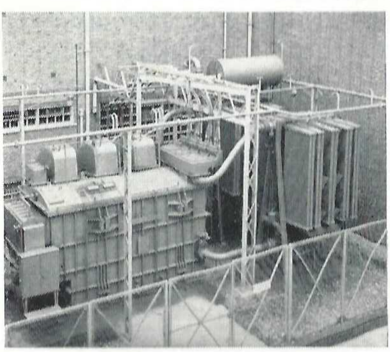
Into the colliers' holds, quayside cranes lower their grabs and unload the coal. Each grab can lift up to 6 tons.



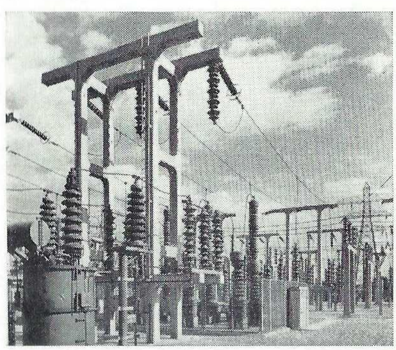
Each turbine consists of a high-pressure, intermediate and low-pressure cylinder in which the steam expands, driving a bladed rotor.



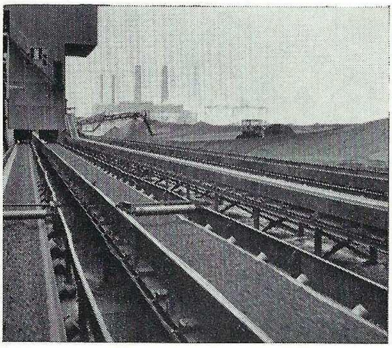
Steam is directed against the rotor blades by others attached to the inside of the cylinder casings; the rotor shaft is coupled to an electrical generator.



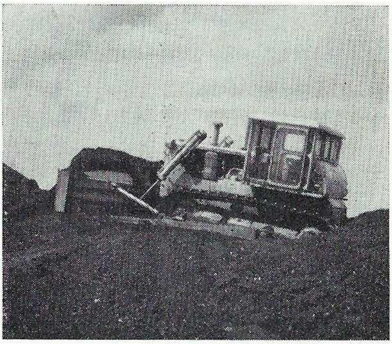
Current from the generators is stepped up to a higher voltage by the windings of oil-cooled transformers.



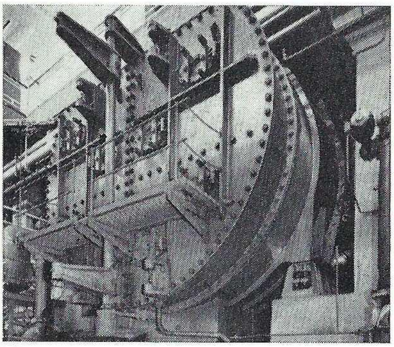
In the substation is the switchgear and its operating mechanism controlling power flow on grid lines.



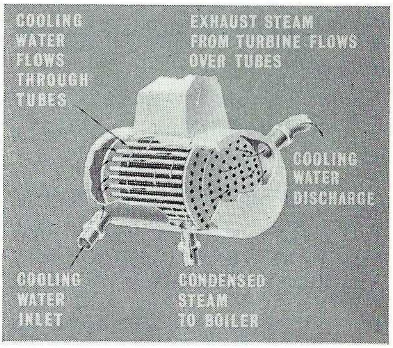
Automatically weighed, the coal is put on high-speed conveyor belts to take it to bunkers in the boiler house.



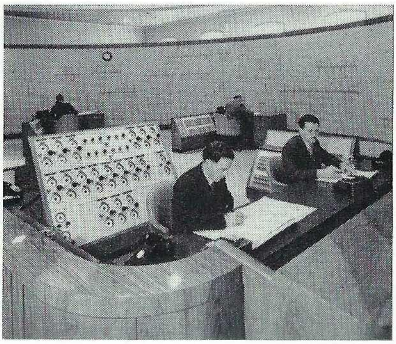
Some coal goes to a reserve stock-pile and is consolidated by bull-dozers to prevent spontaneous combustion.



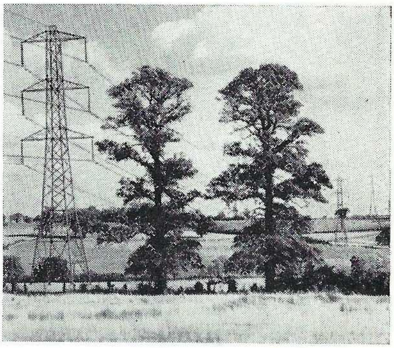
After passing through the turbine the steam exhausts into a condenser, and again becomes water which is returned to the boiler.



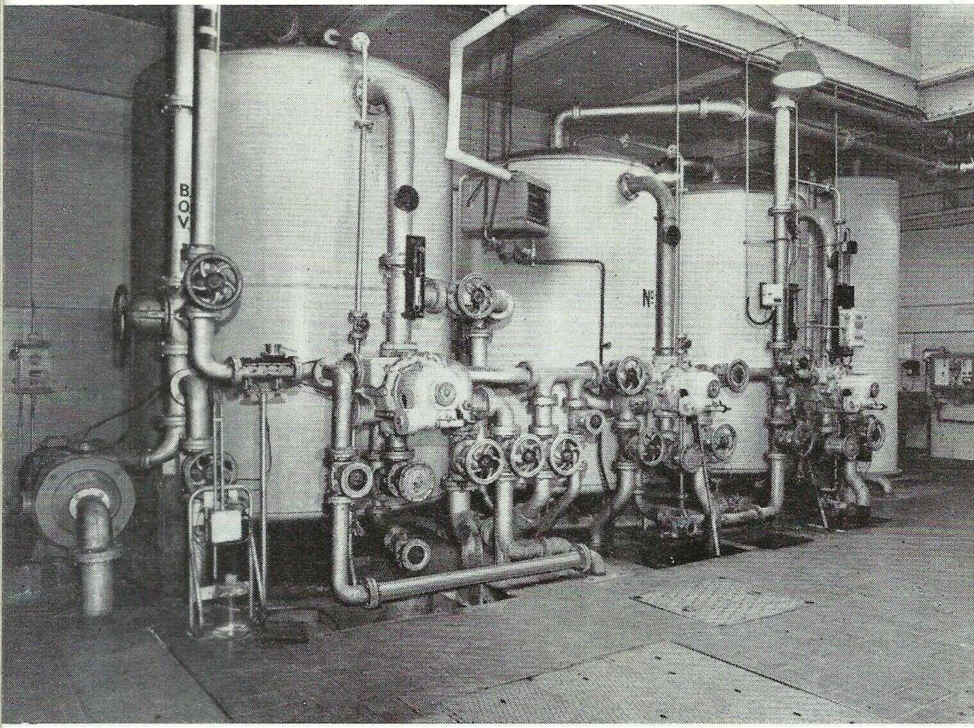
The condenser is a large vessel containing thousands of cooling tubes through which seawater is constantly pumped.



In the grid control centre directions are issued for feeding the high voltage current into the National System.



The steel towers of the Grid carry high-voltage lines to remoter sub-stations.



One of the two boiler make-up water treatment units.

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