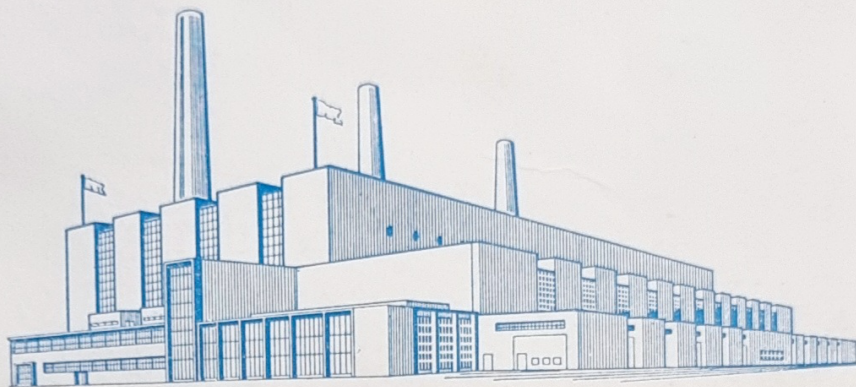




Carmarthen Bay  
Power Station

BRITISH ELECTRICITY AUTHORITY  
SOUTH WALES DIVISION



CARMARTHEN BAY POWER STATION

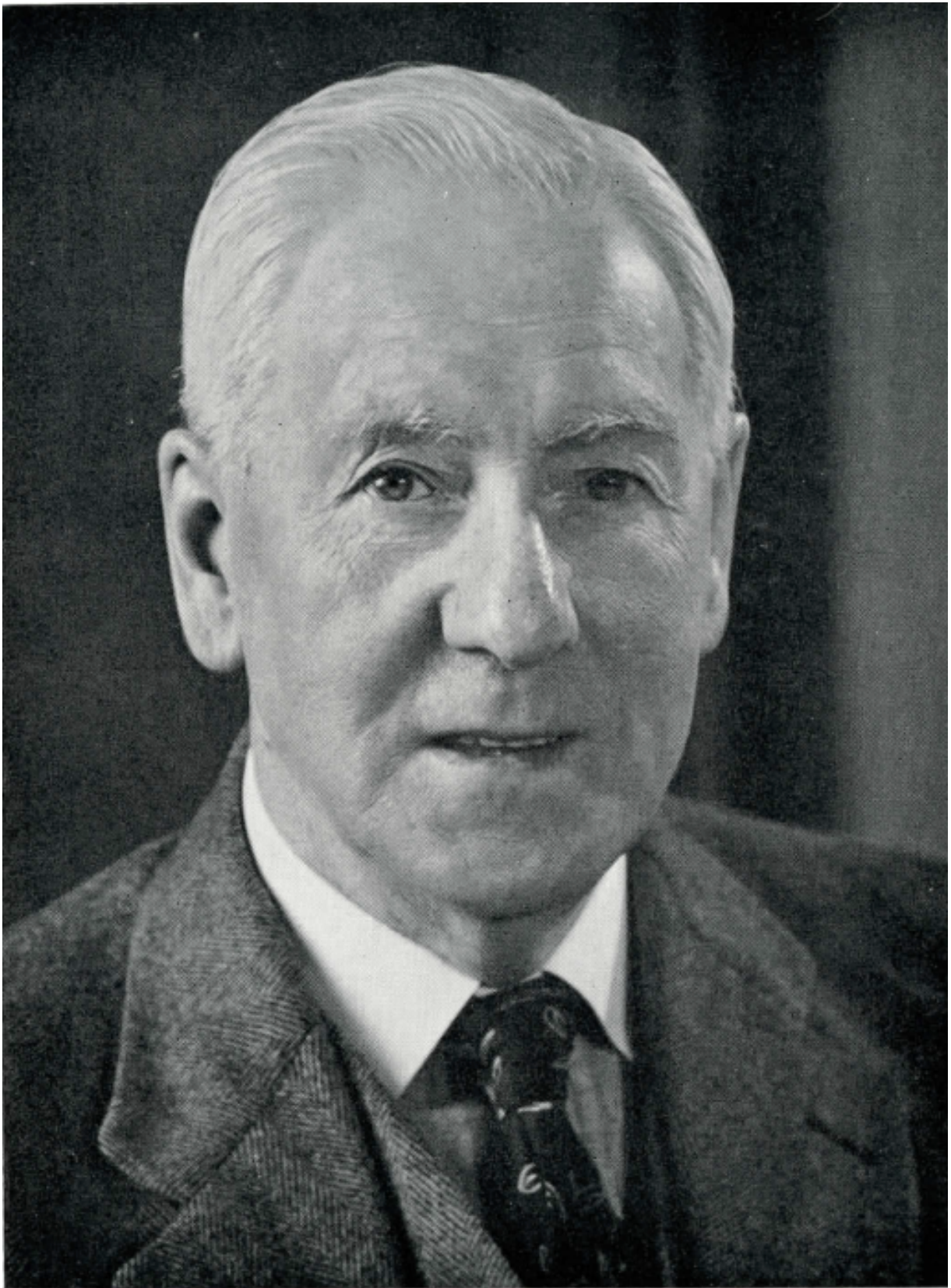
Opened by

SIR HENRY SELF, K.C.B., K.C.M.G., K.B.E., Comp. I.E.E.

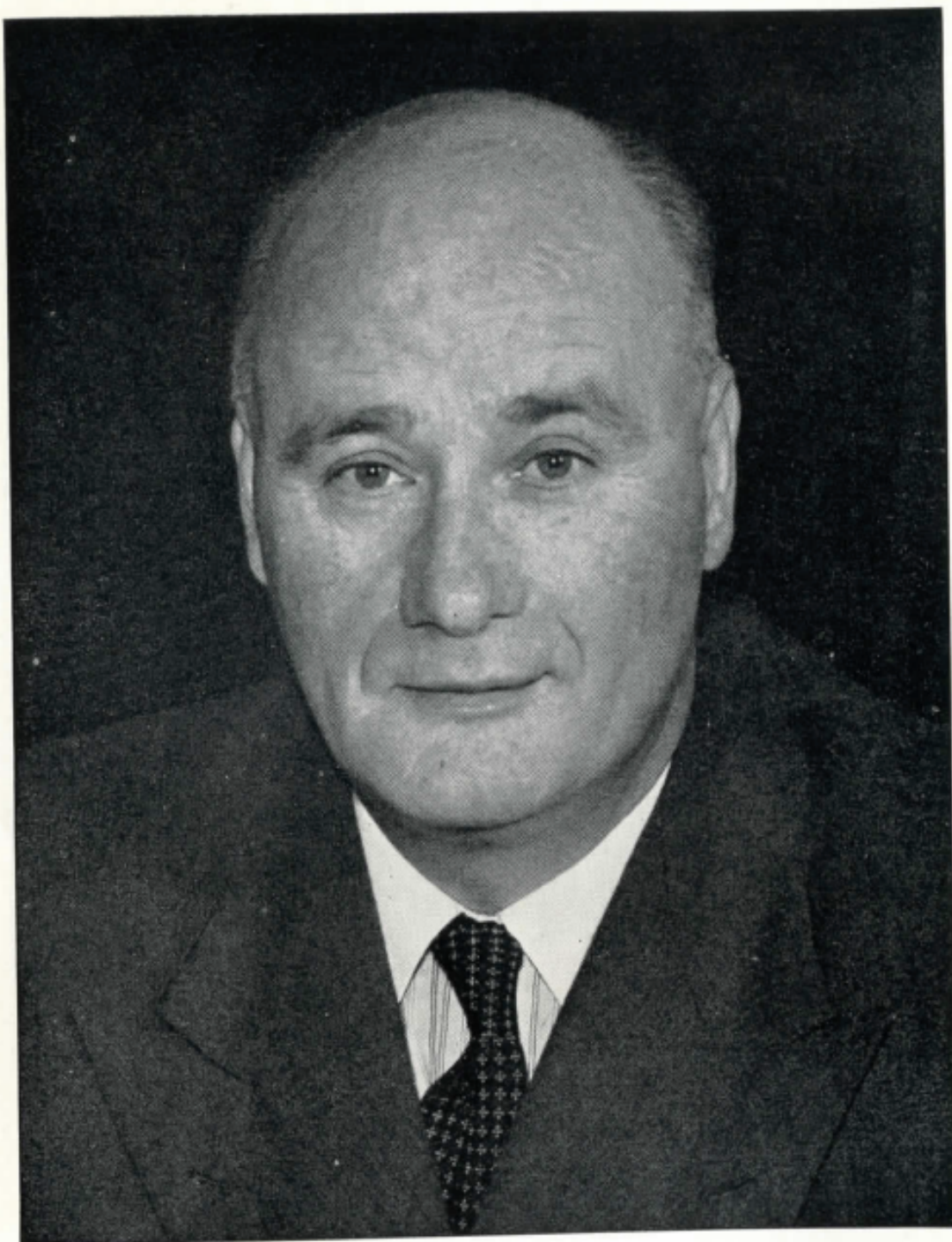
*Deputy Chairman (Administration)*

*British Electricity Authority*

27th August 1954



RT. HON. LORD CITRINE, P.C., K.B.E., Comp. I.E.E.  
*Chairman, British Electricity Authority*



SIR HENRY SELF, K.C.B., K.C.M.G., K.B.E., Comp. I.E.E.  
*Deputy Chairman (Administration), British Electricity Authority*

## CARMARTHEN BAY POWER STATION

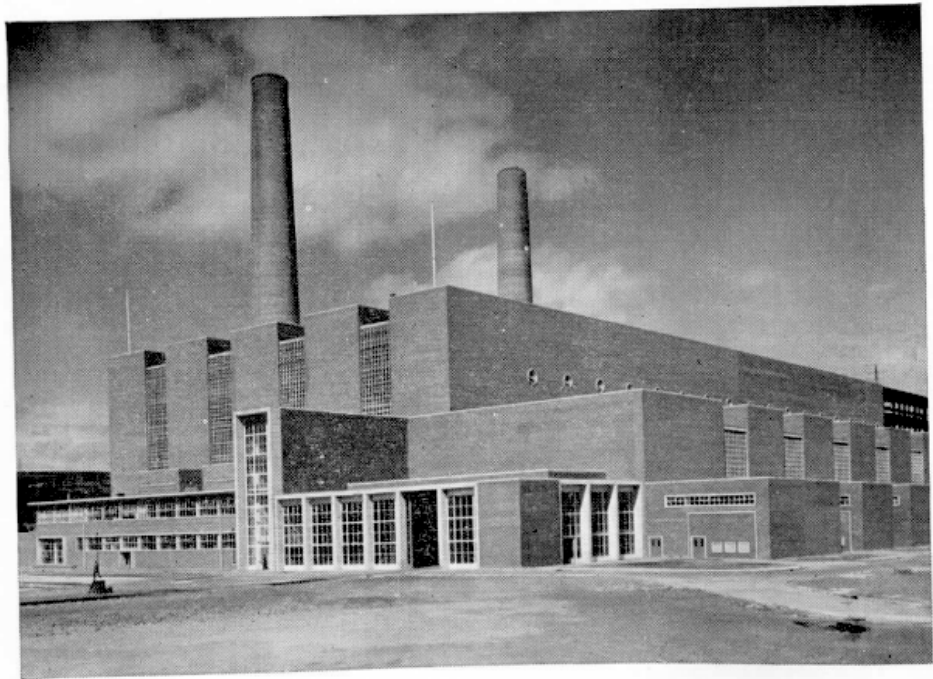
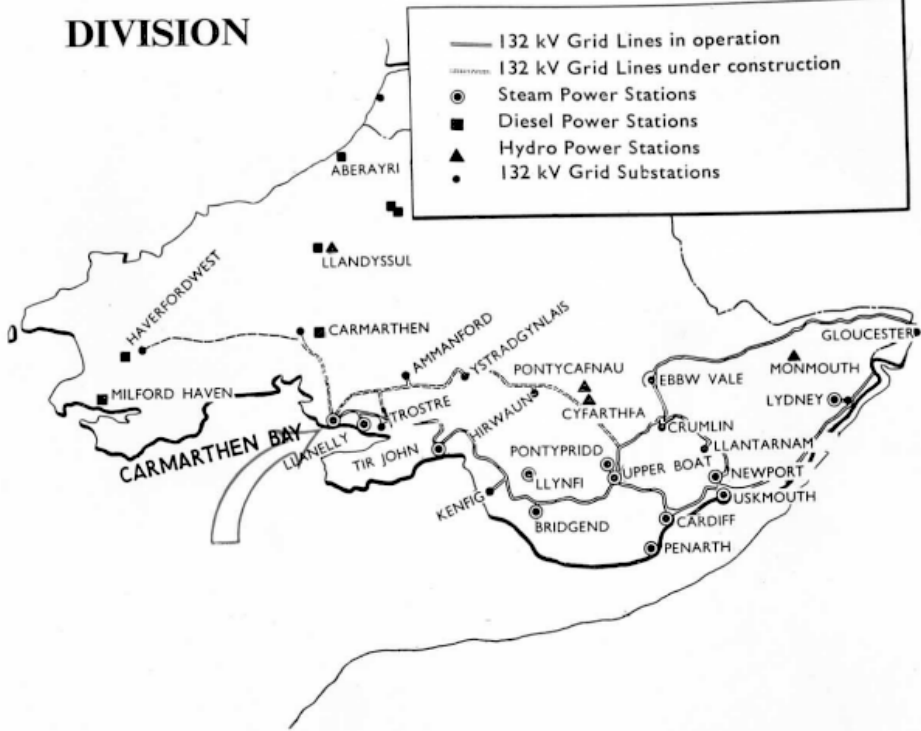
After the nationalization of the electricity supply industry in 1948, the overall supervision of power station construction in the southern half of the Principality fell under the purview of Mr. H. V. Pugh, M.I.E.E., M.I.Mech.E. He was appointed Controller of the South Wales Division of the British Electricity Authority, with his Generation Construction staff led by Mr. T. H. Wood, M.I.Mech.E., A.M.I.E.E., who had taken on the role of Chief Generation Engineer (Construction) for the Division.

One of the power station projects in South Wales, taken over on Vesting Day, was the Carmarthen Bay station being constructed by Balfour, Beatty & Co., Ltd., for the Carmarthen Bay Power Station Co., Ltd. The architect for this project was Sir Percy Thomas, O.B.E., J.P., D.L., LL.D., P.P.R.I.B.A. This brochure commemorates the inauguration of the power station, which is projected to have a generating capacity of 345,000 kilowatts.

In October 1951, Mr. Pugh assumed the role of Controller of the London Division, and he was succeeded by Mr. H. J. Bennett, A.M.I.E.E. In April 1953, Mr. Wood retired, and Mr. C. W. Priest, B.Sc.(Eng.), A.M.I.Mech.E., M.I.E.E., took over as his successor.

The development of the station was greatly aided by the cooperation of various entities. The Authority extends its gratitude to Carmarthenshire County Council, Burry Port Urban District Council, Llanelli Borough Council, Llanelli Harbour Trust, British Railways (Western Region), Docks and Inland Waterways Executive, Ministry of Housing and Local Government (Welsh Office), and local industrialists.

# SOUTH WALES DIVISION



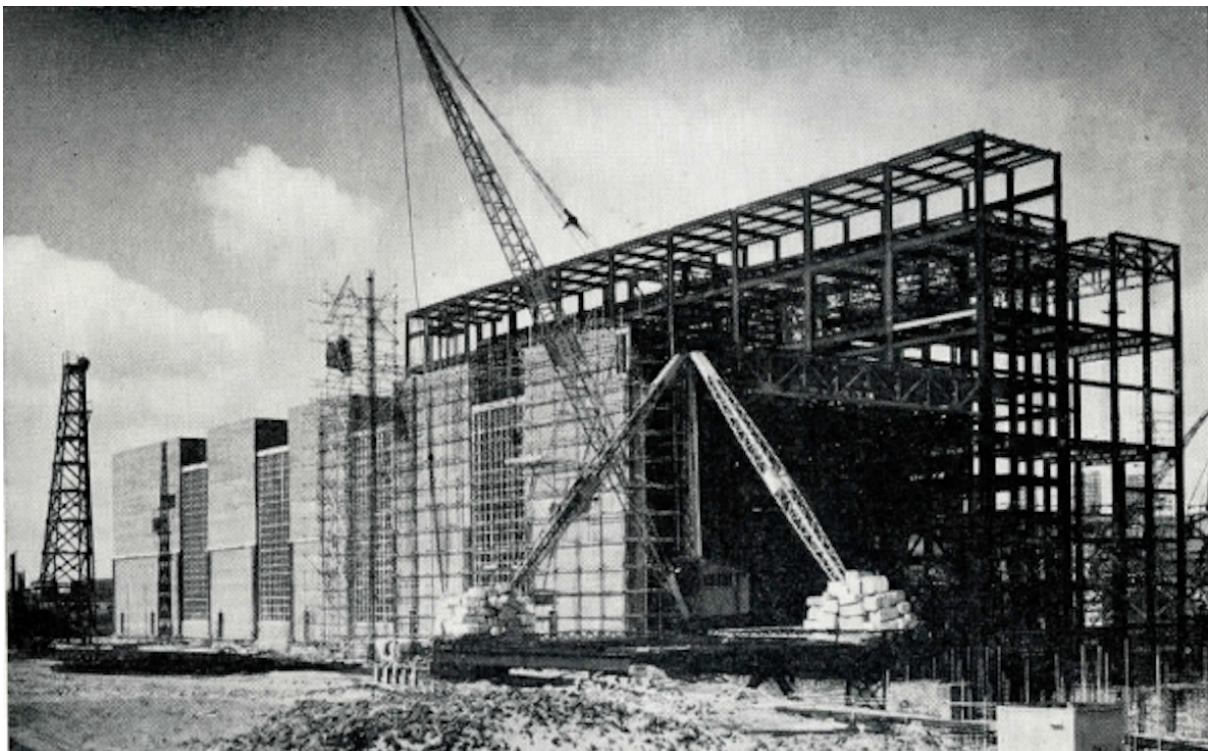
## BRIEF HISTORY OF THE CONSTRUCTION

THE Carmarthen Bay power station site, situated on the Burry estuary, spans approximately 214 acres. Originally, it was marginal coastal land, susceptible to flooding in certain areas, with a small portion occupied by a disused copper works.

Demolition and clearance activities commenced on April 29, 1947. The site's inauguration involved the felling of a 300 ft chimney from the old copper works. Prior to actual construction, about eighteen months were dedicated to demolishing these works and removing copper slag. Derelict structures were leveled, old underground flues were filled in, and an area was prepared to receive building materials. To facilitate construction, significant quantities of filling were brought in to raise the level by approximately eight feet. This included the construction of 4,800 yards of 21 feet roadway and 1,000 yards of 15 feet secondary roads capable of handling constant traffic volumes.

For assessing the site's conditions, an amphibious "Dukw" and a large motor-driven lifeboat were employed to take soundings, measure sea water temperatures, and gather other necessary data.

Trial borings revealed that beneath superficial slag deposits, there existed around 20 feet of fine brown sand, followed by 40 feet of grey silty sand interlaced with clay seams. At a depth of 65 feet, a substantial seam of sandstone rock was encountered.



## CONSTRUCTION PROGRESS

With the standing water level some 12 feet below the surface, a de-watering system had to be used for work to be carried out in the boiler house and turbine house excavations which were at 3 feet above and 12 feet below ordnance datum respectively.

The de-watering system, reputed to be the largest of its kind, maintained the working conditions required to construct the deep foundations some 40 feet below ground level. Electric pumps constantly prevented the ingress of water into the deep level workings, and diesel pumps were standing by ready to take over in emergency.

Excavation for the main building basements started in June 1948 and an approximate total of 5,500 reinforced concrete piles were driven from excavation level to support the turbine house and boiler house. A further 275 steel box piles were used to support ancillary buildings adjacent to these, consisting of canteen, workshop and office block.

The first set of 52,500-kilowatt capacity was commissioned on 28th. June 1953, and the second of similar capacity was commissioned on 30th September 1953.

By 1957, it is anticipated that an additional four 60,000-kilowatt sets will be installed, bringing the total capacity of the station to 345,000 kilowatts.

## CIRCULATING WATER PUMP HOUSE

As part of the initial scheme, a portion of the foreshore was reclaimed to create a site for the construction of the circulating water pump house. A protective bund or embankment, measuring approximately 30 feet in height and 700 feet in length, was erected. This structure enclosed the site on the seaward side, serving as a robust breakwater protection for the pump-chamber excavations within the land-locked area.

The pump house buildings above ground level have dimensions of approximately 241 feet in length, 134 feet in width, and 50 feet in height, with foundations reaching down to the rock level. Excavation for the pump house commenced in January 1951 and was successfully completed by September of the following year.

Given the significant rise and fall of the tide (30 feet) in the Burry estuary, it was imperative to construct a deep pump house to prevent the drowning of the suction

inlets of the circulating water pumps at all tide states. An unconventional construction method was employed, wherein the excavation took place inside a sheet steel pile cofferdam. Six reinforced concrete diaphragms were cast, creating multiple floors. Circular openings were formed within these diaphragms, allowing excavation to proceed underneath after casting the first diaphragm at five feet below ground level.

This process was iteratively repeated until all six diaphragms were completed, with the last diaphragm forming the base of the pump house. The diaphragms, each two feet thick, utilized common bricks and Winget blocks for vertical shuttering on the internal faces of the various cylindrical cells. A traveling shutter was employed for constructing the reinforced concrete walls, which were built up from the base around various openings, forming a series of deep cylindrical chambers. These chambers house the pumps, screens, penstocks, and associated equipment. Any spaces on the outside of the cylindrical walls not needed for housing plant equipment were backfilled with sand pumped from a stockpile. The cofferdam piling was retained as part of the structure, with the diaphragm reinforcement welded to it to secure the diaphragms in position during construction.



**CIRCULATING WATER  
PUMP HOUSE UNDER CONSTRUCTION**

The subterranean portion of the pump house was designed to comprise three sections interconnected solely by waterways equipped with sluice gates. Lifts were incorporated to facilitate access to each section.

For the intake and outfall culverts of the circulating water system, facing similar challenges as the pump house, construction also extended onto the foreshore.

Most of the work occurred between high water and beyond low water levels, presenting significant challenges due to demanding tidal conditions.

To overcome this, sheet steel cofferdams were constructed, allowing the work to progress in sections. The excavated sand was pumped from the cofferdams onto the foreshore.

The inlet culvert spans approximately 300 feet in length, with an invert level 25 feet below ordnance datum. In contrast, the discharge culvert is 560 feet long, with an invert level 20 feet below ordnance datum. Both culverts were constructed using reinforced concrete, and a traveling shutter was employed for their construction. The culverts feature internal cross-sectional dimensions of 19 feet by 15 feet. The piles used for the cofferdams were either withdrawn or cut off at culvert level.

For the construction of the circulating water pump house and associated works, an estimated 3,100 tons of sheet steel piling were utilized connecting the pump house and the station, the intake flumes are made of spun concrete pipes.

The inlet and outlet flumes, extending the length of the turbine house, are constructed in reinforced concrete to create a continuous cellular block. This block is three flumes wide by three flumes deep, with six of the flumes serving as inlets and three as outlets.

## TECHNICAL DETAILS

### BUILDINGS AND CIVIL ENGINEERING

The main buildings are supported by a network of 5,500 reinforced concrete piles, with lengths ranging from 40 feet to 55 feet based on their specific locations. These piles, each with a 14-inch square section, were cast on-site to ensure precision.

For the ancillary structures, including the canteen, workshop, and office block, approximately 275 sheet steel box piles provide the necessary support both the main and ancillary buildings feature a construction design comprising fabricated steel framing with brick cladding.

The turbine house, spanning 740 feet in length and 96 feet in width, includes a tank annexe and feed pump bay in close proximity.

Adjacent to the northern wall of the turbine house, three boiler houses are arranged at right angles, each measuring 225 feet in length and 220 feet in width. Each boiler house is crowned by a single chimney standing 300 feet high from ground level. These chimneys are constructed of brick and mounted on reinforced concrete pedestals that extend to the roof level of the boiler house.

The roofing construction incorporates asbestos decking, while self-centering techniques are extensively employed in floor construction. When completed, the main buildings will have utilized approximately 16,000 tons of structural steel work, attesting to the scale and complexity of the construction project.

The layout of key components within the power station is strategically organized as follows:

- The control room, generator transformers, and station and unit transformers are positioned along the south side of the turbine house.
- The main administrative block and workshops are situated at the west end of the main building.
- The 132 kV switch house, spanning 440 feet in length and 110 feet in width, is located on the east side of the main building.
- The main store, distinct from the main block, is housed in a two-story building measuring 153 feet in length and 83 feet in width.

This thoughtful arrangement optimizes the functionality and operational efficiency of the power station, with each component strategically placed for ease of access and coordination.

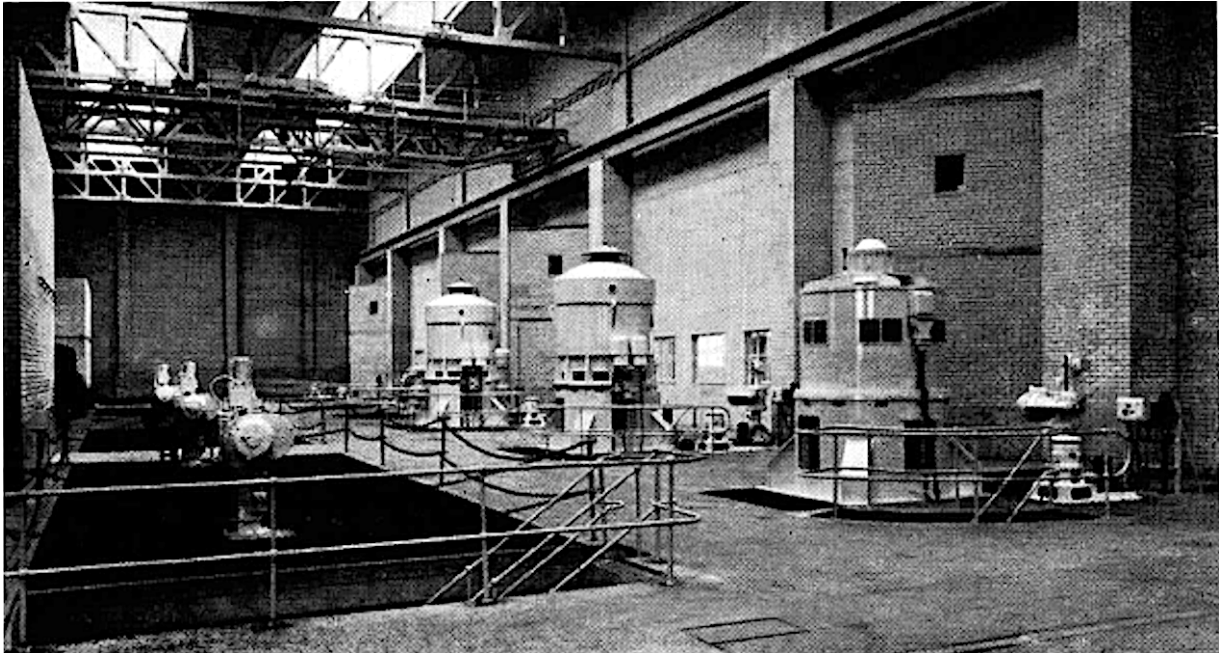
#### CIRCULATING WATER SYSTEM

Water for cooling purposes is sourced from the Burry estuary using seven vertical spindle two-stage axial flow circulating water pumps. Each of these pumps can handle a substantial 3,156,000 gallons per hour.

The process involves the circulating water traveling from the pump house through the surge shaft and inlet flumes to reach each turbine condenser. Each set is supplied with cooling water from one of these seven pumps, with the seventh pump held in standby for backup purposes.

Following the cooling process, the discharge from each pair of sets is directed through one of the three outlet flumes.

This discharge is channelled to the outfall, positioned approximately 1,080 feet upstream from the power station. This system ensures an efficient and reliable means of cooling for the power station's operations.



### CIRCULATING WATER PUMPS

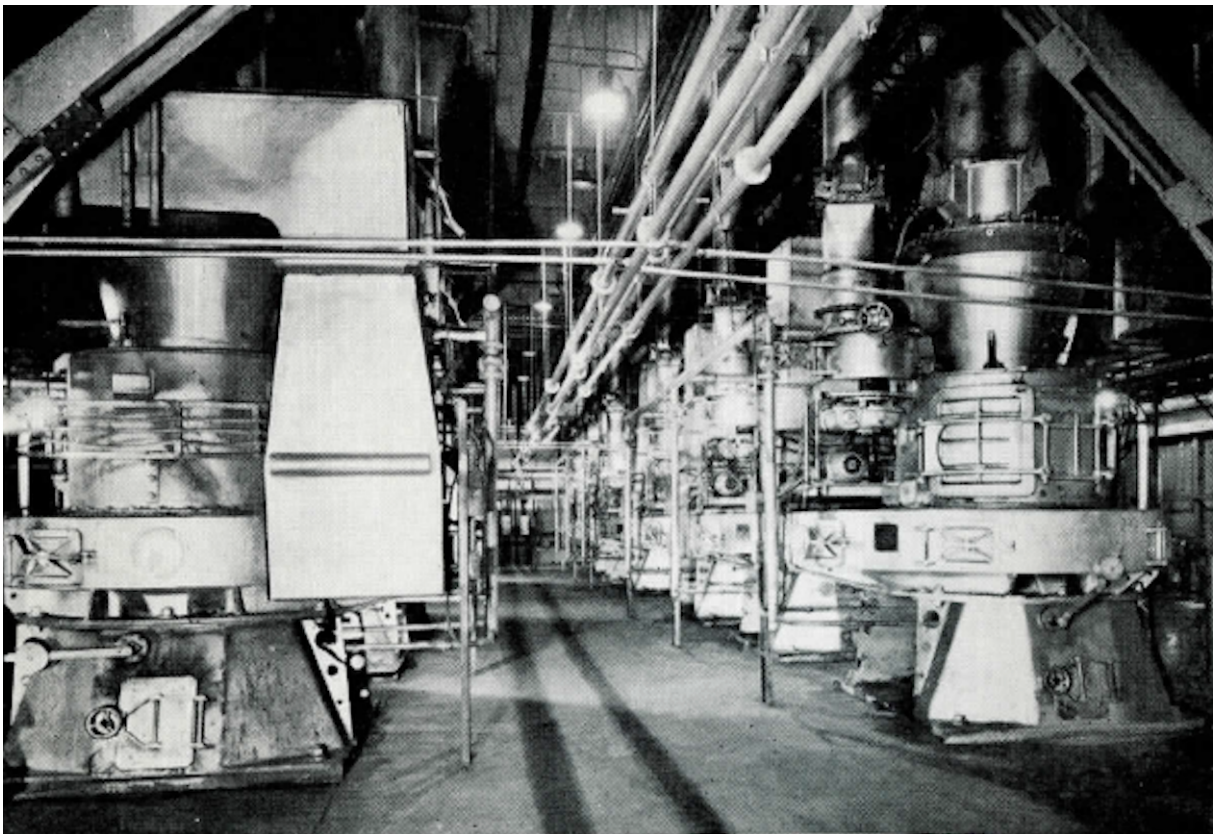
To account for the significant tidal range in the area, three of the circulating water pumps are equipped with variable-speed A.C. motors, while the remaining four are powered by fixed-speed motors. This design allows for adaptive and efficient operation, ensuring that the pumping system can effectively manage variations in tidal conditions and maintain optimal performance during different operational scenarios.

### BOILER PLANT

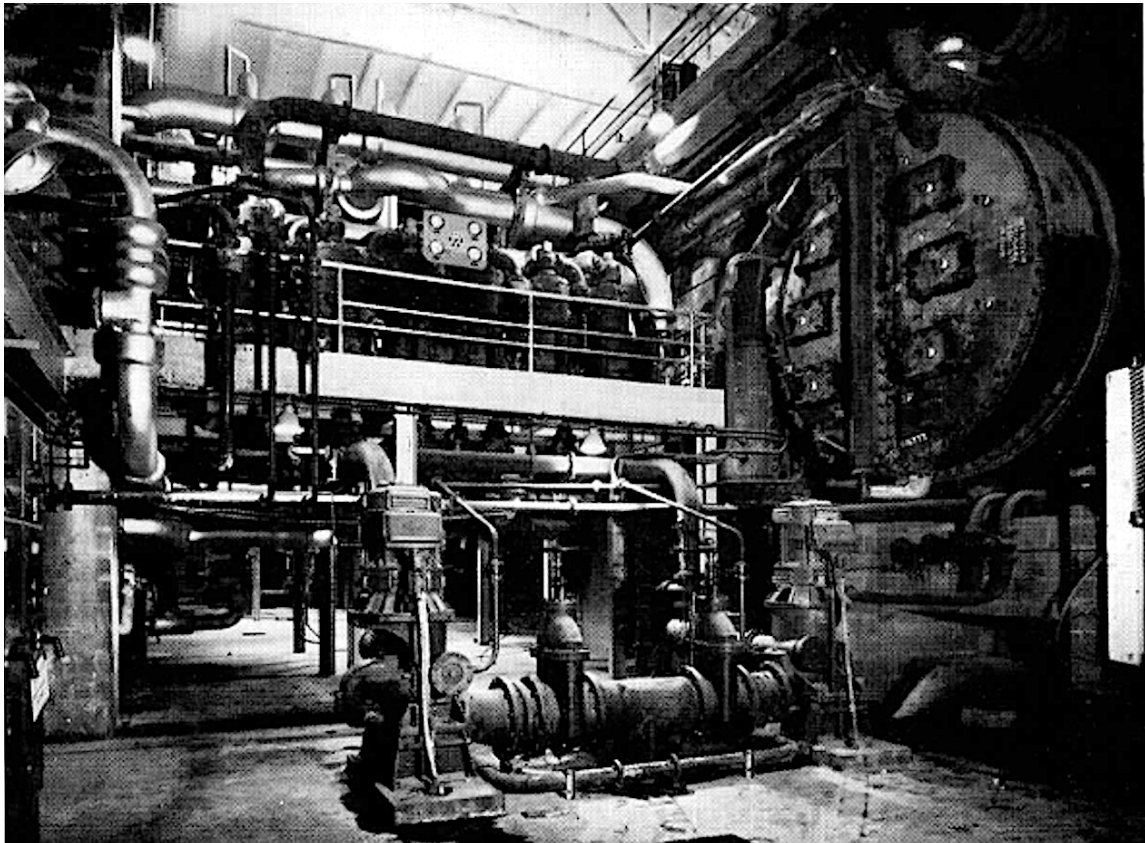
Each of the three boiler houses is designed to house six boilers, each with a steaming capacity of 240,000 pounds per hour at a pressure of 940 pounds per square inch and a temperature of 925 degrees Fahrenheit. However, only five boilers per boiler house are initially being installed. The total of 15 boilers is sufficient to provide the necessary steaming capacity to allow the full output of the six generating sets.

The process involves feeding coal from the bunkers into the pulverizing plant, which consists of three pressure-type mills for each boiler. At the front of the furnace chamber, nine down-draft burners are fired initially using an electrically ignited oil lighting-up system. This configuration ensures efficient and controlled combustion, contributing to the overall operational effectiveness of the power station.

The draught plant comprises two induced draughts, forced draught, and primary air fans for each boiler. Both the induced fans and forced draught fans are powered by variable-speed motors. This design allows for precise control over the air circulation and pressure within the boiler system, optimizing combustion efficiency and supporting the overall performance of the power station. Variable-speed motors enable adaptive operation, ensuring flexibility and responsiveness to varying operational conditions.



PILVERISING-MILLS



## CONDENSER

In the boiler system, each forced draught fan draws air from the top of the boiler house and delivers it through a rotary air heater. A system of ducting then distributes the air to the combustion chambers. The combustion gases, after leaving the boiler, pass through several components in sequence: economiser, air heaters, mechanical tubular dust collectors, and finally, an electrostatic precipitator. This comprehensive process ensures the effective removal of impurities before releasing the gases into the main flue and chimney.

The superheaters in the system are of the multiloop type, incorporating surface-type attemperators between primary and secondary stages for the control of final steam temperature. Gas by-passing arrangements are also incorporated for added operational flexibility.

The economiser, designed as a multiloop type, is arranged in two banks parallel on the water side. With a feed temperature of 365 degrees Fahrenheit, the estimated temperature at the leaving end of the economiser is 502 degrees Fahrenheit. This configuration enhances the efficiency of the system by optimizing the temperature of the feedwater before it enters the boiler, contributing to the overall performance of the power station.

Automatic boiler control is implemented to regulate combustion, steam pressure, and temperature within the system. This automated control system ensures precise and efficient operation of the boilers.

The steam generated from each set of boilers is directed to a steam receiver. Each steam receiver is designed to supply the associated turbine with steam. To optimize the utilization of boiler capacity, the six receivers are interconnected individually and in pairs. This interconnected configuration allows for a coordinated and efficient distribution of steam, enhancing the overall performance and responsiveness of the power station.

## COAL HANDLING PLANT

Within the station boundary, there are approximately ten miles of marshalling sidings, providing facilities for 600 wagons of coal awaiting discharge and 300 empty wagons awaiting removal.

A distinctive feature of the handling plant is its concealed nature. Except for the wagon tippers, which are located a short distance from the boiler house, none of the coal handling equipment is visible externally. The aesthetic appearance of the station was a key consideration during the early planning stages, emphasizing the importance of avoiding gantries that would detract from the architectural features of the building. Using belt and gravity bucket conveyors and a space in the chimney base, the handling plant has been effectively concealed.

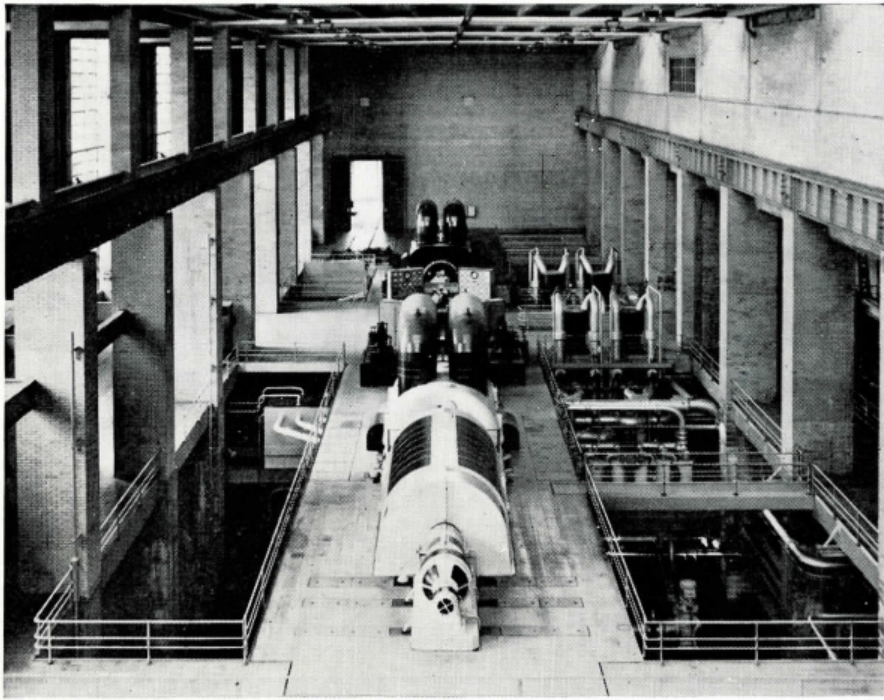
In the typical coal traffic operation, two tippers per boiler house are utilized. Coal is discharged from the tippers, then conveyed to the bunkers after undergoing crushing and screening. This process is facilitated by belt and bucket conveyors, each with a capacity of 75 tons per hour.

The storage area has a capacity for accommodating 140,000 tons of coal. For stocking purposes, coal is discharged from wagons by tippers onto a stocking-out conveyor. Subsequently, it is stocked and reclaimed when needed using bulldozers and carryalls.

The coal is then transferred to a traveling telfer and transported into rail wagons for carriage to the boiler house tippers. This sophisticated system optimizes coal handling efficiency while maintaining the visual appeal of the power station's architectural design.

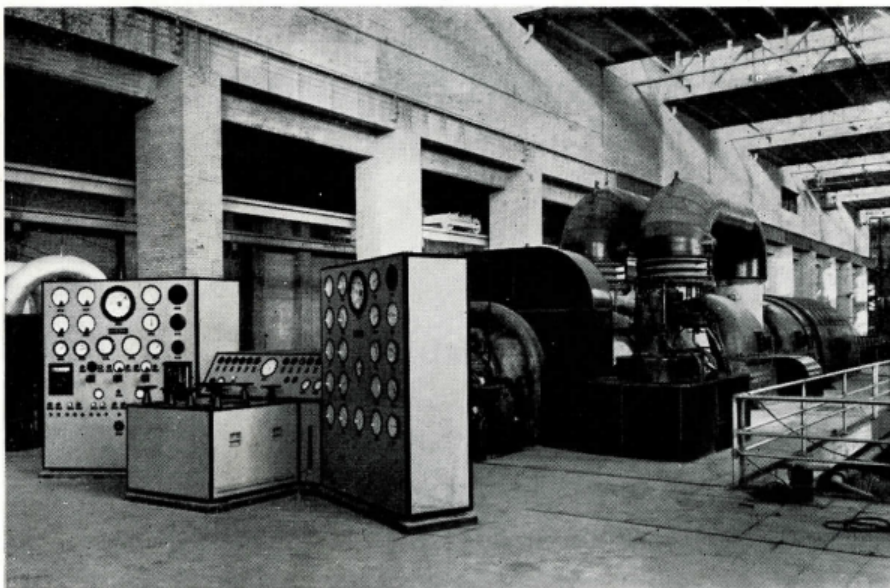
## TURBO-ALTERNATORS

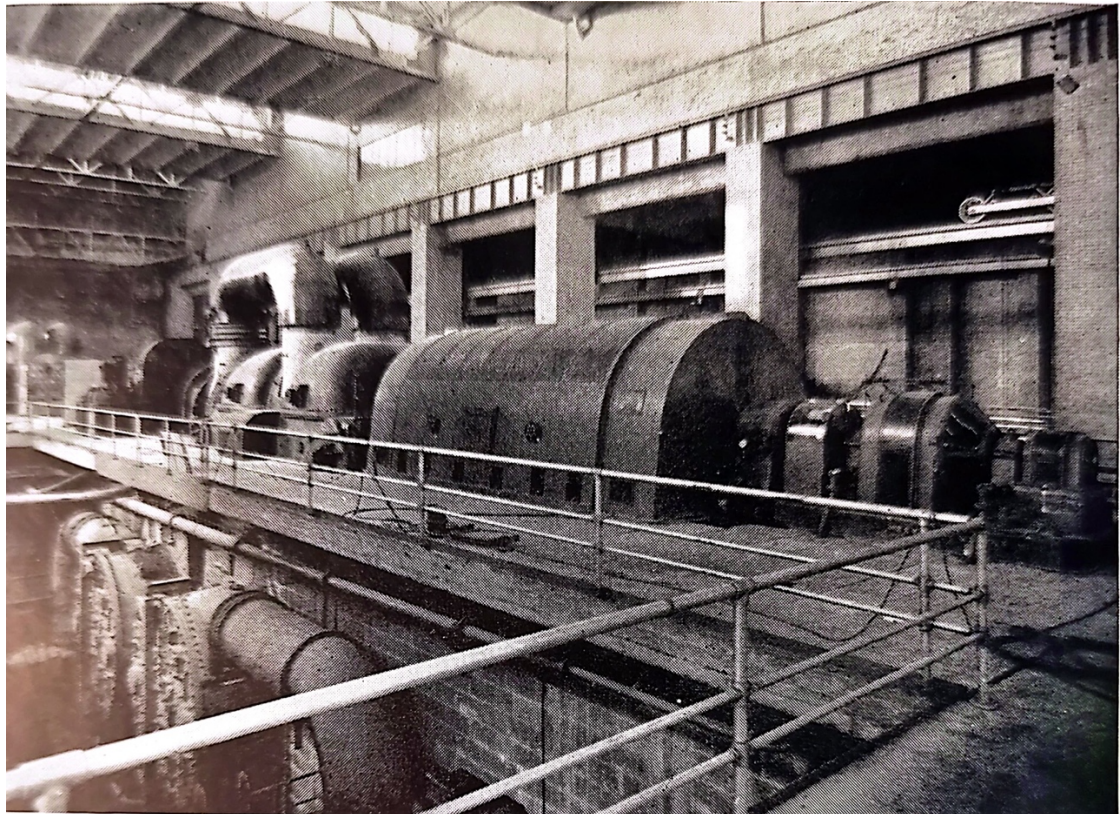
The commissioned plant currently in operation comprises two 3-cylinder type turbines, each generating 52,500 kilowatts at a speed of 3,000 revolutions per minute (r.p.m.). These turbines are paired with air-cooled alternators, showcasing a sophisticated and high-capacity power generation system within the power station.



TURBINE HALL

TURBINE CONTROL PANEL





ONE OF THE 52,500 KILWATT TURBO-GENERATORS WHICH THE STATION WILL HOUSE



BOILER HOUSE AISLE

The remaining four turbines will have an output capacity of 60,000 kilowatts at 3,000 revolutions per minute (r.p.m.), and these alternators will be hydrogen-cooled.

Each turbine will be supplied with steam at a pressure of 900 pounds per square inch and a temperature of 900 degrees Fahrenheit. The condensers are designed to maintain a 29-inch vacuum, with cooling water entering at a temperature of 58 degrees Fahrenheit.

Following the turbine operation, steam is exhausted into twin condensers. The air is extracted by two three-stage steam-operated air ejectors. The resulting condensate is removed by vertical extraction pumps, delivering directly to the low-pressure stages of the feed heating system. The condensate then passes through a high-level full-duty type de-aerator, a direct-contact heater, and ultimately through the boiler feed pump to the high-pressure feed heat stages before reaching the boiler.

The alternators generate electricity at a voltage of 11,800, and their output is fed directly into a 63,000 kVA transformer, which steps up the voltage to 132,000 volts. This comprehensive system highlights the advanced design and efficiency of the power station's turbine and generation setup.

## FEED WATER SYSTEM

For the operation of two turbo-alternators and five boilers, the power station is equipped with three electric pumps and one steam pump. The pipework on the suction and discharge sides is meticulously arranged to ensure redundancy and standby capabilities. Specifically, one of the electric feed pumps serves as a standby for each of the main electric pumps. Additionally, the steam-driven pump can function as a standby for any of the electric pumps.

Feed water make-up is sourced from the town's unfiltered supply and undergoes treatment through a water softening plant and evaporating plant. The current softening plant boasts a capacity of 40,000 pounds per hour, and there is one live steam evaporator with a capacity of 20,000 pounds per hour per set, feeding into the feed suction line.

To further enhance water quality, feed water treatment involves chemical injection into both the feed suction line and the boiler drums.

The system includes a conservator tank, serving the dual purpose of collecting clean drains and facilitating boiler emptying without the loss of feed water. This comprehensive setup underscores the attention to detail and redundancy planning to ensure the reliable and efficient operation of the power station.

## ASH HANDLING PLANT

In the first boiler house, each boiler is equipped with a dry ash hopper. At intervals, the ash is discharged from the hopper to sluiceways, then directed to the ash sump. This includes the dust collected from mechanical arrestors, precipitators, and flues. The combined ash and dust are pumped to ashing grounds on the east side of the station. To ensure operational reliability, duplicate ash pumps, sealing pumps, overflow pumps, and one ash crusher are provided. Given the considerable length of the ash discharge line, which spans 5,000 feet, booster ash pumps are employed.

The second and third boiler houses will have similar equipment, but water-filled ash hoppers will be utilized. To enhance emergency response capabilities, interconnection is established, allowing any ash sump to handle adjacent boiler houses if needed.

The high-pressure sluicing water required for this process is supplied by four sluice pumps located in the circulating water pump house. This integrated system highlights the robust design and contingency planning in place to manage ash disposal efficiently and address potential emergencies in the power station.

## ELECTRICAL EQUIPMENT

The alternators within the power station feed into the Grid transmission system through six main transformers, each with a no-load ratio of 11,800/141,600 volts. The first two transformers have a capacity of 63,000 kVA, while the remaining four have a capacity of 72,000 kVA.

For station auxiliary supplies, two station transformers of 10,000 kVA capacity, with a no-load ratio of 132,000/3,457 volts, are employed. Additionally, six-unit transformers of 6,000 kVA capacity, with a no-load ratio of 11,800/3,457 volts, contribute to the auxiliary network. These transformers are all water-cooled and equipped with on-load tap changing gear. They are housed in structures along the south side of the turbine house.

The auxiliary network is comprised of 3,300-volt, 150 MVA, and 415-volt, 25 MVA air-insulated air-break gear. Unit and station boards are in the switchgear room in the tank annexe, with boiler boards situated in switchgear annexes adjacent to the boiler houses. The air-cooled auxiliary transformers, with capacities of 250 and 500 kVA and a no-load ratio of 3,300/433 volts, are housed alongside the switchgear.

In addition to these supplies, a 150 kVA emergency diesel set is in place to maintain essential services in the event of a complete shutdown, ensuring the reliability of critical operations.

The station battery serves as the source of direct current for the 132,000-volt switchgear and other switchgear components, as well as providing power for certain emergency lighting systems.

To streamline cable lay-out and maintenance, cable tunnels are positioned below the main banks of switchgear. These tunnels run across and extend the full length of the turbine house. This design enhances the accessibility and manageability of the cable infrastructure, contributing to efficient operation and ease of maintenance within the power station.

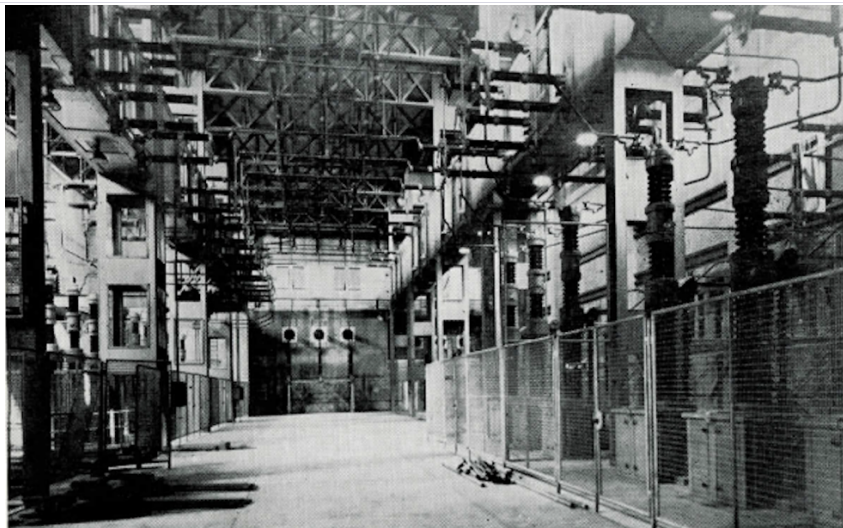
## MAIN SWITCHGEAR

The main switchgear at the power station operates at 132,000 volts, and its arrangement is unconventional for the country's standards. The typical outdoor switchgear is enclosed in a "hall type" building, offering protection against salt spray, and yielding significant floor space savings.

The switch house, measuring 320 feet in length, 90 feet in width, and 50 feet in height, is structured with an unusual design. It is divided into two main halls, east and west, by a central block. This central block houses essential components such as feeder and busbar protective gear, compressed air and CO<sub>2</sub> firefighting equipment, low voltage A.C. and D.C. distribution boards, offices, store accommodation, and a room dedicated to the main busbar section switch.

Additionally, there is a basement constructed with cellular design beneath the entire building, serving for cable and airline storage. The basement comprises 92 compartments, providing a robust and organized solution for cable management and air distribution, contributing to the overall stability and functionality of the power station.

## 132 KV SWITCHHOUSE



Each half of the building accommodates 10 circuit-breakers with associated isolators, designed for a double busbar layout. The reserve busbar in each half forms a "U" shape along the north, south, and central block walls. The two halves are interconnected via isolators and through-wall bushings.

The main busbar extends down the entire length of the central block and includes a section switch with through-wall bushings in the central block. Normally, all busbars, positioned 38 feet above floor level, are supported by porcelain insulators suspended from the underside of the roof trusses.

Maintenance access to the busbars is facilitated by overhead trolleys on rails fixed to the underside of the roof trusses and between the busbars. Trolleys are typically parked over platforms at the ends of the building, with entry allowed only when the corresponding busbars are earthed.

The busbar and feeder bypass isolators are mounted vertically above circuit-breaker level. The main and reserve busbar isolators are erected back-to-back with a screened-off passageway between them. Platforms can be lowered from this passageway for maintenance work on any isolator. Feeder isolators are mounted horizontally on steel structures. Electrical and Castell interlocks ensure correct operation and safeguard personnel.

The north wall provides provision for eight feeder and two reactor circuits, while the south wall accommodates six generators, two station transformer, and two bus-coupler circuits. Generator and station transformer circuits are cable-connected using single-core 132,000-volt oil-filled cables laid directly in the ground. They terminate in end boxes on the transformers and cable sealing ends at the switch house. Sealing ends for each circuit are housed in separate compartments built along and outside the south wall.

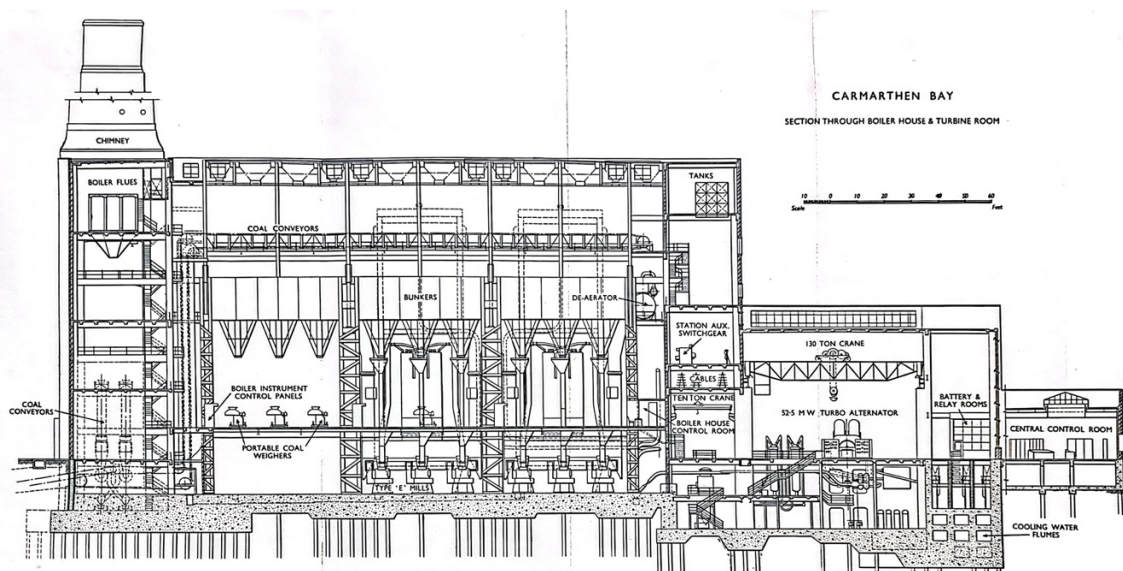
For 132,000-volt interconnections, paper and oil-insulated condenser bushings are utilized through walls between overhead lines and cables, and their respective switch units. These bushings, equipped with porcelain weather shields at both ends, also house all protective current transformers.

Given the use of porcelain or porcelain-clad insulators and the minimal presence of oil, the risk of flashover or fire is significantly reduced. Voltage transformers are the only equipment items containing oil.

# CONTROL ROOM



# SECTION THROUGH BOILER HOUSE & TURBINE ROOM



## Civil and Plant Details

### CIVIL WORKS - PROJECT OVERVIEW

**CONSULTANTS:** Balfour, Beatty & Co. Ltd.

### MAIN BUILDINGS

#### 1. TURBINE ROOM

- Length: 740 ft.
- Width: 96 ft.
- Height above ground level: 60 ft.
- Depth below ground level: 26 ft.

#### 2. TANK ANNEXE

- Length: 713 ft. 6 in.
- Width: 30 ft.
- Height above ground level: 113 ft.
- Depth below ground level: 26 ft.

#### 3. BOILER HOUSES (3)

- Dimensions of each:
  - Length: 225 ft.
  - Width: 220 ft.
  - Height above ground level: 113 ft.
  - Depth below ground level: 13 ft.

#### 4. WELFARE AND OFFICE BLOCK

- Length: 208 ft.
- Width: 48 ft.
- Height above ground level: 31 ft.

### Structural Details:

- Number of reinforced concrete piles: 5,517.
- Average length of piles: 55 ft.
- Structural steelwork: 16,000 tons.
- Number of bricks: 11,500,000.

### CHIMNEYS (3)

- Height above ground level: 300 ft.
- Internal diameter at exit: 20 ft.
- Type of construction: Brick with concrete pedestal.

### STORES BUILDING

- Length: 153 ft.
- Width: 83 ft.
- Height: 36 ft.

### **132 kV SWITCH HOUSE (HALL TYPE)**

- Length: 440 ft.
- Width: 110 ft.
- Height above ground level: 50 ft.
- Structural steelwork: 1,186 tons.
- Foundations: Raft construction.

### **CIRCULATING WATER PUMP HOUSE**

- Length: 240 ft.
- Width: 130 ft.
- Height above ground level: 47 ft.
- Depth below ground level: 55 ft.
- Number of diaphragms: 6.
- Structural steelwork: 509 tons.

### **CIRCULATING WATER CULVERTS**

- Length of intake: 300 ft.
- Pump house to turbine room: 180 ft.
- Length of culverts in turbine room: 750 ft.
- Length of discharge: 560 ft.
- Type of construction: Reinforced and sound concrete pipes.

### **RAILWAY SIDINGS**

- Total length of sidings: 10 miles.
- Capacity of full wagon sidings: 600 wagons.
- Capacity of empty wagon sidings: 300 wagons.
- Handling rate: 700 tons per hour.

### **TURBO-ALTERNATORS**

- **Manufacturer:** Metropolitan-Vickers Ltd.
- **Turbines:**
  - Six-Multistage impulse type turbines.
  - 3 cylinders, operating at 900 p.s.i. and 900°F.

- Speed: 3,000 r.p.m.
- **Alternators:**
  - Nos. 1 & 2: 52.5 MW (Air-cooled).
  - Nos. 3 to 6: 60 MW (Hydrogen-cooled).
- **Hydrogen Details:**
  - Hydrogen pressure: 0-5 p.s.i. gauge.
- **Voltage:**
  - All generators operate at 11.8 kV.

## Condensing Plant:

- **Nos. 1 and 2:**
  - Twin condensers, 2 pass.
  - Capacity: 330,000 lb/hr.
  - Cooling water: 44,000 g.p.m.
  - Vacuum: 29 in. (Bar 30 in.) with C.W. at 58°F.
- **Nos. 3 to 6:**
  - Twin condensers, 2 pass.
  - Capacity: 377,000 lb/hr.
  - Cooling water: 50,000 g.p.m.
  - Vacuum: 29 in. (Bar 30 in.) with C.W. at 58°F.

## Feed Heating Plant:

- Five-stage.
- Components:
  - Two L.P. heaters.
  - One de-aerator.
  - Two H.P. heaters.
- Final feed temperature:
  - Nos 1 and 2: 365°.
  - Nos. 3, 4, 5, and 6: 380° at Full Load.

## Steam Raising Plant:

### Boilers:

- **Manufacturer:** Babcock & Wilcox, Ltd.
- **No.:** 15.
- **Capacity:** 240,000 lb/hr, 940 p.s.i., 925°F.
- **Type:** High head, single drum P.F.

- **Furnace Heating Surface:** 4,375 sq ft.
- **Furnace Volume:** 21,900 cu. ft.
- **Superheater:** Multiloop draining type with primary and secondary heating surface.
  - Primary: 8,150 sq ft.
  - Secondary: 2,900 sq ft.
- **Attemperators:** Surface type, two per boiler.
- **Economisers:** Multiloop type, Heating surface: 9,600 sq ft.

#### Air Heaters:

- **Manufacturer:** James Howden & Co. (Land) Ltd.
- **No. per boiler:** Two.
- **Type:** Contra-flow Ljungstrom vertical type.
- **Heating Surface (each):** 34,200 sq ft.

#### Firing Equipment:

- **P.F. Mills:** Babcock & Wilcox, Ltd, Type 'E,' size 44, three per boiler.
- **P.F. Burners:** 10 in vertical type, nine per boiler.
- **Oil Lighting-up Equipment:** Four pressure atomizing oil burners.

#### Fans:

- **F.D. Fans:**
  - **Manufacturer:** Davidson & Co. Ltd.
  - **Type:** 60 in dia. single inlet backward-bladed.
  - **Capacity:** 39,700 c.f.m. at M.C.R.
  - **No. per boiler:** Two.
- **I.D. Fans:**
  - **Manufacturer:** Davidson & Co. Ltd.
  - **Type:** 81 in dia. single inlet radial-bladed.
  - **Capacity:** 62,000 c.f.m. at M.C.R.
  - **No. per boiler:** Two.
- **P.A. Fans:**
  - **Manufacturer:** Davidson & Co. Ltd.
  - **Type:** 72 in dia. single inlet backward-bladed.
  - **Capacity:** 26,000 c.f.m.
  - **No. per boiler:** Two.

#### Dust Collectors:

- **Manufacturer:** Prat-Daniel (Stanmore) Ltd.
- **Type:** 3 R.A.S.5 (12 x 15) tubular.
- **Capacity:** 60,800 c.f.m.
- **No. per boiler:** Two.

### Electrostatic Precipitators:

- **Manufacturer:** Sturtevant Engineering Co., Ltd.
- **No. per boiler:** One.

### Feed Pumps:

- **Manufacturers:**
  - Harland Engineering Co., Ltd.
  - G. & J. Weir & Co., Ltd.

- **Electric Feed Pumps:**
  - **Capacity:** 550,000 lb/hr.
  - **Speed:** 3,000 r.p.m.
  - **No.:** Nine.

- **Steam Feed Pumps:**
  - **Capacity:** 550,000 lb/hr.
  - **Speed:** 5,000 r.p.m.
  - **No.:** Three.

### Tanks:

- **Manufacturer:** Braithwaite & Co. (Structural) Ltd.
  - **Town Main Storage (1):** 23,000 gals cap.
  - **Reserve Feed Water (6):** 26,300 gals cap.
  - **Raw Water (3):** 23,000 gals cap.
  - **Treated Water (2):** 26,300 gals cap.

### Evaporators:

- **Manufacturer:** Aiton & Co., Ltd.
- **Type:** Triple effect.
- **Capacity:** 20,000 lb/hr.

### Circulating Water Plant:

#### Pumps:

- **Manufacturer:** Vickers Armstrong, Ltd.
- **Type:** Axial flow, 2-stage, propeller type.
- **Number:** Seven.
- **Capacity:** 52,600 g.p.m. at 365 r.p.m. against a total head of 25 ft.

#### Motors:

- **Manufacturer:** Laurence, Scott & Electromotors Ltd.
  - Three A.C. variable speed 935/193 b.h.p., 472/262 r.p.m.
  - **Manufacturer:** British Thomson Houston Co., Ltd.
  - Four constant speed 560 b.h.p., 365 r.p.m.

#### Circulating Water Screens:

- **Manufacturer:** F. W. Brackett & Co., Ltd.
- **Type:** Central Flow band type 60 in.
- **Capacity:** 3,156,000 gals/hr.
- **Number:** Seven.

#### Coal Handling Plant:

##### Conveyors:

- **Manufacturer:** Babcock & Wilcox, Ltd.
  - Six belt 24 in. size.
  - Twelve gravity bucket.
  - **Capacity:** Each conveyor 75 tons per hour.

##### Coal Crushers:

- **Type:** 36 in. x 36 in. flextooth.
- **Number:** Six.
- **Capacity:** Each 75 tons per hour.

##### Screens:

- **Type:** "Niagara" single deck.
- **Number:** Six.
- **Capacity:** Each 75 tons per hour.

##### Coal Reclaiming Transporter:

- **Capacity:** 100 tons per hour.

### Tipplers:

- **Manufacturer:** Strachen & Henshaw, Ltd.
- **Capacity:** 240 tons per hour.
- **Maximum Lift:** 24-ton wagon.
- **Number:** Seven.

### Stocking-Out Conveyor:

- **Manufacturer:** Rhymney Engineering Co., Ltd.
- **Type:** Belt.
- **Capacity:** 125 tons per hour.

### Bunkers:

- **Manufacturer:** South Durham Steel & Iron Co., Ltd.
- **Number:** Three per boiler house.
- **Capacity:** 375 tons per boiler.
- **Construction:** Steel.

### Coal Storage Area:

- **Capacity:** 140,000 tons.

### Ash Handling Plant:

#### Ash Hoppers:

- **Type:**
  - 5 boilers - dry hopper.
  - 10 boilers - water-filled hoppers.

#### Ash Sumps:

- One per boiler house.

#### Pumps per Boiler House:

- Two ash pumps 1,600 g.p.m.
- Two ash booster pumps 1,600 g.p.m.
- One h.p. sluicing pump.
- Two sealing water.
- Two overflow.

## Ashing Area:

- **Area:** 85 acres.

## Electrical Plant:

### *Auxiliary Transformers:*

- **Manufacturer:** Ferguson Pailin Ltd.
- **Type:** Air blast.
- **Rupturing Capacity:** 2,500 MVA.

### *132 kV Switchgear:*

- **Manufacturer:** Ferguson Pailin Ltd.
- **Type:** Air blast.
- **Rupturing Capacity:** 2,500 MVA.

### *3-3 kV Switchgear:*

- **Manufacturer:** British Thomson Houston Co., Ltd.
- **Type:** Air break.
- **Rupturing Capacity:** 150 MVA.

### *415 Volt Switchgear:*

- **Manufacturer:** British Thomson Houston Co., Ltd.
- **Type:** Air break.
- **Rupturing Capacity:** 25 MVA.

### *Transformers:*

- **Manufacturer:** A.S.E.A.
  - Six Generator Transformers
    - Nos. 1 and 2: 63 MVA.
    - Nos. 3 to 6: 72 MVA.
    - No load ratio: 11.8/141.6 kV.
  - Two Station Transformers: 10 MVA.
    - No load ratio: 132/3.457 kV.
  - Six Unit Transformers: 6 MVA.
    - No load ratio: 11.8/3.457 kV.
- **Manufacturer:** Hackbridge & Hewittic Electric Co., Ltd.
  - Capacity: 250 and 500 kVA.
  - Voltage: 3-3 kV/433 V.

### *Lighting:*

- **Manufacturer:** Metropolitan-Vickers Electrical Co., Ltd.

### *Diesel Set:*

- **Manufacturer:** National Gas & Oil Engines Ltd.
- **Capacity:** 150 kVA.

**Crane:**

- **Manufacturer:** Cowans, Sheldon & Co., Ltd.
- **Type:** 130-ton turbine room crane.

**132 kV Cable Connections:**

- **Manufacturer:** Pirelli General Cable Works, Ltd.
- **Type:** Generator and Station Transformer Cables.
- **Voltage:** 132 kV single-core oil-filled.

**Main and Sub-Contractors:*****Foundations and Superstructure, River Works, Pump House, Railway Sidings, L.P. Pipework, L.V. Cabling, Dewatering System:***

- **Contractor:** Balfour, Beatty & Co. Ltd.

**Steelwork:**

- **Contractor:** Millars Machinery Co. Ltd.

**Windows (Metal):**

- **Contractor:** South Durham Steel & Iron Co. Ltd.

**Windows (Glascrete):**

- **Contractor:** Henry Hope & Co. Ltd.

**Floors:**

- **Contractor:** J. A. King & Co. Ltd.

**Floor Finishes:**

- **Contractor:** Self-Sentering Expanded Metal Co.

**Roof Decking:**

- **Contractor:** Trussed Concrete Steel Co. Ltd.

**Asphalting:**

- **Contractors:** Universal Asbestos Manfg. Co. Ltd., Bettles & Co. Ltd.

**Precast Stonework:**

- **Contractor:** Prodorite Ltd.

**Staircases:**

- **Contractor:** A. M. Macdougall & Sons Ltd.

**Painting:**

- **Contractors:** Universal Asbestos Co. Ltd., Wm. Briggs & Sons Ltd.

**Concrete Pipes:**

- **Contractor:** General Asphalte Co. Ltd.

**Hot Water and Space Heating:**

- **Contractor:** Faldo Asphalte Co. Ltd.

**Chimneys and Brick Flues:**

- **Contractors:** Gloucester Stone Co. Ltd., Frederick Braby & Co. Ltd., Haywards Ltd.

**Precipitator Casings:**

- **Contractor:** E. Edgar Williams & Sons.

**Boiler Control Instrument Panels:**

- **Contractor:** Ian Williams & Co. Ltd.

**Thermal Insulation:**

- **Contractors:** Baxter Bros., Sharp Jones & Co. Ltd.

**H.P. Valves:**

- **Contractor:** G. N. Haden & Co. Ltd.

**L.P. Valves:**

- **Contractor:** Chimneys Limited.

**H.P. Pipework:**

- **Contractors:** J. L. Kier & Co., Bailey Meters & Controls Limited.

**Water Treatment Plant:**

- **Contractor:** Newalls Insulation Co. Ltd.

**Chemical Injection Plant:**

- **Contractor:** Dewrance & Co. Ltd.

**Vacuum Cleaning Plant:**

- **Contractor:** Hopkinsons Ltd.

**Air Compressors:**

- **Contractor:** Alley & McLellan Ltd.

**Locomotives:**

- **Contractor:** Chimneys Limited.

**Caterpillar Tractors:**

- **Contractor:** J. L. Kier & Co.

**Carryalls:**

- **Contractor:** Bailey Meters & Controls Limited.

**415 V Fusegear:**

- **Contractor:** Newalls Insulation Co. Ltd.

**Batteries and Rectifiers:**

- **Contractor:** Dewrance & Co. Ltd.

**Cables:**

- **Contractors:** Hopkinsons Ltd., Alley & McLellan Ltd.

**132 kV Transmission Lines:**

- **Contractors:** Blakeborough & Sons Ltd., Stewarts & Lloyds Ltd.

***Lighting and Heating Circuits 132 kV Switch House:***

- **Contractors:** Paterson Engineering Co. Ltd., Permutit Co. Ltd., Sturtevant Engineering Co. Ltd.

***Additional Contractors:***

- Broom & Wade Ltd.
- Andrew Barclay, Sons & Co. Ltd.
- Jack Olding & Co. Ltd.
- Frederick Myers & Co. Ltd.
- Simplex Electric Co. Ltd.
- Alton Battery Co. Ltd.
- Britannic Cable Co.
- Pirelli General Cable Co. Ltd.
- B.I.C.C. Co. Ltd.
- Hackbridge Cables Ltd.
- British Insulated Callender's Construction Co. Ltd.
- R. Alger & Sons Ltd.

BRITISH ELECTRICITY AUTHORITY  
South Wales Division

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