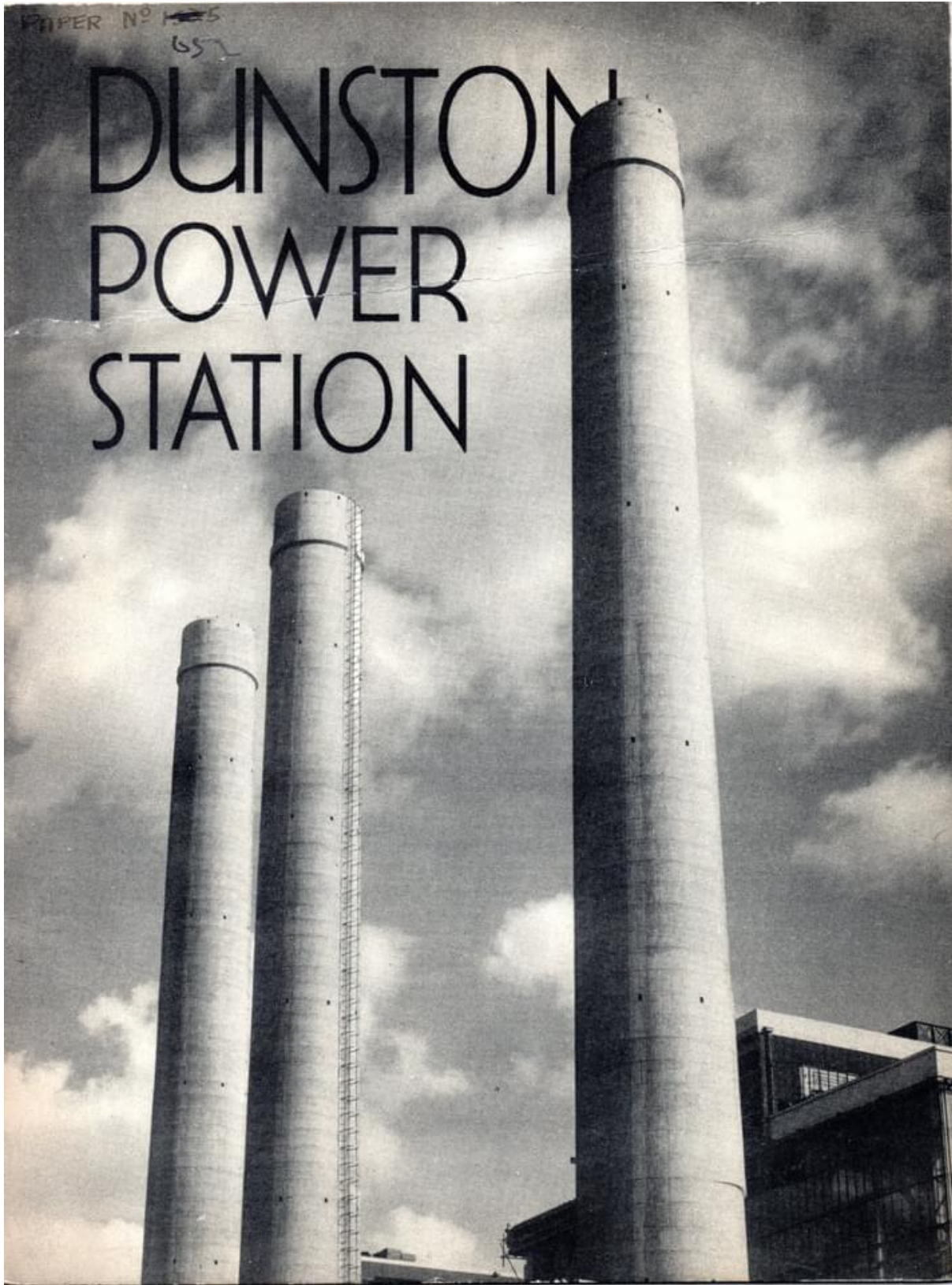


PAPER NO 1-5
657

DUNSTON POWER STATION



NORTH-EASTERN ELECTRIC SUPPLY COMPANY LTD.

Registered Office - - Carlol House, Newcastle upon Tyne, I.

DIRECTORS

R. P. Sloan, C.B.E., M.I.E.E. (*Chairman and Managing Director*)

H. W. F. Bolckow

Alfred Bonnin

The Hon. R. H. Brand, C.M.G.

Sir George B. Hunter, K.B.E.

Norbert Merz

Sir John H. B. Noble, Bart.

James Tennant

GENERAL MANAGER

H. A. Couves, M.I.E.E.

SECRETARY

C. Skipsey, F.C.I.S.

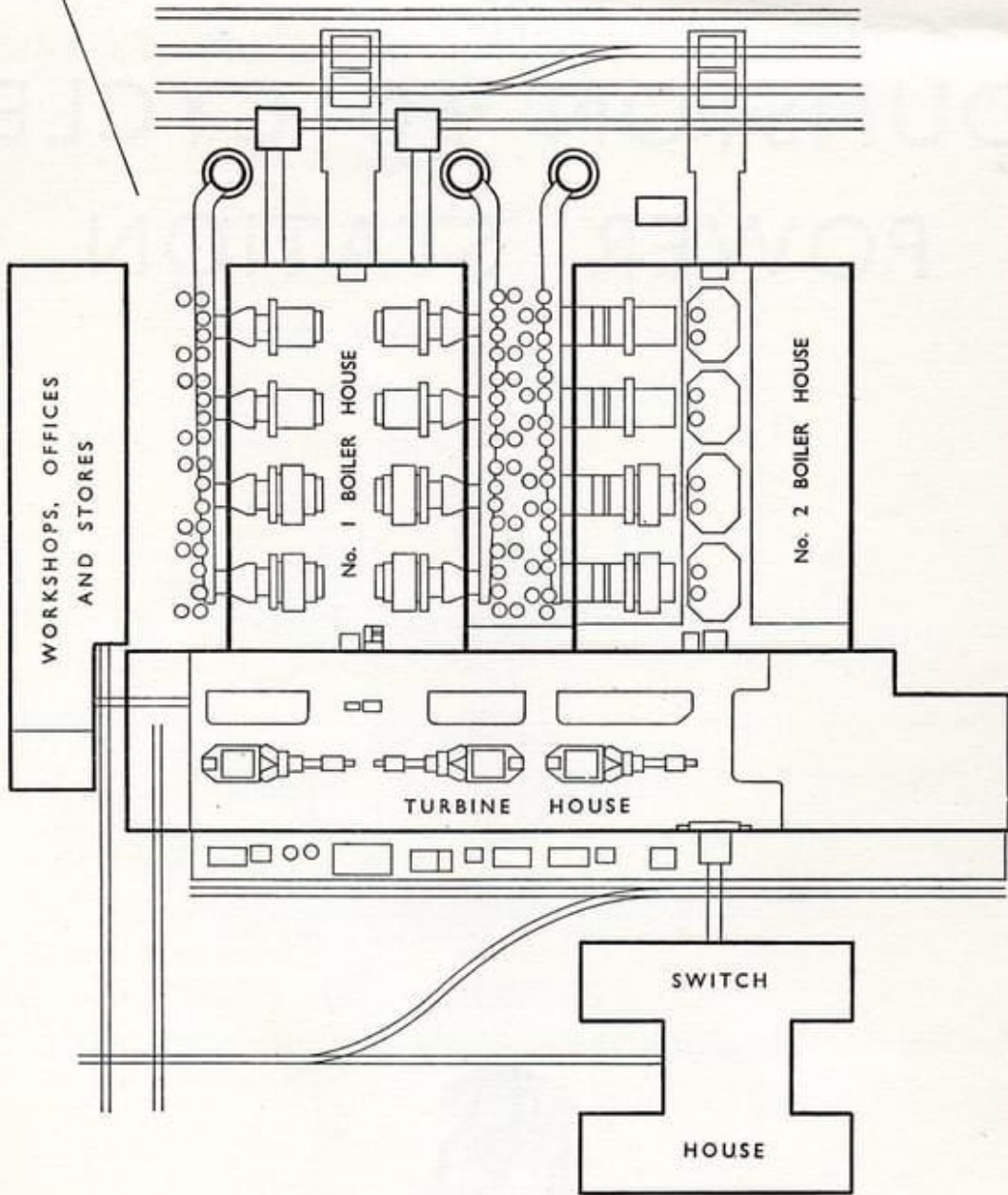
CONSULTING ENGINEERS

Merz and McLellan,
London and Newcastle upon Tyne

A DESCRIPTION
of
DUNSTON 50 CYCLE
POWER STATION



PLAN OF DUNSTON 50 CYCLE POWER STATION



SCALE OF FEET.

100 FT. 50 0 100 200 300 FEET.

FOREWORD

The bringing of the Dunston Power Station into operation, in January, 1933, was of historic interest, in that it marked the first important step towards the supply of electrical energy, throughout the North-Eastern Electric Supply Company's area, at the national standard frequency of 50 cycles per second.

The Company was the first Electricity Supply Authority in the Country to introduce electric power transmission and distribution on the three-phase alternating current system—the first supply being given in 1901.

At that time, a frequency of 40 cycles per second was adopted by the Company as being the most satisfactory in view of manufacturing and other conditions then prevailing.

Many years later, a frequency of 50 cycles per second was approved by the Electricity Commissioners as the national standard, and the North East England Electricity Scheme, which was adopted by the Central Electricity Board on January 22nd, 1930, provided for the frequency of the Company's Undertaking being changed accordingly.

DUNSTON 50 CYCLE POWER STATION

The Site. The site is situated on the south bank of the River Tyne about two miles west of Newcastle and has an area of approximately 75 acres with a river frontage of about one-quarter of a mile. The station is built on the western part of the northern portion of the site and the buildings are sufficient to accommodate four 50,000 kW. sets. Provision has been allowed for extending in an easterly direction to accommodate two more 50,000 kW. sets with the necessary boiler plant.

Foundations, Buildings, and Chimneys. The Contractors for the whole of the civil engineering construction were Sir Robert McAlpine and Sons with Tileman and Company as sub-Contractors for the ferro-concrete chimneys which rise to a height of 250 feet above ground level.

Buildings. The buildings are of steel frame construction supplied by Dorman Long and Company and the walls consist almost completely of patent glazing supplied by Heywood and Company. Three and-a-half acres of glass were used in the construction and the total quantity of steelwork in the buildings is approximately 6,000 tons.

Turbine House. The turbine house contains three 50,000 kW. two-cylinder tandem turbo-alternators running at a speed of 1,500 revolutions per minute and generating electrical energy as three-phase current at a voltage of 13,500 and a frequency of 50 cycles per second. The steam pressure at the stop valve is 600 lbs. per square inch at a temperature of 800° Fahr. Reheating is adopted, the exhaust steam from the high pressure cylinder at a pressure of 115 lbs. per square inch being taken back to the boilers and reheated to its initial temperature of 800° Fahr. before returning to the low pressure cylinder. Steam is bled from the turbines in stages for feed water heating up to 340° Fahr. and for evaporating the feed water make-up.

Each alternator has a continuous maximum rating of 50,000 kW. at .8 lagging power factor and its exciter is direct driven from the main alternator shaft.

The turbo-alternators were manufactured by C. A. Parsons and Company, and each low pressure turbine exhausts into a single condenser supplied by Richardsons Westgarth and Company.

Each condenser is designed to maintain a vacuum of 29 inches of mercury when supplied with 26,500 gallons of cooling water per minute and has a cooling surface of 40,000 square feet.

Air is extracted by duplicate steam ejectors and two water extraction pumps are provided for each condenser.

A non-condensing house turbo-alternator set of 2,500 kW. capacity also made by Richardsons Westgarth and Company is installed for the supply to auxiliaries on starting up, but the normal supply to the auxiliaries is taken either from a unit transformer on each alternator or from the station main auxiliary transformers.

There are two boiler houses, each arranged at right angles to the engine room. The west boiler house contains four steam generating units supplied by Clarke Chapman and Company, and four combined steam generating and reheating units made by Babcock and Wilcox. These units are all fired by chain grate stokers of the Babcock and Wilcox type. Each unit is provided with air heaters, Bailey water cooled furnace walls and Foster economisers. The steam generating units are each capable of evaporating 156,000 lbs. of steam per hour at a pressure of 625 lbs. per square inch superheated to 825° Fahr.

Boiler
Houses.

Each combined steam generating and reheating unit is capable of evaporating 125,000 lbs. of water per hour and reheating 180,000 lbs. of steam per hour from a temperature of about 520° Fahr. to a temperature of 825° Fahr.

The east boiler house is arranged for pulverised fuel firing, only one line of boiler and reheater units at present being installed. The units are of a size and make similar to those in the west boiler house. A unit system of pulverised fuel has been adopted, each boiler having two pulverisers of the Clarke Chapman "Resolutor" type.

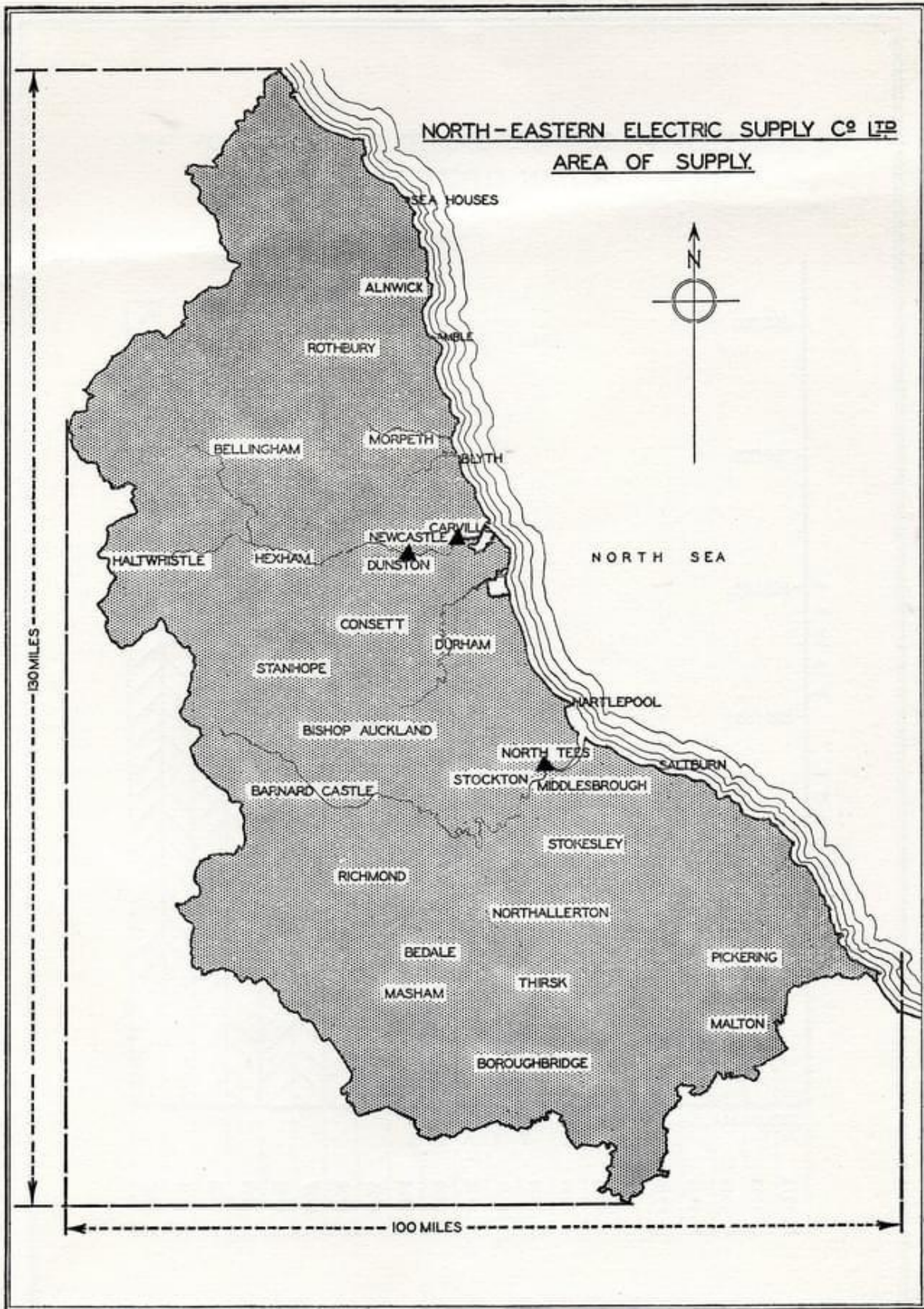
The contractors for the pipework were Aiton and Company. The high pressure piping is of solid drawn mild steel with joints of the "Corwel" sealed-weld type. All high pressure valves were manufactured by J. Hopkinson & Son.

Piping.

The forced and induced draught fans were provided by Davidson and Company who also supplied the system of cyclone dust extractors. The speed of the fans is controlled by hydraulic couplings supplied by the Hydraulic Coupling and Engineering Company.

Fans and
Dust
Extracting
Equipment.

- Circulating Water. The circulating water is pumped from the River Tyne by pumps situated in a pump house at the western extremity of the site and is returned to the river at an outfall at the extreme east end of the site. The pump house will accommodate six vertical spindle pumps, three of which are installed at present, these being supplied by Drysdale and Company. Each pump is capable of delivering 1,860,000 gallons of water per hour against a head of 47 feet and is provided with a vertical rotating band screen manufactured by F. W. Brackett and Company.
- Coal Handling. Coal is elevated into the bunkers by means of gravity bucket conveyors supplied by The Birtley Company. Two conveyors are provided for each boiler house. Each conveyor is capable of dealing with 75 tons of coal per hour.
- Ash Handling. The ash in the stoker fired boiler house is handled by means of water-trough scraper link conveyors made by the Underfeed Stoker Company. The pulverised fuel fired boiler house ash is handled by a sluicing system made by the Ash Company (London), which system is also used for handling the dust caught by the cyclones.
- Switchgear. The current generated at 13,500 volts is transformed to 66,000 volts by means of step-up transformers directly connected to the alternator terminals and the main switching is done at this voltage. The switchgear was manufactured by A. Reyrolle and Company. It is of the duplicate busbar metalclad oil-filled phase isolated type and is accommodated in two separate switch houses, each divided into two sections by fire isolating barriers. The circuit breakers are remote electrically operated and are of the multi-break type having a rupturing capacity of 1,500,000 kV.A.
- Cabling System. The outgoing feeders at present number 16, of which 10 are owned by the Company and 6 by the Central Electricity Board who have constructed on a site, adjacent to the Company's site, a transforming station where certain of the lines step up to 132,000 volts which will connect to the main grid lines running north and south.
- Operating Room. The operating room has been given special consideration with a view to rendering the operation and maintenance of the control apparatus as simple as possible. Over each control panel there is mounted a miniature diagram panel on which the open and closed positions of the circuit breaker, isolators, etc., controlled from the panel are indicated by automatic semaphores. Duplicate automatic synchronising apparatus has been installed in addition to the usual features for manual synchronising.



Area of Supply covers 5,620 sq. miles

GROWTH OF CONNECTIONS TO THE SYSTEM OF THE NORTH-EASTERN ELECTRIC SUPPLY Co. LTD.

