

Ratcliffe fact file based on full output

Coal burned every hour on full output:	812 tonnes
Coal stockpile:	1 million tonnes
Amount of steam produced by boilers:	1.5 million kg/hour or 3.4 million lbs/hour
Steam temperature:	568 degrees C
Steam pressure:	165 bar
Turbo-generators:	Four, each capable of generating 520 megawatts with a net output of 500 megawatts. (500 thousand units of electricity)
Chimney:	200 metres high (650 feet)
Cooling towers:	Eight, 114 metres high (375 feet)
Amount of water cooled by all towers:	218 million litres per hour or 48 million gallons per hour

FGD file

SO ₂ efficiency removal:	92%
Typical quantity of SO ₂ removed:	160,000 tonnes/annum
Typical quantity of limestone used:	340,000 tonnes/annum
Typical quantity of gypsum produced:	480,000 tonnes/annum
Typical quantity of treated liquid effluent discharged:	900,000 tonnes/annum
Treatment sludge produced:	30,000 tonnes/annum



Ratcliffe-on-Soar Power Station

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Introduction

Ratcliffe-on-Soar Power Station is a 2,080MW coal-fired Power Station which can produce enough electricity to meet the needs of approximately two million people.

The 700-acre site, built in the 1960s, sits in the south west of Nottingham where the River Soar flows into the River Trent.

After it was fully commissioned in 1970, Ratcliffe quickly established itself as one of the most efficient Power Stations in the country. It was the first station in Britain to generate 10,000 million and subsequently 15,000 million kilowatt hours of electricity in a single year. It has also recorded consistently high figures for thermal efficiency – a measure of how much electricity is generated from each unit of fuel.

At full output, Ratcliffe is capable of burning six million tonnes of coal every year and producing nearly one million tonnes of ash.

The ash that is produced is called pulverised fuel ash (PFA), and is recycled and used in the building trade.

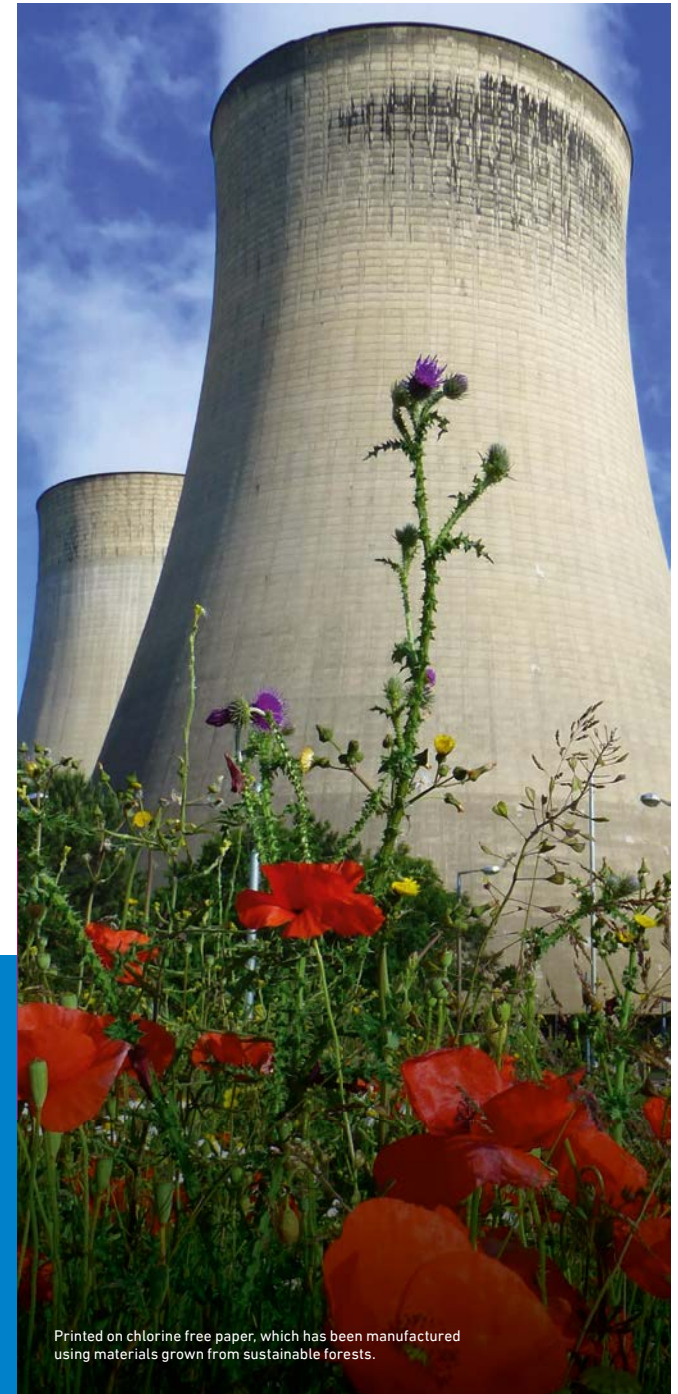
A clean environment

The size of the station and its position in flat farmland means that it is clearly visible for miles around, but the impact on the countryside has been reduced by careful landscaping of the whole site. Large numbers of native trees and shrubs have been planted, including oak, beech and sycamore.

As part of our commitment to the environment, a £250 million flue gas desulphurisation (FGD) plant has been installed at Ratcliffe. The plant is designed to reduce SO₂ emissions from the station by at least 92%.

Also, we have maintained our drive for continual environment improvement by the installation of a Selective Catalytic Reduction (SCR) process, which will reduce emissions of Oxides of nitrogen (NOx) by more than 85%, this is to comply with tighter environmental legislative emission limits. Ratcliffe is the first coal-fired Power Station in the country to install this technology.

Ratcliffe is committed to being part of the low carbon leadership programme and has invested in new plant such as High Performance High Pressure Turbines to increase efficiency and reduce the amount of carbon dioxide (CO₂) the station emits.



Printed on chlorine free paper, which has been manufactured using materials grown from sustainable forests.

The principle of electricity generation was discovered in 1831 by Michael Faraday when he realised that a small current could be produced in a loop of wire rotated between the poles of a stationary magnet. On a much larger scale, this is the method used to generate electricity in a modern power station, except that the magnet is rotated and the equivalent of the wire – a mass of copper windings – is stationary.

Hydro-electric power stations use the natural energy of water to produce electricity, but most of Uniper UK's generating plant is thermal and requires a heat source which can be coal, oil or gas.

1 Coal

Most of the coal is delivered by rail in 75-tonne wagons which pass through the station sidings at a steady speed of half a mile an hour. Doors in the bottom of each wagon open automatically as they pass over the track hopper beneath the rails. The coal is emptied on to an underground conveyor belt which takes it up to the boiler bunkers for immediate use, or to the storage area for use at weekends or in emergencies. Coal can also be delivered by road.

2 Boiler (coal-fired)

The coal is ground as fine as face powder in the pulverising mills, then mixed with warm air before being burned in the huge boilers. These are made up of miles of tubing in which the pure boiler feedwater is turned to steam. The steam temperature is boosted in the hottest part of the boiler before it passes to the turbine.

3 Turbine

The steam goes through the high, intermediate and low-pressure cylinders of the turbine. In between the high and intermediate stages the steam is returned to the boiler to be re-heated to full temperature. As it passes through the turbine, it strikes a series of angled blades mounted around the long turbine shaft, making it rotate at 3,000 revolutions per minute, just as wind turns the sails of a windmill.

4 The generator

As the turbine shaft spins it rotates the huge magnet – the rotor – and an electrical field is generated in the copper coils of the stators which are fixed around it.

5 Transformer

The power is generated at 22,000 volts, then is boosted to 400,000 volts by the generator transformer before going on to the national grid transmission system.

6 Condensers

Meanwhile, the steam, having lost most of its energy in driving the turbine, enters the condenser, where it passes over small tubes containing cooling water. This condenses the steam into water and the water is pumped through the feed heaters and back into the boiler.

7 Cooling towers

The cooling water in the condenser tubes increases in temperature, having done its work in condensing the steam from the turbine, and passes to the cooling towers for cooling. The water is sprayed into the towers near the bottom and the updraught of air passing the water droplets gives the cooling effect. The water falls into the tower pond and, from there, it is pumped back through the condenser tubes for further use in condensing the turbine steam.

8 Ash

Coarse ash from the boilers is mixed with water and piped to a settling pit, from where it will be sold to the building trade or used for manufacturing building blocks. The other waste product of combustion is pulverised fuel ash (PFA), of which over 99 percent is removed from the boiler gases by electrostatic precipitators before the gases pass up the chimney. The PFA is collected in hoppers under the precipitators and sold to contractors who remove it from the site for use in civil engineering projects or lightweight building blocks. The surplus is disposed of in worked-out gravel pits and allows them to be recovered for agricultural use.

9 FGD

Flue gas desulphurisation is a specific plant used for removing sulphur emissions from our flue gas. The process uses limestone to remove sulphur and create gypsum. This gypsum is sold to British Gypsum for use in plasterboard and plaster products.

10 Chimney

The chimney is where our flue gas exits the process after flue gas cleaning. This is where our continuous emissions monitoring systems are located.

How electricity is produced at Ratcliffe-on-Soar Power Station

