Drax Power Limited

Drax Power Station

Environmental Performance Review 2003

Introduction

This is the first Environmental Performance Review produced by Drax Power Limited, which took over Drax Power Station at the end of 2003 following a major financial restructuring. The document reviews the environmental performance and initiatives in which Drax was involved over the whole of 2003.

The management of the Power Station has reaffirmed its commitment to managing the environmental performance of Drax:

"At Drax, the environment is at the heart of our decision-making process, underpinning our overall approach, achieving economic growth while protecting and, where possible, enhancing the environment. The focus on environmental issues has been maintained over the last year despite a major financial restructuring and the emergence of Drax Power Limited as an independent generating company owned by a number of financial institutions."

Gerald Wingrove, Chief Executive, Drax Power Limited

Site Description

Drax is the largest coal fired power station in Western Europe. There are 6 boilers and generating sets each of nominal 660 MW(e) output, giving 3690 MW(e) in total, representing about 6.2% of the installed generating capacity of England and Wales. Coal is the main fuel for these boilers with the small amounts of oil which are used for start-up and shut-down purposes. Over the last year, increasing amounts of biomass have been co-fired.

Drax was built in 2 phases, 1973-5 (boilers 1-3) and 1985-6 (boilers 4-6). Between 1991-96 flue gas desulphurisation (FGD) equipment was fitted to all 6 units to remove around 90% of the emitted sulphur dioxide (SO_2).

Environmental Policy

Following the restructuring of the company in 2003, a new environmental policy has been developed to better reflect the aims and aspirations of Drax Power Limited:

"Drax Power recognises its responsibilities to society and the environment and is committed to being an innovative leader in the management of the environment across all its activities and in all its business decisions.

We regard compliance with legislation as a minimum level of achievement and will perform better than required where practical. We are committed to managing, monitoring and reducing where practicable the environmental impacts caused by our business through continual improvement of our operations, in particular emissions to air, discharges to water, disposal of waste and the use of natural resources.

We will maintain a reputation for effective environmental management, in part by certification to the international environmental management system

standard, ISO14001:1996. This system will be used to set and periodically review environmental objectives and targets.

We will discuss our activities with our stakeholders, engaging with them to help refine and broaden our understanding, taking note of their views and investigating any concerns promptly, courteously and professionally

We will promote environmental awareness amongst our staff, business partners and contractors, ensuring that they understand the environmental aspects of their activities, that they act responsibly and are competent to carry out their jobs."

Environmental Management

Drax manages its environmental compliance under the umbrella of a certified Environmental Management System (EMS). The purpose of the Environmental Management System is to ensure that Drax Power meets its commitments to protect and improve the environment in the course of carrying out its business.

The Station's management system has developed documented procedures for each significant environmental issue and staff are trained to recognise legal and operational requirements contained within them.

Because the site operates within an ISO14001 environmental management system, environmental audits are employed to monitor the effectiveness of the system in fulfilling the environmental policy, objectives and targets. External EMS audits are carried out at regular intervals by an accredited organisation. Drax Power's system was re-certified in October 2001, following a 5 day surveillance audit; surveillance has continued at six monthly intervals since then. A re-certification exercise will be performed in late 2004.

As part of the site EMS, Drax Power has developed a series of environmental objectives and, from these, a set of environmental targets. The table in the Appendix indicates 2003's performance against targets together with the targets for 2004.

The Environmental Impacts of Drax Power Station

Drax's generating units have all been retrofitted with flue gas desulphurisation (FGD) equipment and low NOx burners to minimise emissions to atmosphere. In addition, the operation of the station results in other environmental effects, such as discharges to water, waste material production, and noise.

	2000	**2001**	**2002**	**2003**
Electricity Generated (GWh)	23,000	22,300	19,454	25,980

Fuel

A large proportion of the coal used in 2003 was supplied by rail, from British mines. The coal is unloaded automatically from the rail wagons and transported by conveyor either to bunkers inside the boiler house or to the stockpile. The coal is crushed into a fine powder in the mills before being burnt in the boiler.

Oil is used during boiler light up and for combustion support. In 2003 This was principally heavy fuel oil although consideration was given to replacing this with a renewable fuel.

In 2003 the site commenced trials of biomass.

Fuel Used (thousand tonnes (kt))	**2000**	**2001**	**2002**	**2003**
Coal	8,500	8,380	7,345	9,783
Oil (used at start up and to stabilise combustion)	37.0	40.0	36.0	20.1
Biomass				4.94

Emissions

Burning coal produces carbon dioxide, hydrogen chloride and oxides of sulphur and nitrogen. The gases then pass to the FGD equipment where about 90% of the sulphur dioxide and hydrogen chloride are removed and gypsum is produced. The remaining exhaust gases are released via the chimney into the atmosphere and can be carried hundreds of miles by weather systems. The dispersion ensures that the station's contribution to local and national ground level concentrations is very small.

Total Emissions (kt)	**2000**	**2001**	**2002**	**2003**
Carbon Dioxide	19,000	18,735	16,350	21,642
Sulphur Dioxide	31	45.7	34.6	44.2
Oxides of Nitrogen	59	58.5	49.6	64.7
Hydrogen Chloride	16	4.1	3.1	0.66
Dust	1.5	0.3	0.3	0.3

In 2003, Drax sourced over 95% of the coal from the UK with an average sulphur of around 1.3-1.4%. A large fraction of that was from the local, low sulphur, Selby Coalfield. The current contract with UK Coal sets an annual average sulphur limit of 1.35% although UK Coal will not be able to meet this

level once the Selby Coalfield closes, as its other mines work higher sulphur reserves. Hence it is highly likely that in the next year Drax will burn a substantial amount of UK sourced coal with an average sulphur content of 1.7-1.9%, supplemented by imported coal with a sulphur content of around 1% or less

Sulphur dioxide (SO_2)

The annual SO_2 limit in 2003 ranged from 43 to 48kt depending on the load factor of the plant. Discussions were initiated in 2003 to rationalize this complicated structure.

A mixture of crushed limestone, and water is sprayed into the flue gas in the Flue Gas Desulphurisation (FGD) plant in order to remove sulphur dioxide. The limestone reacts with the SO2 in the flue gas, and forms gypsum which is used in the production of plaster wallboard. The FGD plant has been operated and maintained in 2003 consistent with achieving full compliance with the annual emission limits.

	2000	**2001**	**2002**	**2003**
Limestone used in the FGD process (kt)	361	317	299	439
Gypsum generated by the FGD process (kt)	585	505	472	697

An incident, which resulted in damage to Unit 3A booster fan, occurred on the 4th December 2002. Efforts to return the absorber to service following the incident failed, due to lack of lubricating oil pressure to the fan bearings. It became apparent that the absorber could not be immediately returned to service and further investigation revealed sustained damage to 3A booster fan journals and bearings. The fan, and hence the FGD, was not returned to service until March 2003.

Petroleum Coke

In an attempt to offset the additional costs of its FGD plant, Drax has considered the use of lower cost fuels such as petroleum coke which is a by-product of the oil industry. It has a calorific value that is approximately 30% higher than coal, but it is also higher in sulphur content and some metals - principally nickel and vanadium.

A limited trial burning petroleum coke blends was carried out at Drax over a three-month period in 1997 under the auspices of the Environment Agency, which demonstrated no immediate detrimental impact on the environment. In January 2002, Drax submitted a further application to the Environment Agency for a variation to its authorisation to carry out an 18-month trial on one unit, burning blends of up to 15% Petroleum coke blended with 85% coal. The purpose of the newly proposed extended trial is to determine the effect upon

the plant, to test the Station's ability to receive the material by train, and prove commercial blending capability.

The application for the trial was deemed non-substantial by the EA but was, nevertheless, the subject of full public consultation. A report produced in 2003 by Professor Roy Harrison of Birmingham University and the expert panel on Air Quality Standards indicated that there would not be any significant effect on public health from the trial. In November 2003, the Environment Agency announced that it would allow an 18-month trial burn of a coal/petcoke blend at Drax, following a six month check on air quality in the area. It is expected that this will commence in 2004.

NOx

The annual NOx limit in 2003 was 80,000 tonnes. Emissions in 2003 were considerably less than this limit.

Drax has been planning to fully retrofit low NOx burners to the first half units (Units 1, 2 and 3). A contract was placed with Mitsui Babcock to supply and fit Mk III 71MW burners to Units 2 and 3 during 2003. This was completed and by end 2003 both units were undergoing commissioning trials.

Air Quality

In order to show that the Air Quality Standards can be met in areas surrounding power stations by the target date of 2005, all coal and oil plants in the UK have to install continuous emission monitors for NOx, SO_2 and PM10s in an off-site location close to their emission 'hot spot'. Drax, Eggborough and Ferrybridge are complying jointly with this condition in the Aire Valley. Drax submitted annual reviews for 2001 and 2002 (published March 2002 and March 2003 respectively) to ensure compliance with the National Air Quality Strategy (NAQS) objective, and for publication on the public register.

CO_2 Emissions

Generators of electricity from renewable sources are able to claim Renewable Obligations Certificates (ROCs) for that portion of the electricity produced from a renewable source. Drax submitted an application to the EA in January 2003 for a trial burn of biomass fuels and, following approval from the EA, a trial co-firing Milled Palm Nut (MPN) started in June on one unit. MPN was chosen because it was available in significant quantities, it was reasonably easy to handle and it had been trialled at other UK power stations. The overall objective of the trial was to assess the effect on the plant of burning MPN under different operational regimes. The trial was successful and the outcome of the emissions testing carried out as part of the trial was sent to the EA together with an application to burn a wider range of biomass materials

In addition, Drax made an application to the EA for trial use of a renewable oil to be used as a replacement for Heavy Fuel Oil for light-up and combustion support.

Particulate Emissions

The particulate emission limit for each unit, when operating with its FGD in service, is 25 mg/m^3 at all times. The monthly emission limit for each unit, when operating with its FGD out of service, is 50 mg/m^3.

Compliance with the site's particulate limits is achieved through a combination of the precipitators and the FGD. When the FGD is out of service, there is the potential for higher emissions. Throughout 2003, the plant was compliant with its particulate limits.

Water

Water is heated and converted to steam by passing through piping in the boiler. The steam leaves the boiler at 568°C and 165 bar pressure. This high-pressure steam is used to drive a turbine and in doing so releases its energy and is converted back to water. To aid this process the steam is condensed to water in the condenser after which it is returned to the boiler. The cooling water (CW) used to cool the condenser is abstracted from the river and circulated around the cooling towers in the CW system. Air currents in the cooling towers cool the CW so it can be fed back through the condensers. Water mainly comes from the River Ouse although water used in the boiler is abstracted from two boreholes on site.

Water Abstraction (Million tonnes)	**2000**	**2001**	**2002**	**2003**
River Ouse Water	59.0	57	48.2	59.7
Mains Water	0.18	0.18	0.16	0.17
Borehole Water	1.9	2.0	2.0	2.1
Water Used and Returned	29.5	28.6	27.0	29.2

Approximately 50% of the cooling water is returned to the River Ouse a few degrees warmer than the river. The FGD process effluent water is treated in a specially designed plant before being discharged to the river. Drax ensures that the FGD discharge consents are fully complied with. Drainage from the main plant, coal plant and road drains is discharged to the river. Procedures are in place to ensure that all drainage and discharges to the river are monitored and treated where necessary to meet our discharge consent limits. However in April 2003 the plant breached its limits on discharge when a faulty temporary pipe caused a discharge in to the local Carr Dyke. The EA were informed and discussions took place regarding the nature of the problem and the remedial actions. No further action is being taken by the EA

Ash Production and Management

When coal is burnt ash is left as a residue. The finer particles of ash (pulverised fuel ash or PFA) are collected from the exhaust gases by electrostatic precipitators whilst ash that is heavy enough to fall to the bottom of the boiler is collected as furnace bottom ash (FBA).

Ash has a variety of uses in the construction industry, including in the manufacture of building blocks, floor and wall products, and concrete products; grout for voids and other cavities; fill materials for road foundations; and in ceramics, adhesives and paints. The majority of Drax's ash is sold to the construction industry with the remainder sent for landfill at the Station's adjacent Barlow Ash Mound site.

Total Ash Produced (kt PFA and FBA)	**2000**	**2001**	**2002**	**2003**
Ash Landfilled	360	484	387	801
Ash Sold	939	935	904	1168

Appendix 1

2003 Environmental Objectives, Targets & Performance, 2004 Targets

Objective	Target 2003	Actual Performance 2003	Target 2004
Objective 1. Minimise environmental impacts of the business where practicable.	Reduce raw material consumption and associated emissions by optimising boiler and turbine operating efficiency.	Over the year, an improvement of 0.26% has been achieved. Target TEMP factor was 97.5% actual year end was 97%.	Reduce raw material consumption and associated emissions by optimising boiler and turbine operating efficiency through TEMP targets (97% target).
	Reduce SO_2 emissions by improving FGD availability from 91.5% in 2002 to a target of 93%.	Year end FGD availability was 93.57%. Average scrubbing efficiency was 90.13%.	Reduce SO_2 emissions by achieving FGD availability of >95%. Reduce SO_2 emissions by achieving FGD removal efficiency of >90%.
			Review causes of FGD scaling and develop improvements.
			Consider use of SO_3 injection for precipitator performance enhancement.
			Develop air quality management plan to ensure air quality compliance in 2005.
Objective 2. Optimise use of natural resources.	Optimise water treatment plant by reducing wastage of treated water on site.	Target achieved. Water usage decreased by 188m^3 per day.	Consider new areas for reducing water consumption.
			Review WTP resin fouling and develop improvements.
	Reduce consumption of coal and oil on site by investigating opportunities for the burning of cleaned fuel oil, progressing application for the burning of petroleum coke and progressing applications for the burning of biofuels.	Clean fuel oil. No progress from supplier. Petroleum Coke – Environment Agency approval Biomass - MPN trial completed, application in place for other fuels. Application in place for renewable oil to replace HFO.	Reduce consumption of coal by trialling a wide variety of biofuels Replace HFO by renewable oils as far as practicable..
Objective 3. Improve Management of Waste.	All Technical Officers (TOs) to be trained on management of waste issues regarding contractors working on site.	Target achieved. All TOs trained, 2 TOs audited during September.	Initiate a waste audit to identify and potentially reduce hazardous waste.
	Reduce the amount of PFA deposited at the	Sales have increased by 18.2% over last	Reduce the amount of PFA deposited at the

	Barlow ash disposal site by optimising PFA sales.	year. Total sales were 1,068,000te. However, landfill has also increased as a result of increased generation. Total landfill during the year was 443kt.	Barlow ash disposal site by optimising PFA sales.
Objective 4. Raise environmental awareness of our staff and those acting on our behalf.	Develop and implement Q-Mark "Environmental Awareness" interactive package and ensure 100% of key staff (and site contractors) have completed package by year-end. Implement programme for remainder of site staff to undergo environmental awareness training package.	Presentation and test developed and available on shared drive.	Review general environmental training procedures and practices, including induction and refresher training.
			Develop better understanding of health effects of biomass use.
Objective 5. Maintain compliance with Environmental Legislation.	Ensure zero number of exceedances or breaches of IPC authorisation; zero justified complaints	One unauthorised release to Carr Dyke. One justified complaint in September 2003, a noise complaint from Barlow.	Ensure zero number of exceedances or breaches of IPC authorisation and zero justified complaints.
	Maintain certification of EMS to ISO14001 standard for Environmental Management.	EMS certification maintained.	Maintain certification of EMS to ISO14001 standard for Environmental Management.
			Prepare IPPC application for Barlow Mound and assess current practices against BAT.
Objective 6. Prevention of Pollution	Install low NOx burners on Units 2,3. Reduce NOx emissions to 650 mg/m^3.	Installation completed.	Develop plans to reduce emissions on each Unit to 500 mg/m^3
	Submit proposals to the EA for operation of the process for the 4 year period commencing 1st April 2004.	Target achieved. Document submitted March 2003.	
	Identify alternative methods for disposal of boiler acid clean effluents. Produce a BATNEEC case for alternative routes.	Target achieved. Document submitted November 2003.	
			Develop potential for improving FGD performance.