

COCKENZIE POWER STATION



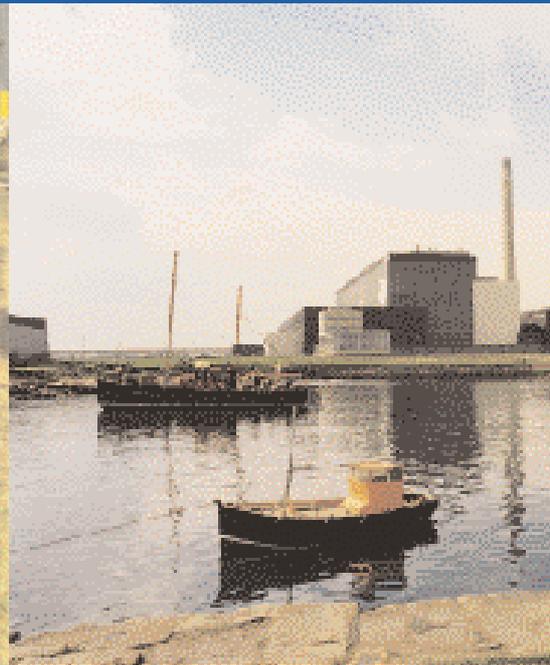
Cockenzie Power Station is a coal-fired generating station situated at Prestonpans in East Lothian, eight miles east of Edinburgh on the south side of the Forth Estuary. The station, with its landmark twin chimneys each 153 metres high, has an installed capacity of 1,200 megawatts (MW) comprising four 300 MW units. Although Cockenzie has been generating electricity since 1968 and has reached the end of its originally intended lifespan, ScottishPower has invested in measures to improve the efficiency and environmental performance of the station to extend its operational life until 2010.

Cockenzie Power Station,
Prestonpans,
East Lothian, EH32 9SD.
Tel: 01875 810075

Cockenzie is a marginal station – it is not normally involved to a great extent in meeting normal customer demand, but is used to guarantee security of supply during seasonal peaks and the non-availability of other plant. Its output is also traded on a competitive basis in the wholesale market in England and Wales. Since December 2001, output from Cockenzie is also being sold to Northern Ireland via a new undersea power link.

A great deal of work has been carried out in recent years to improve Cockenzie's start-up times, enabling the station to take advantage of opportunities to generate. In fact, during 2000-2001 the station recorded its highest load factor for 15 years, supplying 3,563 Gigawatt hours of electricity to the home and export markets, with coal burn reaching one and a half million tonnes. Cockenzie Power Station occupies a site of 24 hectares. Legend has it that part of the site is built on the hideout of General John Cope, whose Hanoverian army suffered a crushing defeat by Bonnie Prince Charlie's highlanders at the Battle of Prestonpans on September 21, 1745.

Generating power for the nation since



FUEL

Cockenzie burns Scottish coal from Mining Scotland, together with coal from other sources. This is delivered to the station by rail in special hopper wagons which carry around 914 tonnes. The coal is delivered into Cockenzie's coal store which has a capacity of around 900,000 tonnes. Coal is transferred from the coal store to the boiler house on a conveyor belt.

After weighing, sampling and screening, it passes into roller mills where it is pulverised to the consistency of face powder, before being mixed with preheated air, blown into the furnaces and burned at very high temperatures to heat the boilers.

WATER FOR STEAM AND COOLING

The boilers at Cockenzie contain a very large number of tubes, which are filled with water. The water used is taken from the local town's water supply and purified further in the station's water treatment plant to avoid "furring up" the boiler. As the very hot gases from combustion of the coal pass over the water-filled tubes the water boils and forms steam. Each boiler can create more than 900 tonnes of steam per hour at a pressure of 162 bars. This is "super heated" to a

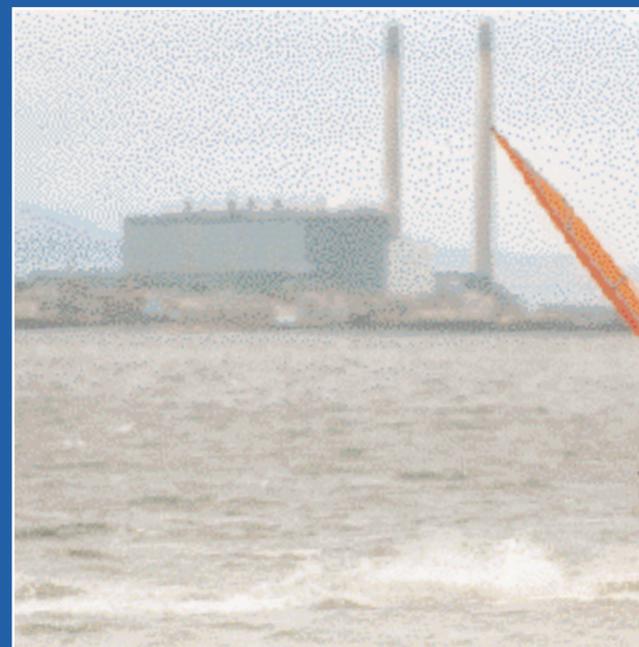
temperature of 556° C before being piped to the high pressure cylinders of the turbines. The steam is fed to the turbogenerators where the force of it striking the turbine blades causes the turbine shaft to spin at high speed.

At the generator end, the spinning shaft of the rotor rotates at 3,000 revolutions per minute within the tightly-fixed coils of the stator, creating electricity. The steam is returned for reheating and then directed to the intermediate pressure and then the low pressure cylinders of the turbine. Afterwards the steam is condensed back into water using cooling water from the Firth of Forth – up to 136,000 cubic metres (30 million gallons) every hour. This water is later discharged back into the sea.

COMPUTERISED CONTROL

The main generating plant at Cockenzie is started up and shut down from a central control room. Computer-based equipment monitors continuously the efficiency of plant

Cockenzie ... pictured from left, the coal store capacity to hold around 900,000 tonnes, a station from Cockenzie harbour and the co the nerve centre of the plant.



operation and tells the operator when there is any deviation from target conditions.

Special equipment also ensures that the generators are connected to the grid system at the right time to meet the varying demand for electricity.

1968



ore has the
view of the
ontrol room,



TRANSPORTING ELECTRICITY

Electricity from Cockerhills's generators is output at 17 kilovolts (kV). The voltage is stepped up by a transformer to 275 kilovolts (kV). The electricity then passes through the switch house and is sent out via overhead transmission lines to



transforming and switching stations on ScottishPower's transmission network. The high voltage transmission network carries electricity at high voltage to population centres.

The voltage is then stepped down at substations before the electricity passes into local distribution systems. Substations can also step up the voltage to transfer power to the east coast interconnector which links the Scottish and English grid systems. A double circuit overhead line, which operates at 275kV and 400kV, runs from Cockerhills and links into the English system at Stella, near Newcastle-upon-Tyne.

ENVIRONMENT

Cockerhills Power Station operates an Environmental Management System which is accredited to the international standard, ISO 14001. The station is also working towards achieving accreditation to EMAS, the EU's Eco-Management and Audit Scheme. Copies of the station's Environmental Policy are freely available to members of the public.

The combustion of fossil fuels, such as coal and oil, causes emissions of carbon dioxide (CO₂), the main "greenhouse" gas which has

been linked with long term climate change. ScottishPower's Generation business is addressing this issue by ensuring a balanced mix of generation resources, including wind and hydro power, as well as coal and gas. Within the station, steps have been taken to reduce CO₂ emissions by improving the thermal efficiency of the plant.

Other emissions from the combustion of coal, such as sulphur dioxide (SO₂) and oxides of nitrogen (NO_x), can cause "acid rain". This has been associated with damage to ecosystems, especially watercourses. Both SO₂ and NO_x have been connected with respiratory irritation in humans.

Cockerhills uses mainly Scottish coal, which is much lower in sulphur than that sourced from other regions of the UK. The station has taken measures to reduce the amount of NO_x formed during combustion by installing Low NO_x Burners. Emission levels and future plans to further improve environmental performance are the subject of on-going discussions with the Scottish Environment Protection Agency (SEPA).

Other environmental initiatives on site include setting annual targets for waste reduction, recycling and reducing on-site water use and energy consumption.

ASH DISPOSAL

Generating electricity from coal produces a significant amount of dust and ash. Electrostatic precipitators are in place at Cockerzie to capture dust from the flue gases and prevent it reaching the atmosphere. The ash produced is of two types, the light and more abundant Pulverised Fuel Ash (PFA) and the heavier Furnace Bottom Ash (FBA). During recent years, a proportion of the ash produced at Cockerzie has been sold by ScotAsh, our joint marketing venture with Blue Circle, for use in construction and products such as grout and cement. The remainder is transferred to ash lagoons at Musselburgh, pictured right, where it accumulates, dries out and is capped and planted for amenity use by the local community.



RISING FROM THE ASHES

The lagoons at Musselburgh include a nature reserve which is managed by a countryside ranger, pictured lower right, sponsored by ScottishPower. The site has become an invaluable habitat for a range of birds, including rare visitors, such as Royal Tern, pictured right, Western Sandpiper, Citrine Wagtail and American Golden Plover. The lagoons hold an important roost for wading birds while artificial wader scrapes have been created to attract wildfowl and other wetland species. Butterflies are also being attracted to the lagoons in increasing numbers, including the Clouded Yellow which was previously rarely seen in East Lothian. The capped lagoon area also features a boating pond and a play park for children. Further information on Musselburgh lagoons is published annually in ScottishPower Generation's Environmental Factsheet.

PART OF THE COMMUNITY

Cockerzie is closely involved with the local community, supporting through donations and practical help a wide range of projects, especially those involving young people, the elderly and disabled.



Some of the worthwhile causes supported by Cockerzie include a talking newspaper for visually-impaired people and East Lothian Voluntary Organisations' annual challenge to fill a bin with new and nearly-new toys for distribution to local charities. Cockerzie's Community in Bloom project has been supported for many years and the station contributed towards the cost of a "fishing boat" display to signify the community's heritage. Sports projects for young people have also been supported, as well as projects to improve the grounds and gardens of local schools and homes for the elderly. Cockerzie supported the development of The John Muir Way, a coastal walk which will eventually stretch from Musselburgh to the border with England. Cockerzie has

also provided a significant level of funding to the East Lothian Biodiversity Action Plan which is helping to monitor and enhance the area's wildlife and habitats. The Action Plan has already helped a range of nature projects in the area, including the creation of a wildflower meadow. Around two-and-a-half acres of No.7 lagoon was sown with the seeds of native wild flowers. The meadow is cut only once a year, strengthening the ecosystem and helping to attract butterflies and birds. The station hosts educational visits by local groups while schools have been given access to its Open Learning Centre, which offers around 1,000 learning programmes.

