Cockenzie Power Station: Site Information

Key facts:
- Opened in 1968
- Located at Prestonpans on the south shore of the Firth of Forth
- 1,200MW capacity
- Environmental Management system accredited to ISO 14001
- Twin chimneys each 149m tall
- Set to undergo redevelopment into CCGT station in 2015

For more than 40 years, the 1,200 MW plant at Cockenzie has played a vital role in securing the nation’s energy supply. Occupying a 93-hectare site on the south shore of the Forth Estuary, and with its fuel handling plant nearby, Cockenzie co-fires coal with a small quantity of renewable biomass materials to generate electricity for up to 500,000 homes.

The ash that is produced as part of this combustion process is piped to settling lagoons at Musselburgh. Upon becoming redundant, these lagoons have been handed over to East Lothian Council who manage the area as a special amenity where the public can enjoy the flourishing wildlife. In particular, the lagoons are widely recognised as one of the best places to watch birds in Scotland.

In addition to minimising its environmental impact, the station has a long history of community involvement and strives to be a good and trusted neighbour to residents in Port Seton, Cockenzie and Prestonpans – meeting local representatives at least four times a year to discuss operations.

Cockenzie, however, is nearing the end of its operational life and must close by the end of December 2015, when it is proposed that the site will be redeveloped. In 2009, ScottishPower started a series of community consultations over its plans to create a new Combined Cycle Gas Turbine (CCGT) power station at Cockenzie. CCGT stations are highly efficient, using less fuel and producing lower emissions per unit of electricity generated compared with conventionally-fired thermal power stations.

An Introduction to Cockenzie Power Station

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Reducing our Environmental Impact

Although Cockenzie is more than 40 years old, ScottishPower is continuing to invest in solutions to improve its efficiency and environmental performance, including reducing emissions to air, waste to landfill and its use of natural resources.

Combustion of fossil fuels, such as coal, results in the release of carbon dioxide (CO₂), a gas that is linked with long-term climate change. To reduce the amount of CO₂ released, the station is improving its thermal efficiency and offsetting up to 5% of the amount of coal consumed by co-firing carbon-neutral biomass fuels, such as wood pellets and sunflower husks.

Other emissions include sulphur dioxide (SO₂), oxides of nitrogen (NOₓ) and dust. A sulphur trioxide (SO₃) injection plant enables Cockenzie to burn coal with a low sulphur content while minimising dust emissions, and a Boosted Over Fire Air (BOFA) system on all four units achieves a reduction in NOₓ emissions of between 20% and 25%.

Most of the ash produced as a by-product of combustion is recycled by ScotAsh, our joint venture with Lafarge Cement. ScotAsh use the recycled pulverised fuel ash (PFA) to produce technologically advanced construction products which are a high quality and sustainable alternative to conventional materials.

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

The station operates subject to conditions contained in Pollution Prevention Control (PPC) permits issued and enforced by the Scottish Environment Protection Agency (SEPA) and employs an Environmental Management System which is certified to international standard, ISO 14001. Cockenzie also operates a site biodiversity action plan (BAP), details of which are available in the biodiversity factsheet.
How it Works

Cockenzie burns coal and biomass products sourced throughout the world then delivered to the station by ship, road and rail.

1. Coal is delivered to the station stock yard, which can hold around 900,000 tonnes, while biomass arrives at a handling facility before being fed into the coal stream on a conveyor system.

2. The fuel mix passes into ball mills where it is pulverised to fine powder and mixed with preheated air. It is then blown to the furnaces where it is burned at very high temperatures to heat the boilers.

3. The boilers contain a large number of tubes filled with townswater that has been purified in the station’s water treatment plant. As the very hot gases from combustion of the coal pass over the boiler tubes, the water boils to form steam.

4. The steam is ‘super heated’ to 556°C then piped to the high pressure cylinders of the turbines. The force of the steam striking the turbine blades causes the turbine shaft to spin at 3,000 revolutions per minute within the tightly-fixed coils of the stator, creating electricity. The steam is returned for reheating, then directed to the intermediate pressure and then the low pressure cylinders of the turbine.

5. 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.

6. This cooling water is later discharged back to the Forth Estuary.

7. Generating electricity from coal produces a significant amount of ash, dust and other emissions to air. An SO3 injection plant enables the station to burn low sulphur coal while minimising dust, and electrostatic precipitators capture particles from the flue gases to prevent them reaching the atmosphere.

8. Two types of ash are produced – pulverized fuel ash (PFA) is captured in the electrostatic precipitators and the heavier furnace bottom ash (FBA) which collects at the bottom of the boiler.

9. Much of the ash produced at Cockenzie is recycled by ScotAsh, ScottishPower’s venture with Lafarge Cement UK, for use in construction and products like grout and cement.

10. The rest of the ash is transferred to storage lagoons at Musselburgh.

Environmental Performance Highlights 2010

- All four units are now equipped with Boosted Over-Fire Air (BOFA) technology that improves the mixture of fuel and air and it is performing to design, achieving a 25% NOx reduction from 650mg/Nm3 to a value of below 500mg/Nm3, and contributed to a reduction in NOx emissions per GWh in 2009. BOFA will help ensure Cockenzie remains within its NOx bubble set by the LCPD until it closure at the end of 2015.

- Environmental performance and management came under increased scrutiny during 2009 as part of SEPA’s Compliance Assessment Scheme (CAS). The CAS end-of-year rating for Cockenzie was ‘good’ while the rating for Musselburgh Lagoons was ‘excellent’.

- There were 12 incidents and 40 community complaints, mostly as a result of dust flakes escaping to the atmosphere from Cockenzie’s stacks. Staff and contractors are working to remedy this issue and the station’s east stack and ductwork were cleaned to help reduce the likelihood of dust flakes arising.

- A trial of a fuel oil additive to improve combustion during start-up and shut-down operations lowered soot deposits.

- Other works during the year included:
  - Inspections of noise monitors have been carried out and plans are in place for their upgrade
  - A management plan for Musselburgh Ash Lagoons was produced and submitted to SEPA
  - Weekly checks have been carried out of the site’s oil management equipment
  - Work continued to optimise the dust suppression system at the coal plant to minimise fugitive dust emissions.