DAMHEAD CREEK POWER STATION SITE FACTSHEET

SCOTTISHPOWER
Energy Wholesale

OVERVIEW

ScottishPower acquired Damhead Creek, a 805 megawatt (MW) combined cycle gas turbine (CCGT) power station, in June 2004 to increase its generation capacity in the south of England.

Built in 2000 and fully operational the following year, the station is located 30 miles south of London on the Hoo Peninsula, Kent.

CCGT technology is one of the more efficient forms of thermal electricity generation with fewer emissions per unit of electricity compared with conventionally-fired thermal power stations.

INTRODUCTION TO DAMHEAD CREEK

Damhead Creek is a highly-efficient generator of electricity that can produce enough power to meet the daily needs of about 450,000 homes.

The combined cycle gas turbine (CCGT) station was built on a brownfield site at Hoo St Werburgh and it began commercial operation in January 2001.

The area, near the Channel Tunnel, has become one of the fastest-growing business corridors in the UK.

It is a haven for high-tech companies and close to the major population centres in the London area.

Damhead Creek is one of three CCGT stations operated by ScottishPower in Southeast England with a combined generation capacity of 1,800 MW.

The plant burns natural gas in two gas turbines, while the hot exhaust gases created as part of this process are recovered to produce steam and generate additional electricity.

Normally Damhead Creek runs continuously to meet market demand for electricity. Comprehensive environmental and safety systems are in place to minimise the station's impact on land, sea and air.

CONTACT US

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ENGAGING STAKEHOLDERS

Damhead Creek works closely with the community and other stakeholders to fulfil the station's obligations as a good and trusted neighbour.

It has an open policy on communications with stakeholders and welcomes feedback on its activities and operations.

The station has liaised closely with conservation groups to develop a strategy for the management of an 32-hectare mitigation area to promote biodiversity, helping to ensure its operation does not adversely affect the area's conservation value.

The air-cooled condenser

REDUCING OUR ENVIRONMENTAL IMPACT

A key advantage of modern CCGTs like Damhead Creek is their efficiency at converting fuel into electrical energy – typically around 55%.

That means less fuel consumption and lower levels of emissions per unit of electricity generated compared with conventional thermal stations.

The station operates subject to conditions contained in a permit issued and enforced by the Environment Agency (EA) and planning conditions enforced by Medway Council.

A Continuous Emission Monitoring (CEM) system has been installed on each of the station's twin stacks to demonstrate to the EA that emissions limits have not been exceeded.

There were no reportable environmental incidents at the site for a third consecutive year in 2009.

Natural gas gives rise to minimal emissions of dust, ash or sulphur dioxide (SO_2) – which has been linked with "acid rain" damage to ecosystems and respiratory irritation in humans.

However, Damhead Creek employs sophisticated abatement technology to control other emissions to air.

The station has Low-NO_x Burners to reduce the formation during combustion of other "acid rain" gases, oxides of nitrogen (NO_x).

Combustion chambers, incorporating hot ceramic liners, help ensure all the carbon in the fuel is converted into CO_2 rather than carbon monoxide (CO), a gas that's highly poisonous if inhaled by humans.

Damhead Creek's control room

Damhead Creek has an air-cooled condenser to minimise the amount of cooling water required and only small quantities of water are discharged into nearby Medway Estuary.

Staff seek to minimise waste from the site and actively recycle paper, card, oil, scrap metal, wooden pallets and printer cartridges.

The station is accredited to the European Union Eco-Management and Audit Scheme (EMAS) and produces an EMAS statement every three years to inform stakeholders about the site's environmental performance.

Damhead Creek also operates an Environmental Management System that is accredited to the standard, ISO 14001. The station received one complaint about noise in 2009 and while this was not considered justified, new noise monitoring is planned in 2010.

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The steam turbine generates electricity using hot exhaust gases

HOW IT WORKS

Damhead Creek uses two gas turbines and a steam turbine generator that together provide one of the more efficient forms of thermal electricity generation.

1 Natural gas is delivered to the site via a three kilometre underground pipeline that links in to Transco's national transmission system.

2 The fuel is burned in two gas turbines (GTs), which are similar to the large jet engines found on aeroplanes, to heat compressed air.

3 The hot gas expands through the turbine blades at 3,000 rpm, forcing a shaft to rotate and drive a generator.

In conventional coal-fired power stations, the hot exhaust gases are lost to the atmosphere, resulting in wasted heat energy.

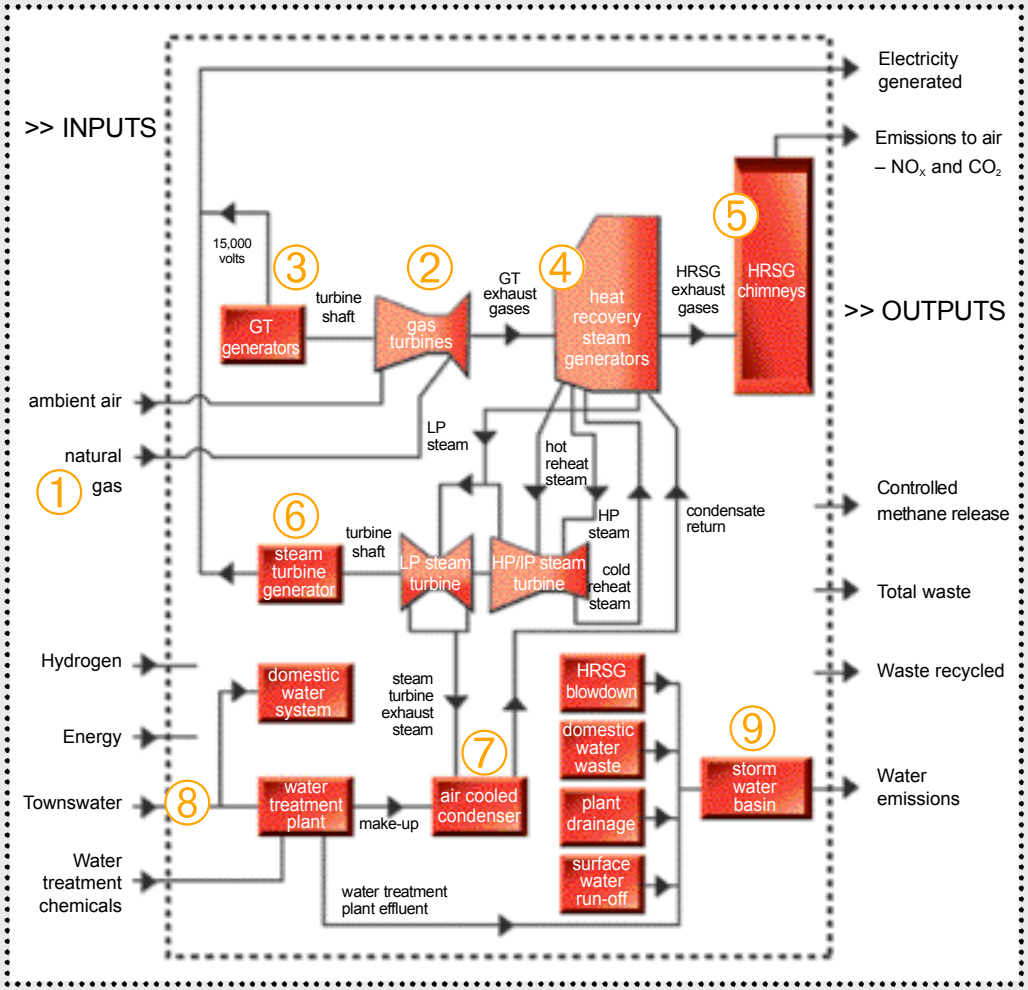
4 At Damhead Creek, however, these gases, at a temperature of 548°C, are reused to heat water-filled tubes in two Heat Recovery Boilers.

5 Waste gases from this part of the process are released to the atmosphere through the station's twin 75-metre high chimneys.

6 The steam created passes through the steam turbine, expanding as it does so that its heat energy drives the turbine rotor at 3,000 rpm.

7 Exhaust steam flows to the station's air-cooled condenser that cools it back into water to be recycled in the Heat Recovery Boilers.

The water treatment plant



The air-cooled condenser at Damhead Creek works like a giant radiator, with 36 cooling fans, each 10-metres in diameter, forcing air over a heat exchanger with a surface area of 105 hectares.

8 Townswater is used for domestic purposes and, following treatment, as boiler feedwater. The station can also supplement supplies with groundwater abstracted from a local borehole.

9 Water discharges are released to Damhead Creek and are comprised of water treatment plant effluent (waste water), boiler blowdown (water drainage), treated sewage and surface run-off water.

Maintenance work on a turbine

ENVIRONMENTAL PERFORMANCE HIGHLIGHTS 2009

Damhead Creek generated 5,889 GWh of electricity in 2009 – up 3% from 5,716 GWh in 2008.

The station operated at baseload during the year, running continuously to generate power.

A key environmental project delivered in 2009 was the sinking of a borehole into a freshwater aquifer 200m underground below the site to provide the station with water.

The borehole can supply around 306 litres of water a minute to offset the use of townswater.

The supply is treated in a new water recovery plant and used for making process steam along with recycled process water from a blowdown blast cooler.

This has achieved considerable savings, resulting in the station's daily townswater use falling in 2009 to an average of $10m^3$ per hour – 50% less than 2007 ($15m^3$/hr).

Two projects implemented in 2009 to reduce Damhead Creek's electricity usage have produced significant energy savings.

Production Technicians looked closely at ways of optimising the station's heat transfer processes, especially during summer when ambient temperatures are higher.

Projects tackled energy savings by subtly altering the operation of the closed circuit cooling water (CCCW) system and the HRSG Preheater Pump Shutdown Logic.

Solutions were built in to the site's logic controls, enabling computer systems to maintain optimal conditions during normal operations.

The CCCW system changes alone saved 50% of its running costs for an average summer period.