SCOTTISHPOWER

DAMHEAD CREEK POWER STATION: SITE INFORMATION

Key facts:

- Opened in 2001, acquired 2004
- 805MW capacity, Combined Cycle Gas Turbine station (CCGT)
- Located 30 miles south of London on Hoo Peninsula, Kent
- CCGT is an efficient form of electricity generation with fewer emissions per unit produced

An Introduction to Damhead Creek Power Station

Damhead Creek is a highly-efficient combined cycle gas turbine (CCGT) station able to produce enough power to meet the daily needs of about 450,000 homes.

The station was built on a brownfield site at Hoo St Werburgh and began commercial operation in January 2001.

Because of the area's proximity to the Channel Tunnel and major population centres in and around London, it has become one of the fastest-growing business corridors in the UK and plays host to numerous high-tech companies.

One of three CCGT stations operated by ScottishPower in Southeast England, Damhead Creek produces 805 MW of their combined generation capacity of 1,800 MW and was acquired in 2004.

The plant runs continously to meet demand

The plant runs continuously to meet market demand, burning natural gas in two gas turbines and utilising the hot exhaust gases created as part of this process to produce steam and generate additional electricity.

Damhead Creek employs comprehensive environmental and safety systems to minimise the station's impact on land, sea and air.

Measuring a Barn Owl's growth

Engaging stakeholders

Damhead Creek aims to be a good and trusted neighbour by working closely with the community and other stakeholders. It has an open policy on communications and welcomes feedback on its activities and operations.

With the help of conservation groups, the station is developing a strategy for the management of a 32-hectare mitigation area to promote biodiversity, and ensure its operation does not adversely affect the area's conservation value.

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% – which results in less fuel consumption and lower levels of emissions per unit of electricity generated compared with conventional thermal stations.

Additionally, burning 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.

Low-NO_X Burners reduce the formation of other 'acid rain' gases, oxides of nitrogen (NO_X) during combustion, while an air-cooled condenser minimises the amount of cooling water required. This results in only small quantities of water being discharged into nearby Medway Estuary.

Further, Damhead Creek's combustion chambers incorporate hot ceramic liners to ensure all the carbon in the fuel is converted into CO_2 rather than highly poisonous carbon monoxide (CO) and to ensure all emissions limits have not been exceeded, a Continuous Emission Monitoring (CEM) system has been installed on each of the station's twin stacks.

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. It employs an Environmental Management System that is certified to the standard, ISO 14001 and staff seek to minimise waste from the site and actively recycle paper, card, oil, scrap metal, wooden pallets and printer cartridges.

European Union Eco-Management and Audit Scheme (EMAS) accreditation has also been achieved and the station produces an EMAS statement every three years to inform stakeholders about the site's environmental performance.

The control room

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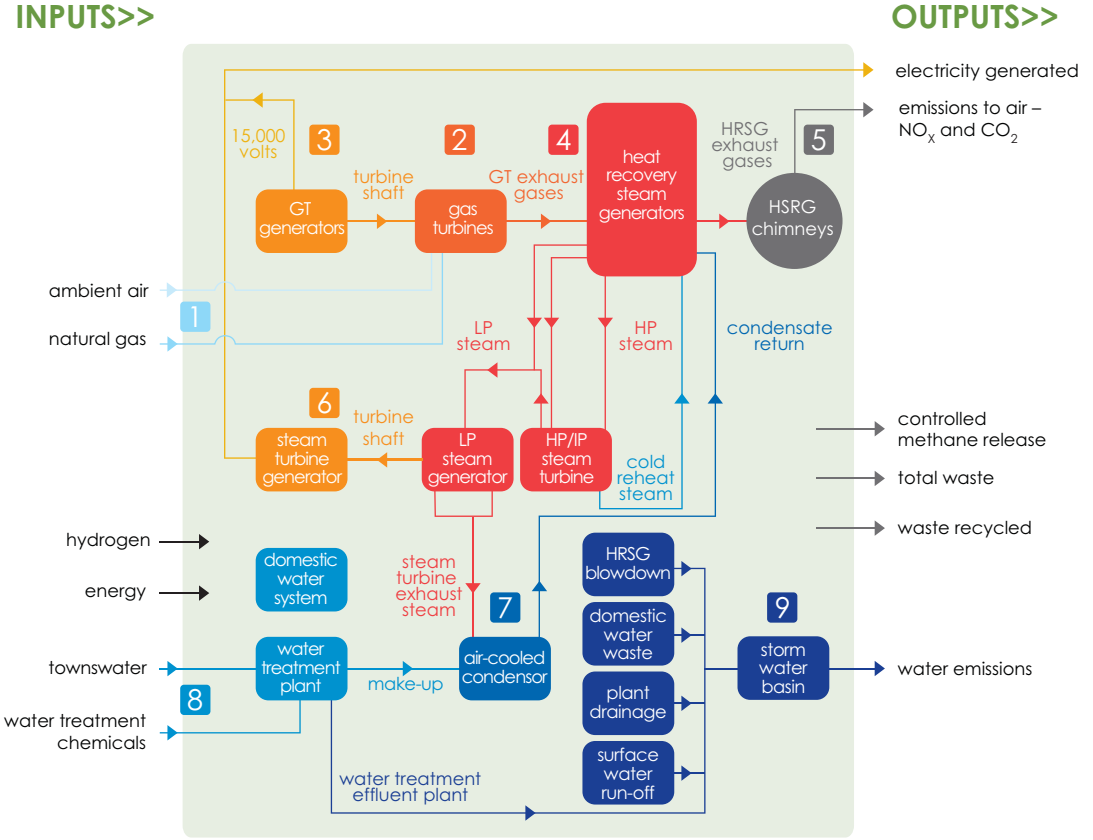
How it Works

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 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.



The turbine hall

Environmental Performance Highlights

A key environmental project was the sinking of a borehole into a freshwater aquifer 200m underground below the site to provide the station with 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. As a result, we have achieved considerable savings, reducing daily townswater use to an average of 10m³ per hour – 50% less than 2007 (15m³/hr).

Two projects implemented 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. The projects tackled energy savings by subtly altering the operation of the closed circuit cooling water (CCCW) system and the HRSG Preheater Pump Shutdown Logic. The solutions were built in to the site's logic controls, enabling computer systems to maintain optimal conditions during normal operations and the CCCW system changes alone saved 50% of its running costs for an average summer period.