

# SHOREHAM POWER STATION SITE INFORMATION



## OVERVIEW

Shoreham Power Station in West Sussex was opened in summer 2000 and is one of three combined cycle gas turbine (CCGT) stations

operated by ScottishPower. Shoreham has a capacity of 420 MW and can generate enough electricity to supply around 250,000

homes. The station uses a gas turbine and a steam turbine and generator to provide one of the more efficient forms of thermal

generation. The flexible plant operates at base load – running its turbines continuously – to meet the south coast's energy needs.

## INTRODUCTION TO SHOREHAM POWER STATION

Shoreham was opened in summer 2000 and operated as a 50-50 joint venture between ScottishPower and AEP until autumn 2004, when the plant was fully acquired by ScottishPower.

Its location, at Shoreham Harbour, has a history of electricity production and the site was formerly occupied by the Brighton 'B' Power Station.

Shoreham's 106-metre chimney – the tallest structure in West Sussex – is on the same spot as the old brick-built stack that was demolished in 1998.

Construction of the modern station has utilised several features from the old plant, such as a cable tunnel under the harbour and cooling water outfall.

Environmental issues were closely considered during the station's development and construction.

Architects designed the profile of the seaside station to resemble a ship while the grounds were landscaped with shingle banks to help rare coastal plants.

Shoreham's Environmental Management System is certified to the international standard, ISO 14001 and the plant is also implementing a site biodiversity action plan (BAP).



■ Shoreham's 106m chimney (left) is the tallest structure in West Sussex; above, the station from the west; right, the plant switchroom and boiler



## KEEPING CONTROL OF OUR EMISSIONS

Shoreham Power Station has been highlighted by the University of Sussex on their website as being "probably the most environmentally-friendly fossil-fuel power station in the UK".

One of the great advantages of combined cycle gas turbine power plants is their efficiency at converting fuel into electrical energy – Shoreham's efficiency is rated at around 55%.

Higher efficiency means less fuel is consumed and levels of emissions per unit of electricity generated are lower compared with conventionally-fired thermal power stations.

Shoreham operates subject to conditions contained in a permit issued by the Environment Agency (EA). There were no justified breaches of emission limits in 2009.

Natural gas gives rise to minimal emissions of dust, ash and sulphur dioxide (SO<sub>2</sub>), which has been linked with "acid rain" damage to ecosystems and respiratory irritation in humans.

Shoreham produces roughly half the emissions of CO<sub>2</sub> – a "greenhouse" gas linked to climate change – compared to conventional thermal plant. Meanwhile, Shoreham's highly-efficient dual combination system produces minimal oxides of nitrogen (NO<sub>x</sub>).

Shoreham is a part of the local community and is committed to ensuring its environmental performance attains the highest possible standards.

There were no justified community complaints in 2009.

## CONTACT US

**Shoreham Power Station**  
Portslade,  
West Sussex, BN41 1WF  
telephone: 01273 427500  
web: [www.spenergywholesale.com](http://www.spenergywholesale.com)

## MAJOR OUTAGE PLANNED IN 2010

Shoreham staff and contractors are gearing up for the biggest outage in 10 years since the station was opened.

The upgrade, scheduled to start in May 2010, will include the replacement of the original transformers and generators and the overhaul of the gas turbine. At 55 days, the duration of the outage is the longest in Shoreham's history and the scope of work is the largest ever undertaken.

A guide has been prepared to assist staff and contractors in managing environmental issues, and health and safety, as part of the outage. The manual details the special measures required to control oil, manage waste and protect the environment.

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## ENVIRONMENTAL PERFORMANCE 2009

Shoreham Power Station generated a total of 2,646 GWh in 2009 – a slight reduction compared with the figure in 2008 (2,788 GWh).

The station was shut for several weeks in January and February following an unplanned outage for a gas turbine repair – otherwise it generated at baseload or continuously.

Shoreham maintained its high standards of environmental compliance, with no justified breaches of emission limits or incidents.

Indeed the plant's Continuous Emissions Monitoring System has indicated that emissions of NO<sub>x</sub> and CO per GWh are less than had previously been calculated.

Shoreham's Environmental Management Statement (EMS) is certified to the ISO 14001 standard and underwent a surveillance audit in February 2009.

Recommendations made during this audit have been implemented with no outstanding issues.

Staff aim to achieve a continuous improvement in the station's environmental performance.

In 2009, a new chlorine monitoring system was installed to more accurately measure the amount of sodium hypochlorite added to seawater used for cooling purposes to prevent the growth of mussels and other marine organisms.



■ Shoreham's control room

The new system is 99.97% efficient and has reduced by about a third the amount of chemical used. Additional dosing protection is being introduced during the 2010 outage.

Meanwhile, a database of specialist or hazardous chemicals stored at the station has been compiled and environmental impact mapping has been completed.

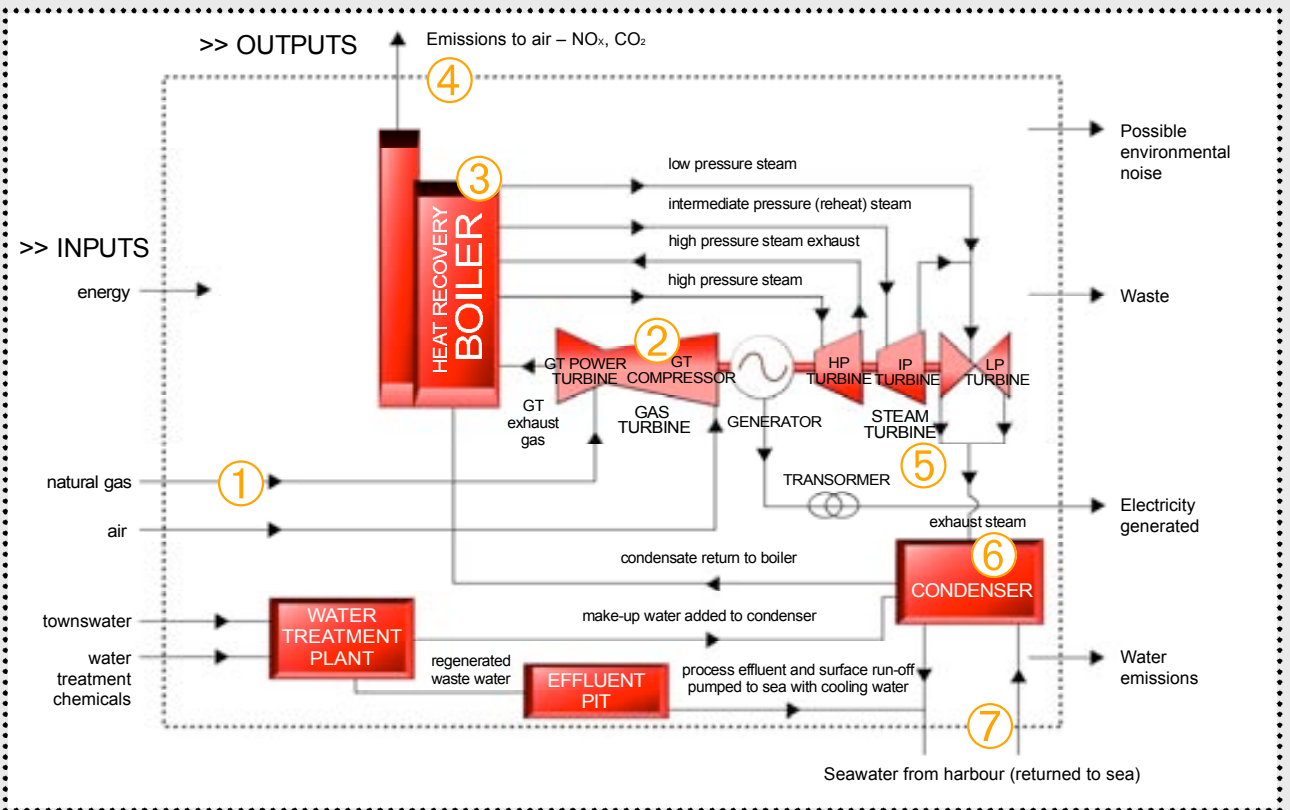
These projects feed into Shoreham's Aspects and Impacts Register which defines the aspects of site processes that impact on the environment under normal, abnormal and emergency conditions. It also identifies the significance of these impacts and the measures in place to control them.

Meanwhile, a new, user-friendly reporting tool has been introduced for the Register. The new format and its reporting data were described during an ISO 14001 audit as a strong point within the station's EMS.

Meanwhile, Shoreham has been highly commended by the EA for its new procedures and facilities for waste segregation aimed at reducing the amount of waste sent to landfill.

New colour-coded and labelled segregation bins were installed at two sites at Shoreham for plastic, waste metal, wood etc.

Around 20% of the site's total waste was recovered for reuse or recycling.



## HOW SHOREHAM WORKS

- ① Shoreham Power Station burns natural gas that is brought to the site by a purpose-built underground pipeline from the Transco compound at Devil's Dyke on the Sussex Downs.
- ② The gas is ignited within the Alstom GT26B gas turbine, which works in a similar way to a car engine. Air is compressed and heat is added by burning fuel. The hot combustion gases are directed through the turbine, where the hot gases expand through blades, causing the turbine shaft to rotate at 3,000 revolutions per minute. This drives the generator to produce electricity.
- ③ In conventionally-fired power stations, hot exhaust gases from

the turbine are lost to the atmosphere, resulting in wasted heat energy.

At Shoreham, however, the exhaust gases at a temperature of 600°C, are passed through a heat recovery boiler that contains a large number of tubes, filled with purified town's water. The water in the tubing is heated by the hot exhaust gases to produce steam.

④ Waste gases from this part of the process are then released through the station's 106-metre chimney.

⑤ The steam created in the heat recovery boiler is used to drive a steam turbine.

The gas turbine shaft and the steam turbine shaft are coupled together to

drive the generator, which produces the 420 MW output.

⑥ As the steam leaves the steam turbine it is condensed using sea water extracted from the tidal area of Shoreham harbour.

This condensate is then returned to the heat recovery steam generator (boiler) to be reheated.

⑦ The cooling water is discharged back into the English Channel through the refurbished outfall at Southwick Beach. This avoids the need for cooling towers. All of the steps in the process are highly automated and controlled and monitored constantly by operators from Shoreham's central control room.



■ The turbine hall at Shoreham