

# Energy and atmosphere

*The burning of fossil fuels to generate electricity, and to power transport vehicles results in the release of gas to the environment. For this reason energy, transport and emissions to atmosphere are considered together in this report.*

## Background

- 1,711 MWh of electricity generated from renewable sources exported to the grid
- 55.2% biogas generated is used as a source of fuel for boilers for producing heat in digesters and dryers and as a fuel for Combined Heat and Power (CHP) units.
- Southern Water's vehicle fleet at the end of March 2004 consists of:
  - 357 cars
  - 627 commercial vehicles
  - 29 heavy goods vehicles
  - 37 plant vehicles (tractors, etc)



*We need to be mobile to manage the company's network of sewers and mains*

Climate change is a very complex issue with serious global implications for economies, societies and the environment. Emissions of gasses generated by human activities enhance the natural greenhouse effect of the Earth's atmosphere. This has led to the now widely accepted situation that people's actions, over time, can affect global climatic conditions. This is now known as climate change. After water vapour, carbon dioxide is the most significant contributor to the greenhouse effect. Carbon dioxide is always released when any fuel containing carbon is burnt.

**For more information**  
See *Managing our Future in the Performance Summary* section of this report at [www.southernwater.co.uk/sustainability](http://www.southernwater.co.uk/sustainability).

## Energy

Energy use in the UK water and wastewater industry sector currently stands at 6,000GWh per year, which accounts for more than 2% of total UK industrial energy consumption. European Union Directives aimed at improving wastewater quality as well as the quality of the environments into which the wastewater is released increase the energy requirements for treatment processes. To achieve quality standards we need to use processes including ultra-violet disinfection of treated wastewater before it is discharged to the surrounding environment and higher levels of treatment of the sludge that is a by-product of the wastewater treatment process.

**For more information**  
See the *Wastes* section of this report at [www.southernwater.co.uk/sustainability](http://www.southernwater.co.uk/sustainability).



## CASE STUDY

### Seeking alternatives

*The UK government has set a target of 10% of the UK's energy demand to be provided from renewable sources by 2010. This equates to a reduction of 12 million tonnes of carbon dioxide gas being emitted to the atmosphere by 2010.*

*Our wholesale electricity costs rose by 59% since the beginning of 2003. In addition, the population growth in the South East is greater than the UK national figure. Our energy requirement increases to meet this additional demand.*

**For more information**  
See *Sustaining our Future in the Performance Summary* section of this report at [www.southernwater.co.uk/sustainability](http://www.southernwater.co.uk/sustainability).

*In an attempt to reduce our energy usage and cost, and also to reduce our reliance on energy generated by using fossil fuels (gas, oil or coal), we looked at what other options were available to us.*

*We undertook a feasibility study to determine the possibility of installing a number of large-scale wind turbines on a number of suitable sites across the company. Three sites have been identified where a total of seven large wind turbines could be installed.*

*Discussions have been held with a number of wind turbine developers to determine the level of interest and requirements for installing the wind turbines on these sites.*

LINKS: [www.water.org.uk](http://www.water.org.uk) | [www.defra.gov.uk](http://www.defra.gov.uk) | [www.wrcplc.co.uk](http://www.wrcplc.co.uk) | [www.ukwir.co.uk](http://www.ukwir.co.uk) | [www.bbc.co.uk/climate](http://www.bbc.co.uk/climate) |

It is predicted that the UK will experience an increase in the number of days of heavy rainfall in the future. This increased erratic weather is one of the anticipated impacts of climate change. The Environment Agency is also anticipating an increase in the occurrences and locations of major flooding incidents. We anticipate this predicted increase in rainfall will increase the demand on our pumps and processes to treat more water. This would require more energy.

We are looking at ways of reducing our overall demand of fossil fuel derived energy. In addition to our two existing combined heat and power (CHP) plants, which are producing and exporting energy using a renewable fuel (biogas), we are currently installing four more CHP plants. These plants are planned to come into operation during 2004. These will be located at wastewater treatment sites that produce significant amounts of biogas from the treatment process.

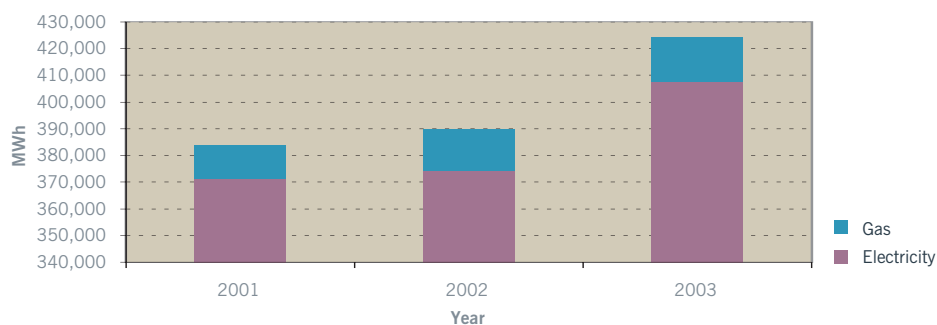
We are expecting that, once operational, these four additional plants will produce around 900MWh of electricity per month of renewable energy. Electricity produced at our existing CHP plants more than meets demand at our headquarters over the year.

Following our pump efficiency study in 2002, we have been able to achieve energy cost savings at targeted sites during 2003. We anticipate these savings to continue in future years.

We are continuing to enhance our computer-based energy management system. Forty major wastewater sites and 74 major water supply sites now have detailed energy consumption data and accurate flow data. This is available electronically, enabling our process scientists to identify where more detailed investigations need to be carried out to further improve our operational energy efficiency.

Over the past year, we have been looking at a number of options involving the use and generation of renewable energy and the possibility of using sustainable technology.

### Energy consumption



This chart shows a gradual year-on-year increase of energy consumption for both electricity and gas. Electricity consumption in 2003 was 407,418MWh compared to 371,209MWh in 2001. This increase is largely associated with the increased wastewater treatment processes required under the European Union directives.

We are currently involved in a project with the Water Research Centre and the Centre for Alternative Technology, looking into the possibility of using sustainable technology on small wastewater treatment works. Options being researched are the use of solar energy (photovoltaics) and small-scale wind turbine electricity generation. In addition, large-scale reed beds and settling lagoons are being

proposed as alternative (less energy intensive) technologies to current treatment processes.

We have also undertaken preliminary work looking into the possibility of using the waste exhaust heat from our combined heat and power units to dry wood chips that have been harvested from coppiced woodland. This could then be used as a renewable fuel.

2003-2004 target	Progress against target	2004-2005 target
<b>ENERGY</b>		
Implement use of energy auditing and modelling database.	Users, auditors and estimators have been identified, set up and are active on the system.	Carry out water and wastewater works optimisation to save 400,000kWh.
Improve energy efficiency for six water supply sites compared with 2002-2003 performance.	We improved efficiency at a number of supply sites. Our pumping efficiency study monitors 74 sites.	
Increase number of sites where unit energy production efficiencies are calculated and used (from current level of 28 sites to 50) by 2004.	A total of 114 sites are now being monitored to enable energy efficiencies to be carried out.	Deliver four new biogas fuelled combined heat and power electricity generation systems.
Undertake a feasibility study into the opportunities for energy generation from wind at our sites.	Feasibility study carried out.	

KEY: Target met In progress Target not met

## Emissions to atmosphere

Odour is a specific issue associated with wastewater treatment processes. Hydrogen sulphide is a gas that is released during this process. Very low concentrations of this gas are detectable by a characteristic 'bad egg' smell. The purpose of our odour removal plants is to deal with this hydrogen sulphide gas. Our wastewater treatment processes generate a flammable gas by-product, which is known as biogas. This is also considered in this section of our report.

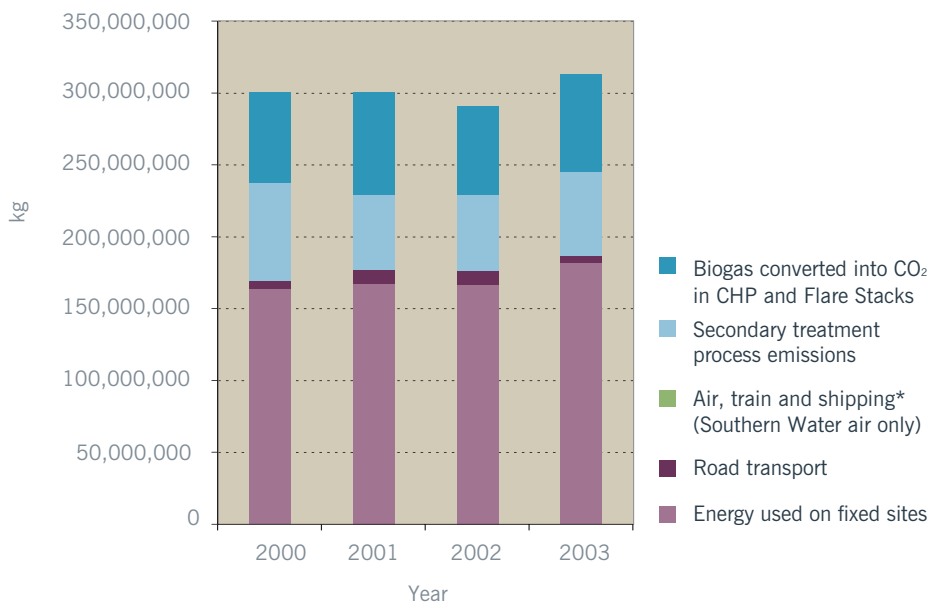
**For more information**  
See the Wastes section of this report at [www.southernwater.co.uk/sustainability](http://www.southernwater.co.uk/sustainability)

A waste product of burning fossil fuel is carbon dioxide gas. This is considered to be a greenhouse gas. Natural emissions of greenhouse gasses ensure that the atmosphere of the earth is kept at a global average of 15°C. Without this natural greenhouse effect, the average global surface temperature of the earth would be -18°C, a reduction of 33°C. Additional man-made emissions increase this natural effect. It is the increase in the greenhouse effect that is leading to climate change. Nationally, carbon dioxide emissions increased by 1.5% in 2003. This rise has been attributed to the greater use of coal by power stations in generating electricity. However, total greenhouse gas emissions were 14% below their 1990 level in 2003 compared with the UK's Kyoto Protocol target of a 12.5% reduction.

We have been monitoring our biogas production and use during 2003. We estimate that we used 55% of this biogas as a fuel in our boilers, dryers and combined heat and power units in 2003. Our flare stacks burnt off the biogas that we did not use.

The Department for Environment, Food and Rural Affairs (Defra) *Code of Practice to Control Odours from Sewage Treatment Works* was due for publication in the early part of 2004. In the absence of a code of practice, we have been actively monitoring and assessing odour issues.

## Carbon dioxide (CO<sub>2</sub>) emissions



This chart shows the total CO<sub>2</sub> emissions that we have produced over the last four years. Data quality has improved year on year, giving more accurate figures. The overall rise in total emissions in 2003 is mainly due to increased energy demands from our fixed sites. \* Negligible.

An internal Air Quality Forum monitors these issues. Actions are carried out to determine the problem and what is required to alleviate the situation.

We have put in place a programme to assess the condition of our 17 odour control plants in operation. We have carried out a full assessment report on each of the 17 plants. To ensure standardised levels of maintenance are carried out on the plants, a maintenance contract is to be set up during 2004. Site-based employees have received training in the maintenance of the odour control plants until this contract is in place. This training

included detailed maintenance activities, who should carry out particular actions and what to do should a problem occur. This is to ensure continuous correct operation of each plant so that any gas emissions to the atmosphere are kept to a minimum.

We are also involved in a project, with other water industry companies and UK Water Industry Research to develop a standard way of determining greenhouse gas emissions for different types of water and wastewater processes. Completion of this project is expected by mid 2005.

2003-2004 target	Progress against target	2004-2005 target
<b>EMISSIONS TO ATMOSPHERE</b>		
Implement formal training for operational staff on how to deal with potential odour issues.	Training carried out on operation and maintenance of an odour treatment technology with operational staff.	Develop periodic regionally controlled programme for the maintenance of odour control units to ensure efficient and effective operation.

KEY: Target met In progress Target not met

## Transport

We monitor our fleet vehicle mileage and fuel usage and this is reported as an impact to the atmosphere in our carbon dioxide chart in the previous Emissions to Atmosphere section.

In addition to the routine servicing and maintenance carried out on our fleet, we carry out random monthly inspections on our fleet vehicles. This consists of an inspection checklist (dependent on type of vehicle), weight and tyre checks. A well maintained vehicle emits less pollution and is more fuel-efficient.

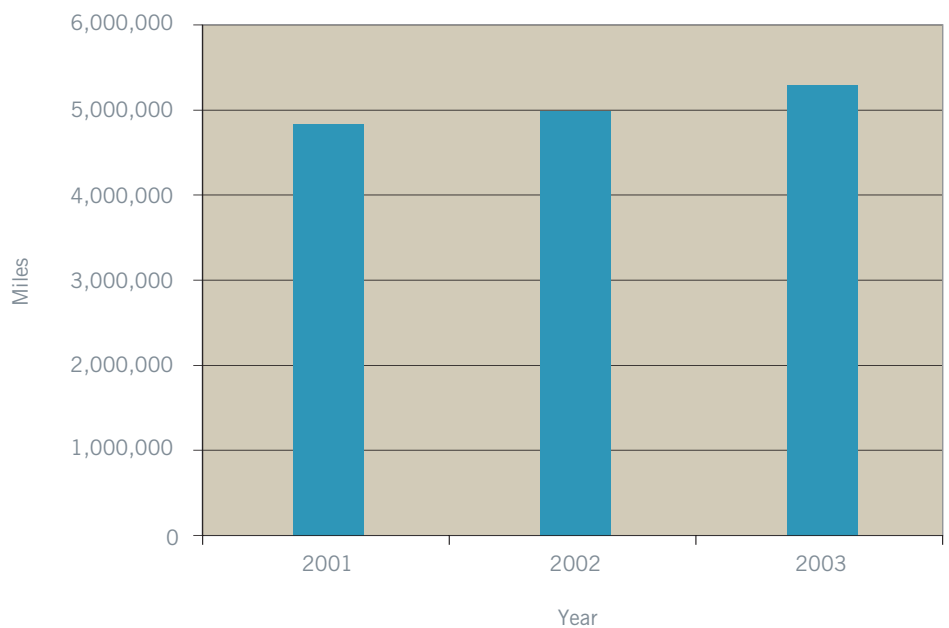
Our vehicle accident rate is well below the UK average for corporate vehicles. Independent statistics (from the RAC) show that, in the UK, 65% of all corporately driven vehicles are involved in a crash every 12 months. Our fleet vehicle accident rate was 23% for 2003. As part of our continual process of improving driver awareness, all drivers needing to tow trailers have received appropriate training and their licences checked to ensure legal requirements are met. In addition, training in the correct use and operation of on-board cranes on vehicles has been carried out appropriate to need. This year we also produced a video called *Driving and Vehicle Safety*.

**For more information**

See the *Managing our future in the Performance Summary section and the Employee section of this report at [www.southernwater.co.uk/sustainability](http://www.southernwater.co.uk/sustainability)*

We are reviewing and updating our Driver's Handbook which covers statutory regulations, vehicle insurance, use of mobile phones, loading limits, accidents, break downs, towing, defensive and environmentally-friendly driving. This will be issued to all company vehicle drivers when the review is complete.

**Combined company vehicle and car mileage**



*This chart shows a gradual increase in the total combined annual mileage of our company vehicles and cars.*

2003-2004 target	Progress against target	2004-2005 target
<b>TRANSPORT</b>		
Develop a transport training plan (including driver legislative awareness).	Trailer towing and on-board crane training carried out. Licence checks to ensure driver legislation is adhered to.	Put Transport Training Plan into place.
Review Transport Manual and development of Driver's Handbook (including driver practices and fuel efficiency).	Draft copy of reviewed Driver's Handbook produced for comments before publication and distribution.	Investigate high fuel consumption data identified in fuel consumption reports.

**KEY:** Target met In progress Target not met