



**How we
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We're committed to becoming a more sustainable business, at the same time as keeping our customers' bills as low as possible. A big part of our work with wastewater involves disposing of sludge more sustainably and effectively. Historically we've treated sludge to high standards using anaerobic digestion (AD), producing biogas that can be used as a fuel in our combined heat and power (CHP) engines. This generates renewable energy which we use to run our largest sites, offsetting the need to import electricity from the national grid with its associated carbon emissions.

Background.

We're committed to reducing our contribution to climate change, and we aim to reduce our carbon emissions in line with the Climate Change Act 2008. Compared to our levels of 845.8 kTCO₂e in 1990, we've achieved a 67 per cent net reduction in our emissions including the purchase of renewable grid electricity.

Until recently, the main focus of our efforts to reduce our carbon emissions centred around reducing our consumption of grid electricity – by increasing our own supply of renewable energy and increasing energy efficiency across our operations.

This was because emissions associated with grid electricity have traditionally made up the largest component of our overall footprint, typically around two thirds. However, from October 2016 we started to purchase 100% Renewable Energy Guarantees of Origin (REGO) accredited renewable grid electricity, and we can now turn our attention to emissions from other non-grid related sources.

- **GHG emissions 67 per cent below 1990 levels.**
- **Purchasing 100% REGO accredited renewable grid electricity.**
- **Generated a record 289GWh of renewable electricity from sludge.**
- **Reduced distance sludge travelled via tankers by around 334,000km.**



We expect to be able to reduce our carbon emissions even further by better understanding where our overall emissions come from, and the way our operations contribute towards them.

The significance of emissions generated through managing and disposing of sludge will continue to rise for us, due to population growth and therefore the increased amount of sludge we'll need to treat, manage and dispose of in the future.

By better understanding the carbon related and wider environmental benefits of the way we manage our sludge, we can identify new ways to increase these benefits - helping us work towards our goal of becoming a more sustainable business.

We're taking this very seriously, not just because protecting the environment is the right thing to do, but also because meeting the challenges of population growth will help us provide value for money to our customers.

Emissions from digestion.

A key change in the way we manage our sludge during the current AMP has been to move towards advanced digestion using Thermal Hydrolysis Plant (THP) technology. Using THP before anaerobic digestion helps break down the organic matter in the sludge into compounds which the microbes in the anaerobic digesters find it easier to use. The microbes digest these compounds more efficiently, which results in more biogas production.

This has allowed us to make more efficient use of sludge by increasing the amount of biogas we're producing, and therefore increasing the amount of renewable electricity and heat we can generate. We've increased the volume of biogas we produce from 76 million m³ in 2013/14 to 122 million m³ in 2017/18.

Although THP requires the addition of a small amount of energy, this increase in biogas and the resulting renewable energy outweighs this. Compared to traditional digestion alone, we've seen an overall reduction in greenhouse gas emissions of 9 KtCO₂e when we've been using THP.

Generating more electricity from sludge.

We generated a record 289GWh of renewable electricity from sewage sludge in 2017/18. This represents a 90 per cent increase in generation compared to 156GWh in 2013/14 - reducing our reliance on grid electricity and making even better use of sludge.

Our green tariff renewable grid electricity has allowed us to offset a significant cost associated with the price of the grid electricity that would otherwise have to be procured. This saving allowed us to invest even more in developing our renewable energy generation capacity, and in environmental improvements elsewhere in our operations.

Less tankering.

Moving towards advanced digestion has provided us with big additional environmental benefits – including less sludge that needs to be transported by tanker to other sites for treatment, and less treated sludge, known as biosolids, being taken to farmland.

Improving how we manage sludge transportation in our region has also reduced our tankers' mileage by around 335,000 kilometres in 2017/18 compared to the previous year. This has allowed us to save 1KtCO₂e in greenhouse gas emissions, while improving local air quality, reducing disturbance for local communities, and the risk of health and safety incidents at our sites and on the roads.

Continuing our journey.

As well as expanding our use of the advanced digestion and THP, we're also piloting a full scale advanced energy recovery (AER) to treat sewage from around 250,000 people.

Following THP and anaerobic digestion, the AER plant uses pyrolysis and involves processing sewage sludge at temperatures of up to 800 degrees Celsius, in close to atmospheric pressure without oxygen, to produce fuel gas that can be used in engines to produce electricity. AER is still in its infancy, but when its full potential is reached, it's predicted to extract over 80% of the available energy that's left in sewage after conventional processes. We can then use this energy to power our operations.

The residual product (called char) is a carbon-based and mineral-rich material. We hope to be able to recover nutrients, precious metals and carbon from char, contributing even more to the circular economy. Extra cuts in carbon emissions are also likely as a result of using more biogas for heating and drying sludge before anaerobic digestion and pyrolysis. We're hoping to make AER economically viable, which will unlock potential benefits for customers, the environment and wastewater industry.



THP (above) and pyrolysis plant (right).

