

THE LEEDS RECYCLING AND ENERGY RECOVERY FACILITY FACT FILE 3:

Energy from Waste

The Leeds Recycling & Energy Recovery Facility (RERF) formally opened in 2016 as a high quality, innovative building, located on the site of the former Cross Green wholesale market in east Leeds. Standing at 42 metres high and 150 metres long, this award-winning, landmark building is highly visible in the city and incorporates a visitor centre providing local schools with an education resource to support learning about waste, recycling, energy and the environment.



Schools have a key role in contributing to Leeds' ambition to be a 'zero waste' city as waste from UK primary and secondary schools totals around a quarter of a million tonnes each year, equivalent to 185 double decker buses every school day!



Energy from waste, also referred to as waste to energy, is a process by which energy is generated as electricity and/or heat from treating waste through combustion (a form of energy recovery). Managing waste in this way can significantly reduce the amount of waste disposed of in landfill and maximises the value of any waste not recycled.

Recovering energy from waste in this way makes an important contribution to reducing the United Kingdom's long-term energy gap, as we move away from burning fossil fuels such as coal, and increases landfill diversion as part of an integrated waste management strategy.

The RERF treats all of Leeds' black bin household waste, currently at a rate of around **170,000 tonnes** each year.

The RERF is permitted to treat up to **214,000 tonnes** each year. The treatment process involves a number of stages illustrated in detail in the diagram over the page and summarised below:



- After collection, household waste is shredded and metals (ferrous and non-ferrous) are mechanically removed and recycled.
- The remaining waste goes to a storage bunker before undergoing a **specialised combustion process** via a feed hopper.



- The resulting steam (generated from the energy created in the combustion process converting water in the boiler tubes to steam) is **used to drive a turbine generator** producing electricity. Excess electricity is sent to the National Grid and excess heat is supplied to the Council's District Heating Network.
- The RERF can **power up to 22,000 homes** via the National Grid on an annual basis.
- The resulting ash at the bottom of the furnace (bottom ash) is taken off site and used as **road aggregate** as well as being able to be made into **breeze blocks**.



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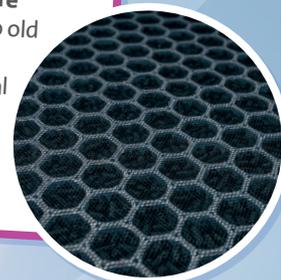


The RERF supplies energy to a local district heating network (DHN) using steam from the energy recovery process to heat local buildings.

for example, homes, hospitals or the city's universities. Buildings that are connected to a district heating network do not require fossil fuel which conserves precious resources and reduces carbon emissions released into the atmosphere every year.



Gases formed in the combustion process are extensively cleaned before being released through the chimney, including: **neutralising any acid gases with lime and removing pollutants and heavy metals with 'activated carbon'.** The resultant products and fine particles are captured with fabric filters (similar in appearance to old style vacuum cleaner bags). When compared with how Leeds City Council previously dealt with residual waste, through landfill, there is now a reduction of approximately the equivalent 40,000 tonnes of carbon dioxide (a greenhouse gas) per year, equal to taking around 19,500 cars off the roads.



The RERF operates within strict emission limits set by the Industrial Emissions Directive and recognised by all relevant agencies as a safe, efficient method of treating waste streams that cannot be recycled.



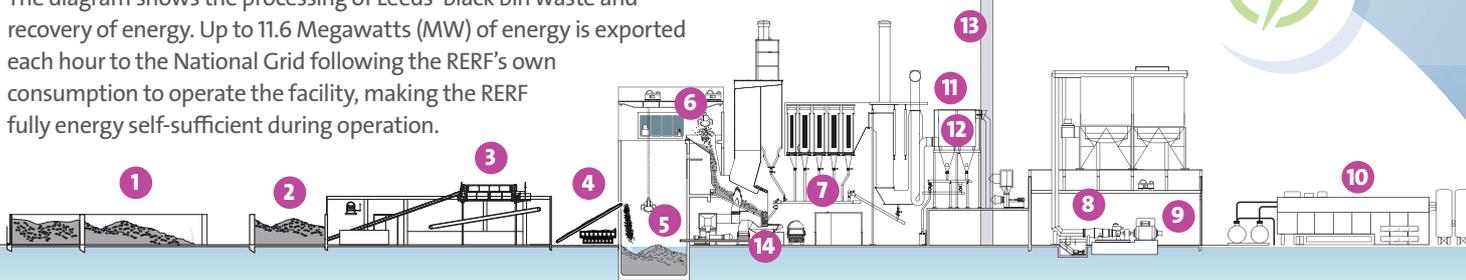
The RERF is forecast to save around **£270m for Leeds City Council over the next 25 years** compared to the cost of sending waste to landfill.



The pre-treatment and energy recovery process

The RERF makes a significant contribution to creating energy from waste.

The diagram shows the processing of Leeds' black bin waste and recovery of energy. Up to 11.6 Megawatts (MW) of energy is exported each hour to the National Grid following the RERF's own consumption to operate the facility, making the RERF fully energy self-sufficient during operation.



1 Household black bin waste in Leeds is brought to the facility and is tipped onto the tipping hall floor.

2 This waste is then picked up and dropped into two shredders that operate at a rate of more than 50 tonnes per hour.

3 The shredded waste goes through a series of mechanical sorting equipment where a minimum of 2 percent of the waste is extracted and recycled.

4 Ferrous and non-ferrous metals are separated from the rest of the waste stream and are channelled to large skips which are then taken off site for processing.

5 The remaining waste goes into a storage bunker via a conveyor belt where it is lifted and fed into a feed chute by an overhead crane.

6 This is the start of the combustion process where waste is fed into the furnace at a rate of around 20.5 tonnes an hour.

7 The combustion process generates heat, above and around the furnace are boiler tubes containing water which is heated up and converted to steam.

8 This steam is then processed further and used to drive a turbine.

9 The turbine generator can produce enough electricity to export 11.6 MW to the National Grid, the equivalent of powering 22,000 homes per year.

10 Steam from the RERF is utilised to provide heat energy to a District Heating Network which supplies energy to homes and businesses across the city of Leeds.

11 The hot gases formed in the combustion process go through an extensive cleaning treatment where lime and activated carbon is introduced to neutralise the acidity of the gases and absorb other pollutants.

12 The cooled gases pass through bag house filters where particulates are removed. Any particulates collected in this process are then stored in a silo for use by other industries.

13 After this cleaning process, the cleaned gas is then released through the chimney. These gases are monitored continuously to ensure they meet strict environmental regulations.

14 Ash from the incineration process is sent via a conveyor belt for storage and is then taken off site for further processing and to be recycled into new materials such as road aggregate.

Curriculum links

- National Curriculum **Science (Physics)**
- National Curriculum **Energetics (Chemistry)**
- National Curriculum **Geography**
- National Curriculum **Citizenship**
- Programme of Study for **PSHE Education** (non-statutory)