

# ENERGY FROM WASTE

## *Thermal Treatment Fact Sheet*



SPITTELAU EFW PLANT (VIENNA) - SUCCESSFULLY OPERATING SINCE 1971

## What is Energy from Waste?

Energy from Waste (EfW), also known as Waste to Energy (WtE), refers to a process of converting residual wastes into energy such as heat, electricity, or liquid transport fuels.

The term EfW is broad, encompassing a range of thermal and biological processes. These include mature technologies, including combustion for heat and power, anaerobic digestion to generate biogas, and emerging technologies that allow waste to be converted to other energy products, such as gas or liquid fuels.

This is the first in a series of fact sheets to be published on this topic, focusing on thermal EfW technologies. In these systems, the energy is harnessed by combusting waste at high temperatures to be used for industrial heating or to drive a turbine that creates electricity.

EfW can form a vital part of a sustainable waste management chain, is fully complementary to recycling, and is already part of the global move towards implementing circular economy principles in waste management. There are more than 2,000 EfW facilities operating safely across North America, Europe, the Middle East, and Asia and over 200 of those were constructed between 2011 and 2015. While EfW facilities are limited in numbers in Australia, it is important that decision makers in the political, planning, infrastructure, environment, energy, and media sectors are aware of the factual elements relating to EfW and this fact sheet aims to provide a base level of information.

## Why EfW?

EfW technologies are an attractive option to treat non-recyclable waste streams not only due to the challenges associated with landfill availability and related greenhouse gas emissions, but also their potential contribution to sustainable baseload power generation, heat recovery, metals and aggregates recycling, as well as regional development and jobs.

## Is EfW safe?

EfW facilities use the best available technology to control emissions by removing chemical contaminants and further filtering the air to remove particulates from the gas. As part of the planning and permitting process, a comprehensive air quality and human health risk assessment is carried out. This is to confirm whether emissions to air meet regulatory limits and are based on health-based research.

During operations, exhaust emissions from these facilities are continuously monitored using gas measuring equipment to ensure they comply with even the most stringent environmental standards. The plants are commonly located in urban areas, close to the source of the waste and needs for the energy produced, and many modern facilities routinely operate to limits well below the thresholds set by regulating authorities.

## Does EfW smell?

The main sources of odour from an EfW plant come from the areas that receive and store waste before it is treated. These areas are fully enclosed and operate under negative pressure to contain the odorous air. Once the waste is processed in the facility, the odorous compounds are destroyed. In the downtime during maintenance when the chamber is not operating, odour is managed through air pollution technology, biofilters and/or managing waste delivery times.

The high level of management and ongoing assessment of air quality means that today, many European, Asian, and Northern American cities have EfW facilities within their metropolitan areas, often only a few hundred metres or less away from residential dwellings, without any problems. The Spittelau EfW facility for example is located in the middle of Vienna, Austria. The plant sells electricity directly to its neighbours, and also provides heating (in winter) and cooling (in summer) to residents.

## Does EfW reduce greenhouse gas emissions?

Studies have shown that the increased deployment of EfW compared to landfill can reduce greenhouse gas emissions. This is because when residual organic material is placed into a landfill, bacteria breaks it down to produce a gas called methane. Some of this methane can be captured in well-operated landfills however, it is often difficult to fully contain. Any methane that is released into the environment is 25 times more potent than carbon dioxide and therefore, reducing methane emissions from landfill is one of the focus areas for meeting our international commitments to reduce greenhouse gases.

An example of this greenhouse gas benefit is demonstrated by the Kwinana WtE project in WA. It has been calculated for this project that there will be an estimated 400,000-tonne reduction of greenhouse gas per year simply by diverting the waste from landfill and offsetting other fossil fuel energy generation.

# What is the waste hierarchy and where does EfW sit within it?

The key framework underpinning waste management policy and practice in Australia is the waste management hierarchy. This hierarchy prioritises specific waste management processes over others based on environmental outcomes, ranking them in order of preference, with avoiding the creation of waste as the most desired outcome and disposal to landfill as the least desired outcome. The Waste Management and Resource Recovery Association of Australia together with Bioenergy Australia fully support these fundamental principles of waste management and resource recovery.

Materials such as clean plastics and paper or cardboard (placed into the yellow lidded bin) can be recycled, as well as organic and green waste (collected in the green lidded bin), which can be revalued through composting or anaerobic digestion processes. However, currently in Australia, the general waste (intended for the red lidded bin) is normally disposed of to landfill without additional value being recovered (other than landfill gas). It is at this stage therefore that diverting the material to an EfW plant for energy recovery can provide for better environmental outcomes.



WASTE HIERARCHY (NSW EPA)

It is the relevant local council's or industry's responsibility to direct the waste collected from the various bin systems but in some areas of Australia, particularly in regional or remote locations where the amount of recyclables is too small or the distance to transport is too great, it may not make sense either economically or environmentally to separate recyclables.

Notwithstanding this, we should always strive to recycle before energy recovery and EfW is therefore a way of treating the residual waste that would otherwise be dumped in landfill, without taking away from higher order recycling.

## Does the EfW process produce waste (residual) materials?

An EfW facility generates two broad categories of residue – Bottom Ash (BA) and Air Pollution Control Residue (APCR).

BA is the non-combustible part of the waste stream which comprises metal, stone, glass and ceramics – materials which can be recovered. This ash can be used in the construction industry as an aggregate material like sand and gravel or compressed into bricks for construction. This is subject to local regulations.

APCR is a mixture of fine ash collected in the exhaust gas filters, as well as the products from reaction of the flue gas treatment additives which remove harmful gases and heavy metals from the exhaust gas before it is released out of the stack. APCR represents a very small proportion of the total residues collected but must be disposed of carefully in a properly engineered containment facility (landfill). Various treatments exist which are able to reduce the hazards associated with this material and these can be applied prior to disposal. Landfills will still be needed therefore, to manage the residual ash material and residual waste that is unsuitable for energy recovery but the volume of material they receive is reduced significantly.

## How is EfW different from incineration?

When waste is treated in an EfW facility, the energy embedded within this waste is harvested and recovering this energy is akin to recovering a resource (i.e. energy), which otherwise would come from fossil fuels.

Waste incineration without energy recovery by comparison is considered waste disposal or destruction. Most Australian capital cities already have waste incinerators, some of which have been operating for about three decades but these facilities are used to incinerate hazardous material such as medical waste.

## What is the circular economy and how does EfW fit into it?

A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them while in use, then recover and regenerate products and materials at the end of each service life. The use of EfW rather than disposal to landfill is a move away from the disposal element of the linear economy, and further towards a circular approach to using the available resource (in this case residual waste). Related, emerging technologies (such as those based on gasification) have the potential to produce feedstock for industrial or agricultural processes wherever it is economically feasible to do so. This would provide an additional pathway for integration of waste streams into circular economy processes.

If we imagine an EfW facility located close to waste generators and close to users of all sorts of energy, this means that the waste resource does not need to travel far and energy is supplied to those in need of it, increasing energy security for these stakeholders.

## What are the economics?

Apart from the significant benefits of electricity supply and heat production (some of which are renewable), projects like the proposed Maryvale EfW facility in Victoria could create up to 1,000 jobs in construction and up to 100 full-time roles during operation. EfW facilities are technologically advanced operations and have the capacity to stimulate skilled job growth in both the short- and long-term.

With the cost of landfill increasing as well as some major Australian cities running out of landfill space, EfW can assist in managing these materials. Processing non-recyclable wastes for energy recovery rather than sending them to landfill also increases the lifespan of existing landfills.



AMAGER BAKKE EFW PLANT IN COPENHAGEN, OPENED IN 2017.