GOVERNMENT OF WESTERN AUSTRALIA

WASTE AUTHORITY
WA...TOO GOOD TO WASTE

WasteSorted
A Waste Authority Program

Position statement on waste to energy

Getting our WasteSorted

September 2020

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Acknowledgements
The Waste Authority would like to acknowledge the contribution of Department of Water and Environmental Regulation staff in the development of this document.

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This document is available in alternative formats and languages on request to the Waste Authority.

Statutory context
The Waste Authority is charged with promoting better waste management practices in Western Australia under the *Waste Avoidance and Resources Recovery Act 2007*. One of the Authority's functions under the Act is to draft, for the Minister for Environment's approval, a long term waste strategy for the whole of the State for continuous improvement of waste services, waste avoidance and resource recovery, benchmarked against best practice and targets for waste reduction, resource recovery and the diversion of waste from landfill disposal. The *Waste avoidance and resource recovery strategy 2030* was released on 10 February 2019.
The Waste Authority publishes position statements from time to time. Position statements formalise the views of the Waste Authority and may be used to inform decisions relevant to the Waste Authority's role in implementing the strategy.

Background

The Waste Authority released its first *Waste to energy position statement* (thermal treatment) in May 2013. The position statement complemented joint advice from the Environmental Protection Authority (EPA) and Waste Authority on the environmental and health performance of waste to energy technologies using thermal treatment (EPA Report 1468). The advice was provided to the Minister for Environment under section 16e of the *Environmental Protection Act 1986* (EP Act).

In 2019, the *Waste avoidance and resource recovery strategy 2030* (waste strategy) replaced Western Australia's first waste strategy, *Creating the right environment.*

The waste strategy contains a vision for Western Australia (WA) to become a sustainable, low-waste, circular economy in which human health and the environment are protected from the impacts of waste. The waste strategy includes objectives and targets to **avoid** waste, **recover** more value and resources from waste, and **protect** the environment by managing waste responsibly.

A key feature of the waste strategy is the inclusion of material recovery targets to support the move towards a more circular economy. The waste strategy also contains a target to recover energy only from residual waste from 2020. The targets apply to municipal solid waste (MSW), commercial and industrial (C&I) waste, and construction and demolition (C&D) waste. These streams are the focus of this position statement.

Agricultural, mining and medical waste streams are not covered here, nor does the position statement extend to the production of fuel products. However, the principles and approaches in the waste strategy were developed to apply broadly to waste management across WA.

This revised waste to energy position statement has been updated to align with WA's new waste strategy. It contains references to a circular economy and updated principles, many of which have been adopted in other Australian jurisdictions.

Waste to energy technologies

'Energy recovery' refers to the process of converting waste materials into some form of energy, usually as solid, liquid or gaseous fuels, or as heat. Energy recovery options are normally referred to as 'waste to energy' (or energy from waste) and can include both thermal and non-thermal technologies.

Thermal

Thermal treatments such as combustion, gasification, pyrolysis and plasma processing primarily convert waste into energy products such as heat, steam, synthetic gas, pyrolysis oil or char. These energy products can either be used directly or as inputs into subsequent electricity production or industrial processes.

Primary thermal waste to energy technologies

Combustion: uses excess air or oxygen to combust waste to produce heat (for direct use and/or electricity production), solid residues and flue gases.

Gasification: converts waste into synthetic gas (syngas) and solid residues via a low oxygen/air reaction. Syngas can be used to produce heat and/or electricity.

Pyrolysis: uses external energy to heat waste, which is converted into a range of gaseous, liquid and solid energy products.

Plasma processing: uses very high temperature plasma to produce combinations of heat, fuels and products (for example metals and construction products), as well as some emissions.

Non-thermal

Non-thermal treatments such as anaerobic digestion and fermentation involve the use of biological and mechanical processes to sort and convert waste into waste-derived products (material recovery) and/or biofuels. These products originate from the controlled decomposition of biodegradable materials, such as food and garden organics.

Primary non-thermal waste to energy technologies

Anaerobic digestion: biological breakdown of organic matter by microorganisms in the absence of air or oxygen, which produces a biogas (which can be used to generate renewable electricity) and a compost-like material which can be used as a soil amendment.

Fermentation: the biological breakdown of carbohydrates in organic materials into alcohols and/or organic acids, with the remaining residues available for further recovery.

Legislation and policy

The Government of Western Australia is committed to avoiding waste, recovering more value and resources from waste, and protecting the environment by managing waste responsibly. The *Waste Avoidance and Resource Recovery Act 2007* (WARR Act) and the EP Act are the key legislative documents that support this commitment.

The waste strategy is also key to achieving this goal, and two crucial components of the strategy are the waste hierarchy and circular economy. The waste hierarchy ranks waste management options in order of their general environmental desirability. A circular economy complements the waste hierarchy – it aims to keep materials and energy circulating in the economy for as long as possible.

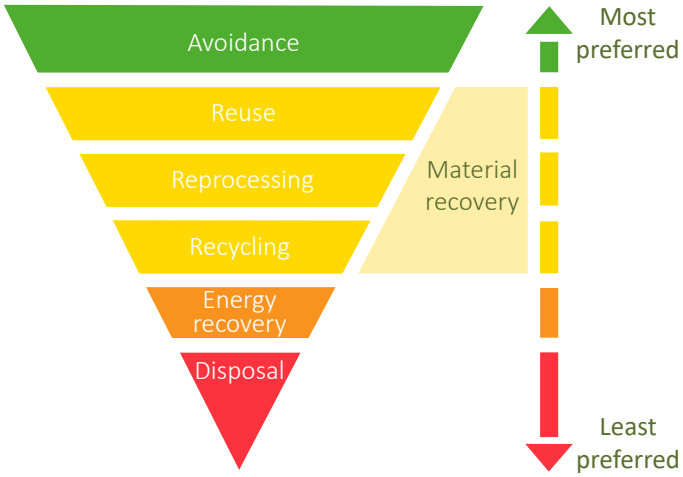
The waste strategy recognises the role of waste to energy as an alternative to disposal to landfill. It also recognises that, consistent with the waste hierarchy and achieving a circular economy, avoiding waste and then maximising material recovery is preferable to energy recovery. Energy recovery should only be used for residual waste once better-practice source separation approaches have been exhausted, so as to maximise material recovery.

The targets in the waste strategy reflect these approaches, with goals to increase material recovery (to 70% by 2025 and 75% by 2030), and recover energy only from residual waste from 2020.

Principles

The waste hierarchy

The waste hierarchy ranks waste management options in order of their general environmental desirability. A waste hierarchy is set out in the WARR Act.



The Waste Authority *Position statement on the waste hierarchy* explains the waste hierarchy and how the Waste Authority will apply the hierarchy in its decision-making in delivering the waste strategy.

The waste hierarchy favours options that recover materials (including reuse and recycling) to those that recover energy. Material recovery options also align with the material recovery targets in the waste strategy.

The waste hierarchy also recognises waste to energy as being preferred to landfill disposal.

The circular economy

The waste strategy aims to move WA towards a more circular economy in which human health and the environment are protected from the impacts of waste.

A circular economy complements the waste hierarchy and aims to keep materials and energy circulating in the economy for as long as possible.

A move towards a circular economy is underpinned by the following broad principles:

- foster system effectiveness: design out waste and pollution
- optimise resource yields: keep products and materials in use
- preserve and enhance natural capital – control impacts to and regenerate natural systems (Ellen MacArthur Foundation 2015, p. 22).

To support WA's move towards a more circular economy, waste management options that recover materials are preferred to waste management options that lose or degrade materials. A circular economy also provides opportunities for increased local recycling activity, which in turn supports investment opportunities and job creation.

Source separation

'Source separation' involves separating waste into similar material streams or categories at the source, for separate collection. This may be achieved using separate bin services or vergeside collections, or through direct delivery of specific wastes to drop-off facilities.

Source separation can enable the processing of certain waste streams higher up the waste hierarchy than would otherwise be possible in a mixed-waste stream. Separating waste at the source directly supports material recovery by producing a more homogenous and higher-value stream which is easier to recover.

The Waste Authority recognises the separation of waste at source as best practice, and strongly supports source separation wherever reasonably practicable (technically, environmentally and economically).

An example of best-practice source separation is the separate collection of food organics and garden organics for material recovery. A headline strategy of the waste strategy commits to:

> A consistent three-bin kerbside collection system, which includes separation of food organics and garden organics from other waste categories, to be provided by all local governments in the Perth and Peel regions by 2025 and supported by the State Government through the application of financial mechanisms.

Material recovery

The waste strategy aims to recover more value and resources from waste and includes material recovery targets.

Waste to energy primarily aims to recover energy from waste, and material recovery is normally a secondary objective. Thermal treatment technologies can recover some materials from mixed-waste streams; however, the material recovery rate is generally far lower than the rate achieved by facilities dedicated to recovering materials, such as composting facilities or recycling facilities.

Estimated material recovery rates from European waste to energy facilities using mass combustion (incineration) are typically less than 30 per cent (under the environmental requirements in those jurisdictions), with the recovery being primarily inert construction products and metals, both derived from facility bottom ash (WSP 2013).

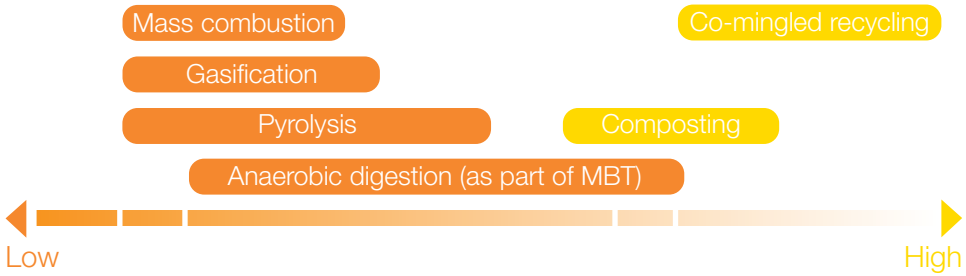
Certain types of non-thermal treatment technologies, broadly termed mechanical biological treatment (MBT), can also recover materials from mixed-waste streams. The material recovery rate from MBT can vary depending on the feedstock, specific process and end markets for the waste derived products.[1]

[1]Some types of MBT use non-thermal waste to energy methods to directly recover energy or produce fuels.

Recycling systems dedicated to recovering materials typically achieve far higher material rates compared to waste to energy technologies, and in particular, thermal technologies such as incineration. For example, high-performing co-mingled material recovery facilities (MRF) recover more than 80 per cent of materials received; recovery rates of up to 75–85 per cent are possible for C&D waste; and recyclers that participate in the National Television and Computer Recycling Scheme are required to achieve a material recovery target of 90 per cent.

The Waste Authority considers waste to energy to be an appropriate resource recovery option **only** when there are no technically, environmentally and economically practicable options higher up the waste hierarchy available, and any recovered material has been used as a recognised input into another product or process (see DWER 2018a).

Figure 1: *Material recovery performance of common waste technologies*



Residual waste

The waste strategy defines residual waste as:

> Waste that remains after the application of a better practice source separation process and recycling system, consistent with the waste hierarchy as described in section 5 of the *Waste Avoidance and Resource Recovery Act 2007* (WARR Act). Where better practice guidance is not available, an entity's material recovery performance will need to meet or exceed the relevant stream target (depending on its source – MSW, C&I or C&D) for the remaining non-recovered materials to be considered residual waste under this waste strategy.

The Waste Authority considers best practice waste to energy processes to be preferable to landfill **for the management of residual waste** but not at the expense of reasonable efforts to avoid waste or recover more value and resources from waste.

Waste that is unable to be practically or economically recovered – and therefore considered to be genuinely residual – may vary from region to region and over time, depending on the availability of recycling and recovery options. The Waste Authority would only consider waste to be genuine residual waste if all practical steps have been applied to recover materials through best practice source separation.

Environmental Protection Authority inquiry

In 2017, the Minister for Environment requested that the EPA inquire and report on conditions for waste to energy proposals to support the acceptance of genuine residual waste in accordance with the waste hierarchy under section 5 of the WARR Act.

In October 2018, the EPA recommended a new definition for residual waste, and new conditions for increased waste monitoring and continuous improvement at waste to energy facilities (Report 1623).

The recommended residual waste definition (subsequently adapted in the waste strategy) is:

> Waste that remains after the application of a best practice source separation process and recycling system, consistent with the waste hierarchy as described in section 5 of the *Waste Avoidance and Resource Recovery Act 2007* (WARR Act), and the waste strategy approved or revised from time to time under the WARR Act.

In response to the inquiry's recommendations, conditions for waste to energy approvals under Part IV of the EP Act were updated. Proponents of a waste to energy facility are required to develop and submit a waste acceptance system plan:

- showing that the technology has the ability to operate on 'residual waste' only
- describing the waste types accepted and the source separation processes employed.

Updated proposals also include requirements for a waste acceptance monitoring and management plan. Proponents need to document the suppliers of the waste, describe the types of waste, and record the waste loads and quantity accepted.

Better practice

Better practice is one of five key principles in the waste strategy. The Waste Authority is committed to the use of better practice approaches for resource recovery and waste management.

The EPA and Waste Authority's 2013 joint advice concluded waste to energy facilities can meet strict emissions requirements when employing best-practice technologies and processes. The advice recognised only proven technology components should be used in waste to energy facilities and proposals must demonstrate best practice and meet European emissions limits for waste to energy (European Commission 2010).

Better practice can be applied to a variety of systems within our society, including waste and recycling systems.

Key characteristics of better practice include:

- proper identification, assessment and management of risk
- use of transparency in monitoring and reporting
- proper accountability within a system to support efficiency and effectiveness
- use of suitable quality control and quality assurance systems
- adoption of continuous improvement informed by better practice benchmarks for processes and systems
- use of approaches that are clear, practical, evidence based and can be managed effectively.

Sources: DMP 2014; DWER 2018b.

Social licence

A social licence refers to projects or activities that are generally accepted by the local community. Engagement with the community through the full planning, design, environmental approvals and commissioning process for waste to energy plants is essential to build community confidence and acceptability. Non-technical aspects applied by waste to energy proponents, such as aesthetic and design considerations, and publicly available real-time monitoring of emissions, are also important aspects of a social licence.

The Waste Authority recognises that a social licence is an important requirement for a waste to energy facility.

Energy efficiency

Waste to energy facilities should achieve a minimum level of energy recovery. This should be assessed with reference to the European Union's R1 energy efficiency indicator for determining the energy recovery performance of thermal treatment facilities for solid waste from non-hazardous sources.

The R1 indicator determines the net potential heat and electricity production from a facility, given the types of waste feedstock entering the facility.

The Waste Authority confirms its support for waste to energy technologies that meet minimum energy recovery performance, as determined using the R1 energy efficiency indicator.

Continuous monitoring

Waste to energy facilities should monitor emissions, continuously where possible. Emissions monitoring supports a facility's operational requirements, promotes effective environmental compliance and reporting, and increases transparency.

Continuous emissions monitoring should be implemented where feasible. Emissions monitoring should capture seasonal variability and associated characteristics in waste feedstock where possible. The waste feedstock and air pollution control techniques are key considerations for the focus of emissions monitoring.

The Waste Authority recognises that effective monitoring of emissions from waste to energy facilities supports the waste strategy objective to **protect** the environment by managing waste responsibly.

Hazardous waste exclusion

The 2013 EPA and Waste Authority joint advice recommended that waste to energy facilities should avoid processing hazardous waste streams.

The Waste Authority considers hazardous waste streams to be generally unsuitable for waste to energy facilities that have been primarily designed to process mixed wastes from the municipal, C&I and C&D waste sectors. Significant quantities of hazardous waste feedstock have the potential to increase the likelihood of processed wastes (including bottom ashes) being classified as hazardous, which in turn may limit recovery opportunities for those materials and increase management costs.

Specific hazardous substances may also require higher temperatures or longer residence times for destruction and additional emissions measures if they are to be considered acceptable to the community.

Hazardous wastes are better managed by dedicated and suitably designed facilities, with a primary purpose of reducing any hazards and **protecting** the environment by managing wastes responsibly.

Waste to energy policy in Australia

The Waste Authority reviewed waste to energy (or energy from waste) policy and guidance documents from elsewhere, including Australian jurisdictions, to inform this position statement.

The following documents were reviewed when preparing this position statement:

- NSW: *Energy from waste policy statement* (2015)
- Victoria: *Guideline: Energy from waste* (2017)
- South Australia: *Thermal energy from waste (EfW) activities – Position statement* (2020)
- Queensland: *Energy from waste policy* (2020).

The Waste Authority recognises the benefits of harmonising waste policy across Australian jurisdictions to provide greater consistency and clarity to the waste sector and the community about the types of issues that should be addressed during development, consultation and approval processes.

Other matters of interest to the Waste Authority

The Waste Authority reconfirms its position on the following matters:

Waste governance arrangements

Waste to energy facilities rely on a certain volume of feedstock (waste) to ensure viability over the longer term. However, long-term waste supply arrangements have the potential to undermine the application of the waste hierarchy. They can 'lock up' waste streams for a specific use, thereby undermining the viability of future higher-value waste management options (such as recycling).

The Waste Authority encourages waste management practices that are consistent with the waste hierarchy. This requires flexibility in waste collection and processing arrangements to allow waste to flow to its 'best' (highest value and lowest impact) use over time.

Siting considerations

The Waste Authority confirms its support for joint advice Recommendation 20, which states:

> Waste to energy plants must be sited in appropriate current or future industrial zoned areas with adequate buffer distances to sensitive receptors. Buffer integrity should be maintained over the life of the plant.

The Waste Authority considers that the location of waste to energy facilities in industrial areas in the early stages of waste to energy processing in WA is an appropriate approach. However, each case must be considered on its merits and other siting options may be possible, depending on the circumstances.

The Waste Authority recognises the benefits of siting waste infrastructure close to the source of waste generation. These include fewer adverse impacts from the transporting of waste, such as reduced greenhouse emissions and traffic congestion, and improved community amenity.

Given the advances in pollution control technology and architectural design, the Waste Authority provides in principle support for more flexible siting arrangements for waste to energy facilities into the future, when informed by suitable risk assessment. Flexible siting arrangements may help to reduce the overall impacts to the environment and community.

The Waste Authority also understands that waste to energy operations require long-term certainty. The Waste Authority supports waste to energy operators owning or controlling their own buffers to help protect long-term siting. This would also encourage the development of precincts where compatible uses are incorporated into the buffer boundary of waste to energy facilities and would ensure that tracts of land are not locked up unnecessarily as empty buffer zones.

Energy use agreements

Waste to energy proponents should secure long-term energy supply arrangements for energy produced by a facility. Energy supply arrangements help to ensure that the energy produced by a facility is productively used in the marketplace and contributes to reducing the demand for energy generated by fossil fuels.

Summary

The waste strategy aims to move WA towards a sustainable, low-waste circular economy in which human health and the environment are protected from the impacts of waste.

The waste hierarchy and circular economy are central to the waste strategy. The waste hierarchy ranks waste management options in order of their general environmental desirability. A circular economy complements the waste hierarchy and aims to keep materials and energy circulating in the economy for as long as possible.

The waste strategy recognises the role of waste to energy as an alternative to disposal to landfill. It also recognises that, consistent with the waste hierarchy and achieving a circular economy, avoiding waste and then maximising material recovery is preferable to energy recovery. To maximise material recovery, energy recovery should only be used for residual waste once better-practice source separation approaches have been exhausted.

The targets in the waste strategy to increase material recovery to 70 per cent by 2025 and 75 per cent by 2030, and recover energy only from residual waste from 2020, reflect these approaches.

The 2018 EPA inquiry report provides further details on how waste to energy proposals should operate to support the waste strategy and the achievement of the WA's targets.

The principles in this position statement form the basis of the Waste Authority's views on waste to energy.

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