WASTE MANAGEMENT & RESOURCE RECOVERY ASSOCIATION AUSTRALIA

Ms Georgie Purcell
Committee Chair
Legislative Council Economy and Infrastructure Committee
Parliament of Victoria
Parliament House, Spring Street
EAST MELBOURNE VIC 3002
Email: wastetoenergyinquiry@parliament.vic.gov.au
Submission via online portal

2 April 2026

Dear Ms Purcell

Re: Inquiry into the development and expansion of Waste-to-Energy infrastructure in Victoria

WMRR appreciates the opportunity to make a submission to the Legislative Council Economy and Infrastructure Committee ("the Committee") on the development and expansion of Waste-to-Energy (WtE) infrastructure in Victoria. The Waste Management and Resource Recovery Association of Australia (WMRR) is the national peak body representing Australia's $21 billion waste and resource recovery (WARR) industry. With more than 2,300 members from over 400 entities nationwide, we represent the breadth and depth of the sector, including representation from business organisations, the three (3) tiers of government, universities, and Non-Government Organisations (NGOs), including research bodies. Our members are involved in a range of important WARR activities within the Australian economy, including infrastructure investment and operations, collection, manufacturing of valuable secondary raw products from resource recovery, energy recovery as well as community engagement and education. In Victoria, WMRR represents over 530 individual members from more than 90 entities.

The Terms of Reference (ToR) for this review broadly consider the suitability of current waste-to-energy (WtE) infrastructure plans, regulations and policies, the impacts of WtE processes, alternative waste management options and emerging technologies that support circular economy principles, alongside assessing the effectiveness of current community consultation practices. It follows that the Committee appreciate from the outset that WtE is not something that can be reviewed in isolation, but rather, needs to be considered as an integral part of the state's waste and resource management system. Fundamental to this is appreciating WtE is higher on the hierarchy than disposal and is therefore a preferable option to landfill, as part of a sustainable solution for managing residual waste within a circular economy that seeks to use less for longer, mitigates carbon impacts and produces energy.

WtE facilities are modern, highly regulated industrial facilities that operate safely in proximity to communities. International and Australian evidence demonstrates that emissions are tightly controlled and continuously monitored, facilities operate well below health-based limits and can be co-located with industrial precincts reducing transport impacts and providing sustainable energy solutions. From the outset, it is important to point out that in order to meet the relevant regulatory controls required, reference facilities for WtE in Victoria will necessarily be considered, global best practice WtE facilities, having benefited from more than 120 years' experience in the European Union (EU). WMRR emphasises that the old 'incineration' technology is very different to current technology used in WtE and these cannot and should not be directly compared. Modern

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WtE facilities also recover recyclable metals from the bottom ash residue to produce an aggregate material suitable for beneficial reuse, thus avoiding landfill disposal and supporting the circular economy. The reality is that Australia by being later to adopt these facilities has benefited greatly from these advancements, ensuring that facilities built in Victoria will be deploying proven technology.

WMRR emphasises the importance of evidence-based consideration of WtE. Modern WtE facilities operate under stringent regulatory frameworks, incorporating advanced emissions control technologies and continuous monitoring, and are widely deployed internationally as critical infrastructure. Greater recognition of their environmental, economic and social benefits is necessary to support informed decision-making and balanced community engagement around WtE as part of an integrated waste and resource recovery system. It plays a defined role within the circular economy as the preferred treatment option for residual waste that cannot otherwise be avoided or recovered. WMRR's Energy from Waste FAQ document is provided at **Annexure A**.

i. Suitability of existing WtE infrastructure plans and policies (ToR 1)

a. WtE is a preferable solution to landfill

This opportunity to help fully inform Victorian residents and present a balanced response to the proposed WtE facilities through this inquiry, is welcomed by WMRR. It is important when considering WtE to consider it as part of the broader system, recognising that in 2026 we continue to have poorly designed materials placed on market that cannot be recovered, as such it is preferable to capture energy than create methane through disposal to landfills. In many ways, there has not been - in WMRRs view – enough public discussion of why WtE is preferable to landfill for:

- environmental and health reasons, noting that modern WtE technologies utilised overseas continually meet strict best practice regulatory compliance with a level of continuous monitoring and scientific rigour, whereas landfills emit methane that is 25 times more warming to the environment than carbon; and
- improving economic growth opportunities for the surrounding precinct via local job opportunities and co-located industrial investment.

These factors are crucial for understanding why the proposed WtE facilities are in development, and why there are more than 2,000 such facilities operating safely around the world as critical waste management infrastructure.

Figure 1 The waste and resource management hierarchy (Source: NSW Waste and Circular Infrastructure Plan)

As a solution for residual (or unrecoverable) waste, WtE does not displace higher order recovery efforts such as waste avoidance, reuse, repair, recycling or composting. WtE however does sit in the waste and resource management hierarchy as a preferred treatment method compared to landfill for residual material given it:

- Reduces landfill: diverting non-recyclable materials that cannot be composted or recycled.
- Generates energy: converting waste into a reliable, local source of base load electricity for the region.

- Supports recycling: by focusing only on residual waste, WtE works alongside existing recycling and resource recovery systems, not in competition with them.
- Improves environmental outcomes: by reducing greenhouse gas emissions from landfill and using proven, advanced combustion and emission control technologies that meet strict environmental and health standards.
- Plays a vital role in the circular economy by recovering valuable metals that would have otherwise gone to landfill.

Alongside efforts targeting each stage of the product lifecycle to avoid the creation of residual waste (including design, manufacturing, consumption, reuse and repair), WtE supports the transition to a circular economy by acting as the last link in the chain after all other materials recovery strategies have been exhausted, to avoid residual waste going to landfill (noting that at some stage all products reach end of life).
This has been recognised in the EU, for example, which has embraced WtE technology as a complement to its *Waste Framework Directive* which sets targets and requirements for the separate collection of materials to promote high-quality recycling and reuse. Up to ten (10) key waste fractions are prioritized for separate collection and sorting, though the specific number and categories can vary by Member State. These mandatory fractions include paper, cardboard, glass, metals, plastics, textiles, bio-waste, food and drink cartons, hazardous household waste, and residual waste. Energy recovery from the residual waste stream complements these efforts. Furthermore, the ability to co-locate WtE facilities alongside industrial facilities in precincts enables a source of local energy generation and reduced reliance on fossil fuels, bringing both economic and environmental benefits.

WtE also assists to avoid the creation of landfill emissions. Scottish research has shown that each amount of waste that is treated by an WtE facility rather than landfilled will reduce total greenhouse gas (GHG) emissions significantly. Methane (CH4) is emitted when organic material decomposes in a landfill in the absence of oxygen and landfills continue to release greenhouse gases for many years, even after no new waste is added. By contrast, carbon dioxide (CO2) is emitted when a material containing carbon is burned in the presence of oxygen, for example in a WtE facility. GHG emissions are generally reported in terms of "tonnes of carbon dioxide equivalent", abbreviated to "tCO2e". Methane is approximately 25 times more potent a GHG than carbon dioxide[1], which means that a tonne of the methane will equate to ~25tCO2e.

Unlike WtE, landfills remain in situ permanently, meaning that they will continue to require management of issues such as leachate and gas even post closure and may also cause environmental challenges when operating, including risks to groundwater and surface water, unpleasant odours, noise, dust, litter, and pests. Many active and old landfills are located in flood-affected areas, which are becoming more vulnerable due to climate change, such as heavier rainfall. These risks need ongoing monitoring and management, even after a landfill is closed and covered. On the other hand, WtE facilities are manufacturing facilities with an agreed life span and carefully engineered to prevent contamination with all process fluids contained within the plant, and emissions continuously monitored and highly regulated. Operationally, WtE facilities are a base-loaded renewable energy power stations that require coordination with network operators to manage load changes and interruptions safely. Continuous monitoring and auditing ensure renewable energy claims are verifiable and that plant adjustments are performed safely, maintaining both compliance and community trust. WTE facilities can be

[1] Scottish Government, Decarbonisation of residual waste infrastructure (accessed 20 October 2025)

upgraded and refurbished, ensuring continual improvement to meet the latest scientific and technological standards. Further, at end of life, WtE plants can be demolished with the land restored or the site repurposed for another use.

b. Current Victorian policy settings for waste and resource recovery

The Victorian government is committed to creating a circular economy and reducing waste. Victoria's recycling targets include diverting 80% of waste from landfill by 2030, cutting total waste generation by 15% per capita by 2030 and halving the amount of organic material going to landfill by 2030. In 2022–23 Victorians generated an estimated 16.06 million tonnes of waste. While 65.9% of this waste was recovered or recycled, this means that approximately 5.47 million tonnes of residual waste still went to landfill. Extensive commitments have been made over the last five (5) to transition Victoria to a circular economy, with the introduction of the *Circular Economy (Waste and Recycling) Act* 2021 ("CE Act"), the delivery of the *Victorian Recycling Infrastructure Plan,* Victoria's Big Build and Recycled First policy to drive circular procurement, and the release of the circular economy plan Recycling Victoria: A new economy. Despite these initiatives, as noted by the Victorian Auditor General's Office in April 2025, the proportion of waste going to landfill has not significantly changed, and Victoria is not on track to meet its targets. According to the VRIP*,* Victoria's residual waste is projected to increase to nearly 9 million tonnes per year by 2053, and Victoria will run out of approved landfill capacity in the next decade.

c. Annual caps on waste inputs

Victoria has – in theory – supported WtE as a valuable part of a sustainable waste management solution in its circular economy, with a regulatory cap scheme designed to prevent over reliance on WtE as a solution to waste management and to ensure that Victoria continues to prioritise decreasing waste generation and increasing investment in recycling and resource recovery[2]. In July 2025, DEECA's Regulatory Impact Statement (RIS) for a WtE Cap Scheme examined a range of factors, including feedstock availability, material recovery, avoided use of landfill, electricity generation, net emissions outcomes, costs and benefits. There were concerns that there may not be enough available permitted waste feedstock leading to risks such as over-investment in WtE infrastructure, the need to import waste from other jurisdictions, or an underutilisation of facilities leading to dormant or stranded assets. A 2.5 million tonnes per annum cap for WtE was determined, with Recycling Victoria(RV) issuing seven (7) licences totalling 2,350,000 tonnes per annum.

Whilst the RIS for the WtE Cap Scheme recognised the significant benefits of WtE, including major private investment for Victoria and improved resource recovery outcomes, particularly for metals and aggregates, despite strong policy intent, a number of critical implementation challenges risk undermining the effectiveness of the Scheme and delaying the delivery of essential infrastructure. WMRR maintains that the current cap on WtE is unnecessary and counterproductive – restricting infrastructure higher in the waste hierarchy with no bearing on the amount of waste sent to landfill, creating market distortion and risks delaying critical infrastructure, and simply adding another costly regulatory layer and time delays to already rigorous processes that need to be met by Victorian EPA and planning departments.

[2] In WMRR's view, it makes no sense whatsoever to place a cap on energy recovery which is higher up the waste management hierarchy, yet nil on material to landfill.

d. Strategic planning and policy framework

Victoria's current WtE infrastructure planning framework is not fit-for-purpose. While previous planning under the *Statewide Waste and Resource Recovery Infrastructure Plan* (SWRRIP) identified strategic sites and provided a coordinated network approach, the current VRIP does not identify sites, lacks spatial mapping and provides no overarching waste and resource recovery system narrative.

The SWRRIP identified key sites across Victoria as Waste and Resource Recovery Hubs of State Significance, recognising their strategic role while also acknowledging that additional suitable locations may exist. In contrast, the current VRIP provides no identified sites, infrastructure mapping, or overarching strategic narrative to guide planning and investment. This represents a significant step backwards from the certainty and strategic direction previously provided by the SWRRIP to government, industry and the community in progressing with developing the infrastructure needs to support Victoria's waste and resource recovery targets. Instead, the VRIP appears to treat waste and resource recovery infrastructure as a series of discrete development opportunities rather than as a coordinated, statewide network of essential infrastructure. This represents a significant regression in planning certainty and undermines coordinated infrastructure delivery.

This mismatch between the policy direction of the WtE Cap Scheme and CE Act, and the lack of strategic planning provided by the VRIP, has resulted in significant waste supply and infrastructure timing gaps between declining landfill capacity and the delivery of WtE infrastructure. WtE facilities are capital intensive developments with long lead times of no less than five (5) years, and those already in the pipeline are not expected to be operational until later in the decade, while landfill capacity continues to diminish, and Council contracts due to expire in 2027 with limited landfill capacity on South East Victoria, given the SWRRIPs intent of not building new landfills in this precinct. The most progressed Victorian project, in Maryvale, has yet to reach financial close or receive the requisite approvals for transfer station infrastructure. At the same time, constraints on permitted waste streams for WtE may further limit feedstock availability for future facilities. This gap presents a material risk to waste system stability, particularly for councils managing municipal waste.

As mentioned above, the infrastructure timing gap is particularly relevant to the management of waste in Melbourne's southeast. The impending closure of the Hallam Road Landfill (HRL) highlights the need for a clear, coordinated and time-critical government response when assessing infrastructure, including waste to energy (WtE) and transfer station capacity to manage residual waste and reduce reliance on landfill. HRL currently processes approximately 450,000 tonnes of waste per annum and is forecast to close before 2030, creating a significant infrastructure gap in one of the state's fastest growing regions. The viability of the approved Maryvale WtE facility – with capacity to process up to 715,000 tonnes per annum – is intrinsically linked to the delivery of the Hampton Park Transfer Station (HPTS), which is required to aggregate and efficiently transport waste from Melbourne's southeast to the facility. There is evidence that existing transfer stations in the southeast region are already operating at or near capacity and cannot absorb the waste volumes currently managed by HRL. Furthermore, the development of new transfer infrastructure is subject to complex planning, environmental and commercial processes, with typical delivery timeframes exceeding five (5) years. As a result, the HPTS represents a unique and time-critical solution, with alternative options unlikely to be operational prior to the closure of HRL.

Failure to deliver the HPTS (which was always a part of the adopted HRL Masterplan)—and by extension, the Maryvale WtE facility—would have significant system-wide consequences. In the absence of this infrastructure, waste would need to be transported to more distant landfills or alternative facilities, significantly increasing costs for councils and businesses. Transport distances could increase by up to 66 kilometres one (1) way for some councils, resulting in higher operational costs, increased truck movements, and additional pressure on already constrained road networks. At scale, this would require substantial increases in fleet size and labour, compounding cost impacts across the waste management supply chain. Increased transport distances would result in higher greenhouse gas emissions and air pollutants, while the loss of WtE capacity would reduce opportunities for energy recovery and increase landfill gas generation.

e. Regulatory framework – the existing 'TEEP' test favours landfill

Victoria's current regulatory framework is overly complex, uncertain and, in practice, misaligned with circular economy objectives. It relies heavily on case-by-case approvals and places regulatory responsibility on WtE operators for factors beyond their control, creating unnecessary risk and delaying project delivery. Critically, current settings are inadvertently favouring landfill over higher-order recovery options.

The Technically, Environmentally or Economically Practicable ("TEEP") test is a central mechanism for determining permitted waste streams for WtE. While its intent—to ensure only residual, non-recyclable waste is processed—is sound, its practical application presents significant challenges. It places responsibility on WtE operators to ensure only residual waste is processed, despite operators having no control over how waste is generated, separated or collected upstream. In reality, source separation occurs before waste reaches a facility, leaving operators reliant on contracts and audits rather than direct control. This creates a clear disconnect between regulatory obligations and operational reality. Furthermore, the interaction between the TEEP test and evolving kerbside collection standards risks constraining feedstock supply for WtE, particularly during the transition to consistent service systems. This creates a perverse outcome: residual waste that could be recovered through WtE is instead diverted to landfill.

f. Uncertainty in governance and regulatory transition

WMRR further notes that institutional changes, including the transfer of Recycling Victoria functions to the EPA, risk weakening strategic system coordination at a time when strong governance is required. Councils are facing imminent pressures, including expiring landfill contracts and limited alternative infrastructure, and require clear, coordinated direction from government. There is limited clarity on how roles and responsibilities will operate when licensing, regulation, and policy functions sit within the same entity. While legislative provisions under the CE Act will be transferred, implementation details of remain unclear, creating uncertainty for investors and operators. This lack of clarity risks delaying project development, weakening investor confidence, and slowing progress toward infrastructure delivery. A clear, whole-of-government approach is required to provide leadership and certainty to avoid emerging capacity shortfalls and system instability.

ii. The Impact of WtE (ToR 2)

a. WtE is part of a circular system that aims to design out waste

As discussed in the previous section, WtE complements, rather than competes with, recycling and organics recovery. WtE facilities process only residual waste - that is, the discarded materials left after source separation from the waste suppliers has occurred. This means that WtE operations meaningfully coexist with upstream recovery systems such as recycling, organics processing (such as composting), reuse and repair. Residual waste generation is driven by upstream factors, including lack of product design standards, limited producer responsibility and insufficient recycled content requirements . Addressing these issues is essential to reducing long-term reliance on WtE and landfill. International experience confirms that high recycling rates and WtE can coexist within a circular economy framework.

Australia must look to the EU's model, introducing regulations that drive better product design, increase material recovery, and are underpinned by the polluter pays principle. By holding producers accountable and incentivising sustainable design, we can reduce the generation of residual material and move closer to achieving a circular economy.

b. WtE are highly regulated facilities with strict emissions standards

It is important to note that modern WtE plants use advanced flue gas treatment and automated systems to ensure emissions remain well below safe limits. WMRR has included further information about these processes in **Annexure B** (prepared by EnRiskS). Given these extensive technical and regulatory safeguards, the emissions from the proposed WtE facilities should not be considered an unacceptable risk. This fact is evidenced by European WtE facilities being located in the immediate neighborhood of residential areas in cities, including the Amager Bakke Facility in Copenhagen (pictured) located just 1.66km away from Amalienborg – the home of the Danish Royal Family. According to the European Suppliers of Waste-To-Energy Technology (ESWET) 50% of the district heating network in Paris is supplied by energy recovered from WtE plants whilst in Sweden, WtE provides heat to 1.2 million Swedish households and electricity for another 800,000. Having these plants in close proximity to homes in cities underscores the success of the BREF in ensuring that WtE facilities operate with acceptable, low-level risks to the environment and human health.

c. Health impacts from currently operating older technology waste incinerators as compared to the proposed newer technology

"Modern energy from waste is very different to older waste incineration technology and cannot be compared. Technologies for combusting waste and controlling air emissions have significantly changed and improved as better controls and improved monitoring have been developed."[3]

WMRR reiterates that modern WtE facilities are required to comply with the BREF that stipulates how the facilities operate, the level of pollution control required, sets emission limits for what can come out of the stack and outlines requirements for monitoring and management (including upset conditions). The BREF has been developed since 2000, with the most recent revision or refinement, that incorporates continual improvements

[3] NSW Energy from Waste Policy Framework (accessed 27 October 2025)

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issued in 2019, and all facilities to be built in Victoria will meet these standards. WMRR reiterates that studies show no evidence that pollutants emitted to air from modern WtE facilities that operate in compliance with the BREF change existing concentrations in soil or produce, and there is no evidence of adverse health effects in the community surrounding these facilities. For further information, please refer to the fact sheets from EnRiskS provided at **Annexure B**.

d. Cost-benefit for consumers and businesses

WtE delivers significant economic and system benefits by reducing long-term reliance on landfill, providing stable, local energy generation that can offset fossil fuel use, supporting jobs and industrial activity for the region and improving system resilience as a secure option for processing residual waste. Failure to develop WtE infrastructure will likely result in:

- increased waste transport costs for servicing disposal at landfills further away from the source. This phenomenon has been seen in some Australian states whereby waste is transported across borders to where there is available landfill capacity; and
- accelerated landfill depletion and demand for more land.

iii. Alternative Approaches and Emerging Technologies (ToR 3)

WMRR has outlined in an earlier section why WtE is a preferable solution to landfill and reiterates that WtE is not a competitor to, but rather, a component of a sustainable circular economy wherein residual waste is minimised and less materials are used for longer. WMRR strongly supports this systems-based approach to waste and materials management, prioritising the hierarchy waste avoidance, reuse and repair, recycling and composting. However, even with best practice upstream interventions, residual waste will remain.

Waste projections are increasing globally with the World Bank forecasting waste generation to increase by ~55% by 2050 from 2025 levels[4]. This growth in residual material is a result of a number of issues, including population growth. However, increasingly in Australia (which is out of step globally) the lack of regulation to require generator obligations or standards for products to be designed for re-use, repair and recycling, the lack of obligation to incorporate recycled material or prohibition on the ability to include problematic chemicals such as PFAS in products, is making them unrecoverable. In the absence of these regulatory interventions, regrettably Victoria will continue to need facilities that can safely manage unrecoverable residual material. WtE is required to manage this residual stream and should be considered alongside advanced recycling technologies, improved material recovery systems and product stewardship and design reforms. Victoria's landfill capacity constraints further reinforce the need for WtE as part of a balanced waste management system.

iv. Community consultation (ToR 4)

Despite the recognised role of WtE in achieving diversion targets, community and political support remains mixed. EPA approval processes already require industry is required to undertake significant engagement efforts, including council forums and educational initiatives. However, current public discourse is often influenced by

[4] World Bank Blogs, How the world Bank is tackling the growing waste crisis (accessed 27 October 2025)

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outdated perceptions of incineration, which do not reflect modern, regulated WtE facilities. There remains a need for stronger, coordinated government advocacy to build community understanding and awareness of what WtE is, and reinforce the role of WtE within the broader circular economy.

Community consultation remains a critical factor in WtE development. A coordinated government-led approach is required to build public confidence.

v. Other related matters (ToR 5) - WtE in Western Australia

The Western Australian experience is evidence that both government and regulators play a critical role in establishing both clarity of the system in which WtE rightly operates and setting clear environmental and operational boundaries, supporting social license for WtE proponents. Australia's first WtE facilities - the Kwinana Energy Recovery Facility and the East Rockingham WtE project - were permitted following the Western Australian Environmental Protection Authority (EPA) commissioning detailed studies in Europe to evaluate WtE technology, assessing both environmental and health impacts. These studies confirmed that operations adhering to best practice standards are acceptable, establishing a framework that can guide future projects. The WA Waste Authority and WA EPA issued the following statement endorsing the social license for such facilities:

"The EPA and Waste Authority are confident that, subject to appropriate regulation, along with the matching of suitable technologies to types of waste input and appropriate plant scale, waste to energy plants employing best practice can be operated with acceptable impacts to our community"[5]

Figure 2 Kwinana Energy Recovery Facility Source: Ramboll

The Kwinana Energy Recovery Facility is Australia's proof-of-concept modern WtE facility, which diverts up to 460,000 tonnes of waste from landfill to recover and recycle both ferrous and non-ferrous metals and produce Incinerator Bottom Ash Aggregate (IBAA) to displace virgin material use in construction aggregates. The facility generates more than 38MW of electricity (enough to power 55,000 homes) and reducing GHG emissions equivalent to taking 85,000 cars off Perth's roads. The facility is certified by the Clean Energy Regulator (CER) to produce Large-scale Generation Credits (LGC's). According to the City of Kwinana, the facility has become an integral part of the community and economy achieving to date, 75% reduction in waste service emissions, leading to a cleaner environment and generating local job opportunities got the Kwinana industrial area. The City is anticipating an increase in its materials recovery from 19% to 49% by utilising WtE alongside a separate organics waste collection service.

Closing remarks

WtE facilities are large scale power stations that are proven, efficient, and capable of significantly reducing greenhouse gas emissions. WMRR emphasises that modern WtE facilities employ advanced, proven systems

[5] Waste Authority (WA), Waste to energy (accessed 20 October 2025)

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that meet strict environmental and safety standards. Unless Victoria acts, it faces a significant timing gap between declining landfill capacity and delayed delivery of WtE infrastructure. This creates risks including capacity shortfalls, increased costs and reduced system resilience, particularly for Council at the end of 2027. Without targeted policy refinement, regulatory clarity, and stronger government leadership, the current framework risks delaying investment, constraining supply, and ultimately undermining the achievement of the state's diversion targets and circular economy goals. WMRR welcomes the opportunity to further contribute to this important inquiry and would appreciate the opportunity to present. Please contact the undersigned if you wish to further discuss WMRR's submission.

Yours sincerely

[redacted]

Chief Executive Officer

Waste Management and Resource Recovery Association of Australia

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WASTE MANAGEMENT & RESOURCE RECOVERY ASSOCIATION AUSTRALIA

Annexure A:
WMRR Energy from Waste FAQs

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ENERGY-FROM-WASTE (EFW) FAQS

What is Energy-from-Waste (EfW)

EfW provides a safe and proven way to manage residual waste, generate reliable energy and support Australia's circular economy.

EfW, also referred to as Waste-to-Energy (WtE) or Energy Recovery Facility (ERF), converts non-hazardous residual waste, which can't be recycled, into energy sources such as heat and electricity, and enables the recovery of other resources such as metals and construction aggregates.

EfW is critical waste management infrastructure that supports a circular economy by complimenting recycling, enabling energy recovery and avoiding landfilling and associated emissions.

Many countries, including the US, Europe and the UK, prefer EfW over landfill. There are more than 2,000 such facilities operating safely around the world.

Current technology

Modern EfW facilities are very different from the waste incinerators of the past.

Emission control
Older facilities had limited pollution control. Modern EfW plants use advanced flue gas treatment and automated systems to ensure emissions remain well below safe limits.

Energy efficiency
Current plants recover more energy – often 25–30% compared to less than 20% previously.

Regulation
Strong environmental laws now require continuous monitoring and automatic shutdowns if any system fails.

Resource recovery
Metals and aggregates are recycled from the bottom ash, reducing landfill and supporting circular economy goals.

Why EfW?

EfW provides a sustainable solution for managing non-recyclable, non-reusable residual waste that would otherwise go to landfill.

It sits in the waste management hierarchy as a preferred treatment method compared to landfill because it:

- Reduces landfill by diverting non-recyclable materials be composted or recycled
- Generates energy by converting waste into a reliable source of base load electricity for the region
- Supports recycling by focusing only on residual waste works alongside existing recycling and resource reco systems, not in competition with them
- Improves environmental outcomes by reducing green emissions from landfill and using proven, advanced c and emission control technologies that meet strict en and health standards
- Plays a vital role in the circular economy by recoverin metals that would have otherwise gone to landfill.

Waste Management Hierarchy


Blue Phoenix - IBA Aggregates

Reusable residues

What types of residues are produced?

1. Incinerator Bottom Ash (IBA)
The non-combustible portion of waste - usually 20–25% of what is processed - is treated to recover metals and turned into Incinerator Bottom Ash Aggregate (IBAA) for use in road building and concrete.

2. Air Pollution Control Residue (APCr)
A fine powder collected from emission control systems, makes up about 3–5% of the waste received and is managed safely at licensed facilities or treated for reuse under strict regulation.

Air quality and health

How are emissions controlled?

EfW facilities use advanced monitoring and cleaning systems:

- Continuous Emissions Monitoring Systems (CEMS) check key pollutants such as nitrogen oxides (NO_x), carbon monoxide (CO), dust and acid gases.
- Flue gas cleaning removes particles and gases using lime scrubbers, activated carbon and baghouse filters.
- Combustion temperatures of around 850–1,100°C destroy harmful compounds.
- Independent testing verifies results and compliance.

Are emissions safe?

Yes. Emissions from modern EfW plants are well below limits set by the World Health Organization and the European Union. Studies in Europe, the UK and Australia show no increased health risks for communities living near EfW facilities.

The main emissions are nitrogen (~65%), oxygen (~6%), water vapour (~20%), and carbon dioxide (~10%).

Myths and facts

Is Europe closing EfW plants?

No. With more than 500 operating plants in Europe[1], EfW remains a key part of the waste management hierarchy. Some older plants are being replaced, but EfW continues to support the EU's Circular Economy Plan.

At least six (6) new UK projects have been announced in the past two (2) years.

Does EfW discourage recycling?

No. Countries with the highest recycling rates also have the most EfW capacity. EfW is designed to treat waste that cannot be reused, recycled or recovered.

Does EfW support the circular economy?

Yes. EfW recovers metals and other resources that would otherwise go to landfill.

Up to 25% of residual waste can be turned into Incinerator Bottom Ash Aggregate (IBAA), used in road construction and concrete production.

Australia's Energy-from-Waste Facility

ACCIONA owned Kwinana is Australia's first operational Energy-from-Waste (EfW) facility. It diverts up to 460,000 tonnes of waste from landfill each year and generates 38 megawatts of baseload electricity for the Western Power grid – enough to power more than 50,000 homes.


Kwinana Energy Recovery facility

Annexure B:
Energy from Waste Fact Sheets from EnRiskS

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Energy from Waste (EfW) and community health

A bit of history

Most power stations use turbines to generate electricity. These turbines can be run by combusting a fuel such as coal or gas (or using the force of flowing water – hydropower for example). The combustion process produces steam, that then turns a turbine to generate electricity. This process has been around for a long period of time. Instead of combusting coal or gas, EfW facilities combust waste to produce steam, which turns the turbine to generate electricity. Both steam and electricity can be used from these facilities. Only waste that cannot be recycled or reused is sent to an EfW facility, otherwise these materials would end up in landfill.

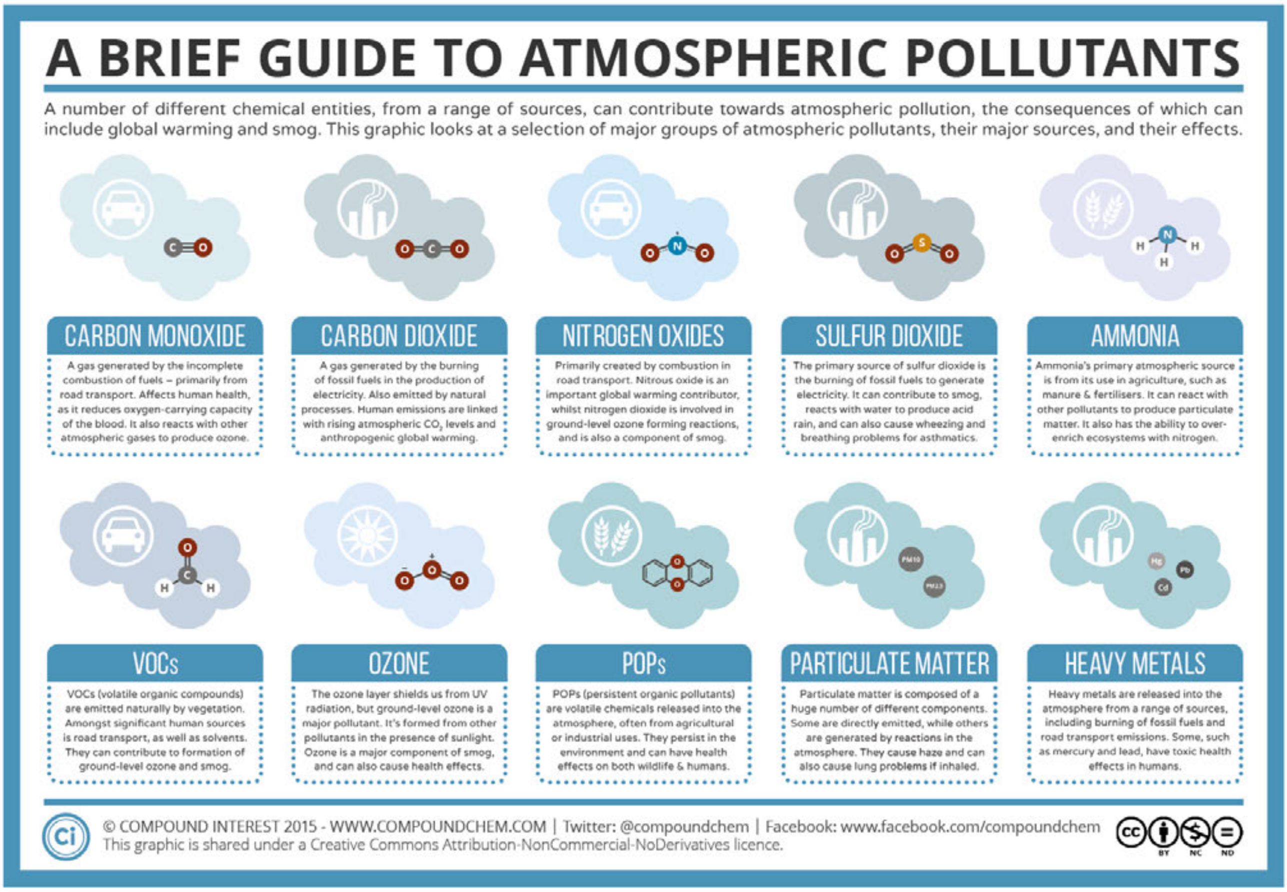
Waste incineration has been around for a long time with large scale incineration being conducted since the late 1800's and continuing into the 1900's. These facilities typically combusted waste for the purpose of waste disposal/destruction rather than to generate power. Some of the facilities in the 1900's were also used to generate steam and electricity. These older facilities had little to no control on emissions, and that resulted in adverse health impacts in the community. When clean air legislation was enacted, most of these facilities were closed.

Old incineration technology is very different to new technology used in EfW and these cannot be directly compared.

Modern EfW facilities are required to comply with EU Best Available Technologies (BAT BREF) [1-5] that stipulate how the facilities operate, the level of pollution control required, sets emission limits for what can come out of the stack and outlines requirements for monitoring and management (including upset conditions). The BREF has been developed since 2000, with the most recent revision or refinement, that incorporates continual improvements, issued in 2019.

Chemicals in air and what we breathe

It is important to remember that just like the earth (soil, rocks and water), the air is made up of chemicals. The air we breathe every day comprises nitrogen, oxygen and carbon dioxide as well as lower levels of many other chemicals. This includes chemicals from dust which includes the metals that are present in soil; pollen/spores and decomposition gases from plants and organic material; chemicals from combustion – like from running a car or truck, or using a wood fired heater or gas cooker; or dust and gases from bushfires. As a result, the air we normally breathe has low levels of a wide range of chemicals in the form of gases and particulates.



Chemicals are present in the atmosphere from numerous sources that include a range of combustion gases, metals and persistent organic chemicals like polycyclic aromatic hydrocarbons and dioxin-like compounds. These are the same chemicals in emissions to air from EfW. It is important to understand what changes in air quality may occur from the operation of an EfW facility.

To understand how the operation of an EfW facility could impact on community health, this requires some understanding of how an EfW facility operates and what could be released into the air, for the community to be exposed to.

How does EfW work and control air emissions?

The technology used in EfW has been refined to maximise energy production and minimise losses including emissions to air, specifically [2, 6]:

- Waste is mixed in a bunker prior to entering the combustion chamber or furnace, so that the fuel used provides a consistent energy input
- The furnace is required to operate at a minimum temperature and waste is combusted for a minimum amount of time, under specific oxygen conditions to maximum combustion (destruction of chemicals in the waste) and minimise the generation of pollutants including the formation of dioxins
- Heat from combustion is used to make steam – this drives a turbine to produce electricity. Both the heat and electricity can be used by other industry or electricity sent to the grid

- Ash is produced in the chamber (like it does in a wood stove) and this can be cleaned up (metal removed) and reused for things like aggregate in roads
- Emissions from the furnace are treated by pollution control equipment before being discharged to air via a tall stack
- What remains in air emissions are primarily atmospheric gases like nitrogen with trace (or very low) levels of pollutants
- EfW facilities have continuous monitoring of a number of important parameters to make sure they are operating well – just like coal or gas fired power stations
- EfW facilities are also required to monitor a range of pollutants in the stack to make sure these meet licence emission limits – just like coal or gas fired power stations and other industrial facilities
- If something goes wrong and it cannot be fixed straight away by the operator, the facility shuts down. The first step is to stop waste entering the furnace, which prevents emissions to air occurring. It is also noted that there is no way the pollution control equipment can be bypassed at any time.

What then happens with the air emissions?

Emissions from an EfW process, after all the pollution control steps to remove pollutants from the air, are discharged to the atmosphere via a tall stack.

The stack is engineered to make sure emissions are well dispersed (i.e. mixed) in the atmosphere, before reaching anywhere that the community may be exposed [7].

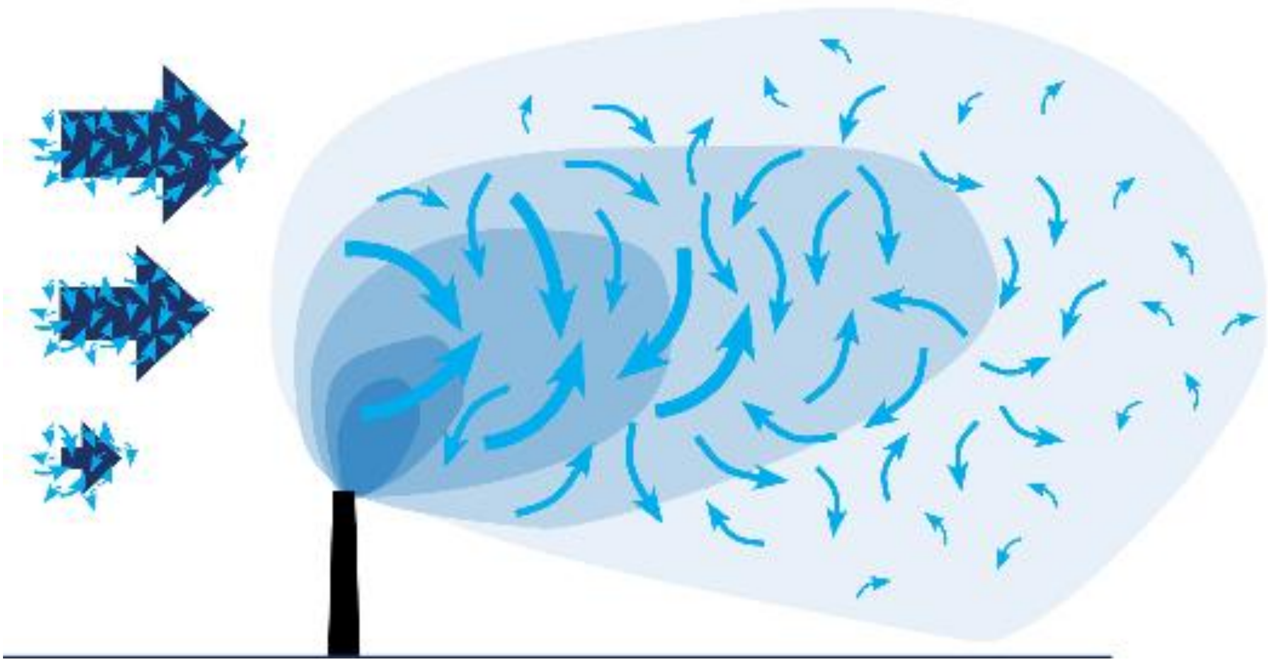


Figure showing air dispersion from a stack [7]

This means pollutant concentrations in air where the community may be present are much lower than in the stack. Concentrations in the air the community is exposed to are estimated using air dispersion models, that are reviewed and approved for use by government experts in Australia [8, 9]. These models use site-specific information such as the stack details such as the location, height, how fast the air moves out of the top of the stack, weather data and terrain, and where people live, work and play.

Assessing health impacts

Assessing whether emissions from an EfW facility have the potential to impact on health can involve conducting a detailed assessment of risks to human health and reviewing published studies.

A detailed assessment of risks to human health is required, by Australian regulations, to be conducted following Australian guidance from enHealth (2012 [10]). Such an assessment:

- Calculates how the community is exposed to pollutants from the EfW facility. It links with the air dispersion modelling to identify concentrations in air that may be in areas the community is exposed – where we may breathe the air (i.e. at ground level in the neighbouring areas). All concentrations in the environment must comply with Australian and state air quality guidelines [8, 9, 11, 12].
- The assessment also looks at the deposition of particles containing metals and persistent organic chemicals. Like all dust in the air, the dust particles can deposit to the ground where they may accumulate in soil, dust inside a home and in water. Once in soil and water the chemicals deposited with the dust can be taken up into produce that may be grown in the soil. The chemicals that may accumulate in soil from EfW are already present in soil from other sources like metals from the earth's crust, fertilisers, controlled burning and bushfires. Exposure to these may occur as a result of ingestion (incidental intakes of soil and dust, drinking water and eating produce) and absorption through the skin (for soil and dust that gets on the skin and water when bathing or swimming for example).
- No EfW facility can be approved if exposure to pollutants in all these ways added together could result in adverse health effects for any members of the community.

The potential for the community to be exposed to chemicals from the operation of an EfW facility, or experience health effects can also include a review of published studies from EfW facilities operating in other jurisdictions. This is the same for all other industrial facilities that currently or may want to operate in Australia.

For modern EfW facilities that operate in compliance with the EU BREF, such studies [13-24] show that there is no evidence that pollutants emitted to air from a modern EfW facility change existing concentrations in soil or produce, and there is no evidence of adverse health effects in the community surrounding these facilities.

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Energy from Waste (EfW) and PFAS

What are PFAS and why are they in our waste?

Per- and poly-fluoroalkyl substances (PFAS) are a family of man-made fluorine-containing chemicals that have unique stain and water-resistant properties. PFAS are a complex group of chemicals, which consists of compounds with carbon-fluorine solid bonds (C-F) which is the shortest and strongest known covalent bond in nature and is responsible for the thermal and chemical stability of PFAS.

These chemicals were developed between the 1930s and 1950s for a wide range of uses. Only since the 2000’s have analytical methods been developed to be able to measure these chemicals in the environment. The unique properties of PFAS (which make them so useful in many products) also mean that once in the environment these chemicals are persistent and generally mobile, with some of PFAS chemicals also able to bioaccumulate.

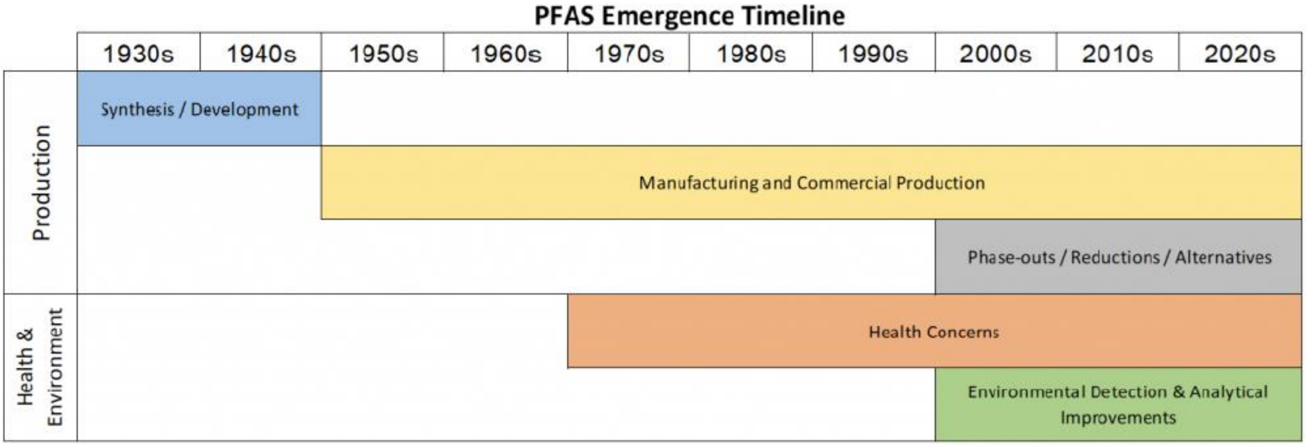

Figure 1: General timeline of PFAS emergence and awareness (from ITRC [1])

Due to the widespread use of PFAS in many products (**Figure 2**), PFAS is present at low concentrations in waste – municipal solid waste (MSW) and construction and demolition waste. MSW does not include PFAS from key source areas such as fire fighting foams, manufacturing wastes and other industrial processes.

While the manufacture, import and use of PFOS and PFOA were banned in 2025 in Australia, and levels of these compounds would be expected be reducing in waste post 2025, consumer products contain many other PFAS compounds that would remain in waste.

Studies that have looked at MSW waste found that PFAS was present in a lot of different waste materials (**Figure 3**) with household waste being the largest contributor [2].

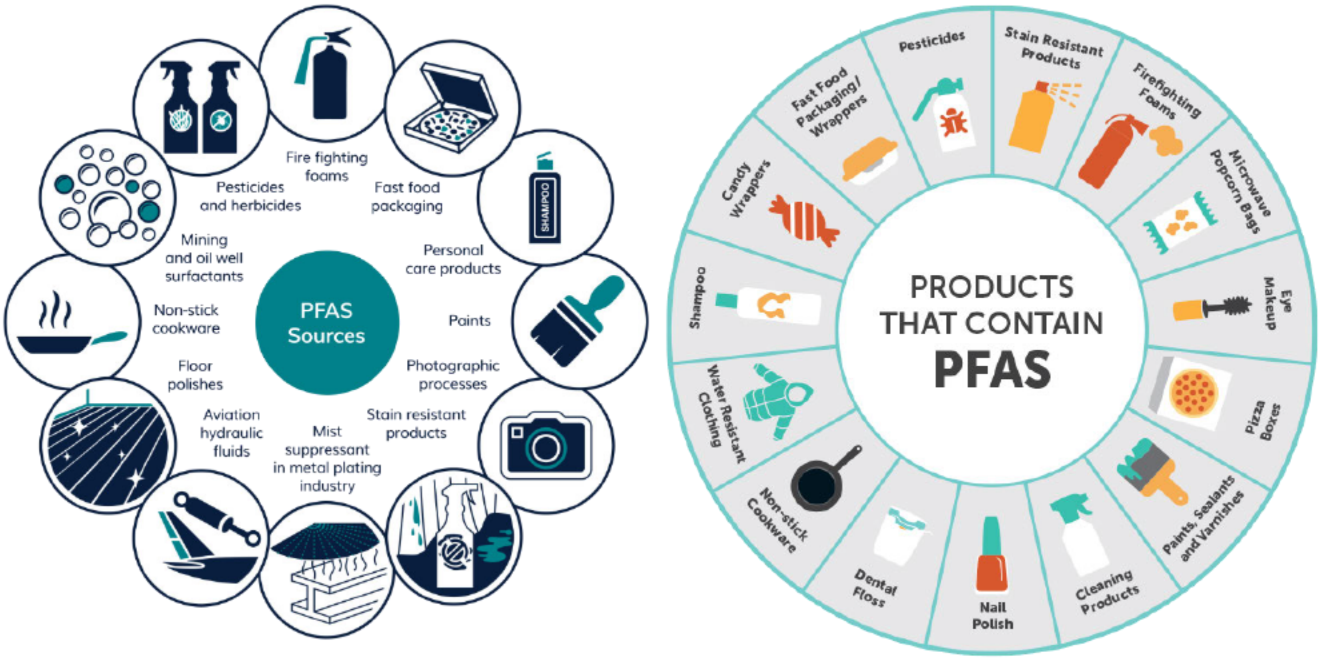

Figure 2: Key sources of PFAS (from Australian Government[1]) and key products that contain PFAS [2]

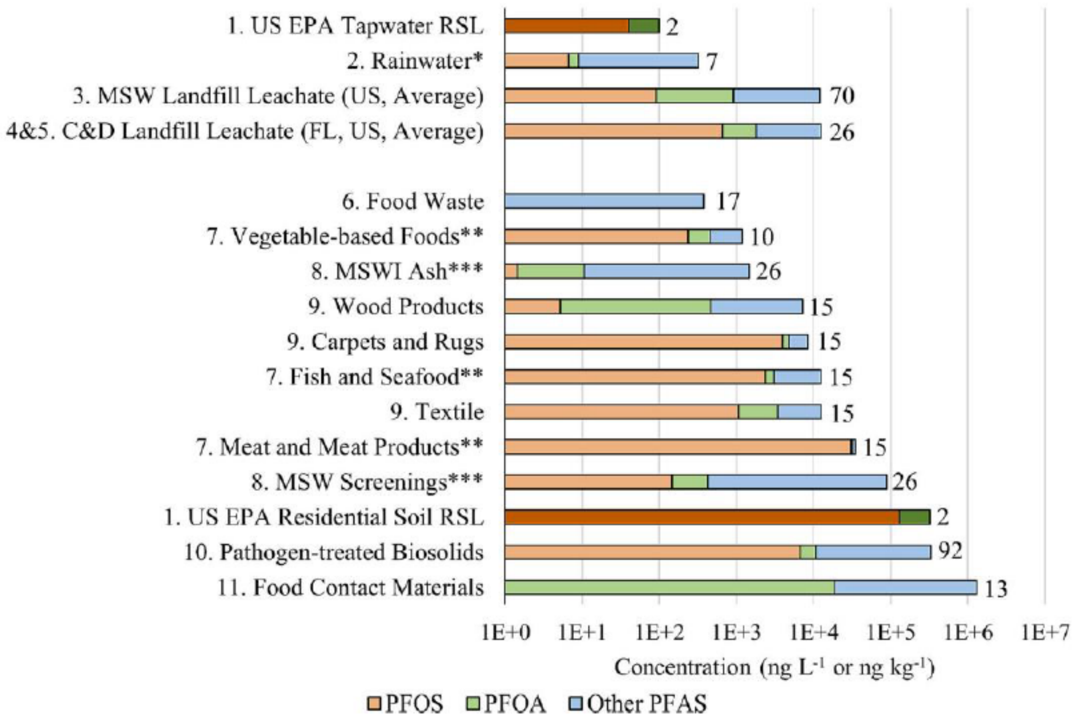

Figure 3: PFAS concentrations and compositions measured in various products, wastes and environment compared with PFAS in leachate at MSW landfills [2]

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1 https://www.infrastructure.gov.au/infrastructure-transport-vehicles/aviation/pfas-your-questions-answered

2 https://watermanaustralia.com/pfas-contaminated-water-treatment-techniques/

Where waste is disposed to landfill PFAS migrates to leachate which requires management. PFAS (in particular the volatile PFAS chemicals which are short-chain chemicals) are also present in landfill gas. Hence PFAS are already in the environment as a result of the disposal of waste to landfill.

EfW only receives PFAS as a low-level contaminant from MSW (as above). EfW cannot accept high concentrations of PFAS waste from firefighting foams, industry or contaminated sites.

What happens to PFAS in EfW?

There is a requirement under the Stockholm Convention to manage PFAS in waste in a way that the chemicals are destroyed or irreversibly transformed or disposed in an environmentally sound manner. Australia is a signatory to the Stockholm Convention.

Incineration of solids and liquids has been identified as one of the few technologies that can "potentially destroy PFAS" [3-5], compared with many other technologies for treating PFAS contamination which rely on absorbing the chemicals to another media (just like a home water filter absorbs chemicals from water prior to coming out of a tap) or techniques to concentrate the PFAS for disposal.

Mineralisation is the more correct term to describe the process of complete breaking down PFAS molecules into base elements and compounds. This means the entire PFAS molecule (alkyl chain (tail) and functional groups (head)) are defluorinated and converted into fluoride salts, hydrogen fluoride and small hydrocarbons.

The carbon–fluorine bond in PFAS is much stronger than the carbon–chlorine bond in chemicals such as dioxin-like compounds. Breaking the carbon–fluorine bond requires 1.5 times more energy and therefore higher temperatures and reaction times. Hence the temperature and residence time for breaking the bonds in PFAS need to be considered. Concern has been raised in relation to the formation of products of incomplete combustion (PIC), where carbon-fluorine fragments recombine [5].

So, when PFAS is in waste that goes into an EfW facility the things that need to be looked for are PFAS that may not have been destroyed and PIC (**Figure 4**).

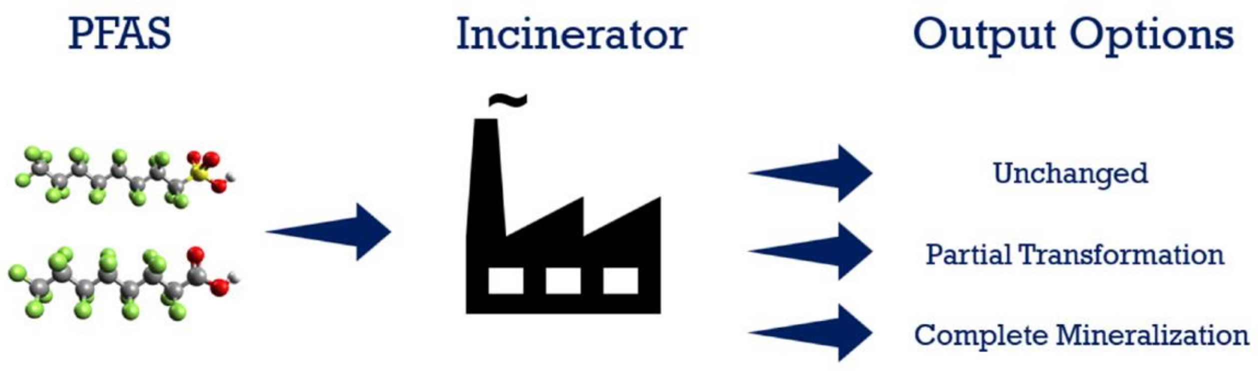

Figure 4: PFAS and incineration [6]

In an EfW facility PFAS is removed from the waste through destruction in the combustion chamber, and through the implementation of pollution control equipment to capture and remove residual gases and particulates.

Combustion conditions*

- Temperature and residence time are important to break the C-F bonds
- EfW conditions have been found to result in high levels of destruction of PFAS (more data is required)
- Products of incomplete combustion (PIC) potential – short chain PFCs

*Combustion conditions required to be used in EfW have been shown to be effective in destroying PFAS and minimising the formation of PIC [5, 7-12]

Acid gas treatment**

- Removes acid gases from emissions
- Also captures breakdown products and PIC from PFAS

Activated carbon**

- Proven method to adsorb and remove key PFAS - commonly used to remove PFAS from water

Baghouse**

- Chemicals attached to particles are captured in baghouse
- Includes PFAS bound to particulates
- PFAS removed are present in air pollution control residues (APCr)

** Air pollution control steps that also remove PFAS from air following combustion [3, 5] before being discharged to air via the stack

Are there studies that have looked at PFAS emissions from EfW?

There are a number of studies that have been conducted to assess the effectiveness of EfW in destroying PFAS as noted above. It is noted that more studies are required to further support these outcomes.

The EU BREF does not currently include any requirements for the sampling or analysis of PFAS in emissions from any waste incineration process. There are studies that have been conducted where measurements have been done to look for PFAS in emissions from EfW facilities.

The few studies available on measured levels of PFAS in stack emissions from operating EfW facilities, have reported very low level detections of some short-chain PFAS (noting methodological issues with this study) or no detections of PFAS in emissions [10, 13, 14][3].

In bottom ash PFAS were either not detected or at low and variable levels [15, 16]. Some PFAS with less than nine carbon atoms have been detected at low concentrations in air pollution control residues [15, 16].

Can the presence of PFAS in emissions be of concern to community health?

PFAS are persistent organic pollutants (POPs) and these are assessed in the same way as other POPs that may be present in emissions to air from the operation of an EfW facility. This involves following Australian guidance [17] on assessing risks to human health. This is the approach that is recommended by the NSW Chief Scientist [18]. The same as other POPs a risk assessment is required to assess all the ways the community may be exposed to PFAS. This includes inhalation as well as the deposition to soil and water, and potential uptake into produce that may be consumed. No EfW facility can be approved unless there are no risks to human health from being exposed to all emissions, including PFAS and other POPs.

[3] https://norfors.dk/ikke-fundet-pfas-i-roggassen/

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