Guiding principles for environmental regulators: Energy from Waste - Thermal

1. Introduction

Energy from Waste (EfW) activities have the potential, as a component of integrated waste management strategies, to reduce the impacts associated with waste disposal and deliver positive outcomes for the community and the environment.

National principles referring to international best-practice when applied consistently across jurisdictions can provide confidence and certainty to the community and industry.

The following guiding principles are recommended for consideration by environmental regulators and all levels of government when considering EfW policy affecting the development and operation of thermal EfW activities, including those that would utilise municipal solid waste and/or commercial and industrial waste as inputs. The principles are intended to outline the minimum requirements that should be considered; jurisdictions may decide to implement more stringent requirements if necessary.

2. The Waste Management Hierarchy

2.1. The Waste Management Hierarchy is used by many environmental regulators and governments, internationally and across all Australian jurisdictions, as a best practice waste management framework to prioritise waste avoidance, reuse and recycling opportunities. The Waste Management Hierarchy is a key feature of the European Union Waste Framework Directive and is also applied by the United States EPA.

2.2. Under this Hierarchy, all resource management options must be considered in the following order[1]:

- Avoidance of unnecessary resource use and waste generation
- Reuse
- Recycling
- Material Recovery
- Energy Recovery
- Treatment of Waste; and
- Disposal.

2.3. Energy recovery is placed above disposal and treatment in the hierarchy because the recovery of EfW provides an opportunity to utilise the embodied energy in waste, offset the use of non-renewable energy sources, and to avoid methane emissions from landfill.

2.4. While the recovery of EfW is generally preferable to landfill disposal, it is less preferable to avoidance, re-use, and recycling. Decisions regarding EfW should promote the source separation of waste (where technically and economically achievable) and ensure that only residuals from resource recovery

1 The Waste Management Hierarchy differs slightly among jurisdictions, however the prevailing hierarchical differentiation between the waste management options is commonly interpreted and applied in the order shown here.

operations that would otherwise be disposed to landfill are eligible for use as a feedstock for an energy recovery facility.

2.5. Energy recovery activities have the potential to cannibalise current and future material resource recovery activities. Strong and resilient recycling markets, both local and global, can reduce this risk. Good source separation systems, such as council collection services for dry recyclables, garden waste and food waste, can also lead to preferred outcomes in accordance with the Waste Management Hierarchy and should not be undermined in favour of energy recovery pathways.

2.6. Within the European Union, where EfW is prevalent, the European Commission has cautioned against over-subscribing to energy recovery infrastructure, advocating instead to foster circular economy principles, and increased material resource recovery and remanufacturing. Changes in waste generation rates and composition over time have the potential to generate stranded EfW assets—this has led to an over-supply of EfW capacity in some European countries[2].

2.7. The introduction of resource recovery criteria requiring a minimum level of material resource recovery by limiting the amount of waste available to EfW activities, could ensure that only non-recyclable residuals are available for energy recovery purposes. Adopting a consistent approach around Australia provides confidence to industry and the community that EfW activities will complement recycling and material resource recovery rather than competing with it or replacing it entirely in favour of energy recovery. Furthermore, in the absence of clear criteria, changes in waste generation and composition over time have the potential to generate stranded EfW assets, as cautioned by the European Commission.

2.8. Strategic planning of resource recovery and source segregation infrastructure and development will assist in establishing a sound material resource recovery system. This may include identifying residual waste streams available to EfW activities once resource recovery outcomes have been achieved.

3. Community Acceptance

3.1. Community acceptance is central to ensuring the successful operation of EfW activities. EfW proposals should consider the social costs and benefits of the proposal, in addition to environmental and economic considerations, and the potential community responses to the proposal.

3.2. EfW proponents should be required to engage in a genuine dialogue with the community ensuring the provision of accurate and reliable information about the proposal and the ongoing operation of the facility.

3.3. The community consultation approach should primarily emphasise the building of respectful relationships with the community and encourage active participation from community representatives in order to understand community perceptions and expectations, which can then be used to inform project decisions.

3.4. Community views, concerns and acceptance of EfW facilities may vary over time in response to changes in circumstances. Implementation of good neighbour and corporate citizen principles during all stages of design, development, construction and operation of an EfW facility are fundamental in obtaining a social licence and can greatly improve the relationship between the proponent and the community.

4. Best Available Technology

2 European Commission 2017, The role of waste-to-energy in the circular economy, Brussels, viewed 1 March 2019, http://ec.europa.eu/environment/waste/waste-to-energy.pdf.

4.1. EfW activities should demonstrate that they will employ current international best practice techniques[3], in particular with respect to:

- process and emission control equipment design;
- emission monitoring with real-time feedback;
- arrangements for the receipt of waste; and
- management of residues from the energy recovery process.

4.2. Potential pollutants and emissions must be below levels that may pose a risk of harm to the environment and/or human health at all stages of the EfW process, including up and downstream supporting facilities.

4.3. It is the decision of each jurisdiction as to how proponents are required to demonstrate best practice techniques.

5. Thermal Efficiency

5.1. EfW activities should be designed primarily to recover EfW for combined heat and power schemes rather than as a means of disposal. Proponents should also demonstrate that any heat generated by the thermal processing of waste is recovered as far as practicable.

5.2. The net energy produced by a facility, including the energy used in applying best practice techniques, must therefore be positive. It is the decision of each jurisdiction as to how proponents are required to demonstrate net-positive energy production. Examples include:

- The R1 thermal efficiency indicator[4] used within the European Union's Waste Framework Directive. The R1 formula is used to determine whether a facility is categorised as a disposal or energy recovery facility[5].
- The current NSW EfW Policy Statement[6] requires proponents to demonstrate that at least 25% of the energy generated by an energy recovery facility will be captured as electricity (or an equivalent level of recovery for activities generating heat alone).

6. Continuous monitoring

6.1. Thermal energy recovery activities should undertake continuous monitoring of air emissions for key parameters as they are relevant, such as:

- nitrogen oxides (NOx);
- carbon monoxide (CO);
- total particles;
- total organic carbon (TOC);
- hydrogen chloride (HCl);

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3 The European Commission's Best Available Techniques (BAT) Reference Document (BREF) entitled *Integrated Pollution Prevention and Control Reference Document on the Best Available Techniques for Waste Incineration* outlines specific techniques that can be applied to thermal EfW, specifically those utilising combustion, gasification and pyrolysis technologies. The most recent version of the Waste Incineration BREF can be accessed through the European Commission's website, available at: http://eippcb.jrc.ec.europa.eu/reference/wi.html. Note also that BAT may be defined in Australian jurisdictional legal frameworks.

4 Further information on the R1 Energy Efficiency Indicator can be found at: http://ec.europa.eu/environment/waste/framework/energy.htm.

5 Due to climatic differences between Europe and Australia, the R1 formula may not be suitable for use in some parts of Australia.

6 Available at: https://www.epa.nsw.gov.au/your-environment/waste/waste-facilities/energy-recovery.

- hydrogen fluoride (HF); and
- sulphur dioxide (SO_2).

6.2. Air emissions data from continuous monitoring should be made available to the appropriate regulatory authority in real-time. This is consistent with international best practice, i.e. the European Parliament Industrial Emissions Directive[7]. It is the decision of each jurisdiction whether air emissions data should also be made available to the public in real time.

6.3. Continuous emissions monitoring for operational parameters including temperature, oxygen, pressure and water vapour content of exhaust gas, and regular emissions monitoring for heavy metals, polycyclic aromatic hydrocarbons and chlorinated dioxins and furans can also assist in regulating EfW activities in a responsive and timely manner.

7. Hazardous waste

NOTE: This section is to be read in conjunction with all other principles set out by previous sections.

7.1. Certain wastes have properties that make them hazardous and potentially harmful to human health or the environment. All jurisdictions have, in varying forms, a regulatory regime for managing hazardous wastes at their source, during transport and when they are treated or disposed.

7.2. Hazardous wastes with characteristics incompatible with each other present an increased risk of harm to human health or the environment when mixed. Jurisdictions that allow energy recovery from hazardous waste should, therefore, ensure that any incompatible hazardous wastes used as a feedstock for EfW activities are not stored, handled or utilised in a manner that could result in harm to the environment or human health, including at or near the facility, and at upstream or downstream supporting facilities.

7 Directive 2010/75/EU of the European Parliament and the Council on industrial emissions (the Industrial Emissions Directive or IED) is available at: http://ec.europa.eu/environment/industry/stationary/ied/legislation.htm.