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Waste reduction and recycling policies

Submission from the Centre for Safe Air (NHMRC CRE)

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About the Centre for Safe Air

The Centre for Safe Air is a Centre of Research Excellence funded by the National Health and Medical Research Council. The Centre brings together more than 20 researchers at the forefront of their fields, based in 13 of Australia's leading research institutions. The Centre supports multidisciplinary research across epidemiology, exposure assessment, toxicology, climate and air science, biostatistics, respiratory medicine and health economics to pursue collaborative projects and to develop capacity. The vision of the Centre is "*to achieve substantial improvements in population health, safety, and resilience in the face of existing, emerging, and escalating airborne hazards through evidence-based policy and practice interventions*".

Summary of recommendations

1. Health stakeholders should be invited to comment on the efficacy of Australia's waste and recycling policies, especially in relation to air quality and health impacts of emissions from waste-to-energy (WtE) processes.
2. A full assessment of the environmental impacts life cycle assessments (LCAs) of WtE plants should be considered on a case-by-case basis to evaluate the risks and benefits of pollutant emissions and less obvious potential impacts on the local and wider community, within the life cycle of WtE and alternative/traditional processes.
3. The establishment of a nationally consistent best-practice approach to monitoring and minimising harmful emissions from WtE processes.
4. National consistency is required to consider health benefits/disbenefits for any new biofuel product including adequate health and toxicity consideration.
5. Consideration be given to the safe recycling and reuse of end-of-life components from low-no carbon technologies such as batteries, PVC panels and wind turbine components.

Introduction

The world is in a waste and pollution crisis, presenting clear risks for the environment and human health. However, in the push to establish a circular economy and recover energy and resources from waste, it is crucial that new recycling and waste management industries, policies and practices do not inadvertently increase the health burden associated with waste. In particular, our submission draws to the Committee's attention potential air quality and health impacts associated with emissions from 'waste-to-energy' (WtE) facilities. We highlight the need for appropriate environmental monitoring and health risk assessment in the planning phase and monitoring of emissions and health risks in the operational phase of any new facility. Our submission responds to terms of reference (TOR) (b) the efficacy and progress on circular economy deliverables; and (d) any other related matters.

TOR (b) the efficacy and progress on circular economy deliverables;

As part of a push towards a circular economy, there has been interest from Australian governments to invest in WtE facilities. In particular, Target 3 of the National Waste Policy Action Plan calls for 80% average resource recovery rate from all waste streams following the waste hierarchy by 2030[1]. As a general rule, the CSA acknowledges and strongly supports the concept of the waste hierarchy as an over-riding framework to minimise waste as a first principle, then reuse, recycle, recover, treat (in that order) and disposal of waste, at the bottom of the hierarchy, being the least desirable method to treat waste.

WtE falls under 'Recover' in the Waste Hierarchy with 'Recover' considered the fifth most preferable waste minimisation practice[2]. Energy recovery technologies currently in use in Australia include landfill gas (83% of the energy recovery), waste-derived fuels, anaerobic digestion, and thermal energy-from-waste[3]. Since 2014-15, there has been an 11% decline in energy recovery from waste due to declining landfill gas energy—more of which is being simply burnt on site through flaring rather than captured and sold[3]. That said, new energy recovery facilities are being proposed by state governments, some of which are facing opposition from community groups concerned about the health impacts of their emissions[4,5]. To reassure these communities that new facilities will not undermine local health outcomes it is crucial that they use best practice techniques in terms of the fuel they use, how they treat it, and how they monitor and minimise harmful emissions.

Health outcomes from Australia's recycling and waste management practices need to form part of the assessment of their effectiveness. Here we address concerns regarding air quality and health impacts of WtE emissions and processes, biofuel production and consideration of end-of-life components arising from rapid uptake of the energy transition.

TOR (d) any other related matters.

WtE (energy from waste) processes

In 2020 Centre for Safe Air researchers undertook a review to determine the extent of existing evidence around the health impacts of WtE or energy from waste practices and processes[6]. To the best of our knowledge, this was the first systematic review internationally of the health impacts associated with WtE, although several pre-existing reviews on incineration in general had been published. We found 19 scientific studies which were directly relevant to our scope of "how does WtE processing impact on our health?". Overall, we found that there were very few health studies of WtE processes. Only two studies were epidemiological studies which included direct monitoring of health in humans, and as such, there was limited research of adverse impacts (or estimated impacts) from well operated and managed WtE facilities[6]. The research indicated that WtE, if done properly, can result in less emissions than normal waste incineration processes or sending waste to landfill, and less emissions than using fossil fuels for energy.

Our review found evidence that less optimal practices, especially incinerating unsorted municipal solid waste, can produce much more harmful emissions. However, the increased concentrations of plastics, textiles, rubber in refuse derived fuel (RDF) which forms the feedstock to many municipal WtE plants, may lead to greater emissions of carcinogens, including dioxins and chromium, than does incinerating unsorted municipal solid waste[6,7]. The review found that combustion of plastic municipal waste in particular, can emit organic chlorinated and fluorinated compounds such as dioxins, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) and that emissions controls need to particularly target removal/reduction of these compounds. Our review also concluded that regulation of the feedstock used is critical for maximising complete combustion and so minimising carcinogenic emissions of compounds[6].

A review of the epidemiological evidence of the potential health impact of WtE processes revealed inconsistent findings[6]. Some studies found significant associations between exposure and adverse birth outcomes, lung/throat cancer and ischaemic heart disease, while other studies found no significant associations with these outcomes or other outcomes, including respiratory function and symptoms[6]. In older studies, the review found consistent evidence of the presence of biomarkers related to waste products (such as organic compounds and heavy metals) in the blood or urine of incinerator workers[6] that may be avoided in newer incinerator systems.

We are aware that most Australian states have, in the last two years, developed WtE policies to guide assessment of these projects [8–12] and some of these reference health considerations. With regard to emissions controls, some of these state government policies reference the EU Directive for emissions limits, however, the NSW documents are the most prescriptive with respect to emissions limits, allowable feedstock, and prescribing monitoring and reporting [11,13,14]. We have noted the lack of national consistency in this regard and highlight this as an area to be addressed.

We concluded that although there is a need for further studies on the health impact of WtE facilities, the cost of completing well designed and powered epidemiological studies where there are sufficient sample sizes means that other forms of assessment such as health risk assessment and life cycle assessments (LCAs) along with exposure modelling and environmental monitoring, are needed[6]. As such, there is a need for comprehensive human health risk assessments to form part of the EIS process when considering new WtE facilities, taking into account the individual specifications of each facility such as:

nature of the feedstock; the extent and consistency of feedstock required; how this will be sourced and transported to the facility; modelling used to estimate emissions during normal processing and during adverse events/breakdowns, process management and monitoring requirements to minimise plant failures and hence likelihood of emissions exceedances; disposal/reuse options for bottom ash and reporting of adverse events. The UN also advocates for WtE practices to be supported by a detailed legislative framework including specifications for the above mentioned issues, as well as maintenance and decommissioning, guidelines for disposal of toxic by-products (commonly found in the bottom ash), medical monitoring of workers and the local community (if required) and accident management procedures (United Nations Environment Programme ns).

To that end, the methods for emissions modelling from WtE plants should be standardised nationally, as our review found that modelled estimates of harmful emissions vary due to model sensitivity based on the type of waste processed, the model inputs used, the reference criteria used and the facility operations conditions[6]. Modelling studies should explicitly reference the model input assumptions and associated uncertainties.

Where appropriate, LCAs should be required to determine feasibility of WtE processing for each proposed project to ensure that feedstock will be adequate and that transport of feedstock to the plant, will not in itself, impact adversely on the environment or health with respect to direct impacts and transportation emissions. There is some concern over the reliance of WtE plants on substantially high usage of feedstock to maintain consistency in operation. This can sometimes lead to overcapacity of supply and/or impact on efforts to reduce and recycle waste further upstream[15]. The need for intensive supply of feedstock can also lead to importation of waste from long distances. As WtE processes require large amounts of energy to fuel the process, LCAs should be used to determine the net benefit/disbenefit of each WtE plant with respect to overall energy emissions.

Biofuels

Reuse of organic and liquid waste into biofuels has been earmarked nationally as a potential for rapid expansion although the major barrier remains its cost competitiveness[16,17]. Nevertheless, to encourage development in this area, the Australian RENA provided funding of around $131 million between 2012-2020 to bioenergy projects with a net worth of $1.4 billion[18]. Given this background, we are of the opinion that it is vital to consider public health during the development and assessment phase, so that we can be assured that emissions from the use of new biofuel/bioenergy products are deemed safer than emissions from existing fuel stocks. However, given a further review conducted by researchers at the CSA (as yet unpublished), we are not confident that health is adequately considered as we found that "health" is not considered or mentioned in any of the major Australian policy or "roadmap' reports[18,19].

An example in support of the need to avoid unintended consequences of substitution of fuels, is the rapid uptake in Europe over the past three decades of the diesel vehicle fleet with the aim of reducing particle pollution[20]. This inadvertently led to an increase in emissions of nitrogen oxides and nitrogen dioxide, with much higher ‘real world emissions’ than had been recorded in laboratory testing[21]. As a result, the UK and various other European countries are now phasing out diesel fuelled vehicles[21].

Our CSA review also highlighted the uncertainty over whether LCAs are incorporated into the Australian bioenergy sector decision making or whether there is any consideration of human toxicity potential and air pollution exposure. While ARENA has published a guidance document on LCA methodology for bioenergy which considers particulate matter (PM) air pollution it stated that there was “no agreed approach in Australia” for a human toxicity indicator [22], and a supporting document which was instrumental in setting guidance for LCA, did not recommend health or toxicity criteria[22].

We therefore highlight the lack of health consideration in the assessment of implementation of new biofuel opportunities, as a gap in research and practice which needs to be addressed.

End of life considerations for alternative energy processes and plants

We note and support the rapid transition to cleaner and non/low-carbon based energies, however wish to highlight the need for consideration and regulatory and policy support for reuse and recycling of clean energy infrastructure at the end of its life. This applies, but is not limited, to components such as batteries used for solar systems, photo-voltaic cell (PVC) panels and wind turbine blades and other components. The safe recycling of batteries with precious metal components is of particular importance.

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