Committee Secretary
Standing Committee on Industry, Innovation, Science and Resources
PO Box 6021
Parliament House
Canberra ACT 2600

By email to iisr.reps@aph.gov.au

31 January 2020

Dear Sir/Madam,

We have been advised that the House Standing Committee on Industry, Innovation, Science and Resources of the Federal Government, will inquire into and report on innovative solutions in Australia's waste management and recycling industries, including:

- Industrial, commercial and domestic waste;
- Waste in waterways and oceans;
- Landfill reduction; and
- Other related matters

We are further advised that the Committee will focus on opportunities presented by waste materials, including energy production, innovative recycling approaches and export opportunities, and also consider current impediments to innovation.

One technology currently under consideration by governments in Australia wishing to reduce reliance on landfill, is **mixed Waste to Energy (WtE) incineration**. Ipswich Residents Against Toxic Environments (IRATE) is opposed to this technology for reasons outlined in the attached submission and we feel that the Federal Government should be made aware of our objections and the reasons for them, in the context of consideration of new approaches to waste management in Australia.

Ipswich Residents Against Toxic Environments (IRATE) is a non-profit community action group formed to represent people in Ipswich Queensland on matters related to an increasing concentration of waste industries in Ipswich and in particular, the adverse amenity, social, economic and environmental impacts of those industries.

We thank you for the opportunity of making a submission to the House Standing Committee on this important matter.

Yours sincerely,

Geoff Yarham
Secretary, Ipswich Residents Against Toxic Environments
[redacted]

Submission to the House Standing Committee on Industry, Innovation, Science and Resources inquiry into Australia's waste management and recycling industries

by Ipswich Residents Against Toxic Environments (IRATE)

INTRODUCTION

Ipswich Residents Against Toxic Environments (IRATE) is a non-profit community action group formed to represent people in Ipswich Queensland on matters related to an increasing concentration of waste industries in Ipswich and in particular, the adverse amenity, social, economic and environmental impacts of those industries.

IRATE is advised that the House Standing Committee on Industry, Innovation, Science and Resources of the Federal Government, will inquire into and report on innovative solutions in Australia's waste management and recycling industries, including:

- Industrial, commercial and domestic waste;
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- Landfill reduction; and
- Other related matters

We understand that the Committee will focus on opportunities presented by waste materials, including energy production, innovative recycling approaches and export opportunities, and also consider current impediments to innovation.

One technology currently under consideration by governments in Australia wishing to address the above matters and reduce reliance on landfill, is **mixed Waste to Energy (WtE) incineration**. This technology is being considered within a broader suite of Energy from Waste (EfW) technologies. In our region of Ipswich, the waste company REMONDIS has applied to the Queensland government for Coordinated Project Status for a proposed mixed WtE incinerator in Swanbank. IRATE is opposed to this technology for reasons outlined in this submission and we feel that the Federal Government should be made aware of our objections and the reasons for them, in the context of any consideration of new approaches to waste management in Australia.

Incineration is defined by the EU Waste Incineration Directive (WID) which is part of the Industrial Emissions Directive (IED) 2010/75/EU as:

Incineration plant means any stationary or mobile technical unit and equipment dedicated to the thermal treatment of waste with or without recovery of the combustion heat generated. This includes the incineration by oxidation of waste, as well as other thermal treatment processes such as pyrolysis, gasification or plasma processes insofar as the substances resulting from the treatment are subsequently incinerated.

IRATE is concerned that Australian State and Federal governments have been signalling increasing support for Energy from Waste (EfW) technologies including large-scale mixed waste to energy (WTE) incineration, as a solution to the environmental impacts of landfilling, the current recycling crisis brought on by cessation of waste exports to Asia and and an impending waste export ban.

A recent example of government support for WtE incineration is the Federal Government's partial funding of the Kwinana WtE incineration project in Western Australia through ARENA and the CEFC.

Another example is the inclusion of WtE incineration in the funding models of the Queensland Government's Resource Recovery Industry Development Program (RRIDP) and Waste To Biofutures (W2B) funding initiative. IRATE is opposed to mixed WtE incineration receiving public funding through ARENA, the CEFC or state government funding models as it is primarily waste disposal, the limited net energy produced is neither clean nor renewable, and there is a big question mark over this technology in terms of public and environmental health.

We acknowledge that Energy from Waste (EfW) refers to a number of quite different processes, some of which are more environmentally friendly than others. However, EfW is next to last on the waste hierarchy and we regard mixed Waste to Energy (WtE) incineration as especially problematic from a social and environmental point of view.

IRATE's OBJECTIONS TO MIXED WASTE TO ENERGY (WTE) INCINERATION

Summary

It is our view that mixed WtE incineration:

- is primarily about getting rid of waste as it produces only a very small percentage of a society's energy needs and the energy is expensive when compared to alternatives
- is not sustainable, renewable or environmentally friendly and will not assist Australia to meet its greenhouse gas emissions targets, as it immediately releases CO2 into the atmosphere which then takes many decades to re-sequester
- is not resource recovery as incinerators only make use of materials for their calorific value and once burnt, the resources are out of the economic loop
- is voracious, requiring long-term municipal supply contracts for large quantities of waste in order to recoup investment. It therefore undermines efforts to move society towards waste reduction, recycling and a circular economy
- perversely encourages production of more waste and transportation of waste over long distances to maintain economic viability
- produces concentrated hazardous waste and releases toxic air pollution and is therefore no better than landfill and probably worse
- creates social, health and economic disadvantage in regions already experiencing disadvantage
- may not be effectively managed by the regulatory environment to protect communities – this has been the experience overseas, and
- as such should not be subsidised by Australian taxpayers

Waste companies, both Australian and international, regard Australia as a greenfield opportunity for the development of WtE incineration at a time when this method of dealing with waste is meeting concerted opposition in the northern hemisphere, both at governmental and community levels.

It should not be assumed that incineration is better than landfilling, nor will incineration solve problems caused by unsustainable resource use, wasteful management of discarded materials or pollution of the environment. WtE incineration will not negate the need for landfills, the toxicity of which will increase, and will only add another polluter to the landscape.

If the Federal Government is serious about waste reduction and recycling, it would be prudent to put strategies in place which meet those aims, encourage appropriate societal and industry responses and only then determine if WtE incineration is a desirable or even viable part of an overall waste management strategy.

Further detail supporting IRTATE's objections is provided below.

The so-called benefits of WtE incineration – waste reduction, energy production

Any benefits of mixed WtE incineration such as waste volume reduction and the production of energy (net of that needed by the incineration process) do not outweigh the social, health and environmental risks of this technology.

Incineration reduces the volume of waste but for approximately every tonne of waste input, it produces ¼ tonne of concentrated toxic waste which must be encapsulated and placed in specially designed hazardous waste landfills. Incineration also produces emissions which contain persistent organic pollutants (POPs) including dioxins and furans which bio-accumulate in the environment, animals and produce and are dangerous to human life.

In relation to energy production, WtE incineration does not consistently convert at least 25% of the energy it produces into useful electricity for export to the grid. Most of the electricity produced is likely to be used to run the incineration process and such plants are essentially waste disposal facilities. The Queensland Government recognises this, stating:

In areas where electricity generation has been specifically incentivised, thermal EfW plants make a very small contribution to national electricity supply and are not discussed within national electricity policies. (Energy from Waste Policy, Discussion paper for consultation, June 2019)

Paris' state-of-the-art Isséane WtE incinerator was commissioned in 2007 costing around €540 million (AUD884 million). The plant's data sheet describes it as a 52MW energy producer with approximately half that output running the plant and the other half being exported to district energy networks. Statistics published by the operator show that while the plant is a consistent producer of heat energy, its annual power output between 2012 and 2017 ranged between 0-114MW. In 2014 the plant purchased nearly 36MW but sold only 9.5MW, meaning its net intake of power from the network was 26.5MW. In 2015 the plant appeared to produce no electricity, having to purchase 48MW to operate.

At best, efficiencies for energy recovery from European WtE incinerators have been in the order of 72% for heat conversion, 68% for combined heat and power (CHP) and less than 25% for electricity generation. Eurostat data for 2013 showed that total energy recovery from WtE incineration represented just 1.5% of total energy consumption of the twenty-eight member states of the EU (Ricardo Energy Environment, March 2017).

The Kwinana WtE plant under construction in Western Australia is expected to produce around 36MW of base-load power for export to the grid annually. To put this in perspective and assuming this benchmark is consistently attained, 36MW represents about one tenth of the electricity produced by a single turbine in a coal-fired power station.

Production of energy through WtE incineration compares even less favourably to other sources of generation when you consider the amount of energy required to extract raw materials and fabricate them into usable goods. Recycling and composting reportedly save up to five times the amount of energy produced by burning waste while the amount of energy wasted in the US by not recycling aluminium and steel cans, paper, printed materials, glass and plastic, is estimated to equal the annual output of fifteen medium-sized power plants (Zero Waste Europe, February 2018).

The idea that WtE is an internationally mature technology, so it will be good for Australia

Notwithstanding that WtE incineration exists overseas and is promoted by the waste industry as 'mature internationally', this doesn't mean that WtE incineration in the northern hemisphere has not been problematic or that this technology is right for Australia. When considering the track record of so-called mature technologies, opinions differ as to the benefits, efficiency and risks. There are many examples of WtE incineration plants in the northern hemisphere not having lived up to expectations on emissions or energy outputs. Many plants have been shut down due to technical and financial failures. Other projects have failed in the proposals stage despite significant investment as a result of community opposition and closer government scrutiny of operator claims.

In Australia in July 2018, the Eastern Creek WtE incinerator proposed for western Sydney was rejected by the NSW Independent Planning Commission as not being in the public interest. The reasons included concerns about feedstock, the plant's ability to safely handle waste stream variations, uncertainty about how dangerous regulated wastes would be excluded, insufficient evidence that the pollution control technologies to be used would be capable of managing emissions, uncertainty about temperatures being sufficient to destroy harmful emissions, concern about the relationship between air quality impacts and water quality impacts, the possibility of cutting corners (on energy usage) leading to adverse environmental outcomes, and concern about site suitability and human health impacts.

The Amager Bakke plant in Copenhagen, boasting a synthetic ski slope, climbing wall, hiking trail and cafe is often touted as a model project by proponents of WtE incineration, yet this plant has been plagued by problems from its inception and is a study in what not to do. The Danish publication *Finans* reported that Amager Bakke has been beset by multiple scandals since the five owner-municipalities gave the project the green light in 2012, including cost blowouts, political controversy, delays, a fatal explosion and the sacking of key executives associated with the project.

In 2010 a report by EA Energianalyse produced for Copenhagen City Council, warned against building a big, new expensive incinerator because recycling in Europe was growing while incineration was declining. EA Energianalyse recommended upgrading an existing plant in Amager. Germane to this advice was the fact that although Denmark burned 50% of all household waste (the highest percentage in Europe), it had set a target to recycle 50% of waste sent to incineration by 2018. At first the advice was heeded but according to *Finans,* lobbying by a board member of the publicly-owned waste management company Amager Resource Centre (ARC), eventually secured a 4 billion kroner loan to help build the plant. *Finans* reported that the ARC board member sent a letter to the Ministry of Finance days before the vote on the development, seeking a public declaration that a new incineration plant would not compromise the government's coming resource strategy. The then-

finance minister also received a letter supporting the project from a company in his constituency in West Jutland, B&W Vølund, which happened to have won the contract to build the Amager Bakke incinerator. Several members of Copenhagen City Council, claim the finance minister pressured the Council to agree to the loan which was subsequently approved in September 2012. Denmark's environment minister at that time, condemned ARC's political lobbying stating, 'The leadership has played politics instead of being civil servants who serve the public interest and decisions that are made in the City Hall and government. We now have a facility that – as expected – does not have enough trash and therefore has a massive deficit which Copenhagen taxpayers have to pay.'

The original cost of the plant was equivalent to €500 million but technical issues causing commissioning delays increased the cost by 100 million kroner. Following commissioning in May 2017, the plant's furnaces failed, forcing the owner-councils to seek special permission to store tonnes of waste. By the end of June 2017, cost blowouts caused heads to roll at both ARC and B&W Vølund. (*Finans*, Denmark, August 2017). Technical issues continued. In September 2018, the plant shut down when it was discovered that compensators installed in the plant were too small.

With an annual capacity said to be between 400,000 and 500,000 tons of waste, the plant's capacity is far too high and it threatens to be economically unsustainable. In 2016, the Danish newspaper *The Murmur* predicted that the owner-municipalities would not produce sufficient waste to burn and that running the plant under capacity would potentially accumulate an operational deficit of 1.9 billion kroner by 2020, a deficit for which taxpayers would ultimately be responsible. Therefore in contradiction of both Danish and EU resource strategies, an estimated 20% of the plant's capacity (90,000 to 115,000 tonnes of waste) would have to be imported each year to make up the deficit. The imported waste contains more plastic which releases higher levels of greenhouse gases such as CO2 when burnt, meaning the waste imports increase Denmark's carbon footprint. Furthermore, importing waste will only work to prevent the plant being an economic burden as long as other countries produce enough excess waste for Denmark to import. (http://murmur.dk/copenhagens-dirty-white-elephant/). In this way, the efforts of the EU to create an EU-wide circular economy, are subverted.

WtE incineration pollutes

It has been reported that a number of European incinerators were belatedly found to have exceeded EU emissions limits. The Scotgen gasification incinerator for municipal solid waste in Dumfries, Scotland violated dioxin emissions limits repeatedly. For three years, the Scotland Environmental Protection Agency (SEPA) considered it Scotland's worst polluter. SEPA finally closed the facility in 2013 and then revoked the incinerator's permits. The Isle of Wight gasification incinerator in the UK, breached dioxin limits significantly in several tests and continued to have serious problems despite significant public funding support. The local government there decided to implement more reliable and affordable recycling efforts. At the Scilly Isles waste incinerator in the UK, regular compliance breaches for dioxins and other pollutants were documented between June 2010 and 2012 with dioxin emissions found to be sixty-five times higher than the permitted limit. In 2014, Air Products signed a contract with the UK Government for a waste gasification facility in Tees Valley. Two years later the company abandoned the technology due to design and operational challenges. In November 2018, Reststoffen Energie Centrale (REC), the newest and most 'state of the art' incinerator in the Netherlands, was found to have been frequently emitting dioxin, furan and persistent organic pollutants far in excess of EU limits over a protracted period. In June 2019, the Netherlands Council of State declared that REC had incorrectly applied the provisions concerning the measurement of toxic emissions. Testing had been unreliable and had seriously understated emissions levels. In July 2019, the Danish Environmental Protection Agency released information that the Norfos incineration plant had violated dioxin emissions limits for three of the previous five years. Measurements revealed that

the plant emits dioxins, furans, and toxic pollutants far in excess of national and European limits, impacting the surrounding environment. (Zero Waste, June & July 2019) Following revelations of exceedances, there is little reason to be confident in the veracity of performance data from EU WtE incinerators.

In Asia, the situation is no better. In Japan, advanced thermal treatments such as pyrolysis, gasification and plasma gasification are considered 'mature' but Japan reportedly has the highest dioxin output of any country in the world. In January 2018, the Supreme Court of Indonesia ruled that use of thermal technology is against Indonesian law because it poses a threat to the environment and health by producing hazardous materials such as dioxins, furans, mercury, lead and cadmium. Despite this and the fact that Jakarta is one of the most polluted cities on Earth, the Indonesian government decided to press ahead with the installation of WtE incinerators in six cities and on Bali. And to facilitate this, the state-owned power company PT PLN agreed to sign twenty-year purchase contracts to buy electricity generated by the plants at prices higher than other cleaner energy sources (Tempo.co, December 2018).

The waste industry says that 'quenching' will destroy dioxins. Quenching needs to be done while gases are above ~1,000 degrees Celsius but furnace gases may not rise above 600 degrees Celsius. The hotter the process, the more energy is used in the process and the less that is available to export. Gas temperatures after driving turbines may not be suitable for quenching and therefore there is no guarantee that dioxins and furans would be removed from gases exiting the flue. Additionally, as gases cool in the flue and on exit to the atmosphere, dioxins can potentially reform.

When pollution is not released to the air, it's captured and concentrated in toxic bottom ash, air pollution control residues (fly ash) and spent precipitator bags. Around one tonne of bottom ash is produced for every four tonnes of waste input, hence volume is reduced but toxicity is increased. Fly ash is considered a hazardous waste and must be encapsulated in concrete and/or contained in specially engineered landfills. According to the United States EPA, almost all WtE incinerator ash produced in the US is landfilled. Of the thirty million tons of municipal solid waste (MSW) processed in WtE facilities in the US annually, approximately seen million tons of ash and non-combustible materials remain (Environmental Leader, October 2016). Sweden was reportedly exposed for dumping its toxic incinerator ash on an island off Oslo in Norway, where the pollutants pose a serious health threat to local communities and marine ecosystems. (Zero Waste, Europe)

The data sheet for the Paris Isséane WtE incinerator states that it inputs around 460,000 tons per annum (tpa) of municipal solid waste and produces 112,000tpa of bottom ash, 6,300tpa of filter dust and 5,500tpa of flue gas treatment, so around ¼ of the waste that goes in, comes out as toxic solid by-products. According to Zero Waste France, in 2017 this plant produced 80,000 tons of bottom ash which although highly loaded with pollutants, was subject to permissive legislation allowing it to be used for road-base, while 12,000 tons of fly ash and and solid residual waste were barged down the Seine to hazardous waste landfill (Zero Waste France, January 2019).

Bottom ash has been used in road construction though when it is used, specific additional processing is required to reduce its undesirable properties, and the proportion of it in mixes has to be limited to achieve the desired durability and behaviour of road surfaces (*Municipal incinerated bottom ash (MIBA) characteristics and potential for use in road pavements,* Lynn, Ghataora & Dhir, March 2017). Unwashed bottom ash presents critical issues for uses as alternative aggregates in construction due to excessive release of pollutants. Where bottom ash has been used to make concrete, it was found that crushing significantly increased the release of pollutants including heavy metals (*Leaching*

behaviour of municipal solid waste incineration bottom ash: From granular material to monolithic concrete, Sorlini, Collivignarelli & Abbà, July 2017).

The history of WtE incineration in the northern hemisphere offers a cautionary tale and although cleaner than the incinerators of the past, new WtE incineration plants still emit mercury, lead, dioxins and a variety of other toxic substances. This is why communities slated to host these facilities object to them so strongly.

WtE incineration is not renewable and will not contribute to a zero net emissions future

The argument that burning waste including that derived from petroleum will reduce greenhouse emissions and reliance on energy from fossil fuels is difficult to sustain. IRATE does not agree with the characterisation of WtE incineration as renewable energy generation. Unlike wind, solar, wave or in some circumstances, hydro generated energy, waste doesn't come from infinite natural processes. It is sourced from finite resources – minerals, fossil fuels and forests that are cut down at an unsustainable rate. Plastic is a petroleum by-product. Burning it is the same as burning fossil fuel and produces similar emissions.

The *Commonwealth Renewable Energy (Electricity) Act 2000,* considers biomass incineration to be a form of renewable energy generation. Burning trees from land clearing cannot be considered renewable energy because the carbon in the trees is instantly released to the atmosphere and replacement trees take decades to grow and re-sequester an equivalent amount of carbon.

Writing in *The Australian* in May 2019, business journalist Terry McCrann pointed out that energy generated in Europe from 'biomass', involves burning wood which is partly sourced from forests in the US. Eurostat reported that in 2016, 65% of all 'renewable' energy generation came from biomass – wood, charcoal, biogas, biofuels and municipal waste. Burning wood contributed nearly half the energy generated. The biggest biomass power station, Drax in northern England, switched from burning coal to burning wood. McCrann writes that while it was burning coal, it was considered to be contributing to climate change but the increased CO2 produced once it began burning wood, is considered by the European Commission to be non-existent. Despite that a biomass power station releases 50-100% more CO2 than a coal-fired power station generating the same amount of power, the EC considers biomass power stations to be 'carbon neutral'. This is because in a truly bizarre twist of thinking, the CO2 generated is considered to be cancelled by the CO2 which will be taken up by new plant growth as a consequence of increased CO2 in the atmosphere. This ignores the fact that sequestration of the carbon equivalent to that being pumped into the atmosphere might take up to 100 years. A case was launched in March 2019 seeking to have the EU General Court rule that biomass cannot be counted as renewable. (*The Great Carbon Con,* McCrann, 4 May 2019*)*

Mixed waste is an inhomogeneous feedstock producing variable levels of emissions when burnt. Unlike burning high-grade thermal coal, it is difficult to tune the boiler in a mixed waste incineration plant to remove emissions. There are spikes in dangerous emissions outputs due to the variability of the feedstock. It is a dirtier way of extracting energy than burning coal and instantly releases more CO2 to the atmosphere per megawatt-hour than coal-fired, natural-gas-fired or oil-fired power plants. Denmark discovered that its incinerators were releasing twice the amount of CO2 than originally estimated, causing it to miss its Kyoto Protocol greenhouse gas reduction targets. By comparison, a study by the United States EPA concluded that up to 42% of US greenhouse gas emissions could be mitigated through the implementation of zero waste strategies (Zero Waste Europe, February 2018).

WtE incineration purports to be the solution to landfill methane gas emissions. Methane is a potent greenhouse gas which forms within 1-3 years after dumping, peak gas production occurs after 5-7 years, almost all gas is produced within 20 years, and small quantities of gas continue to be emitted for 50 or more years (US Environmental and Energy Institute, 2013). However, burning hundreds of tonnes or more of waste daily will immediately release the CO2 in the waste into the atmosphere rather than the waste emitting greenhouse gases slowly over years and decades. That immediacy increases its potency. Methane in landfills can be and is often captured and either flared or used to produce energy. A better solution to the methane problem is diversion of materials from landfill through recycling.

WtE incineration does not reduce the impact of waste on the environment and communities, it simply replaces one set of impacts with another. WtE incineration runs counter to the idea of a 'zero net emissions' future.

Potential adverse health outcomes

WtE incineration releases compounds such as dioxins and furans as well as metals such as mercury, lead and cadmium, acid gases, particulates (dust and grit) and carbon dioxide (CO2). Particulate pollution, particularly PM2.5, leads to decreased lung function, cardiac disease and death. Dioxins and furans are some of the most toxic man-made substances in existence and have an irreversible effect on humans and the environment. Dioxins (compounds containing chlorine) are classified by the World Health Organisation as one of the most toxic chemicals on earth. They are highly carcinogenic, decompose slowly and enter the food chain by bio-accumulating in the adipose tissue of animals. Dioxins may be destroyed by incineration if temperatures are high enough but can reform when emissions cool in the flue or on release to the atmosphere.

Writing in the journal *Environmental Health Western Australia* (Vol 25, No. 1, 2019) Emeritus Professor Odwyn Jones AO and Clinical Professor Bill Musk AM made the following points about air pollution:

. . . it is important to point out, that "it's safe to say there is no safe level of air pollution" and consequently it is dangerous and false to define health hazards based on threshold values (Barnett A.G, 2014). Unfortunately thresholds give the impression that levels below the quoted threshold levels are safe but, as far back as 2005 the WHO air quality guidelines state "there is little evidence to suggest a threshold below which no adverse health effects would be anticipated" . . . Globally, it is claimed that air pollution currently causes more deaths annually than tobacco and new studies identify increasing range of hazards of exposure to toxic air such as huge reduction in intelligence and evidence of pollution particulates in mothers' placentas.

A 2018 UK study led by Professor Frank Kelly, King's College, London, (Carey, I.M. et al, 2018) suggested that '*each extra microgram per cubic metre of PM2.5 (particles less than 2.5 microns in size) increased dementia risk by 7%'.*

A 2018 study by researchers from Beijing University, Yale School of Public Health and Peking University, (Zhang X. et al, 2018) indicated that people living with air pollution are '*not only suffering from increases in respiratory illnesses and other chronic conditions but are also losing their cognitive functions'* and '*increasing CO2 levels are degrading our ability to develop new ideas and formulate complex thoughts'.*

In 2015 *The New York Times* reported that Baltimore's Curtis Bay would be getting the largest WtE incinerator in the US which would be permitted to emit up to 240 pounds of mercury and 1,000

pounds of lead annually in a community which already suffered high rates of cancer and asthma. A 2013 MIT report had found that Curtis Bay ranked among the top postcodes in the US for release of toxic emissions and Baltimore had the highest emissions-related mortality rate of the 5,695 American cities in the study. (https://www.nytimes.com/2015/01/11/us/garbage-incinerators-make-comeback-kindling-both-garbage-and-debate.html)

Dr Peter Tait is a General Practitioner and Clinical Senior Lecturer in Population Health at ANU Medical School. A paper by Dr Tait et al published in the *Australian and New Zealand Journal of Public Health* entitled *The health impacts of waste incineration: a systematic review* (August 2019), identified a range of adverse health effects associated with mixed WtE incineration, including some neoplasia, congenital abnormalities, infant deaths and miscarriage. The study concluded:

- This systematic review highlights significant risks associated with waste incineration as a form of waste management.

- Ingestion of pollutants in contaminated produce is the dominant exposure pathway for both nearby and distant communities. Both local residents ingesting food grown in close proximity to incinerators, as well as more distant populations consuming food transported from areas near an incinerator, are open to exposure.

- While occupationally exposed groups have been shown in primary studies to most likely suffer adverse effects, they are a relatively smaller population than all residents in the vicinity of incinerators.

- There is some suggestion that newer incinerator technologies with robust maintenance schedules may be less harmful, but diseases from exposures tend to manifest only after many years of cumulative exposure, so it is premature to conclude that these newer technologies improve safety.

- Local community groups have a basis for legitimate concern and so siting of incineration facilities needs to take these concerns into account.

- Building reliance on a waste stream for energy counters the need to reduce waste overall.

The idea that no buffer zones are needed between communities and WtE incinerators

The extent of buffer zones (usually just a few hundred metres) separating sensitive receivers from noxious waste industries appears not to be founded on empirical evidence. The record of complaints from Ipswich residents to the Queensland Department of Environment and Science about odour, dust and smoke demonstrates that such zones are inadequate. A scientific study (Fewkes, 2015) found that bioaerosols in compost which are hazardous to health, were migrating from unenclosed composting facilities in Ipswich over distances far in excess of industrial buffer zones. Noxious waste industries should never be located in or near communities.

Siting noxious industries in demographically lower socioeconomic regions entrenches inter-generational inequity and appears to be a world-wide phenomenon. A May 2019 report *U.S. Municipal Solid Waste Incinerators: An Industry in Decline* by researchers at the Tishman Environment and Design Centre at The New School, New York, stated that of the seventy-three incinerators that remain in the US, around eight out of ten are located in poorer communities, already burdened by pollution

from other industrial sources. This causes cumulative impacts that regulators fail to take into account when setting emissions limits. The report also states that government regulations and enforcement (prevention and monitoring) do not do enough to protect people from the consequences of incineration (Zero Waste, June 2019 https://zerowasteeurope.eu/2019/06/the-story-of-rec/).

A particularly concerning trend in Australia is the recent push by the waste industry to site WtE incineration plants within urban areas close to 'the generators of the waste and the users of the energy'. Industry bodies cite the location of overseas incinerators as justification for having no buffers between incinerators and people, homes, schools and businesses. The Waste Management and Resource Recovery Association of Australia (WMRR) made a statement to this effect in its July 2019 fact sheet on Energy from Waste (EfW) and waste company Cleanaway made a similar statement in its May 2017 submission to the NSW Portfolio Committee No.6 inquiry on matters relating to the waste disposal industry in New South Wales. Cleanaway said:

An area of concern is the potential introduction of large buffer zones into the planning, licencing and consents for "energy from waste" plants. International experience, where plants are situated in close proximity to the community have shown that the introduction of buffer zones is unnecessary. For example, 50% of Paris is heated by an "energy from waste" plant located at Issy-les-Moulineaux, which is approximately 7 kilometres from the CBD and four kilometres from the Eiffel Tower. The technologies now developed and used in the USA, Europe and Asia are increasingly located close to the waste source and have shown minimal impact on the community.

It would appear that the motivation is profit through reduction of waste transportation costs and power line energy losses. Ordinary people are well aware that when waste industry lobbyists talk about proximity to waste generators and end-users of energy, they are not talking about themselves and their communities or families (ie. affluent waste sources and users of energy). Environmental and human health should never be subordinated by economic considerations.

The idea that regulatory frameworks will protect communities from adverse outcomes

The Ipswich experience is that the regulatory framework governing environmentally relevant activities in Queensland, has failed to protect communities from adverse social and health outcomes caused by the operation of waste facilities, especially where those facilities breach the conditions of their approvals. Environmental authority conditions are soft controls which depend on compliance by the operator, and are only as good as the effectiveness of the monitoring and enforcement which backs them up. Concentration of waste operations in Ipswich has made monitoring and enforcement difficult for regulators. Investigations have at times been ineffective or have not progressed. Ipswich City Council refusal of waste operation development applications is invariably tested in the Queensland Planning and Environment Court and until very recently there was a history of those decisions being overturned without the amenity and needs of residents being considered. Environmental and health risks of some processes were not properly understood when approval was granted and measures to mitigate risks have been ineffective. Growing urbanisation of once semi-rural or underpopulated areas within Ipswich City, has brought residential communities into conflict with 'noxious' and so-called 'difficult to locate' industries. As a result there has been a slump in community confidence in existing regulatory frameworks.

In 2019, an Environmental Authority was issued by the Queensland Department of Environment and Science for a co-generation facility in Ipswich, to burn waste timber, green waste from land clearing, particle board and MDF (the latter two materials containing resin glues). This facility if it had gone ahead, would have been less than a kilometre from homes. The plant's boiler would have run

continuously (except for a shutdown over Christmas), with the potential to seriously degrade the amenity and health of residents. Issuing an Environmental Authority for such a facility near populated areas demonstrates that the regulatory environment is not working for communities. Community opposition to this co-generation waste to energy facility eventually resulted in its withdrawal.

The idea that only 'residual waste' would be incinerated

Proponents of mixed WtE incineration say that only residual waste or waste that is not practical or economically viable to recycle will be incinerated. How is 'residual waste' defined? And that which is not practical or economic to recycle now, may become so in the future with the right settings. It also needs to be understood that some residual waste, such as automotive recycling floc and end-of-life tyres, are toxic when burnt.

SYCTOM, the waste management consortium made up of Paris and eighty-three municipalities which built the Isséane WtE plant in Issy-les-Moulineaux, states its recycling rate is 30%. However, Zero Waste France state that only 184,600 tons of waste or around 8% was actually recycled in 2017. In that year, SYCTOM processed 2,313,363 tons of waste of which 1,881,817 tons (80%) was incinerated while 147,943 tons were landfilled. Zero Waste report that bottom ash from the incineration process is counted as recyclable and that 42% of the residual waste sent to the incinerator (up to 75% if organic waste is included), could be diverted through more efficient consumption and sorting. (Zero Waste France, January 2019 https://www.zerowastefrance.org/en/isseane-incineration-plant/)

In Queensland it has been suggested that incinerator operators could pre-process waste into recyclable and non-recyclable waste streams. There is an immediately apparent potential conflict of interest in allowing pre-processing of waste streams by WtE operators for the obvious reason that it is in the interests of the WtE operator to incinerate as much as possible. In Sweden for example, it has been reported that much plastic waste that is supposed to be recycled is actually incinerated. Large-scale WtE incineration requires constant throughput of large quantities of waste. In this way it undermines efforts to recover resources. This is why the priority for governments must be strategies to create a viable recycling and re-manufacturing industry before considering WTE incineration.

WtE incineration is not recycling, it is anathema to recycling

Mixed WtE incineration is not recycling and has been found to undermine recycling and reduction initiatives in other parts of the world. It will not support the aim of moving towards a zero-waste economy, quite the reverse.

In Queensland, the State Government acknowledges that combustion and advanced thermal treatment technologies process a wide variety of materials including recyclables, and therefore pose the greatest potential conflict with reuse and recycling (*Energy from Waste Policy, Discussion paper for consultation*, June 2019). Yet it still believes that policy can be formulated to ensure that uptake of EfW does not impact on reuse and recycling activities. This ignores the experience in the northern hemisphere where there is tension between the disparate interests of WtE incinerator operators and governments trying to increase recycling. Where incineration is king, waste production is growing while recycling is low or non-existent.

The EU recently set higher targets for organics management, recycling, waste reduction and waste diversion which resulted in incineration overcapacity in many European countries, meaning there are more incinerators than waste to be burned. This overcapacity produced a perverse incentive to create more waste while discouraging and removing incentives for genuine recycling and waste reduction. It also created strong competition for imported waste which is transported long distances

to incinerators, adding to transport pollution. Some countries are now reliant on imported waste to ensure continued operation of large-scale WtE plants.

Incineration in Denmark has significantly reduced landfilling but it has also stunted the growth of recycling. According to Eurostat, Denmark has the highest municipal waste generation rate per capita in the EU (781kg per annum), burns over 50% of its waste, and is still struggling to transition toward a zero waste economy (Zero Waste Europe, July 2019). Sweden boasts high recycling rates but Swedish waste statistics count toxic ash produced by incineration (much of which ends up in landfill) as industrial waste rather than municipal waste. This false accounting means that incinerator ash from burning municipal waste doesn't get counted in municipal waste statistics. Sweden incinerates up to 86% of all plastics. Despite laws making producers responsible for recycling their products (Producer Responsibility), Sweden still struggles with plastics recycling. (ABC's *War on Waste*, August 2018). The EU has now issued a directive to member countries to move away from incineration and concentrate on reduction and recycling. Sweden and Denmark are among a number of countries including Austria, Belgium, Finland, France, Germany and the Netherlands that will need to reduce the amount of waste burnt to below 35%, in order to meet the new recycling targets.

In July 2017, the European Parliament released a report calling for a halt to subsidies for waste incineration. That year, the European Commission issued a communication on the role of WtE in the circular economy stating that 'increasing waste prevention, reuse and recycling are key objectives both of the action plan and of the legislative package on waste'. The communication added that 'mixed waste still accounts for a substantial share of the waste used in waste-to-energy processes, mainly incineration (52%)'. Existing legal requirements and circular economy waste proposals are bound to change this situation. Rules on separate collection and more ambitious recycling rates covering wood, paper, plastic and biodegradable waste are expected to reduce the amount of waste potentially available for waste-to-energy processes such as incineration and co-incineration (Zero Waste Europe, October 2017).

In 2018, Professor Ian Boyd, a Chief Scientific Adviser of the UK's Department for Environment, Food and Rural Affairs (Defra) warned that further investment in EfW would stunt the UK's recycling rate. He said that incineration would encourage the production of residual waste:

If you are investing many tens of millions, hundreds of millions, in urban waste incineration plants – and those plants are going to have a thirty to forty year lifespan, you have to have the waste streams to keep them supplied. If there is one way of extinguishing the value in materials fast, it's to stick it in an incinerator and burn it. Now, it may give energy out at the end of the day, but actually some of those materials, even if they are plastics, with a little bit of ingenuity, can be given more positive value. (*Resource, Sharing knowledge to promote waste as a resource*, 8 May 2019).

In 2015, *The New York Times* reported that despite decades of incinerators, US recycling programs had stalled and the country was outputting record amounts of waste. A WtE incinerator in West Palm Beach, Florida combusts up to 4,000 tons of material per day and not just MSW but wood, tyres and floc from vehicle recycling which contains polyurethanes, vinyls and rubber which produce toxic gases when burnt. When it was commissioned, it was planned to accept waste from outside the county for at least eight years by which time the county's population was expected to catch up with the incinerator's capacity. It would seem that incineration has made it easier and cheaper to produce more waste and incinerate it instead of recycling and tackling waste reduction. Some US municipalities have deemed recycling an expensive luxury, dispensing with it altogether and incinerating their waste while others such as Seattle and San Francisco (which mandates recycling

and composting), divert 60-80% of their waste from landfill. Seattle also imposes fines on residents who fail to compost food waste.

At between $400 million and $1 billion dollars to build, WtE incinerators are a significant investment with a long asset life of between twenty and thirty years. They therefore require long-term municipal waste supply contracts to recoup the investment. Australian Paper and Suez recently received approval from the Victorian Government for a WtE incinerator in the Latrobe Valley. They stated:

There are still some significant hurdles for the project. The main one being that we need to develop a long-term supply of waste.

The Queensland Government aims to reduce household waste by 25% and recycle 75% of all waste by 2050. Recycling includes composting and organic bio-digestion but not EfW. If 75% of waste is recycled, it is assumed the remaining 25% of the waste is intended to be processed using a variety of EfW technologies. That being the case, a fraction less than 25% will be sent to WtE incineration. Twenty-five percent is a percentage, not a volume. If the Queensland Government achieves its reduction and recycling aims, it must be assumed that the volume making up less than 25% of total waste will get progressively smaller. Putting aside environmental, health and social risks, a massive investment in WtE incineration will not stack up economically in the long-run.

From a purely economic standpoint, the question would seem to be, do governments want a sustainable recycling and re-manufacturing industry and a society which produces less waste, or do they want WtE incineration? Because far from being a temporary fix, WtE incineration will ensure self-perpetuation of this technology through disincentive to produce less waste and diversion of waste from recycling.

Recycling, resource recovery and re-manufacturing – a better way

WtE encourages over-consumption and wastefulness and is counterproductive to reducing waste through recycling and the development of reusable, recyclable and compostable materials. Instead of considering (and funding) mixed WtE incinerators, governments should adopt policy and mechanisms which discourage recyclable waste from going to landfill, encourage further separation at the source of waste production, and encourage the development of products from remanufactured materials and viable end-markets for those products. Bans on specific materials being accepted at landfills should be progressively introduced as re-manufacturing industries come online and those materials can be redirected to beneficial re-use.

Resource recovery necessitates both segregation and pre-processing. Therefore it needs to be easier for domestic and commercial waste sources to sort and separate waste through the provision of more dedicated receptacles for different types of waste, with only organic waste needing to be picked up each week. To support this, community education, incentives and disincentives are needed to improve source separation of waste both domestically and commercially.

In tandem with strategies to encourage proper source separation, recovery and recycling, Governments in Australia also need to have a conversation about waste reduction. Strategies for reducing unnecessary and difficult to recycle packaging and extended producer responsibility for products need to be developed and implemented. Manufacturers, supermarket chains, retailers and the hospitality industry all have a social obligation to assist in waste reduction. There is a proliferation of unnecessary single use plastic packaging such as that around fruit and vegetables and too much packaging unnecessarily made of composite materials. Packaging should also have clearer recycling

labelling to aid in waste separation. The Australian Government has a policy target of 70% of all packaging being compostable or recyclable by 2025 (that's *compostable* – not combustible).

Waste tracking and documentation practices must be improved to support resource recovery and prevent resources which could be recycled going to landfill. One of the recommendations of the Federal Environment and Communications References Committee, which completed its inquiry into the Australian waste and recycling sector in June 2018, was that the Australian Government implement sixty-five agreed improvements to the National Waste Report, including data collection and analysis practices, and that the National Waste Report be published at least biennially. Other important recommendations of the Committee are:

- prioritising establishment of a circular economy in which materials are used, collected, recovered, and re-used, including within Australia
- prioritising waste reduction and recycling above waste-to-energy
- phasing out petroleum-based single-use plastics by 2023
- establishing a Plastics Co-Operative Research Centre (CRC) to lead Australia's research efforts into reducing plastic waste, cleaning up our oceans and finding end-markets for recovered plastic
- assisting recyclers to increase diversion of material from landfill, improve the quality of materials recovered through collection programs, improve sorting of materials at recycling facilities, and assist manufacturers to increase the amount of recycled material used in production
- pursuing sustainable procurement policies to ensure strong domestic markets for recycled material
- educate the public on recycling
- mandatory establishment of product stewardship schemes for tyres, mattresses, e-waste, and photovoltaic panels under the *Product Stewardship Act 2011,* and extension of producer responsibility under product stewardship schemes to ensure better environmental and social outcomes through improved design
- state and territory governments fully hypothecating landfill levies towards measures that reduce consumption and creation of waste, and to increase the recycling of waste materials.

It may be easier in the short-term to incinerate waste than develop products from recycled waste and markets for those products but this is short-sighted. Governments and their agencies such as ARENA and the CEFC, should be supporting true clean energy projects and the development of recycling and re-manufacturing industries rather than WtE incineration.

There are already successful recycling industries in Australia and more is being done
One such operation is Integrated Recycling which makes railway sleepers out of recycled plastic. This company and another like it, RePlas also make bollards, decking, pathways, fencing, retaining walls, architectural screens, fitness trails, street and park furniture, plastic sheeting, signage and traffic control products out of recycled plastic.
http://www.integratedrecycling.com.au/, https://www.replas.com.au/products/

Plastic bottles and aluminium cans can be recycled. However, only 10 percent of plastic bottles are recycled compared to 50% of cans which are more efficient to recycle than bottles. Once the aluminium has been produced, it can be recycled over and again. For this reason, reusable aluminium containers should be encouraged over single-use plastic bottles which are a scourge on a planetary level and are more difficult to recycle. Plastic also requires the use of petroleum, a limited resource that has demands in other industries. https://sciencing.com/plastic-bottle-vs-aluminum-can-13636298.html. The plastic supermarket carry bag should be banned as is the case in Canada where all single- use plastics are being phased out over two years. https://www.sbs.com.au/news/national-solution-canada-will-ban-all-single-use-plastics-from-2021

Australia produces about one million tonnes of waste glass waste every year, of which approximately half is recycled back into glass receptacles. The remaining half million tonnes is used for low grade products such as road aggregate or dumped into landfills. There are 300,000 tonnes of stockpiled waste glass in Victoria alone. Every tonne of recycled glass used in glass re-manufacturing, replaces 1.2 tonnes of the virgin material (sand, soda ash) used to make new glass. Unless fragmented, glass is 100 per cent recyclable and infinitely recyclable into re-manufactured glass receptacles. Glass fragments which are too small to make into new glass containers can be crushed for cullet and used to replace fine sand in a variety of manufacturing processes. https://www.abc.net.au/news/2017-05-22/can-all-glass-really-be-recycled-war-on-waste/8541048. Researchers at University of Melbourne have found that waste glass can replace sand, fly ash and slag in concrete to make stronger, more lightweight and cheaper prefabricated concrete construction panels. Being lighter, the panels cost less to transport and are cheaper to produce since waste glass is one third the cost of fine sand. The material has also been found to possess excellent sound, thermal insulation and fire resistance properties. Researchers are also investigating the use of recycled tyre crumb in the manufacture of lightweight, ductile concrete which is highly acoustically insulating.
https://www.thefifthestate.com.au/innovation/materials/waste-glass-could-lead-to-cheaper-lighter-stronger-prefab-concrete/

The research in Australia is encouraging and should be supported by the Federal government.
http://www.smart.unsw.edu.au/

CONCLUSION

IRATE considers that the decision by governments in Asia to ban contaminated mixed paper and plastic recyclables from Australia has prompted something of a knee-jerk response from State and Federal governments in Australia which proponents of WtE incineration are seeking to exploit.

WtE incineration plants require large upfront and ongoing investment and therefore require large, guaranteed waste streams to maintain viability. WtE incineration undermines development of genuine recycling industries, as has been seen in the northern hemisphere where plants import waste and often burn materials which could be recycled. WtE incineration produces toxic pollutants and requires special, dedicated landfills for concentrated toxic solids. Proliferation of WtE incineration

plants in Australia will cause environmental problems and degrade the amenity, health and economic status of Australian communities.

Location of WtE incineration in socially disadvantaged areas, will entrench social inter-generational inequity and attempts to do so will meet strong resistance from the public. The promise of jobs will make no difference since there are many other industries which create jobs and are more socially beneficial and environmentally friendly.

The EU published its Circular Economy Plan outlining an approach to waste management which focuses on minimisation, reuse and recycling of products and materials within the economy. It states that mixed waste incineration is no better than landfill and recommends 'introduction of a moratorium on new facilities and the decommissioning of older and less efficient ones.' (*The role of waste to energy in the circular economy*, January 2017)

In Australia, the Federal Environment and Communications References Committee, which completed its inquiry into the waste and recycling sector in June 2018, recommended that the Australian Government prioritise waste reduction and recycling above waste-to-energy, and seek a commitment to this through a meeting of State and Federal Environment Ministers.

That Australia has been forced to deal with its own waste, presents an opportunity to further develop genuine recycling industries and markets for re-manufactured products which will benefit society environmentally and economically by directing waste away from landfill and creating more jobs. This is where public funding support should be directed rather than to WtE incineration.

IRATE urges the Australian government and governments at all levels to reject Waste to Energy incineration.

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