Comments on the Final Scoping Report for the Proposed Waste Recovery, Beneficiation and Energy Project, Drakenstein Municipality, Western Cape

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20 August 2015

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Executive Summary

Drakenstein Municipality, together with Interwaste (Pty) Ltd proposed to erect a Waste to Energy (WtE) facility adjacent to the current municipal landfill at Wellington. The proposal is premised on the need for an integrated waste management solution other than landfilling.

This report comments on the Scoping Report that has been produced by Resource Management Services (RMS, 2015) as part of the environmental impact assessment for Interwaste. This report is produced for DEW (Drakenstein Environmental Watch).

Of most significant concern is the lack of a sufficiently detailed explanation in the scoping report of the flow of materials through the proposed facility. The report needs to state what contaminants are contained in the incoming waste and what happens to them after the combustion process. The document is short on the nature of the ash produced and its quality and whether leaching could occur when dumped to landfill. It is important to understand the different paths the contaminants take after combustion and their fate. This knowledge would then explicitly drive the identification of the specialist studies.

Further, it is necessary to understand the efficiency and effectiveness of process controls (emissions abatement), including operating procedures should there be failures of process control in any part of the proposed facility (no plant can run for 100% of the time at 100% efficiency). The frequency and integrity of compliance monitoring around the proposed facility also needs to be specified.

In these respects and others, the Scoping Report is deficient and these shortcomings should be remedied before specialist studies are initiated.

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1 Introduction

Municipal waste streams are problematic because of the large quantities of solid materials that are contained within them. Landfills run out of space and new ways must be found to deal with the ongoing flow of solid wastes. Burning the waste and using the energy generated to produce electricity, as well as reducing the volume of material substantially is seen as one way of dealing with these ongoing flows of materials. The Drakenstein Municipality has proposed (along with Interwaste) to install a facility in its industrial area to burn municipal solid wastes (MSW) and produce electricity, which is known as a Waste to Energy (WtE) process and is promoted as a means of first, reducing the volume of landfilled waste and secondly as means of producing electricity, of which there is a scarcity. However, such proposed facilities must undergo an environmental impact assessment process before any installation is built, in order to ensure minimum impacts on people and the environment.

This report briefly examines the Final Scoping Report produced by Resource Management Services (RMS, 2015) for Interwaste, as part of the EIA process as specified in the NEMA EIA regulations of 2010. This report discusses some of the pollutants likely to be generated by the burning of MSW and their likely fate in the environment. Conclusions and recommendations are presented at the end of the report.

2 Comments on the final scoping report

Regulation 28 of the NEMA EIA Regulations of 2010 outlines the required content of a Scoping Report. These reports are prepared by service providers conducting the EIA process and are required to adhere to these conditions. A clear description of the proposed activity is set down as one of the activities required in a Scoping Report. The report by RMS (2015) does not do this. In that report on page 84, Table 12 lists the contents of the scoping report, as outlined by the NEMA regulations, as being Chapter 2. The actual Chapter 2 of the RMS (2015) presents a baseline report, followed by alternatives. The baseline report merely indicates, to a large extent, some of the different components of the process. The Executive Summary captures more detail about the process than the main report, which is misleading and even this lacks sufficient detail.

The scoping report does not describe sufficiently all the different parts of the material flows of the proposed process. For example, is fresh water required on site (it seems so as part of the steam generation process)? Is waste water generated and if so, where does it go? Even more importantly, the incoming solid waste stream undoubtedly contains contaminants. Where are these captured (mostly) and where do they go once captured. The scoping report should present a view of the sums of material going into the plant, which must equal the sums going out. The RMS (2015) report must therefore identify the conversion and partitioning process into the different exit paths of materials. In this way I&APs can make sense of the likely impacts of the facility.

Therefore, what is required is the clear explanation of material flows and likely pathways of contaminants. A correct and full specification of the material flows will allow a more detailed identification of the likely issues at hand and therefore the subsequent identification and selection of the EIA specialist studies, which seems not to be sufficient in the RMS (2015) report. Some of these shortcomings will be explained later. Other questions include:

1. Metals are separated from RDF (how is this done and is this sufficiently effective? What is the error rate or efficiency?
2. Burning in the DC plant will generate "inert" ash (ashes usually produces leachate), according to RMS (2015). The inertness of the ash needs to be investigated.
3. The DC accepts inorganic wastes – what is in that material – plastics? How much of this gets through to the combustion process?
4. The process diagram – Fig i, is not sufficiently detailed or annotated. It is not clear where waste materials such as dense plastics go – there is merely an arrow showing some direction. From these diagrams, could it be expected that dense plastics are recovered to another facility (where) and plastics of low density are consumed in the combustion process?
5. What happens to HDPE (high-density polyethelene), plastic film, paper/cardboard and glass picked out at the manual sorting place? Are they trucked away as recyclables?
6. Will medical waste be processed? Explicit undertakings are needed on this point as the treatment of medical waste is problematical South Africa.
7. What are the expected emissions factors for different contaminants from the combustion process and what percentage of this can be expected to be permanently recovered in the flue scrubbing process?
8. What is the process of ongoing evaluation/monitoring of air toxics around the plant?
9. What is the process of emissions control from the combustor?

3 Background

The composition of emissions from waste incinerators depends to a certain extent on the type of waste that is being burnt. Most municipal solid waste (MSW) by volume consists of combustible resources such as paper, food products and wood. It also usually contains materials such as plastics and other solids of indeterminate sources that may also (likely) contains metals and other inorganic compounds. Especially problematic is the possibility of the waste stream containing electronics waste (ewaste). Concerns by UNEP regarding the environmental risks posed by MSW combustion relate to contaminants emitted to the atmosphere and into water through ash leachate. Contaminants are expected to be detected in areas under the emissions plume, with increasing concentrations closer to the facility (UNEP, n.d.).

Heavy metals cannot be dissociated in incinerators no matter how high the temperature. Common heavy metals that occur in MSW are mercury, cadmium and lead (US EPA, 2014), as well as arsenic, copper and zinc (UNEP, n.d.). Sources of these metals are in waste streams containing plastics, coloured printing inks, certain rubber products, and hazardous waste from households and small industrial sources (UNEP, n.d.). Waste products of concern include household batteries, thermostats, fluorescent lamps, plastics, and solder-bearing items (e.g., consumer electronics, light bulb sockets, and plated metals) (UNEP, n.d.). The sorting and picking process needs to be extremely efficient and effective. The efficiency and effectiveness of this process is not stated in the RMS (2015) scoping report. The metals separation process is not specified except to note there is a reference to a ferrous metals separator.

Dioxins are not necessarily present in the incoming MSW but are produced as a by-product of the combustion of chlorinated wastes. Furans are also produced in the combustion of MSW. While technologies for reducing the dioxin and furan loading of the gaseous emmisions have become more efficient, it is a fact that some dioxin contaminants will escape the system (US EPA, 2014).

Table 1 below presents categories of hazardous waste according to waste classification regulations, as measured against against SANS 10228 or a modified 10228 (DEA, 2012a). Some or all of these could be expected within the incoming waste streams.

Table 1 Hazardous waste categories (Source: DEA)

Level 1	Level 2
HW01	Gaseous waste
HW02	Mercury containing waste
HW03	Batteries
HW04	POP Waste
HW05	Inorganic waste
HW06	Asbestos containing waste
HW07	Waste Oils
HW08	Organic halogenated and /or sulphur containing solvents
HW09	Organic halogenated and/or sulphur containing waste
HW10	Organic solvents without halogens and sulphur
HW11	Other organic waste without halogen or sulphur
HW12	Tarry and Bituminous waste
HW13	Brine
HW14	Fly ash and dust from miscellaneous filter sources
HW15	Bottom ash
HW16	Slag
HW17	Mineral waste
HW18	Waste of Electric and Electronic Equipment (WEEE)
HW19	Health Care Risk Waste
HW20	Sewage sludge
HW99	Miscellaneous

3.1 Materials unintentionally diverted to the Combustion Process

3.1.1 Materials containing electronic waste

Of concern is whether any computer and related electronic waste (ewaste) enters the waste stream at the combustion facility. The combustion of the following create specific problems:

- Electronic waste (ewaste) containing heavy metals.
- chlorinated wastes, which result in dioxins and furans when burned.

In the United States, toxic materials generated by MSW incinerators (combustion facilities) are strictly regulated by the Maximum Achievable Control Technology (MACT), which has had a significant impact on emissions, reducing them substantially. What are the control processes in place for the proposed Wellington facility?

3.1.2 Materials containing medical waste

It is possible that once a large (by local standards) MSW combustion facility is established, it could attract quantities of medical waste, which is currently problematical to dispose of in South Africa. These are otherwise known as Healthcare Risk Wastes (HCRW) and contain infectious waste (containing pathogens), pathologic (body parts), sharps, chemicals (including pharmaceuticals) and radioactive waste. Heavy metals include mercury. The processing of medical waste is strictly regulated in South Africa, but the effectiveness of such treatment depends on the efficiency of separation at source (DEA, 2012b). This is not always the case in practice and it is quite feasible that some HCRW enter the municipal waste streams. This is especially the case with small waste generators (relatively) such as general practitioners, veterinary surgeons, tattoo artists, home-based health care and dentists because it is much harder to ensure monitoring and compliance (DEA, 2012b).

3.2 Treatment of waste from the burning process

3.2.1 Bottom ash and fly ash

The ash generated by combustion results in about 10% by volume and 25-35% of by weight, of waste incinerated (UNEP, n.d.). Questions that need to be asked is where the ash will be dumped, which must be in such a way as to minimise migration of heavy metals into the environment (and especially the hydrological cycle – via surface and ground water pathways). Ash may be vitrified through pyrolysis, however this will add further costs to the process. Cost-effectiveness of the whole process must be considered carefully.

3.2.2 Ash qualities

The quality of the ash that is produced (with entrained contaminants) is of interest because the final disposal of the ash also determines potential threats to the environment. Several ash streams could be produced, which includes bottom ash, fly ash, scrubber ash and precipitator or baghouse ash (which depends on the particular design of the facility). Bottom ash may include bits of glass, ceramics and pieces of metal. Ashes from MSW combustors are often combined into a single waste stream and have higher concentrations of volatile heavy metals (eg lead, cadmium, zinc) (FHA, 2012). The nature of the ashes produced is quite dependent on the range of processing systems used to screen the incoming MSW stream.

If calcium and other salts are present in the combustor ash, hydration and/or cementitious reactions may occur, resulting in swelling, which would make it somewhat unsuitable for use as a concrete aggregate. High salt contents would interfere with curing and strength development if used in Portland cement, or make the ash corrosive if placed in contact with metal structures (FHA, 2012)

4 Pollution Controls

Emissions from MSW plants can be controlled effectively but with increasing cost according to minimum thresholds required. It remains to be determined what levels of constant emissions qualities can be guaranteed. Emission controls are not perfect. The required high technical standards are obstacles to implementation of MSW in developing countries (UNEP, n.d.). Maintenance of emission control standards over long periods of time are difficult enough even for technically advanced and wealthy countries, such that "*Small mistakes in the operation of such facilities can easily lead to significant emissions of toxic substances"* (UNEP, n.d.).

Adding expense to the controls of such facilities to try to minimise even these small mistakes is unlikely to be cost-effective. Considerable effort will have to given to sorting the waste streams and removing items which could contain heavy metals in one form or another. This is of particular concern if waste streams are imported to the area in order to supply a sufficient fuel component. The most efficient and effective way to do this is usually at source but this is unlikely to be in place in terms of the waste streams being utilised by the proposed Drakenstein facility.

4.1 Toxic pollutants of concern

The burning of municipal waste results in the emissions of the following gases: nitrogen oxides (NOX – the mono-nitrogen oxides nitric oxide NO and nitric dioxide NO_2), sulphur dioxide (SO_2) and carbon dioxide (CO_2) and hydrogen chloride (HCl). Toxic elements and compounds of concern that may be emitted by the burning process may also include mercury, lead, cadmium, chlorine, zinc, dioxins and furans, as stated before.

Mercury occurs in such items as compact fluorescent lights (CFLs) and because these are fragile items and breakages occur, contaminated broken glass and components cannot be kept out of the waste stream or even removed during the picking process. The white powder within the CFLs contains mercury and is there to make the light more efficient.

The pathways of the heavy metals

pollutants in the burning process include volatilisation of the metals at high temperatures, some of which may be captured in the pollution control systems, some which escapes to the atmosphere and the remaining quantity remaining in the bottom ash. The ash is dumped (or may be used as additives in concrete), from where it potentially leaches into the environment.

4.2 Bio-accumulators of heavy metals

Heavy metals accumulate through the food chain (trophic levels) and hence any contaminants then enter the environment, particularly the Berg River, could be transported long distances and result in the contamination of the water and sediments all the way to the Berg River wetlands and estuary (Veldrif). Birds, fish and mussels and likely humans will then be exposed to the hazards of ingestion of such contaminants. This comment does not detail the biological effects of such pollution as it is well described elsewhere in the scientific literature. The possibility of this happening however should be of considerable concern to all I&APs as well as other stakeholders.

5 Efficiency of Control Processes

Of note is the following statement "*the difficulty, and the necessity, of maintaining emissions control systems in essentially perfect order over a long period of time is daunting even to industrialized countries. Small mistakes in the operation of such facilities can easily lead to significant emissions of toxic substances."* (UNEP, n.d.). What comfort can Interwaste give (or even guarantee) that the combustor and other processes will operated at maximum efficiency (and what is the efficiency rating) on a permanent basis?

5.1 Operational procedures in case of outages

No plant can operate at 100% efficiency for 100% of the time. What are the operational procedures to be followed when there is a diversion away from the standard operating procedures (SOP)? In the case of the proposed Wellington facility, if the plant must shut for any short period, the facility must still receive and store MSW. These procedures have not been specified. Not only is teh specification of the flow and type of materials essential, but so are the various controls and operating procedures and especially those in case of an excursion from the SOP. Risk reduction and reducing the likelihood of hazard exposure means all eventualities (within reason) being specified and accommodated in operational procedures. The necessary process for downtime should be included in the scoping report, in the final EIA and become part of the sign-off of the facility on the part of DEA and any other licensing body.

6 Pathways of Pollution

This section describes how pollutants travel in the environment

6.1 Surface runoff and drainage

Arial deposition of contaminants through fallout and precipitation from the flue gases onto the immediate facility site and also onto the surrounding land is certain (Feng et al., 2007). What is not certain is the rate of fallout and accumulation on the land surface. Following heavy rainfall, the transport of heavy metals via surface runoff from the facility and surrounding land will almost certainly take place. Stormwater drainage from the site must be catered for in the design and layout of the facility. Where will this water be directed and how is it treated, if at all? It is likely to contain contaminants, especially from aerial sources (precipitate fallout) (Feng et al., 2007). Heavy storms, which are likely to occur periodically, imply overland runoff and runoff from site. Quickflow will then find its way to the nearby river. The possibility of a pulse of contaminated water reaching the river during a severe storm needs to be examined. This should be investigated in one of the specialist studies, although these have not yet been specified. Contaminated quickflow (stormwater)reaching the Berg River has implications for water quality all the way to the estuary and the local environs, which hosts filter feeders such as mussels, thereby affecting the quality of the local fishery, as well as all accumulator species (predators) in the river. Artisanal fishing in the river and estuary, as well as the wetlands in and near the estuarine environs could be contaminated. It should be noted that the Veldrif wetlands are an important site for 25 species of bird of national importance and at least five are considered Red Data listed species according to IUCN classifications. The wetlands are being considered for RAMSAR status and are an important source for local tourism (Western Cape Birding, 2015).

6.2 Groundwater

Potential pollution of groundwater at the site of the proposed facility was mentioned in the scoping report. The view of the RMS (2015) authors was that little threat exists because of the lack of groundwater abstraction in the area and the presence of current contamination plumes emanating from the current waste treatment activities – the landfill. Nevertheless, further pollutant loading of groundwater in the area – with the alluvial plain close to the Berg River, should be of concern and must be adequately dealt with in the EIA. Ash from the combustion process will be dumped in the current site from where leachates could be expected to contaminate local groundwater at least (Dabo et al., 2009). The propensity for groundwater movement to take place and the possibility of a contamination plume developing from the current dump site and moving towards the Berg River (following the normal path of groundwater movement) should be noted. If such a contaminated plume is already in place, then it indicates the existing movement of contaminants, which, if augmented by leachate from DC ash components, will ensure the very long-term development of a source of toxic contaminants and be a permanent feature in the landscape.

7 Discussion

Limiting factors for achieving emissions control

While technologies may be available for limiting emissions of toxic elements and compounds from a combustor, other factors also come into play that may inhibit efficient emissions control. These are the lack of capacity for planning, budgeting and enforcing regulatory compliance requirements and/or issues of plant maintenance, downtime, forced closures (for whatever reason) (UNEP, n.d.). These limiting factors need to be adequately identified in the scoping report.

Diversion and separation of waste streams containing toxic materials should occur at source, ie should waste streams be imported to the combustion facility then it cannot be confirmed that the waste streams are free of volatile metals and other contaminants. Adequate identification of the possible risk pathways needs to become part of the scoping report so that the appropriate specialist studies can prepare sufficiently detailed assessments and that alternative separation activities be put in place.

The Scoping Report as it stands is not sufficiently detailed enough to identify all the different pathways of contaminants leaving the combustion facility, or the processes put in place to manage contamination, compliance monitoring and enforcement of emissions controls.

8 Recommendations

1. That the scoping report address the shortcomings of the identification of possible contaminants entering the combustion facility and particularly their likely fate after combustion.
2. That the planned performance monitoring and compliance enforcement should be identified in the scoping report.

3. The scoping report should specify levels of efficiency and effectiveness of contaminant removal so that there is some idea of contaminant loading to the environment and whether these will be within SANS and other guidelines.
4. That the suggested specialist studies should only be identified after a study has addressed the issues outlined in Point 1-3 above.

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