GreenPower Program Rules V7 | March 2011

Public Consultation Period Comment to
The National GreenPower Steering Group

Rule Change Submission Document

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Introduction

Moltoni Energy is grateful for the opportunity to make a submission in relation to the public consultation period for the GreenPower Program Rules Version 7.

Incorporated in this submission are some unique attributes that will challenge some of the program rules which currently discourage the recognition of the world's leading and most environmentally proven waste to energy technology, mass burn incineration. By recovering energy from residual waste, which would otherwise be destined for landfill, this technology is capable of generating baseload renewable energy, while minimizing the reliance on waste to landfill. Internationally such outcomes are common place and considered to be fundamental in achieving sustainable communities. Here in Australia though the use of such technology is only beginning to be considered on large commercial scales, as evidenced by the recent (7 March 2011) visit to a modern incineration plant located within Tokyo by the premier of Western Australia (http://www.moltonienergy.com/knowledge_bank).

It is our view that the GreenPower Program Rules unfairly disadvantages world's best practice and commercially proven thermal waste to energy technology. Therefore, it is our intention to address the concerns underlying the current program rules. We would entreat the National GreenPower Steering Group to take this opportunity to familiarize itself with modern incineration technology and reconsider its current position to exclude incineration from the GreenPower Program.

Further details can be sought from:

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Who is Moltoni Energy?

Moltoni Energy (http://energy.moltoni.com.au/home) is a privately owned Australian company whose prime business focus is the creation of sustainable waste and energy management through the use of resources that our society currently discards. Moltoni Energy is proud to be associated with two of the world's leading providers of thermal Waste to Energy (WTE) plant and technology, one of whom is Mitsubishi Heavy Industries Environmental & Chemical Engineering Co. Ltd, exclusive partner (and a license holder) of the Martin Gmbh grate type mass burn incineration (or mass combustion) thermal Waste to Energy technology in the Asia Pacific region. In addition, Moltoni Energy is the exclusive license holder of the Alter NRG Westinghouse Plasma Corporation's plasma assisted gasification technology in Australia and New Zealand. The Alter NRG Westinghouse Plasma Corporation plasma assisted gasification technology is used in the only commercial scale plasma gasification facility converting municipal solid waste (MSW) to electricity.

Observations and Comments on the GreenPower Program Rules Version 7

The following sections from the GreenPower Program Rules relate to the current National GreenPower Steering Group's current position on Incineration of industrial, commercial and MSW.

In section 2.1 "***Industrial/Commercial/Municipal Solid Wastes – Incineration****, There is wide scale public concern about the operation of incinerators for solid wastes. Such generators are therefore unsuitable for inclusion in GreenPower Products. 'Green' waste incineration, where plant matter is separated from other wastes, is covered in the paragraphs below on "Wood Wastes".*"

In section 5.3 ***Specific Exclusions***, item (2) "*Generators that involve the incineration of industrial, commercial or municipal solid wastes.*"

In section 5.4 ***Specific Inclusions***, item (2) "*Industrial, commercial and municipal solid wastes (excluding incineration). Where a fossil fuel component is mixed in with the waste stream and cannot be reasonably removed from the fuel mix, the fossil fuel component will be netted out on a pro-rated basis (according to calorific value of fossil fuel component)."*

While the waste streams themselves are considered to be suitable as a fuel source/feedstock, and the approach to handling the fossil fuel component of the waste streams is consistent with the ORER (Office of the Renewable Energy Regulator) Guidelines, the exclusion of Incineration as a suitable GreenPower technology is both inconsistent with the ORER Guidelines and with international best practice.

We take particular exception to the unreferenced statement that "*There is wide scale public concern about the operation of incinerators for solid wastes.*" In our view, this statement does not present an informed view of modern thermal waste to energy (incineration) technologies. Modern mass burn incineration type waste to energy facilities generate 500 – 700 kWh per tonne of MSW processed, while reducing the volume of MSW by approximately 90%. In contrast, landfill gas to electricity processes generate around 120 kWh per tonne of MSW. This demonstrates the stark contrast in resource recovery potential of these two waste to energy technologies. In its independent analysis of the global Waste-to-Energy technology markets in 2010, Pike Research notes:

"*Today, more than 900 thermal WTE plants operate around the globe. These plants treat an estimated 0.2 billion tons of municipal solid waste (MSW) with an estimated output of 130 terawatt hours (TWh) of electricity.*" pg1, and, "***Mass burn, or as-received combustion**, dominates the WTE market. **The market share of mass burn and refuse derived fuel (RDF) combustion is 98% globally, which dwarfs the share of other thermal and biological treatment technologies. Combustion is durably entrenched in the market and the other technologies face high barriers for market acceptance and market share capture.**" pg3*

Such a dominant technology should not be dismissed without regard for its technical, commercial and environmental credentials. Modern incineration plants, many of which are located in or adjacent to major residential areas in Europe, the US and Japan are subject to stringent environmental regulations and requirements for Maximum Available (Air Pollution) Control Technology. We refer the reader to EU Directive number 2000-76-EC on the incineration of waste http://europa.eu/legislation_summaries/environment/waste_management/l28072_en.htm#amendingact, and US EPA 71 FR 27324 http://www.epa.gov/ttn/atw/129/mwc/rimwc.html, for large scale municipal waste combustion. In fact, these regulations are now so stringent that incineration plants are now acknowledged to be one of the lowest emitters of high temperature processes by environmental agencies and academics alike (see http://www.seas.columbia.edu/earth/papers/global_waste_to_energy.html). In addition, the solid ash by-product from a modern incineration plant can be used as road aggregate or construction products and can potentially be converted into bricks and pavers (http://www.pmet-inc.com/pmet_build.html), thus replacing the production of virgin construction materials through the recovery and reuse of both bottom ash and fly ash.

For example, in Tokyo, Japan there are 21 incineration plants converting MSW into electricity (http://www.kankyo.metro.tokyo.jp/kouhou/english/pdf/Waste%20Management.pdf). Ash from those incineration plants is further processed in plasma gasifiers to produce a glass like vitrified product which is used as a substitute for sand and in the production of cement. As an indication of the current level of interest in best practice thermal waste to energy, Mr Peter Dyson, Managing Director of Moltoni Energy recently escorted the premier of WA, the Honourable Collin Barnett on a tour of the Ariake waste processing facility (incineration plant) in Tokyo city (please refer to http://www.moltonienergy.com/knowledge_bank for details).

Overseas tests (e.g. as mandated by the US EPA) require WTE plant operators to demonstrate that the bottom ash by-product is non-leaching and therefore non-hazardous. Furthermore, ferrous and non-ferrous metals can be recovered from the solid ash by-product and recycled. These solid by-products and recovered recyclable metals will further improve the overall lifecycle GHG emissions footprint of the facility by eliminating the generation of GHG emissions associated with the production of virgin materials.

Mass burn incineration is a commercially proven technology for the conversion of MSW to energy. It is also highly flexible technologies, hence their ability to handle mixed waste streams, including biosolids (e.g. sewage sludge) and highly variable wastes such as MSW and commercial and Industrial (C&I) wastes. Due to its inherent flexibility, there is no technological need to introduce either a 'third bin' requirement or a Mixed residual Material Recovery Facility (or a dirty MRF) upstream. The requirement for pre-treatment and/or additional source separation is a necessity for other less flexible and less forgiving thermal conversion processes such pyrolysis, conventional gasification and non-thermal conversion processes such as anaerobic digestion and composting. Without stringent source separation (at significant additional cost, including re-education of both industry and the community), these processes can be rendered inoperable or ineffective in significantly reducing landfill volumes. For example, the EPA has classified much of the compost product

from a typical anaerobic digestor to be a waste stream, since the operators cannot guarantee its quality, due to the inevitable contamination of the organic waste feedstock by glass, sharps and other contaminants which are commonplace in MSW and C&I waste streams.

In summary, mass burn incineration or mass combustion is proven both environmentally and commercially, hence its position as the world's most prevalent thermal waste to energy technology and its importance in any sustainable waste management strategy. The exclusion of this technology by the GreenPower Program purely on the basis of an unreferenced and untested opinion on public concerns puts at risk hundreds of millions of dollars of investment in waste to energy projects Australia wide and ignores global best practice in waste to energy. We would entreat the National GreenPower Steering Group to take this opportunity to familiarize itself with modern incineration processes and technologies, and reconsider its current position to exclude "incineration" from the GreenPower Program.

The National GreenPower Steering Group may also wish to reconsider the use of the word "incinerator" in the program rules, as this word has connotations of a bygone era of backyard incinerators. Today's modern thermal waste to energy facilities are engineered to stringent environmental standards and subjected to rigorous approval processes. As such, we would suggest the use of terms such as "Modern Incineration Plant" and/or "Mass Burn Combustion" (as used in the Pike Research Report) or simply "Mass Combustion (Plant)", would all help to provide a point of differentiation for the community.

The remainder of this submission is dedicated to a discussion about global best practices in eliminating the reliance on landfills and a description of the modern mass burn incineration technology, which is commercially and environmentally proven and available for implementation in Australia today.

Waste to Renewable Energy

Global Best Practices

As can be seen in Figure 1 below, the European communities that are achieving sustainable outcomes in these areas are those that have embraced thermal (mass burn incineration) waste to energy as a corner-stone of their sustainability strategies. Similar approaches to recovering energy from waste resources and diversion of waste away from landfill are common place in Japan and are well established in the USA, and booming in China. Given those achievements, Moltoni Energy feels that it is its corporate responsibility to bring such tried and proven solutions to Australia rather than attempt to re-invent the wheel or deploy higher cost alternatives. As demonstrated throughout this submission, this strategy is also underpinned by maintaining as a minimum the highest environmental standards and community engagement processes.

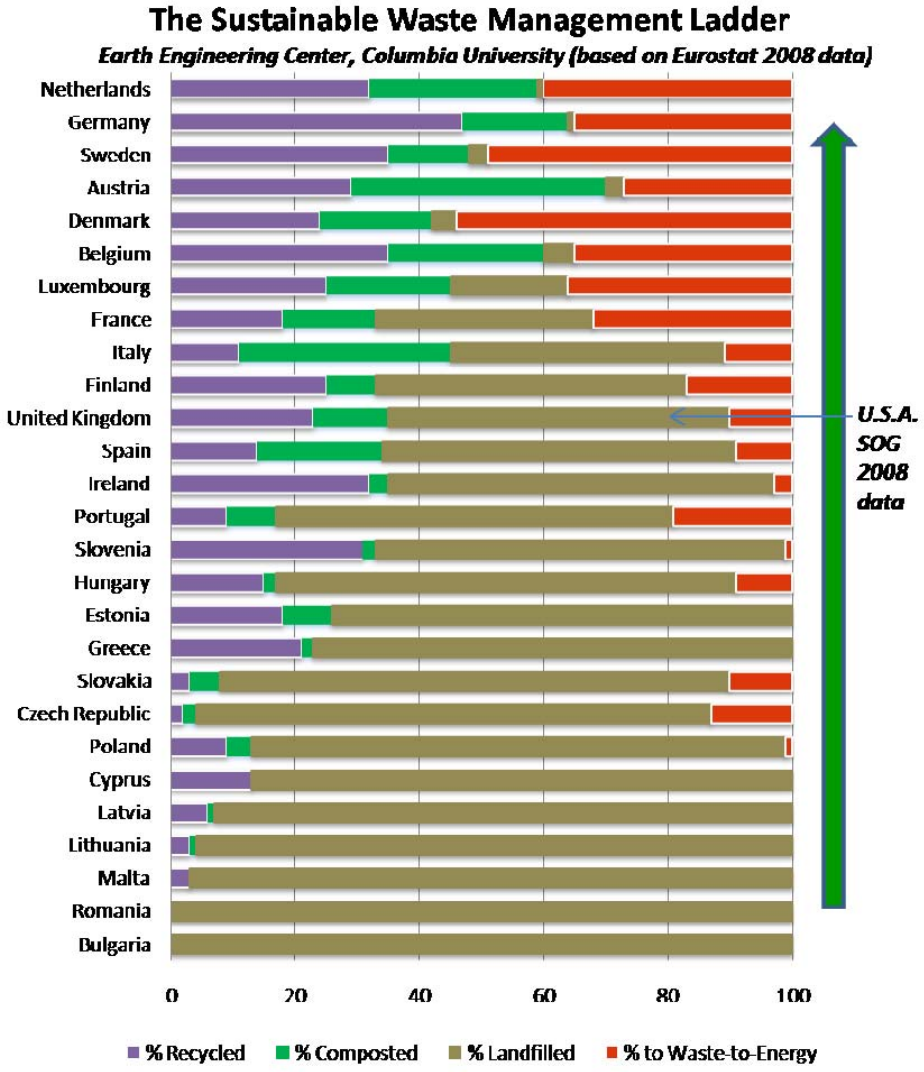

Figure 1 – The Sustainable Waste Management Ladder for Europe (Eurostat 2008 data)

Benefits of Thermal Waste to Energy

The combustion of Municipal Solid Waste (MSW) is listed in the Renewable Energy (Electricity) Act 2000 as being eligible as a renewable energy source. Furthermore, the Office of Renewable Energy Regulator (ORER) Guideline for Determining the Renewable Components in Waste for Electricity Generation states that in the context of MSW combustion, Solid waste incinerators, gasification and pyrolysis are all eligible and acceptable renewable power generation technologies. Modern mass burn incineration WTE facilities are capable of generating 500 – 700 kWh of electricity per tonne of MSW processed.

Like hydroelectricity and geothermal power, but unlike solar and wind energy generation, mass burn incineration (thermal waste to energy plants) are a unique source of baseload renewable energy generation (with regard to the renewable, non-fossil fuel, portion of the feedstock). By integrating the disposal of waste with the generation of energy, waste to energy plants provide a solution to two of society's greatest challenges: waste disposal and energy supply, with a minimal greenhouse gas footprint relative to current landfill and landfill to energy practices, and a net overall reduction in GHG emissions when lifecycle considerations such as replacement of landfills and baseload coal fired power generation, and recovery of recyclable metals are taken into consideration. With over 900 thermal waste to energy plants worldwide (Pike Research, 2010), there is no doubt that such aspirations are not only achievable but demonstrable in practice. Furthermore, thermal waste to energy is the only proven large scale waste to energy technology that delivers on its promise of generating renewable baseload power generation from waste while also reducing landfill volumes by approximately 90%.

A new mass burn waste to energy Plant serving any community will enable the municipality to achieve two of its long-term strategic sustainability goals: encouraging local renewable energy generation and also reducing the volume of household waste to landfill by 90% or more.

Other benefits of a modern thermal waste to energy plant include:

- No need for special and expensive source or secondary separation of municipal solid waste (e.g. no need for a dirty MRF), which reduces complexity and contains the cost associated with waste collection and handling, and therefore does not require any change to current 2-3 bin collection systems (i.e. separating recyclables from household residual and household green waste)
- Able to process both domestic and commercial and industrial wastes, as well as combustible portions of construction and demolition waste, which might otherwise be sent to landfill
- An independent North American study has shown that communities which have a waste to energy plant tend to recycle more than communities without a WTE plant (please refer to page 9 of http://www.energyrecoverycouncil.org/userfiles/file/ERC_2010_Directory.pdf)
- A long term waste supply agreement is required, which also gives the community stable rates for waste collection and disposal, while also allowing the community to benefit through the local generation of baseload renewable electricity
- Ferrous and non-ferrous metals can be recovered post-combustion from the solid bottom ash by-product and recycled, thereby further increasing recycle rates and reducing GHG emissions through avoidance of virgin materials production and associated energy consumption
- In more established markets in North America, Japan and Europe, companies have developed technologies to reuse the solid ash by-product in construction products such as bricks, pavers (for example, please see http://www.pmet-inc.com/pmet_build.html) and aggregate for roads, thus

offering the potential to further reduce landfill requirements. A further benefit of producing these solid by-products is the potential to further reduce lifecycle greenhouse gas emissions by replacing the production of traditional products such as bricks and pavers.

- A long term solution to an on-going challenge. The expected useful life of these types of thermal WTE plants is 30+ years, during which major components such as the grate and boiler can be replaced periodically (after approximately 20 years of operation) so as to extend the plant life indefinitely.
- Reliable. Typical plant availability is 330 days per year or 90%. Furthermore, grate type thermal combustion technology is scalable by nature, with each facility typically consisting of a number lines/grates (with associated combustion chambers, boilers and steam turbines) operating in parallel, which also provides an inherent level of redundancy. Therefore, in order to expand such a facility, additional grates (with combustion chambers and boilers) are added in parallel with the existing grates. In fact, most operating plants have 2 or more lines operating in parallel.
- A large number of construction jobs would be created and 30-50 full time employment positions would be created for plant management, operation and maintenance

WTE Technology Reference Information

Technical information and a process description for a modern thermal Waste to Energy process facility can be found in **Appendix A.** A comprehensive listing of the operating mass burn incineration type thermal waste to energy facilities in the USA along with other information relevant to the state of the waste to energy industry in the USA is provided for reference in the USA Energy Recovery Council 2010 Directory http://www.energyrecoverycouncil.org/userfiles/file/ERC_2010_Directory.pdf.

For additional independent information on thermal waste to energy, the reader is encouraged to visit the Columbia University Earth Engineering Center, Waste-to-Energy Research and Technology (WTERT) Council website (http://www.seas.columbia.edu/earth/wtert/) for a wealth of up to date information on mass burn incineration type WTE facilities and answers to frequently asked questions. Please also refer to http://www.seas.columbia.edu/earth/papers/global_waste_to_energy.html for an article entitled "An overview of the global waste-to-energy industry", by Professor Nickolas J. Themelis (of Colombia University, Earth Engineering Center) in Waste Management World (www.iswa.org), 2003-2004 Review Issue, July-August 2003, p. 40-47.

Responses to common concerns about thermal WTE facilities

Concern 1: **A thermal Waste to Energy solution stifles recycling and innovation**

Response 1: A thermal Waste to Energy plant is only one part of an integrated approach to waste management and when used in conjunction with the waste hierarchy, will always be placed below reduce, reuse, recycle. In fact, independent US University studies have shown that communities that have a mass burn incineration WTE facility tend to recycle more than those without due to the greater awareness by the community of their waste disposal options (see http://www.energyrecoverycouncil.org/userfiles/file/ERC_2010_Directory.pdf, pg9). Furthermore, in most Waste to Energy contracts let, the agreed minimum volumes are less than that being generated at the time of the agreement to reflect the potential reduction in feedstock through gains achieved through reduction, reuse and recycling. Solid ash or slag by-product can be reused in various construction materials such as bricks and road aggregate.

Concern 2: **Waste to Energy plants produce high levels of pollutants**

Response 2: This was certainly true in the 70's and 80's but since the new EU and US EPA regulations were imposed, the emissions from mass burn type waste to energy plants are now orders of magnitude lower than in the past, such that the US EPA now views mass burn incineration WTE facilities as the cleanest form of thermal power generation.

Concern 3: **Waste to Energy plants have negative Health effects**

Response 3: Most if not all reports relating to negative health effects of mass burn type WTE plants are from the '80s and '90s due to legacy effects of the insufficient air pollution controls prior to the '90s. Emissions from modern thermal WTE facilities are now negligible relative to other background activities we take for granted such as driving and wood fires. Furthermore, they provide a proven alternative to landfill, which suffers from methane leakage and leachate contamination of groundwater. There are numerous mass burn type WTE plants operating within or adjacent to major cities and population centres, such as **Paris, Tokyo and London** with no identified health risks.

Concern 4: **Thermal Waste to Energy plants contribute to climate change**

Response 4: Greenhouse Gas (GHG) emissions from thermal WTE facilities can be portrayed as considerably worse than virtually all other forms of energy generation if the analysis is done as a point source, rather than as a lifecycle analysis, and if emissions from the renewable portion of MSW are also included in the total emissions. If we exclude carbon dioxide emissions associated with the renewable portion of residual MSW, thermal WTE plants have considerably lower emissions than coal fired power stations. However, if we take a true lifecycle assessment approach and consider the GHG emissions avoided by diverting waste away from landfills (methane gas is 21 times more potent as a GHG than carbon dioxide), and the GHG emissions avoided by replacing baseload fossil fuel fired energy generation, plus the GHG emissions avoided through the recovery of recyclable metals from the WTE plant, studies have shown that thermal WTE facilities are actually a GHG sink (see http://www.energyrecoverycouncil.org/userfiles/file/ERC_2010_Directory.pdf, p2). Furthermore, re-processing of solid ash or slag by-product into construction materials also avoids GHG emissions associated with conventional production of those materials.

Appendix A – Background on Mass Burn Incineration (or Mass Combustion) Type Thermal Waste to Energy Technology

Many Australians would likely be unaware of the prevalence of mass burn incineration type thermal WTE facilities, which are now common place in Europe, the USA, Japan and various countries throughout Asia. "*Today, more than 900 thermal WTE plants operate around the globe. These plants treat an estimated 0.2 billion tons of municipal solid waste (MSW) with an estimated output of 130 terawatt hours (TWh) of electricity.*" pg1, Pike Research report on Waste-to-Energy Markets, 2010. The Pike Research report (pg3) also notes that 98% of this installed capacity utilises mass burn type thermal WTE technology.

In the 1920's Josef Martin (of Martin GmbH) invented the 'reverse-acting grate' that is based on the premise that fuel ignites more easily when an already existing glowing mass is pushed back underneath it. The concept was developed over time and the grate proved to be the solution to combustion of MSW. This system has been in commercial operation since 1959.

Figure 2 below illustrates the reverse acting Martin grate and its relationship to the combustion chamber and waste heat boiler.

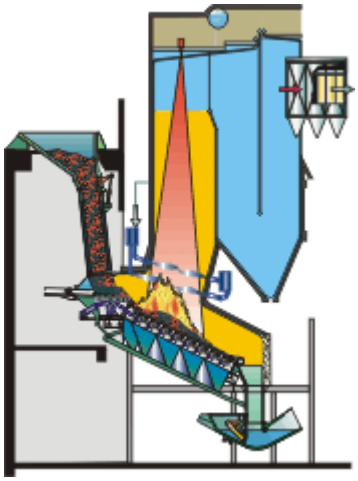

Figure 2 – Martin reverse acting grate with combustion chamber and boiler

One of the key attributes of this technology is the manner in which it employs the use of standard thermal generating plant technology with a unique MSW firing system. By treating MSW as a form of feedstock to fuel standard thermal generating plants, the selection of technologies such as receiving areas, water tube boilers, flue gas clean-up, emissions handling and generating systems, can then be derived from tried and proven technologies and processes.

Within the firing chamber though, the manner in which the MSW is managed and brought to combustion is critical to the performance and effectiveness of the plant and to its emissions. By its very nature MSW is not an entirely predictable fuel in its consistency or its constitution. It is therefore this component of the process which is required to be unique to MSW and other commercial and industrial wastes.

Martin GmbH is the world leader in waste to energy plant design with over 370 commercial reference sites world-wide (http://www.martingmbh.de/index_en.php?level=1&CatID=11&inhalt_id=43). Their exclusive partner (and license holder) for the Asia-Pacific region, including Australia, is Mitsubishi Heavy Industries (Japan) who also provide many of the components for the plant.

Typical Stack Emissions for modern mass burn incineration WTE facilities

Whilst it is indeed true that in the 1970s and 1980s thermal waste to energy plants were seen as polluting, after regulatory changes to emission limits in Europe in the '90s and the introduction of Maximum Available Control Technology (MACT) regulations implemented in 1995 by the US EPA, the US WTE industry invested in retrofitting pollution control systems and has now become one of the lowest emitters of high temperature processes. As a consequence, large thermal WTE facilities are located within or adjacent to major population areas, thus minimizing the handling and transportation of waste. In the US, in 2010, 86 plants operate in 24 states and have capacity to process more than 97,000 tons of municipal solid waste per day and generate the energy equivalent of 2,790 MWh of electricity (ERC Directory, 2010, see http://www.energyrecoverycouncil.org/userfiles/file/ERC_2010_Directory.pdf).

We have elected to use the Martin GmbH Brescia (Italy) plant as a reference. This plant was required to meet stringent Plant Approval emissions limits at the time of design and has since been compared to the EU 2000 limits. The following table is a summary of the criteria and performance.

Table 1 – Gaseous emission limits and actual operating data from the Martin GmbH Brescia (Italy) plant operating on two thirds MSW feedstock and one third biomass feedstock

Stack Emissions	Plant Approval Limits 1993	Plant Design Data 1994	EUROPEAN UNION Limits 2000	Actual Operating Data
Particulate Matter	10	3	10	**<0,5**
Sulphur Dioxide	150	40	50	**10**
Nitrogen Oxides (NOx)	200	100	200	**80**
Chlorine acid (HCl)	30	20	10	**5**
Fluorine acid (HF)	1	1	1	**0,2**
Carbon Monoxide	100	40	50	**20**
Heavy Metals	2	0,5	0,5	**0,01**
Cadmium (Cd)	0,1	0,02	0,05	**0,002**
Mercury (Hg)	0,1	0,02	0,05	**0,002**
PAH (Polycyclic aromatic hydrocarbon)	0,05	0,01	-	**0,001**
Dioxin (TCDD Teq) ng/Nm3	0,1	0,1	0,1	**0,01**

Grate type waste to energy plants operate under a slight negative pressure (i.e. a slight vacuum), with combustion air drawn from the waste receiving bay into the combustion chamber, therefore almost completely eliminating odours both inside the plant and outside the plant. Modern plants use sound attenuation technology and construction methods such that hearing protection is only required inside the main building which houses the grates, combustion chambers and steam and power generation systems. Sound levels outside the main building will not be significantly higher than background noise levels.