Technical Report on the setting up of a
Waste to Energy Facility in Malta

FEBRUARY 2018
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MINISTER’S FOREWORD

In July 2017 Government took the bold decision to include a Waste-to-Energy facility as an integral part of our long term sustainable management of Municipal Solid Waste. This was an environmental responsible decision and will not affect our ambitious objectives to increase our recycling efforts in order to meet the 2030 recycling targets as contained in the Waste Package currently being concluded at EU level. Through the Waste-to-Energy facility, Malta will be in a position to limit the rate of landfilling and recover the energy embedded in the remaining fraction of waste that is beyond the targets.

The objective for such a project has to be seen within the synergy that can exist between Waste-to-Energy and The Circular Economy paradigms that need to co-exist. Decisions taken in waste management policy not only need to ensure essential public services provision but also lead to improved public health and living conditions whilst maintaining financial and environmental health of our nation.

This ambitious project is one of several initiatives that will be implemented over the coming years to change the unsustainable practice of land fill operations that has been with us for decades. From the Government’s side, we shall ensure that there will be an adequate infrastructure mix for future society. On the other hand society at large needs to do its part to first and foremost reduce the amount of waste generated; be conscious to re-use and repair rather than simply discard; and perform their civic responsibility to recycle at source whenever possible. It is only through the combined efforts will Malta as a nation meet its obligations both in waste management and emissions to safeguard our environment.
The current waste management infrastructure in Malta is experiencing a number of challenges in order to achieve short and long term EU targets and deliver on the targets of Malta’s Waste Management Plan (WMP) 2014-2020. The Plan recognises that even if the EU targets are achieved – and this requires a determined improvement in waste reduction and separation efforts, a considerable amount of residual waste will still need to landfilled or further treated through a Waste to Energy (WtE) facility.

The WMP also committed, and in fact delivered, two studies on the potential export of waste against its local treatment using waste to energy technology. The Waste Management Plan for the Maltese Islands 2014 – 2020 in fact proposed to “undertake a cost benefit analysis to establish the most economically and financially feasible option between local thermal treatment and the export of waste for energy recovery” (pg.3). Malta’s over-reliance on landfilling cannot be sustained particularly because Malta’s realistic space for the designation of landfill sites is very limited.

For a number of years a Waste to Energy (WtE) facility has been seen as possible component of a holistic solution needed in order to address some of the future issues of waste management in Malta and Gozo. On the 24th of September 2017, the Minister for the Environment, Sustainable Development and Climate Change set up a Committee to review the various studies within the context of the overall waste management practices and infrastructure and propose a way forward. This Position Paper is the final report of this Committee.
2.0 BACKGROUND

Malta is obliged to reach the following targets by 2020:

- Recycle 50% of paper, plastics, metal and glass waste from households by 2020
- Only 35% (based on 2002 levels) of biodegradable municipal waste will be allowed to landfill by 2020

The EU Landfill Directive (Directive 1999/31/EC) includes targets which are proving challenging to attain. Malta is one of the countries which generated the most municipal waste per capita in the EU, with 647kg per capita generated in 2016 as compared to 480 kg per capita which is the EU average (Eurostat). Total Solid Waste generation in 2015 (according to the NSO) is 1.863 million tonnes. When reviewing the waste generated by category, it can be noted that over the past years, volumes of Municipal Solid Waste (MSW) fluctuated, commercial and industrial (C & I) waste increased, whilst hazardous waste declined. Overall there was a slight decrease but this was erratic and one cannot say there is a trend for a decrease in waste generated.

The building and commissioning of two Mechanical Treatment Plants (MBT) with Anaerobic Digestion (AD) were important milestones towards a more sustainable waste management system. However after two years of operations it is evident that the MBT and AD plants at Maghtab do not suffice to divert all treated MSW from landfills. A substantial proportion of C&I Waste is currently also landfilled.

The capacity of the Ghallies landfill for receiving further waste is calculated to last up to 2020. Landfilling remains the largest treatment option for Malta’s MSW. In order to ensure that Malta has landfilling capacity up to the time when a Waste to Energy facility becomes operational, the area at Ghallies earmarked as a hazardous cell but never used for such a purpose has been identified as an interim landfilling facility.
3.0 DEVELOPING THE BRIEF FOR A WASTE TO ENERGY FACILITY IN MALTA

The feasibility, or otherwise of a waste to energy facility in Malta dates back to a number of years. In fact three major studies have been undertaken on the nature of such a facility for Malta. What follows is a summary of the main findings that emerged.

3.1 Technical report waste-to energy in malta, scenarios for implementation, june 2008

The first in-depth study on the establishment of a Waste to Energy facility was conducted by Umweltbundesamt as part of a twinning project destined to provide assistance to explore long-term projects to manage specific waste streams in a more sustainable manner. The report, Technical Report Waste-to Energy in Malta, Scenarios for Implementation, was published in June 2008. The objective of the study was to formulate a strategy for the selection of an appropriate “Waste-to-Energy” technology for Malta together with technical assistance in the planning and commissioning phases of the recommended Waste-to-Energy facilities.

On the basis of the Solid Waste Management Strategy and the waste management systems being followed or in operation at the time, the firm established a number of waste management scenarios for the Maltese Islands which included a Waste to Energy facility or considered the export alternative. Three scenarios were considered:

**Scenario 1:**
Mechanical Biological Treatment (MBT, three plants) + Thermal treatment using a Fluidized Bed Reactor

**Scenario 2:**
MBT (one plant) + Thermal treatment using a Grate firing System

**Scenario 3:**
MBT (three plants) + Export of Refuse Derived Fuel (RDF)

The consultants analysed the strengths and weaknesses of each scenario and found Scenario 2 as the most favourable. A feasibility analysis of the different scenarios was also conducted, with Scenario 2 being the most favourable and Scenario 3 the least favourable.

Umweltbundesamt also conducted a site selection exercise, evaluating five potential sites against a number of criteria: Infrastructure, Transport, Location, Environment, Knock-out criteria. The sites considered were Marsa, Xewkija, Delimara, Maghtab and Hal Far. The Delimara site was chosen as the most favourable with the Maghtab site ranking second. In their conclusions, Umweltbundesamt stated that “the stage of planning is very early for a final site selection of a waste-to-energy facility and several crucial parameters are not yet identified.” (pg.36)
3.2 THE WASTE MANAGEMENT PLAN FOR THE MALTESE ISLANDS, 2014-2020

The Waste Management Plan for the Maltese Islands, 2014 – 2020 reaffirmed the need for a solution to manage the amount of residual waste that remained after allowing for existing treatment facilities. Commissioning a local WtE facility or resorting for the export alternative were the options identified and the Plan proposed to: “undertake a cost benefit analysis to establish the most economically and financially feasible option between local thermal treatment and the export of waste for energy recovery” (pg. 3) as one of the initiatives to meet its obligations with regards to waste management.

3.3 INCLUSION OF A WTE FACILITY IN THE LIST OF POTENTIAL PROJECTS TO BE FUNDED UNDER THE OP1

The development of a Waste to Energy project is listed as a major project in Malta’s Operational Programme 1 “Fostering a competitive and sustainable economy to meet our challenges” for the European Social and Investment Funds (ESIF) programming period 2014-2020. In addition to its contribution to managing waste in Malta, a Waste to Energy facility provides the opportunity for generation of low carbon/renewable electricity in Malta.
3.4 THE SLR STUDY

Following the publishing of the Waste Management Plan for the Maltese Islands, the Ministry for Sustainable Development, the Environment and Climate Change (MSDEC) appointed SLR Consulting Limited (SLR) to provide technical assistance in support of the development of a Waste to Energy facility. SLR were appointed following a competitive tendering process and the study was part financed by the European Union (Operational Programme 1). SLR’s scope of project delivery was primarily to prepare a Project Description Statement (PDS) for the development of the proposed WtE facility. Equinox and AIS Environment assisted SLR in the Cost Benefit Analysis.

The study comprised five main tasks:

- Task 1: Established the framework of the studies and included two aspects, baseline studies of the volumes of waste generated and how these quantities varied over the years.
- Task 2: Established the Physical and Chemical parameters of the waste
- Task 3: Established Options Analysis and Feasibility, with a testing of the markets for the various options
- Task 4: Alternative Site Assessment
- Task 5: Development of a Project Description Statement

3.5 THE STUDY CONDUCTED BY JASPERS

In June 2016, the Managing Authority - Planning and Priorities Co-ordination Division (PPCD), the division within the Office of the Prime Minister responsible for managing funds allocated to Malta by the EU, formally requested the EU’s Joint Assistance to Support Programmes in European Regions (JASPERS) to support the development of a WtE project in Malta which was listed as a major project in the OP 1 “Fostering a competitive and sustainable economy to meet our challenges” for the ESIF programming period 2014-2015. A fact finding mission was carried out by JASPERS experts to assess the existing situation of waste management in Malta and to discuss plans for a WtE facility in the local context. Upon completion of the mission and an analysis of the documentation received, JASPERS expressed its doubts on the conclusions of the planning framework and demand analysis contained in the SLR study. In the framework of this initial assessment the Maltese authorities asked JASPERS to provide technical support to the project promoter, i.e. WasteServ Malta Ltd in establishing a qualified estimate of the expected treatment capacity and the overall investment cost, together with the drafting of the terms of reference for an updated technical feasibility study for the project. The assignment was concluded on April 2017.
JAPERS drafted Terms of Reference for a special short-term assignment to be carried out by an external expert under JAPERS contract. The specific outputs of this assignment were:

1. a critical review of the key SLR reports (Reports on Tasks 1-3)
2. a critical review of the existing situation of the waste management system in Malta
3. an expert opinion on the general feasibility, opportunities and risks of developing a WtE facility in the local context;
4. a qualified estimation of the range expected for the nominal capacity of a WtE facility (in terms of mass and thermal input) in Malta based on a preliminary demand analysis that takes into consideration the legal requirements and targets.
that Malta needs to comply with in the waste management sector;

5. a qualified estimation of the overall investment cost for the proposed WtE project based on the estimated nominal capacity range and considering state-of-the-art incineration technology (including at least moving grate and fluidized bed incinerators);

Finally, a separate output was:

1. a detailed description of the scope, general approach and methodology of the following activities, to be included in the terms of reference for a subsequent consultancy to prepare an updated technical feasibility study:
   a. establishment of the planning framework for the WtE project,
   b. demand analysis including current and future waste generation and composition,
   c. technological feasibility and options analysis, including analysis of risks and risk trade-offs for different technological options considered

Paul Frith, of Frith Resources Management Ltd, was the expert chosen by JASPERS and undertook the assignment as laid out by JASPERS. The final report was intensively consulted with JASPERS experts in charge of the assignment.

In order to carry out the assignment, Frith Resources Management:

• Undertook a familiarisation visit to Malta and observe the key sites
• Held meetings with officials from Wasteserv, Environment and Resources Authority and other interested players
• Developed a waste-flow model for the period 2016-2030, which model was driven by data in the SLR report. Four time periods were considered, 2017, 2020, 2024 and 2030. These milestones referred to: 2024 – start of plant operations, 2020 – EU waste target, 2030 – EU Waste Management target

• Established the size of the eventual plant. The plant was sized for the 2030 requirements. FRM applied waste arising scenarios and they assumed that after 2030 waste arising would level. The approach to modelling was that waste streams and arisings agreed during meetings with ERA and Wasteserv were applied.

3.6 A COST-EFFECTIVENESS STUDY OF EXPORT AS AN OPTION FOR THE MANAGEMENT OF MUNICIPAL SOLID WASTE IN MALTA

E-Cubed Consultants were commissioned in April 2016 to conduct a study to determine the cost effectiveness of the option of exporting MSW. The analysis considered the export of waste for which no domestic treatment would be otherwise possible with the available infrastructures, as well as the export of residues after treatment within such infrastructures. The analysis considered two scenarios, one a base case scenario as expected by WasteServ which anticipates that the generation of mixed waste drops to 120,454 tonnes in 2020. The other scenario, (the worst case scenario) the composition of waste is based on the continuation of past trends and the targets related to recycling and landfilling of biodegradable waste would not be attained by 2020.

The study considered various export destinations, i.e different WtE facilities in a number of EU countries, two transport logistic options: land mode and sea mode, the total number of trailer loads that would be required for the different waste types and scenarios. For the Land Mode option, the overall cost amounts to €64.7 million annually for the WasteServ scenario and €89.9 million annually for the Worst Case Scenario. The cost per tonne under both scenarios was estimated at about €388 per tonne. The Sea Mode Option considers the use of hopper vessels to transport waste from Valletta to the Port of Rotterdam and by land transport thereafter. The estimated costs would vary from €30.7 million annually in the WasteServ scenario rising to €41.4 million annually in the worst case scenario, resulting in an overall export cost of €163/tonne of waste. When considering these costs, one has to keep in mind that there are notification costs which vary considerably and have not been taken into account. Moreover if such an option
were to be resorted to and a regular contract for transhipment established, more favourable rates than those considered in the report could be negotiated. It is also important to note that the export option reduces the country’s independence in the sector in that it will then depend on other countries to take its waste – which may not always be possible.

3.7 SETTING UP OF THE WASTE TO ENERGY COMMITTEE

On the 24th of September 2017, the Minister for Environment established a Committee to prepare a position paper on the issues relating to the setting up of a Waste to Energy facility in Malta. The Committee is made up of a number of officials from Government Entities which deal directly with waste, a number of persons representing eNGO’s and other experts in the fields of environment and economics. The Opposition was invited to name a representative on the Committee but declined the offer. The specific objectives of this Committee were:

- To establish whether any other feasible alternative to WtE exists
- To study the reports which had been prepared by SLR Ltd and JASPERS/FRM
- To examine why the two reports converge on their proposals but diverge on the sizing.
- To provide an opinion on the technology proposed by SLR and JASPERS/FRM
- To make a recommendation to the Minister on the way forward with respect to WtE infrastructure

The Committee held five meetings during which it reviewed:

- The current waste management facilities and infrastructure operated by Wasteserv Ltd
- The Waste Management Plan
- The relevant EU Waste Management Acquis
- The SLR report
- The JASPERS/FRM Report
- Examples of various existing Waste to Energy facilities with similar capacities to the requirements of Malta and Gozo.

During these meeting the Committee met with officials from WasteServ and representatives of SLR and FRM. Another meeting was held to review the draft memorandum which was prepared for presentation to the Minister for the Environment, Sustainable Development and Climate Change.
4.0 CONTRASTING THE TWO MAIN STUDIES

4.1 SALIENT MATTERS RESULTING FROM THE SLR STUDY

The SLR study had to establish waste generation growth, waste management streams, and size a plant corresponding to these volumes. The commencement of operations of the WtE facility was established as 2021 with a lifecycle of 25 years, that is the end of life of the facility was set for 2045. In their presentation to the committee, the SLR consultants remarked that the main challenge faced during their study was the quality of the data. Five scenarios were established by SLR to predict waste arisings. These scenarios were projections of future population and tourism growth together with different per capita MSW arisings and different growth in per capita Commercial and Industrial Waste arisings. SLR then ranked the likelihood occurrence of these scenarios. SLR considered that Scenarios 1 and Scenario 4 as the most realistic (Vide Appendix I). Eventually the SLR study looked at each of the possible technologies possible and ranked their appropriateness for the Maltese context.

Based on data received and clarified with WasteServ, SLR established that in 2014 waste arising was 310,827 tonnes and this figure was considered as reliable. Waste was categorised as being made up of 24 waste types. These waste types do not include the construction waste which is quarried or the hazardous waste which is incinerated. On the basis of this data, SLR developed a dynamic future looking model. In the forecasting of waste arising, two main categories of wastes were considered, MSW and non-MSW.

One of the studies comprising the SLR full report, Options Analysis and Feasibility Study-Report (Task 3) included a site identification exercise, a technical feasibility and environmental sustainability study and an evaluation of various advanced thermal treatment technologies. In their site identification exercise 8 sites were considered. In this exercise, SLR added a number
of other sites to those previously considered by Umweltbundesamt. The cooling requirement of a Waste to Energy facility implies that the facility needs to be located near the coastline. The SLR Consultants considered that Hal Far and Luqa are not close to the coast and thus these sites do not facilitate cooling. The Marsa site was considered as not of sufficient size, with heavy surrounding traffic. The site identification exercise thus ruled out these sites. SLR concluded that two sites at Maghtab were appropriate locations for a WtE facility. After weighing the different technologies available and the appropriateness of these technologies for the particular waste that would be fed to the facility, and after considering the objectives given by MSDEC to SLR, moving grate technology was chosen as the most appropriate for Malta.1

4.2 SALIENT MATTERS RESULTING FROM THE JASPERS/FRM STUDY

JASPERS considered the waste arisings, combined with the attainment of 60% recycling targets as the most critical factor in establishing the feasibility of an eventual WtE facility in Malta. In their report JASPERS established that waste arisings would be around 310ktpa including mixed MSW, bulky waste, source-separated recycling, source-separated organics, C&I waste, C&D waste and other wastes predominantly sewage sludge. These figures relate to the waste managed by WasteServ Malta Ltd. In addition, there are additional C&I waste amount to around 15ktpa outside WasteServ Malta’s control. The report lists 15 waste streams as potential suitable for combustion. The report carried out a detailed analysis of future waste projections relating to waste growth. In the opinion of the JASPERS consultants, the projections did not seem unreasonable although certain reservations were made. Three possible scenarios were considered by JASPERS:

1 Objectives of MSDEC as specified in the RFP

- Minimising as much as possible all landfilling of non-inert wastes;
- Increasing as much as possible usable energy recovery. Low grade waste heat should only be included in the computation of energy recovered only if such waste heat is utilised in an economically viable and feasible manner;
- Ensuring emissions and environmental impacts are in conformity with the strictest standards and likely future standards. Particular attention should be given to the risk of adverse impacts or emissions in the event of malfunction and/or mis-operation and such risk should be low enough to be considered tolerable;
- Lowest processing cost per ton of waste;
- Good tolerance to contaminants in feedstock; and
- Low mean time between failures, low down time and avoidance of extended periods when waste cannot be processed.
The WtE capacity is expected to be within a range of 79,000 to 114,000 tonnes per annum, on the basis that:

- The overall technical and economic viability of the operational arrangement is confirmed
- Malta achieves at least 60% recycling of municipal waste by 2030
- Waste does not grow at a greater rate than 0.74% per annum between 2015 and 2030 (by weight) and waste arisings post 2030 remain constant

a. To be particularly noted is that the higher extremity of the mentioned capacity range represents the addition of 9-10,000tpa of sewage sludge to the feedstock (scenario 2) in addition to a lower recycling performance.

b. Under each scenario, in the period 2024 – 2029, there is a surplus of potential feedstock to the WtE facility which could not be incinerated (particularly Refuse Derived Fuels (RDF) and rejects from MTPs), and on this basis it is understood that some of this feedstock will need to be either landfilled or exported during this period.

c. There is also a marked difference between the calculated capacity values of this study and the SLR report. Partly due to some of the queries raised in the Critique of the SLR reports (Appendix 1, Critical Review of Reports), not all of the differences could be reconciled, however the key factors are:-

- SLR did not assume a 60 - 65% recycling rate by 2030
- The SLR model considered capacities up to 2045, whereas JASPERS/FRM report sizes the facility for 2030 demands (assuming no further growth of waste beyond that year)
• The different waste streams selected for processing at the WtE facility
• The SLR report also considers different growth rates as scenarios.
• The different starting point and waste data for this study (2015) versus the provisional 2014 data used in the SLR study
• The lack of clarity over the facility mass balances applied in the SLR study versus some operational data and WasteServ Malta assumptions as regards facility performance applied in this study

A sensitivity analysis was also carried out on these scenarios. The parameters which showed the most sensitivity were the composition of the bulky waste stream, thermally drying the non-digested sewage sludge prior to the WtE facility and reject rates at the Material Recovery Facilities (MRFs).

The treatment of non-digested sludge is included as one of the scenarios within the project, but that a separate sewage sludge management plan should be developed for handling the bulk of sewage sludge arising on the islands. Processing of waste of a lower calorific value will impact on the energy levels and therefore the ability to export net electrical generation, with negative environmental and economic implications.

The SLR report had established an operational date of January 2021, based on an overall programme of 32 months from notice to proceed. JASPERS/FRM considered these timeframes as tight and revised the final completion date to the end of 2023.

JASPERS/FRM also commented on the Export Study which had been commissioned, entitled: Cost effectiveness Study of Export as an Option for the Management of Municipal Solid Waste in Malta. JASPERS/FRM Ltd did not consider this document as a study of the cost effectiveness or cost/benefits of exports as it did not include an analysis of other options offering an alternative to export. The document did not assess Trans-frontier Shipment regulations, under EU or national laws, treatment of waste for export, potential facilities that could (in theory accept exported waste).

The Committee was of the view that though the cost of operations of both the WtE plant and the Export alternative were subject to substantial uncertainties that make the long term financial and economic case for choosing one rather than the other rather cloudy and not judicious, a national strategy of a sovereign island state cannot be based on permanent arrangements to export waste and thus be exposed to strategic risks in case of changing regulations and political scenarios. The Principality of Monaco, for example, notwithstanding its being geographically located contiguous to mainland France, has always opted for its own waste management facilities, including a WtE plant.

Furthermore the option to export, needs to be kept as a fall back last resort solution in case the actual level of waste generation and waste recycling targets used in the assumptions underpinning the sizing models for the WtE plant are not fully realised. Having said that, there is confidence that taking into consideration the net energy generation from the proposed WtE facility and re-use of residues for road construction, would contribute to both the financial and the economic case of WtE as compared to the export alternative.
For the purpose of the WtE capacity modelling exercise, it was necessary to assume a realistic operational arrangement for the existing facilities, which was chosen as follows:

- From 2017, any mixed MSW not treated at Sant’Antnin MTP will be diverted for treatment at Malta North MTP (until 2028 when it will be sent directly to the WtE facility).

- From 2021 the larger available capacity at the Malta North MBT is used exclusively for the treatment of mixed MSW and bulky wastes, whereas the MRF and MBT capacities at Sant’Antnin are used for the treatment of separately collected recyclables and bio-wastes this till 2023 by which time, Sant’ Antnin will be decommissioned and moved elsewhere.

- From 2028, five years after the assumed start of operations of the WtE plant (beginning of 2024), the processing of residual MSW in the Malta North MTP is discontinued and
the residual waste stream sent directly for incineration in the new WtE plant. The Malta North MTP + AD is then used to process and treat separately collected bio-wastes from municipal and C&I sources with a view to ensure that their treatment counts towards the MSW recycling target. This would appear to be the most practical operation arrangement taking into account the existing treatment facilities and proposed WtE facility. It is also likely to be the most cost-effective from an operational point of view, including the costs for landfilling and / or exporting of waste.

- Quantities in excess of the permitted throughput in Sant’Antnin (currently 71 ktpa including MRF and MTP) are diverted for treatment at Malta North. From 2028, when residual MSW processing is discontinued at Malta North MTP, all separately collected kitchen / food waste is diverted for treatment at Malta North AD.

5.0 THE MAJOR CONCERNS RAISED BY THE WASTE TO ENERGY COMMITTEE

During the meetings of the Committee, various concerns were raised and discussed by the members of the Waste to Energy Committee. The major concerns are listed below.

5.1 The challenges in meeting the recycling targets

The proposed Waste to Energy plant was one of the pieces which made the whole picture and should not be taken as if it were going to replace existing or future objectives. The other waste management processes in existence, particularly for recycling have to remain. Other countries which have Waste to Energy facilities score high on recyclables. If recycling were not to be pursued and improved, the capacity of the proposed facility would not suffice. Moreover certain wastes, for example sewage sludge could not be recycled. JASPERS/FRM underlined that a WtE facility can only be justified if it forms part of a national strategic policy that is based on low waste growth and high recycling. In the light of the above, it is pertinent to consider that the sizing of any eventual waste to energy facility has to ensure that only residual waste is used for such a plant after all efforts have been made to recover material for recycling in line with Malta’s obligations under the EU Acquis.

5.2 Whether the introduction of a WtE facility would reduce Malta’s efforts to increase recycling.

The JASPERS/FRM report is based on the assumption that all the recycling targets and draft targets are met and that the Landfill Directive obligations are delivered. The economic feasibility therefore is a broad consideration of whether it could be viable to develop a facility in the waste management context of Malta, and in this regard the current model of MTP treatment prior to landfill is unlikely to be sustainable in the medium to long term operationally, environmentally or economically. The same report considered that the alternative model of exporting large volumes of RDF is also unlikely to be a long term sustainable alternative, and is not currently practised from Malta despite large quantities of RDF being generated, baled and stored. Therefore a dedicated WtE facility, using conventional technology is likely to represent one feasible economic alternative to reduce demands on finite landfill resource and the export of residual wastes alternative.
5.3 The ideal size of a WtE Plant in Malta

FRM in reply to this concern said that a country cannot develop a plant with excess capacity because it would not have the waste volumes required to run it. If the plant is sized to lower volumes than the actual waste that potentially requires combustion, the country would either have to export the additional waste or to landfill. JASPERS did not agree with SLR on the sizing of the plant, and considered SLR’s proposal to size to 2045 waste arising as wasteful. When queried about excessive capacity of their proposed plant, SLR had replied that excess capacity in the years leading to 2045 would bring the opportunity to burn legacy waste. The SLR study differed from the JASPERS study on the following criteria:

- JASPERS study to 2030, arisings flatlining post 2030, SLR study to 2045
- SLR used provisional 2014 data on arisings, FRM used provisional 2015 data
- The SLR study assumed 50% recycling rate only (no uplift beyond 2020)
- The JASPERS study increased this to 65% by 2030 and changed the EU calculation method from method ‘a’ to method ‘d’, post 2020, as agreed
- This is a massive increase in recycling (c. 90% of the key recyclables being captured)².

When queried what constitutes this legacy waste, SLR had indicated that the waste landfilled at Zwejra as legacy waste, i.e. waste from the past which can be used for combustion. The problem with such sizing is that the plant has to be operated at whatever capacity it is constructed and installed, it cannot be scaled down. The SLR argument of using spare capacity to process the legacy waste in the facility raises the question of what to use the excess capacity for after the legacy waste is processed.

² EU methods of verifying compliance with Article 11(2)(a) of Dir, 2008/98/EC
   a) The preparation for reuse and the recycling of paper, metal, plastic and glass household waste; [to 2020]
   b) The preparation for reuse and the recycling of paper, metal, plastic, glass household waste and other single types of household waste or of similar waste from other origins;
   c) The preparation for reuse and the recycling of household waste;
   d) The preparation for reuse and the recycling of municipal waste. [post 2020]
5.4 The emissions resulting from the Plant

One concern raised by members of the Committee was that an eventual WtE facility would require a very high stack which would affect the residents of nearby settlements. It was underlined that in the planning of such a facility, a dispersion model would have to be carried out to establish the effect of emissions on nearby settlements. When built, the fumes from such a stacks would come at a high speed which will take the exhaust further away before the fumes start to disperse. It was also underlined that with Malta being a warm country, steam outflow from the stack would not be visible. The EU has very stringent directives with regards to emissions and therefore a quarter of the investment would be on the flue gas treatment to limit polluting emissions.

The facility will be operated under the Industrial Emissions Directive requirements in terms of emission, and regulated by the ERA...

“The facility will be operated under the Industrial Emissions Directive requirements in terms of emission, and regulated by the ERA...”
5.5 The ideal technology for a WtE Plant in Malta

The WtE technology spectrum includes a wide range of proven and unproven systems (oscillating kiln, fluidised bed, moving grate). The oscillating kiln technology is appropriate for plants with a maximum design capacity between 50ktpa – 60 ktpa and are therefore likely to be too small for the requirements of Malta. The fluidised bed system requires pre-treatment of waste to reduce particle size. As a technology it is less prevalent in the treatment of municipal waste than moving grate technologies. In the UK the operational experience of fluidised bed for municipal waste has been of mixed success, with various operational problems. Jaspers/FRM indicated that their preference, considering the waste streams and waste composition, was for moving grate technology for which there are several well-established technology providers in the market. This technology has the required track record. The capacity of the proposed plant is considered as being towards the lower end of commercial facilities capacity range, which in normal circumstances, fall between 90ktpa and 600ktpa.

SLR considered other technologies together with the three already indicated, namely pyrolysis, gasification and plasma. These three technologies were considered as inappropriate and the moving grate technology was considered as the most appropriate.
An exposition of similar sized facilities was given by Paul Frith

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>BUILDING FOOTPRINT</th>
<th>SIZE (MAX CAPACITY PER ANNUM)</th>
<th>COMMENTS RE TECHNOLOGY USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dudley</td>
<td>4,860 m²</td>
<td>105,000 tonnes</td>
<td>Constructed in 1998, the plant can generate 7MW and contains two lines with a combined capacity to process up to 12 tonnes per hour</td>
</tr>
<tr>
<td>Wolverhampton</td>
<td>8,071 m²</td>
<td>110,000 tonnes</td>
<td>Constructed in 1998. The plant can generate 8MW and contains 2 lines with a combined capacity to process up to 12 tonnes per hour</td>
</tr>
<tr>
<td>Peterborough</td>
<td>3,552 m²</td>
<td>85,000 tonnes</td>
<td>Opened in 2016, the plant can generate 7.25MW and will help the city reduce the carbon footprint by 10000 tonnes.</td>
</tr>
<tr>
<td>Bolton</td>
<td>3,710 m²</td>
<td>127,100 tonnes</td>
<td>Constructed in 1971 and refurbished in 2000. The plant can generate 11MW of electricity and is the only plant in greater Manchester that incinerates household waste.</td>
</tr>
<tr>
<td>Kirklees, Huddersfield</td>
<td>4,836 m²</td>
<td>140,000 tonnes</td>
<td>The plant started operations in 2002 and produces 9.5MW of electricity</td>
</tr>
<tr>
<td>Chineham</td>
<td>5,720 m²</td>
<td>102,000 tonnes</td>
<td>Commissioned in 2003, the plant generates 8MW of electricity</td>
</tr>
</tbody>
</table>

The indicative capital costs of a moving grate incinerator are included in the JASPERS/FRM report and indicate an investment of €88 million to €114 million. There are also operational challenges and skills required for running and maintaining a WtE plant to ensure an efficient operation and delivery of the anticipated levels of performance in terms of plant availability, efficiency of waste processing/energy recovery and maintaining environmental emission standards.

When queried about the experience of small countries within the EU, Paul Frith stated that Cyprus does not have a WtE facility, probably because of the availability of landfilling space. On the other hand, Monaco has operated incinerators since 1898 with the plant always being located on the same location at Fontvieille. The plant was built with three identical furnace grates, using two continuously with the third used as a standby. The plant has a capability of processing 80,000 tonnes of waste per annum. The plant is considered very efficient, reducing waste by 90% of its volume and 75% by weight. The plant was upgraded in 1994 to comply with the EC Directive on Air Pollution. The upgrade incorporated a wet scrubbing system to treat the emissions produced. In 2006, the incineration process was further upgraded to incorporate Selective Catalytic Reduction to further reduce the emissions.
5.6 The residue resulting from the operations

Residue would be 25% which is potentially recyclable or could be used in road construction thus very little of that would need to be landfilled. 4% would be fly ash which would have to go to a hazardous land fill abroad. Ferrous and non-ferrous items may also be extracted from the bottom ash, thus generating an additional recycling stream.

5.7 Siting of the Plant and amount of land required

The Maghtab Complex was deemed as the least controversial location for siting the plant. The plant would require between 3700 to 5000 square metres of land, excluding ancillaries. At the Maghtab Complex there is already substantial infrastructure for waste management, (weighbridge, administration offices, wheel cleaning facilities, internal roads, security control) which would be wasteful and difficult to re-create in another location. The SLR study included a site selection exercise, shortlisting two sites at Maghtab as being the most appropriate. Although there was general convergence within the committee with regards the appropriateness of Maghtab Complex for such a facility, further studies may need to be conducted for selecting the specific location.

5.8 Operational parameters of the plant

The plant would be operational for 8,000 hours per annum and would be connected to the electricity grid. The plant is expected to generate around 7 to 8 MW per hour and therefore it is expected to generate between 56,000 to 69,000 MWh per annum. The downtown period of such a facility is minimal and would result in an efficiency of 92%. The bunker servicing this facility would have to provide for four days of waste storage. The WtE process would be considered as a recovery operation instead of a disposal operation if it meets R1 criteria. It would be easier to reach the R1 criteria should the heat energy generated by the plant be utilised for heating purposes, however it is also possible to achieve the R1 criteria with a plant that generates electricity only. It is not considered an option to develop a facility that does not achieve the R1 criteria.

5.9 The experience of similar sized countries in the EU

Various countries with a similar population to Malta were considered. One country with a very long history of WtE facilities is Monaco, which has operated such a facility for over a century. Cyprus, which has a similar population to Malta and is also an EU country did not have a WtE facility. Communities in the UK, with a population size similar to Malta, e.g. The Isle of Wight or Isle of Man, both had WtE facilities.
6.0 CONCLUSION

The Committee accepts the explanations provided by Mr Paul Frith on why the two reports, prepared by JASPERS/FRM and SLR, regarding the sizing of the proposed plants differ. The Committee supports the sizing of the WtE facility as explained in JASPERS/FRM study. This would avoid risk that an oversized WtE facility, apart from requiring higher capital investment, would tempt relaxation of the commitment to achieve recycling targets. The committee also agrees that grate type incineration – as recommended by both studies – is the preferred technology.

The Committee strongly concurs with the underlying philosophy that the eventual development of a WtE facility must be carried out in parallel with an aggressive campaign to attain the targets for recycling, established in various EU directives and the Waste Management Plan for the Maltese Islands, 2014 – 2020. The sizing of the proposed plant is dependent on the attainment of the recycling targets. The failure in attaining these targets would not be solved by the proposed facility but by further investment which would come at a considerable financial cost.

The Committee agrees that the report prepared by JASPERS/FRM provides more realistic parameters of the nature of an eventual WtE plant in Malta.

The Committee agreed with the implied conclusion of the two studies commissioned that the setting up of a Waste to Energy Plant in Malta is an inevitable step in achieving the complete Waste Management Infrastructure necessary for addressing the needs of the Maltese Islands with respect to waste management and achieving the goals of the EU Waste Acquis.
COMMITTEE MEMBERS

CHAIRMAN WTE COMMITTEE
Mr. Tonio Montebello
CEO WasteServ Malta Ltd

WTE COMMITTEE BOARD SECRETARY
Perit Jesmond Mugliett

COMMITTEE MEMBERS:
Dr. Kevin Gatt
Mr. Kevin Mercieca
Mr. Alfred Mifsud
Dr. Alex Sciberras
Profs Edward Mallia
Mr Martin Galea De Giovanni
Dr. Harry Vassallo
## APPENDIX 1: SCENARIOS MODELLED AND GROWTH RATES

Assumed by SLR

### Table 5-3: Population, MSW and C&IW Growth Rates Available for Selection in the Model

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>ASSUMED GROWTH RATES</th>
<th>JUSTIFICATION / SOURCE / NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population Growth - Residents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual growth rate until 2010 [%]</td>
<td>0.43% p.a.</td>
<td>Calculated value so that the population in 2020 would be 434,300, which is the population projected for 2020 by the Planning Authority in the Demography Topic Paper published in 2002.</td>
</tr>
<tr>
<td>Annual growth rate from 2021 onwards [%]</td>
<td>Average: 0.57% p.a. Maximum: 0.91% p.a. Minimum: 0.15% p.a. User Defined: 0% p.a.</td>
<td>Average, maximum and minimum values have been estimated based on actual population data published by National Statistics Office for Years 2006 to 2013. User Defined value is an assumed value and can be varied by the user.</td>
</tr>
<tr>
<td>Estimated annual population of tourists [as % of resident population]</td>
<td>Average: 7.74% p.a. Maximum: 8.38% p.a. Minimum: 7.38% p.a. User Defined: 10% p.a.</td>
<td>Average, maximum and minimum values have been estimated based on actual tourist guest nights data published by Malta Tourism Authority for Years 2010 to 2013. User Defined value has been proposed on the assumption that Malta will not be able to sustain tourist population greater than 10% of its resident population. This value can and will be varied by the user. Note: Tourist population has been estimated by dividing total guest nights data published by Malta Tourism Authority by 365 days.</td>
</tr>
</tbody>
</table>

**Growth in per capita MSW arisings**

*Note: It has been assumed that this applies only to resident population.*

<table>
<thead>
<tr>
<th></th>
<th>ASSUMED GROWTH RATES</th>
<th>JUSTIFICATION / SOURCE / NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Until 2020 [% p.a.]</td>
<td>User Defined 1: -1.1% User Defined 2: 0% User Defined 3: 1%</td>
<td>User Defined 1 value corresponds to the average annual growth rate observed in Malta for Years between 2006 and 2013. User Defined 2 and 3 are assumed values assuming zero growth and modest growth in the short to medium term.</td>
</tr>
<tr>
<td>From 2021 onwards [% p.a.]</td>
<td>Average: 0.3% p.a. Maximum: 2% p.a. Minimum: -1.3% p.a. User Defined: 0% p.a.</td>
<td>Average, maximum and minimum values are based on actual average annual growth observed in EU Member States with reliable data for the period between 1995 and 2013. User Defined is an assumed value, reflecting 0% annual growth, and can be varied by the user.</td>
</tr>
</tbody>
</table>

**Growth in per capita Commercial and Industrial Waste arisings**

<table>
<thead>
<tr>
<th></th>
<th>ASSUMED GROWTH RATES</th>
<th>JUSTIFICATION / SOURCE / NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth rate attributed to resident population until 2020 [% p.a.]</td>
<td>User Defined 1: 2% User Defined 2: 0.5% User Defined 3: -1%</td>
<td>These are assumed values as there are no reliable historic data to inform these assumptions. These rates can be varied by the user.</td>
</tr>
<tr>
<td>Growth rate attributed to resident population from 2021 onwards [% p.a.]</td>
<td>Average: 0.3% p.a. Maximum: 2% p.a. Minimum: -1.3% p.a. User Defined: 0% p.a.</td>
<td>As there are no reliable long term historic data to inform these assumptions, growth rates assumed for per capita MSW arisings have been used.</td>
</tr>
<tr>
<td>Per capita Commercial and Industrial Waste arisings from tourist population [as % of per capita C&amp;IW arisings from resident population]</td>
<td>User Defined 1: 0% User Defined 2: 25% User Defined 3: 50% User Defined 4: 100%</td>
<td>These are assumed values on the basis that the waste generation by tourists can be different than that by the residents. These values can be varied by the user.</td>
</tr>
</tbody>
</table>
APPENDIX II: CLARIFICATIONS BY SLR ON THE CBA CONDUCTED

The financial and economic model built for the purpose of this assignment is based on an ad hoc demand analysis undertaken as part of this set of studies. The most economically viable option under the market conditions that are expected to be attained in the medium-term, after accounting for all costs and benefits, is the Conventional Grate Facility. This has yielded an economic net present value of EUR 58.4 million, an economic rate of return of 8.15 % and an economic benefit-to-cost ratio of 127.27%. The solution, however, is not financially feasible and given that the project yields a positive economic net present value, it needs to be treated as a public good and the funding gap covered through national and EU Funding. This project is also characterised by public good characteristics and is therefore being recommended for ERDF funding.

Please note that the difference between the economic and financial net present value does not relate to costs in nominal and in real (i.e. after discounting) terms. This is not possible to explain in layman terms, as it is, in and of itself a technical concept, but I’ll try to explain it as simply as I can.

In line with the Guidelines for Conducting CBAs issued by the European Commission, the financial analysis deals with all the aspects of a project that have a market value (e.g. capital costs, operational expenses, revenues, etc.) whereas the economics analysis takes into account the variables accounted for in the financial analysis in addition to costs and benefits that do not have a market value, which it then proceeds to monetise (i.e. to give a monetary value to).

The negative financial NPV means that there would not be scope for the market to undertake the project without public sector intervention whereas the positive economic NPV means that if the project had to be undertaken it would result in a net social benefit. Taken together, these make a case for EU co-financing. It is worth noting that these 2 conditions are also a pre-condition for funding mandated by the Commission in terms of the CBA Guidelines and the structural funds’ regulations.

APPENDIX III: ABBREVIATIONS

AD – Anaerobic Digestion
BAT – Best Available Techniques
CBA – Cost Benefit Analysis
C&D – Construction and Demolition Waste
C&I – Commercial and Industrial Waste
EIA – Environment Impact Assessment
ERA – Environment and Resources Authority
EU – European Union
MBT – Mechanical and Biological Treatment Plant
MRF – Material Recycling Facility
MSW – Municipal Solid Waste
MTP – Mechanical Treatment Plant
NSO – National Statistics Office
RDF – Refuse Derived Fuel
tpa / ktpa – tonnes per annum / kilo tonnes per annum
WSM – WasteServ Malta Ltd
WtE – Waste to Energy
Technical Report on the setting up of a Waste to Energy Facility in Malta