Waste to Energy
Doing business in South Africa
June, 2013
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ambassador
of the Kingdom of the Netherlands
to South Africa.

This market entry study provides an overview of the South African Waste-to-Energy market. The study is one of four aimed at informing the entrepreneurs in the Netherlands about the South African renewable energy market with a special focus on Green Buildings, Waste-to-Energy, Biomass-to-Energy and Wind energy.

The South African demand for energy is growing and renewable energy is part and parcel of government policy. This offers interesting market opportunities for the Netherlands. The Embassy of the Kingdom of the Netherlands welcomes this development and sees potential for bilateral cooperation to strengthen the renewable energy sector in South Africa with active participation of the Dutch private sector. The Dutch renewable energy and energy efficiency industry has significant expertise in several fields of clean energy, with a high degree of knowledge, reputable research institutes and innovative industry players. The Embassy believes that cooperation between South Africa and the Netherlands could benefit both countries, as it will allow for technology and knowledge transfer and exploring new market segments.

The Embassy in Pretoria and the Consulate General in Cape Town – in cooperation with Agency NL, the implementing agency of the Ministry of Economic Affairs – offer support to Dutch companies that are already active or want to become active in South Africa. For more information about doing business in South Africa, our services and financial support please visit: zuidafrika.nlambassade.org or www.agentschapnl.nl.

We hope this study will assist you in exploring South Africa or expand your activities in this interesting and beautiful country. If based on this information you would like to further discuss then please contact us through pre-ea@minbuza.nl
6. Funding Options and Support

6.1 Type of Business Venture
6.2 Bankability of Renewable Energy Projects

7. Major Role-Players within the Industry (Market Participants)

8. Conclusions

Bibliography

TABLE OF FIGURES

Figure 1: General Waste Composition, 2011 (percentage by mass)
Figure 2: Hazardous Waste Composition, 2011 (percentage by mass)
Figure 3: Unclassified Waste Composition, 2011 (percentage by mass)
Figure 4: Annual Electricity Supply and Consumption, SA, 1980-2010

TABLE OF DIAGRAMS

Diagram 1: WTE Value Chain
Diagram 2: Electricity Generation and Distribution in SA
Diagram 3: Green Economy Mechanism
Diagram 4: Requirements for Bankability Agreements

TABLE OF TABLES

Table 1: General government policies applicable to the WTE industry
Table 2: Landfill Gate Fees in the Large Metropolitan Municipalities
Table 3: Lifespans of Landfills within the Large Metropolitan Municipalities
Table 4: Proposed Banning
Schedule of NEM-WA Regulations
Table 5: Basic Overview of SA WTE Technology Landscape
Table 6: Production and Landfilling Quantities of Selected Wastes in SA (Adapted from DEA)
Table 7: Potential Energy from Municipal Waste Originating in Densely Populated District Municipalities
Table 8: General Waste Generation and Usage Figures (tonnes) from the DEA Waste Baseline Report (DEA, 2012)
Table 9: National Treasury WTE related PPP projects, 2011
Table 10: Tender Procedures within the SA Business Environment
Table 11: Funding Options

ACRONYMS

B-BBEE Broad-Based Black Economic Empowerment
BRICS Brazil, Russia, India, China and South Africa
CEF Central Energy Fund
CER Certified Emissions Reductions
CO Carbon Monoxide
CPI Consumer Price Index
CSR Council for Scientific and Industrial Research
DBSA Development Bank of South Africa
DEA Department of Environmental Affairs
DST Department of Science and Technology
DTI Department of Trade and Industry
Erg SA Electricity Governance Initiative of South Africa
EIA Environmental Impact Assessment
EPC Engineering, Procurement, and Construction
ESSETA Energy Skills Education Training Authority
FET Further Education and Training
GF Global Environment Facility
GEF Green Energy Efficiency Fund
GHG Green House Gas
GTM Greenshoots Million Time
ICBC Industrial and Commercial Bank of China
IDC Industrial Development Corporation
IPAP Industrial Policy Action Plan
IPR Independent Power Producer
LGSETA Local Government Skills Education Authority
LGED Local and Regional Economic Development
LME Manufacturing Competitiveness Enhancement Programmes
MERSETA Manufacturing, Engineering and Related Services Skills Education Training Authority
MFMA Municipal Finance Management Act (16 of 2003)
MQA SETA Mining and Minerals Sector Skills Education Training Authority
MRAA Municipal Systems Act (56 of 2000)
MCIEC National Development Plan (1 of 1999)
NCV Net Calorific Value
NDP National Development Plan
NECSA South African Nuclear Energy Corporation Ltd.
NERSA National Energy Regulator of South Africa
NGK New Growth Path
NSSD National Strategy for Sustainable Development
NwMS National Waste Management Strategy
PFMA Public Finance Management Act
PPA Power Purchase Agreement
PPP Private Public Partnership
The recent developments in the South African policy environment give a strong notion of the acknowledgement of the needs and benefits that transformation into the integrated green economy can bring. South Africa (SA) generates millions of tonnes of waste annually, with the primary method of waste disposal being landfilling. Less than 10% of South African municipalities generate electricity from landfill gas Waste-to-Energy (WtE) processes, and only the larger municipalities that realised the economies of scale have so far implemented WtE projects. SA is still in its infancy when it comes to WtE, but shows definite interest which will be raised to a necessity with increased environmental pressure and regulations. The landfill-only culture of SA is disappearing and giving way to “green technologies” comprising an array of waste management methods and technologies. There is a high demand for waste recycling, reduction in volumes of waste to landfill, as well as more economical solutions that reduce waste disposal while providing energy in the large urban conurbations. This ultimately leads to greater volumes of municipal, commercial and industrial waste; waste of a different complexity and composition, such as different types of plastics, and increased opportunity for waste management and recovery technologies. Social and economic factors followed by government regulations are the key drivers behind the development of the WtE industry in SA. The available surface space of landfill sites in the more densely populated urban areas are declining. Furthermore, skills shortage and lack of Research and Development (R&D) investment in the industry are additional barriers to growth of the sector. Despite these constraining factors, there are numerous opportunities to be captured.

CONSIDERING THE EXPERTISE OF THE DUTCH COMPANIES, THE AREAS THAT OFFER THE GREATEST POTENTIAL FOR GROWTH AND SUBSEQUENT OPPORTUNITIES FOR MARKET ENTRY INCLUDE, INTER ALIA:  
- Variety of urban waste management technologies.  
- Waste separation/recycling and waste conversion technologies (e.g. refuse derived fuel).  
- WtE skills transfer.  
- WtE solutions for industries (agro processing; automotive and components manufacture; plastics; chemicals; pulp and paper; bio-fuels; and extractive industries).  
- Out-of-the-box WtE solutions for:  
  - Remote and industrial areas, e.g. in the forestry sector and mining industries.  
  - Small and medium-scale farming activities.

1 Figures from http://www.ippre-newables.co.za/#page/303

The Dutch WtE sector is already advanced and equipped with the necessary experience and know-how. Therefore the opportunity exists for these Dutch companies to implement their WtE applications in SA. Dutch companies could potentially form a partnership with South African companies in the form of a Public Private Partnership (PPP).

The SWOT analysis of the WtE industry in SA is evaluated below:

<table>
<thead>
<tr>
<th>STRENGTHS</th>
<th>WEAKNESSES/ THREATS</th>
<th>OPPORTUNITIES</th>
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</table>
| - Significant quantities of landfilled waste and untapped waste resources.  
- Access to relatively advanced banking and financial institutions.  
- A developing regulatory and legislative system.  
- Declining air space of landfill sites in the metropolitan municipal areas.  
- Shortages in electricity supply.  
- Greenhouse gas reduction initiatives.  
- Policy including the National Waste Management Strategy (NWMS) and the Department of Energy (DoE) Independent Power Producer (IPP) programmes that allocated 25MW to electricity to be derived from landfill gas and 12.5MW to be derived from biomass. | - Bureaucratic challenges when dealing with national, provincial and local government.  
- Opposition from environmental and citizen groups that can lead to delays in issuing of environmental authorisations and licences.  
- WtE systems require large investments. | - Supply of waste concentrated mainly in the larger municipalities (Cape Town, Pretoria, Johannesburg, etc.)  
- Increasing cost of coal and electricity creating a demand for alternative energy sources.  
- Households and light commercial waste equal to more than 5 million tonnes per annum (2012).  
- Small-scale out-of-the-box WtE solutions implemented on farms/ remote areas or in the forestry and mining industries. |
SA was ranked 14th in the world in 2011 for Green House Gas (GHG) emissions, emitting a total of 369.4 million tonnes for that year (3). This large quantity of emissions is due to the relatively high energy intensity of the national economy and its reliance on coal as the primary energy source. The energy crisis in 2008 fuelled public awareness of the need to use energy efficiently. In light of this, SA recognised the need for transformation and the shift towards a more resource efficient low-carbon economy that can lead to new sources of growth and compliment economic reforms that support greater competitiveness (4). Government has become increasingly committed to a more environmentally sustainable economy in all sectors through a range of policies and programmes to minimise emissions and maximise the efficient use of energy. The following sections outline the prominent policies and regulations that directly or indirectly promote the development of the WtE industry in the country.

1.1 General Policies

The overall WtE trend in the country stems from government’s focus on greening the economy and improving energy efficiencies. The most important general policies that will have a direct or indirect influence on WtE in SA include the following:

- **The National Development Plan (NDP) 2030, 2011**
  - The NDP is a long-term economic strategy encompassing political and social development objectives.
  - The NDP sets out steps that aim to transform the South African energy system and reduce greenhouse emissions. The target is set up to procure 20 000MW of electricity from renewable energy by 2030 and entrench an economy-wide carbon price by 2030.

- **The Energy Efficiency Strategy, 2008 – FIRST REVIEW**
  - The Energy Efficiency Strategy is the first governmental document that guides the development and implementation of energy efficiency practices in the country. The strategy is aimed at reducing the energy demands of industrial and residential locations through education and rollout of novel technologies that could be used onsite to supplement their energy demands. On-site energy production could fall into this classification especially if it uses waste already present or produced on site.
NEW GROWTH PATH (NGP) FRAMEWORK, 2010

• The NGP is a policy aimed at enhancing growth, employment creation and ensuring that the country’s benefits are shared equitably by all citizens.
• The development of the green economy is identified as a facilitator for employment creation, whereby 400 000 additional jobs are targeted to be created in the green economy by 2030.
• The NGP Framework asked for the development of codes for commercial buildings to reduce energy use and waste and called for the promotion of greater investment by the private sector in green technologies.

NEW GROWTH PATH: ACCORD 4. GREEN ECONOMY ACCORD, 2011

• The Green Economy Accord is an outcome of the social dialogue on the NGP Framework and is a commitment signed by government, organised labour, business, and community constituents.

NATIONAL STRATEGY FOR SUSTAINABLE DEVELOPMENT AND ACTION PLAN (NSSD), 2011 – 2014

• The NSSD is a proactive strategy that regard sustainable development as a long-term commitment, combining environmental protection, social equity and economic efficiency with the vision and values of the country. The strategy calls for the diversification of energy sources and implementation of energy efficiency programmes, encouraging investment in renewable energy.
• The strategy promotes the implementation of green cities and towns, event greening and tourism.

MUNICIPAL SYSTEMS ACT 2000 (ACT NO. 32 OF 2000) (MSA)

• To provide for the core principles, mechanisms and processes that are necessary to enable municipalities to move progressively towards the social and economic enhancement of local communities, and ensure universal access to essential services that are affordable to all.
• The MSA involves the planning and implementing of municipal service delivery, that include waste management, as well as the upgrading, extension and improvement of these services.

MUNICIPAL FINANCE MANAGEMENT ACT NO. 56 OF 2003 (MFMA)

• National Treasury’s primary objective is to secure sound and sustainable management of the financial affairs of government, national, provincial and local, and to lead such policies and reforms. This entails supporting the development of a coherent approach that assists in the improvement of delivery of services to communities.
• The MFMA states that a municipality may enter into a PPP agreement, only if the municipality can demonstrate that the agreement will, a) provide value for money to the municipality; b) be affordable for the municipality; and c) transfer appropriate technical, operational and financial risk to the private party.

1.2 Industry Regulations

The rules and regulations that (foreign) parties who wish to enter the SA market must be aware of and adhere to are specified in this section.
### General Socio-Economic Policies

<table>
<thead>
<tr>
<th>POLICY</th>
<th>OVERVIEW</th>
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<tbody>
<tr>
<td><strong>ENVIRONMENTAL</strong></td>
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<tr>
<td>The National Environmental Management Act (NEMA) 107 of 1998</td>
<td>These acts are for the requirements of all environmental legislation in SA, covering air quality, waste, water use, and general environmental impacts. The focus is on environmental responsibility and steps to take with operating facilities that pose a potential risk to the environment.</td>
</tr>
<tr>
<td>The National Environmental Management: Waste Management (NEM:WA) Act 59 of 2008</td>
<td>Any hazardous waste classification, handling and disposal will have to comply with the steps listed in the requirements stated in this series of documents.</td>
</tr>
<tr>
<td>The National Environmental Management: Air Quality Act (NEM: AQA), 2008</td>
<td>One of the suggested treatment options includes incineration that could be combined with power generation.</td>
</tr>
<tr>
<td>Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste, 1998</td>
<td>The White Paper focuses on pollution prevention at the source so as to minimise the impact on the receiving environment and rehabilitation of degraded environments.</td>
</tr>
<tr>
<td><strong>ECONOMIC</strong></td>
<td></td>
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<tr>
<td>Industrial Policy Action Plan (IPAP), 2012/2013</td>
<td>An overall policy to guide industrial development and focus resources on identified critical sectors to improve the local economy and job market.</td>
</tr>
<tr>
<td><strong>ENERGY AND ELECTRICITY</strong></td>
<td></td>
</tr>
<tr>
<td>REIPPPP, 2011</td>
<td>REIPPPP replaced the Renewable Energy Feed in Tariff programme where prospective producers of sites with capacity over 5MW must bid and the producer with the lowest feed in tariff wins. The bidding is done bi-annually. This could provide a potential source of financial and operational support for certain technologies (onshore wind, concentrated solar thermal, solar photovoltaic, biomass, biogas, landfill gas, small hydro, and small projects).</td>
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<tr>
<td></td>
<td>A separate programme called The Small Projects IPP Procurement Programme is currently being developed for projects under 5MW. The DoE issued Request for Information documents for small-scale renewable energy projects (15 June 2012).</td>
</tr>
<tr>
<td><strong>WASTE MANAGEMENT</strong></td>
<td></td>
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<tr>
<td>South Africa's National Policy on the Thermal Treatment of General and Hazardous Waste, GN. R. 777 of 24 July 2009</td>
<td>This policy document presents government's position on thermal waste treatment as an acceptable waste management option in SA, and provides the framework within which the following thermal waste treatment technologies shall be implemented in the country: (i) The incineration of general and hazardous waste in dedicated incinerators or other high temperature thermal treatment technologies, including but not limited to pyrolysis and gasification.</td>
</tr>
</tbody>
</table>
The National Waste Management Strategy (NWMS), 2012

(ii) The co-processing of selected general and hazardous wastes as alternative fuels and/or raw materials in cement production.

- NWMS is a legislative requirement of the NEM:WA. The purpose of the NWMS is to achieve the objects of the NEM:WA. Organs of state and affected persons are obliged to give effect to the NWMS.
- Waste management in SA faces numerous challenges and the NWMS provides a plan to address them.

Although SA has a developing policy and regulatory framework, the South African Government does not promote the waste management hierarchy. The implementation of significant components of policy and laws are lacking. This is mainly due to limited government capacity.

### 1.3 Regulatory Environment - Licensing

The South African environmental legislation is well developed and comprehensive, regulating both the natural as well as the spatial and social aspects of the environment. More pertinent to the recovery of waste. SA legislation regulates every single aspect of WtE including water and effluent, waste recovery and disposal, emissions to air and air quality, biodiversity and land-use compatibility, visual impact and sense of place. The NEMA prescribes the over-arching environmental legal framework within which inter alia industry, waste managers and all spheres of government in SA operate. Several specific environmental acts (SEMAs) have subsequently been promulgated under NEMA to specifically regulate among other the air quality and waste management. The most pertinent of the SEMAs to the WtE sector are NEM:AQA and the NEM:WA.

Regulations published under the NEMA, NEM:AQA and NEM:WA respectively provides guidance to would-be investors and waste managers on their environmental legal obligations towards potentially establishing a WtE facility in SA. The said regulations contain inclusive lists of activity descriptions and associated thresholds that provide the trigger mechanism as to whether a proposed projects or any aspect thereof requires environmental authorisation from a competent authority to proceed.

**Depending on the Proposed Technology, Generation Capacity and Waste Stream Concerned, any Proposed WtE Facility in SA May Typically Require One or More of the Following Three Authorisations/Licences:**

- **NEMA EIA Regulation Environmental Authorisation:** triggered by various activities potentially associated with significant impacts. In the case of the WtE sector these triggers relate to electricity generation capacity, combustion/thermal processes and emissions to atmosphere and changes in land use amongst others.
- **NEM:WA Waste Activity Regulation Waste Management License:** required for various activities concerning handling storage recovery or treatment of waste created on the producer’s site or elsewhere.
- **NEM:AQA Air Emission License:** required for any air emissions from the combustion or thermal process and/ or recovery of wastes.

With respect to the EIA requirements, projects applying non-thermal technologies to general waste streams (e.g. digestion) and producing less than 10MW of electricity will not require a basic assessment. Facilities producing between 10MW and 20MW will require a basic assessment. However, in the case where more than 20MW of electricity is generated a full Scoping and EIA process is essential. Basic assessment pertains to smaller-scale activities that are considered less likely to have significant environmental impacts and, therefore, do not require a full-blown and detailed Scoping and EIA. A Scoping Report requires a description of the proposed activity and any feasible and reasonable alternatives, a description of the property and the environment that may be affected and the manner in which the biological, social, economic and cultural aspects of the environment may be impacted upon by the proposed activity. It comprises of a description of environmental issues and potential impacts, including cumulative impacts that have been identified and details of the public participation process undertaken. The Scoping and EIA process culminates in the development and submission of the EIA report and the Draft Environmental Management Plan to the Department of Environmental Affairs (DEA) for hazardous waste treatment and power generation projects participating in the REIPPPP or provincial environmental authorities for general waste and power projects not participating in REIPPPP.

For more details on activities that require EIA authorisation refer to the NEMA EIA Regulations (GN. R. S43 of 18 June 2010).
The Scoping and EIA process would typically take 12 to 18 months to conclude and require funding in the order of R500 000 to R1 750 000 to complete (including professional fees and disbursements). The cost depends on both the size and complexity of the project as well as the sensitivity of the receiving environment. Actual expenditure on the EIA process would ultimately depend on the level of complexity in the air dispersion modelling/assessment. This is required to determine a proposed project’s potential impacts on existing ambient air quality in the area of influence, as well as the nature and extent of public participation required to ensure that potentially interested and affected parties are afforded due opportunity to participate in the EIA process. WtE projects may bring about the need for specialist hydrogeological and/or soil impact studies that requires an application for a Water Use Licence (WULA) in terms of the provisions of the National Water Act, 1998 (Act No. 36 of 1998)[NWA].

In instances where WtE projects concerns combustion or thermal treatment of waste, the so-called NEM:AQA stack emission limit regulations will apply. These regulations outline the regulated stack emission limits for the specified pollutants. These limits may be made more conservative at the licensing authority’s discretion, in instances where ambient air quality is already poor. Government Notice 1210 of 2009 and 486 of 2012 gives the regulated ambient air quality limits in SA for the stated pollutants. The performance of any proposed facility/technology would need to be demonstrated/modelled to comply with these limits; where stack emissions would typically be modelled at regulated limits.

*For more details on stack emission limits refer to NEM:AQA stack emission limit regulations as set out in Government Notice 248 of 2010, 31st March.*
Waste management practice in SA historically has had access to freely available land, characterised by low density settlements and arid conditions with abundant supplies of coal. This has translated into very limited incentives to divert commercial, industrial and municipal waste streams away from landfill and towards waste management alternatives. This is in contrast with countries such as the Netherlands. The landfill-only culture of SA is no longer sustainable and SA is now slowly taking up “green technologies” and hereby comprising an array of waste management methods and technologies. Although waste management practices are starkly contrasted between urban and rural local authorities, there is a high demand for waste recycling, reduction in volumes of waste to landfill, as well as more economical solutions that reduce waste disposal while providing energy in the large urban conurbations. Materials Recovery Facilities (MRFs) already gaining ground in SA and the next step is certainly the introduction of appropriate and sustainable WtE plants that incorporate Mechanical Biological Treatment, composting or anaerobic digestion with separate collection and recycling.

WtE projects are enabled by various push and pull factors, most notably by land availability and landfill space. Both typically causing increases in landfill gate costs. Pull factors are typically electricity sales and avoided disposal costs. This has translated into very limited incentives to divert waste streams away from landfill and towards waste management alternatives. Furthermore, despite advances in emission control and stricter emission regulations, public perception is that anything that requires combustion still produces significant emissions and may be opposed as incineration of waste. In the case of incineration activities there is opposition from certain environmental groups arguing that the only real sustainable solution is zero waste which is only achievable through minimisation and recovery practices.

In the case of municipal waste management, both waste collection and disposal is largely implemented by the local municipalities with private waste management undertaken in commercial and industrial sectors. Waste from commercial and industrial sectors may be accessed through private waste supply agreements. A PPP with the municipalities is necessary in all instances where a private developer will engage with a local authority to source waste over a long-term period and also where the local authority is to take equity in the project. However, such a PPP is not required if only a technology is supplied or advisory services are offered to a local authority.

The volume of MSW gathered annually and that is currently disposed of to landfill is given in Table 7. When the current electricity constraints and the potential for waste to be used to generate energy are considered there is a substantial scope for the development of WtE plants. However, it is only recently that landfill space has become scarcer; competition for land more intense and electricity more expensive that the WtE projects have become feasible. A case in point is landfill gas power generation projects that have only recently become viable with Cleaner Development Mechanism (CDM) credits.

Eskom generates approximately 95% of electricity used in South Africa and approximately 45% of electricity used in Africa. Eskom generates, transmits and distributes electricity to industrial, mining, commercial, agricultural, residential customers and redistributors. Additional power stations and major power lines are being built to meet rising electricity demand in South Africa. Eskom will continue to focus on improving and strengthening its core business of electricity generation, transmission, trading and distribution (5).

Delays in the construction of new power stations have left Eskom with a generation deficit and the economy constrained by electricity shortages. Eskom is currently under pressure to generate sufficient electricity to the increasing demand brought about by economic development and continued urbanisation.
COMPANIES WISHING TO IMPLEMENT WTE TECHNOLOGIES IN SA HAVE VARIOUS OPTIONS TO SELL ELECTRICITY GENERATED INTO THE SA ECONOMY, NAMELY:
• To the national electricity grid controlled and operated by Eskom which supplies:
  • The public through either national and/or municipal grids
  by competitive bids in the REIPPPP (where municipal waste
  is deemed as biomass in terms of the DoE REIPPPP) and the
  off-take agreement being secured by successfully bidding
  in this programme.
  • To a third party by means of an electricity off-take power
    purchase agreement (PPA) and a wheeling agreement
    (with Eskom).
• To a municipal electricity grid which supplies:
  • The public municipal grids by off-take and PPA being
    secured by successfully negotiating a PPP.
  • A third party by means of an electricity off-take PPA and a
    wheeling agreement with municipalities that would normally
    be serving a third party.
• For own/ internal use or by off-take and PPA over the fence to a
  third party in a so called energy island at industrial complexes
  served with internal electrical reticulation.

IN SUMMARY:
• The primary method of waste disposal of municipal as well as
  commercial and industrial waste in SA is landfilling. Increasingly commercial
  and industrial wastes are being recovered. The extent to which
  this is taking place however, is not certain as the reporting of waste
  handled, transported, recycled and/or recovered is not currently legislated.
• At present incineration is applied in specific industries for the
  destruction of hazardous waste but not always
  directly linked to WTE. This happens either
  through mass burn 
  incineration or through
  refuses derived fuel
  projects.
• Less than 10% of South 
  African municipalities
  generate electricity from
  landfill gas WTE processes,
  and only the larger metro
  municipalities that realise
  economies of scale have
  so far implemented 
  WTE projects. These
  include Johannesberg,
  Tshwane, eThekwini and 
  Ekurhuleni that have 
  projects in various stages
  of planning, construction
  and implementation.
• SA thermal WTE is still 
  in its infancy stage and 
  the majority of projects
  are undertaken by a 
  few private companies 
  with a number of local 
  authorities having 
  undertaken pre-feasibility 
  studies to investigate the 
  potential for WTE projects 
  through PPP projects.
• Biological WTE technology 
  in SA is currently limited 
  to the extraction of 
  methane gas from
  landfills, agricultural 
  waste and water 
  treatment facilities.
HAZARDOUS WASTE

Hazardous waste falls under various strict legislative measures as to the collection, storage, transport, processing, treatment, and/or disposal of the waste. The hazardous waste categories as well as their input to the composition are illustrated in Figure 2. There are various categories of hazardous waste arising in SA that may be targeted with WtE recovery including tarry and bituminous waste, waste oils and other organics (both with and without sulphur and halogenated compounds).

2.2 Waste-to-Energy Industry Value Chain

This section presents information that includes the collection and segregation of waste as well as each of the different technologies. The backward and forward linkages are also identified in this section.

The value chain consists of a few actions that fall under the waste hierarchy, of which the WtE process forms part of. It is however essential to analyse the entire waste hierarchy in order to understand the backward and forward linkages involved.
THE DEA REQUIRES THAT:

- The volume of waste generated is reduced.
- Waste that cannot be reduced is reused or recycled.
- Waste that cannot be reused or recycled should be treated or the energy should be recovered before landfilling (7).

**THE WASTE HIERARCHY:**

| Collection | Due to variations in community structures and geographical distribution, the same type of waste collection service will not be appropriate and sustainable across areas/municipalities (i.e. one size does not fit all) (8). Service levels may vary between:
- Kerbside collection.
- Organised transport to central collection points.
- Community transfer to central collection points e.g. medium density settlements.
- On-site and regularly supervised disposal which is applicable mainly to remote rural areas with low density settlements and farms. Waste collection systems must provide for the collection of separated waste as required by the Waste Act (Act No. 59 of 2008). |

| Segregation/Treatment | Waste separation at the source or at receiving destinations is important to improve the logistics and processes that follow. The value added is not easily monetised but wastes which are more valuable to recover for recycling are excluded from the process. |

| Waste Storage | Waste is stored at points of generation before collection. Waste storage systems must allow for separation at source. |

| Recycling of Wastes | Waste is stored at other intermediate facilities prior to final disposal to landfill or prior to the waste being treated or recycled. These intermediate facilities are also known as transfer stations, which are strategically located (8). |

**Logistics**

To ensure an effective Waste Value Chain, sophisticated approaches to issues such as route design and collection frequency as well as vehicle maintenance are required. The purpose of collection points and transfer stations is to concentrate the waste (recycling and volume reduction can also be carried out as required). Concentration and temporary storage make it possible to design a system for more cost effective movement of the waste to the point of final disposal.

**Recovery, Re-use & Recycle**

Besides saving resources and reducing the environmental impact of waste, recycling also has the potential for job creation and is a viable alternative to informal salvaging at landfills. (7)

The WtE process described in the value chain is based on a waste incineration/thermal energy technology process. Pyrolysis and gasification, however, follow a similar basic structure to waste incineration and subcomponents used in the plants are to a greater or lesser extent interchangeable.

### 2.3 Current Status of the Industry

The industry is dominated by three overall trends namely, increased generation of waste firstly through a high urbanisation rate and secondly through economic growth in the commercial, industrial and services sectors coupled to the trend to gradually reduce, recycle and recover waste. Less than 10% of South African municipalities generate electricity from WtE processes. South African thermal WtE is still in its infancy stage and is undertaken by few private companies while Biological WtE Technology in SA involves the extraction of methane gas from landfills, agricultural waste and water treatment facilities. The time-consuming process of registering a project for carbon financing, the lengthy EIA process and local government approval processes coupled with
MFMA constraints as well as the cheaper and easier option of landfilling have led most cities to hold back on the WtE project implementation.

2.4 Landfill Gate Fees and Lifespans

A large number of municipalities and project developers are showing increasing interest as energy costs rise and landfill space constraints loom. Increased competition for land in larger metropolitan areas provides a significant driving force for the implementation of WtE technologies. Currently, WtE projects are still hampered by various factors including low gate fees at landfills, low electricity prices, limited opportunity for combined heat and power (no district heating requirements due to mild climate and sprawling urban development) and the complexity of waste supply and electricity off-take agreements involving municipalities (the contracting of waste supply and off-take of electricity is regulated by MFMA and MSA and requires complex PPPs). It is thus reasonable to expect the large metropolitan municipalities that control large waste streams, and that are running out of landfill air space to be the first movers to implement WtE projects. However most metropolitan municipalities have new landfill construction projects in the pipeline, such as Shongweni and Cato Ridge landfills in eThekwini, Zesfontein in Ekurhuleni, and the City of Cape Town considering sites near Atlantis and Kaibaskraal. Gate fees vary significantly between municipalities and there is no set minimum, apart from knowing that these fees will increase over time as pressure mounts to find disposal alternatives both through legal measures as well as landfill space constraints. Landfill space constraints will impact municipalities differently depending on availability of land for expansion, urban growth rates and effect of waste recovery and recycling initiatives.

The gate fees per ton for municipalities are already minimal, however there are certain municipalities that allow up to a certain weight of waste to be disposed for free as a service to tax payers (in part also undertaken to minimise illegal dumping by members of the public). For example, Ekurhuleni and Cape Town only charge for loads in excess of 1 tonne and 1.3 tonne respectively. eThekwini allows loads of up to 100kg to be disposed of for free and Tshwane allows the free disposal of garden refuse.

2.5 Government Initiatives to Minimise Landfilling

The South African Government has developed The National Waste Management Strategy in order to achieve the objectives of NEM:WA. The first goal of this strategy is to promote waste minimisation, re-use, recycling and recovery.

### TABLE 2: LANDFILL GATE FEES IN THE LARGE METROPOLITAN MUNICIPALITIES

<table>
<thead>
<tr>
<th>LANDFILL GATE FEES (RAND/TON)</th>
<th>EKURHULENI</th>
<th>TSHWANE</th>
<th>JOHANNESBURG</th>
<th>CAPE TOWN</th>
<th>ETHEKWINI</th>
</tr>
</thead>
<tbody>
<tr>
<td>General waste</td>
<td>R118.75</td>
<td>R121.00</td>
<td>R141.72</td>
<td>R353.20</td>
<td>R228.00</td>
</tr>
<tr>
<td>Garden refuse</td>
<td>R61.34</td>
<td>R0.00</td>
<td>R151.82</td>
<td>R0.00</td>
<td>R71.60</td>
</tr>
</tbody>
</table>

5 Obtained through telephonic interviews with different municipalities.

### TABLE 3: LIFESPANS OF LANDFILLS WITHIN THE LARGE METROPOLITAN MUNICIPALITIES

<table>
<thead>
<tr>
<th>LANDFILL LIFESSPAN FROM 2013 (ESTIMATED YEARS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EKURHULENI</td>
</tr>
<tr>
<td>Platkop 23</td>
</tr>
<tr>
<td>Simmer &amp; Jack 4.3</td>
</tr>
<tr>
<td>Weltevreden 11</td>
</tr>
<tr>
<td>Rietfontein 15</td>
</tr>
<tr>
<td>Rooikraal 15</td>
</tr>
<tr>
<td>TSHWANE</td>
</tr>
<tr>
<td>Kwaggasrand 0</td>
</tr>
<tr>
<td>Soshangue 8</td>
</tr>
<tr>
<td>Ondersteapoort 1</td>
</tr>
<tr>
<td>Ga-Rankuwa 8</td>
</tr>
<tr>
<td>Bronkhorst-spruit 13</td>
</tr>
<tr>
<td>Tshwane</td>
</tr>
<tr>
<td>Garstkloof 0</td>
</tr>
<tr>
<td>JOHANNESBURG</td>
</tr>
<tr>
<td>Robinson deep 15</td>
</tr>
<tr>
<td>Kwaggasrand 0</td>
</tr>
<tr>
<td>Hatherley 18</td>
</tr>
<tr>
<td>Ga-Rankuwa 8</td>
</tr>
<tr>
<td>Biscar 1.5</td>
</tr>
<tr>
<td>Cape Town</td>
</tr>
<tr>
<td>Coastal Park 6</td>
</tr>
<tr>
<td>Robinson deep 15</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>EtHEKWINI</td>
</tr>
<tr>
<td>Bicasar 1.5</td>
</tr>
<tr>
<td>La Mercy 0</td>
</tr>
<tr>
<td>Mariahill 5</td>
</tr>
<tr>
<td>Cape Town</td>
</tr>
<tr>
<td>Buffelsdraai 55</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
A NUMBER OF INITIATIVES ARE TO BE IMPLEMENTED IN ORDER TO PROMOTE RE-USE AND RECYCLING INCLUDING:

- The improvement of recycling infrastructure, such as MRF’s and buy-back centres as well as implementing recyclable waste collection systems.
- Awareness campaigns that will promote the separation of recyclables from domestic waste in households and organisations.
- The diversion of certain waste streams from landfills such as organic waste that can be used for compost or biogas digesters.
- Certain waste management activities that promote re-use and recycling of waste will be listed as activities that do not require a waste management licence in terms of NEM:WA, and will simplify those activities by removing regulatory constraints.
- Mechanisms that will facilitate the use of waste that cannot be re-used or recycled in energy recovery projects.

The NEM:WA Draft Waste Classification and Management Regulations propose the banning of certain wastes in landfills. This is expected to create significant opportunities in the future, with the expected date of promulgation being later in 2013. The proposed schedule for implementation of the said regulations is as follows:

<table>
<thead>
<tr>
<th>TABLE 6: PROPOSED BANNING SCHEDULE OF NEM:WA REGULATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous waste with a calorific value of &gt; 25 MJ/kg</td>
</tr>
<tr>
<td>Hazardous waste with a calorific value of &gt; 20 MJ/kg</td>
</tr>
<tr>
<td>Hazardous waste with a calorific value of &gt; 10 MJ/kg</td>
</tr>
<tr>
<td>Hazardous waste with a calorific value of &gt;6% total organic content</td>
</tr>
<tr>
<td>Reclaimable or recyclable used lubricating mineral oils, as well as oil filters, but excluding other oils containing waste.</td>
</tr>
<tr>
<td>Reclaimable or recyclable used/spent solvents.</td>
</tr>
<tr>
<td>Waste tyres – whole.</td>
</tr>
<tr>
<td>Waste tyres – quartered.</td>
</tr>
</tbody>
</table>

SA has WtE projects in the cement industry (waste material fuel replacement or so-called alternative fuels), fluidised bed co-combustion of waste streams, landfill gas to energy, as well as small-scale digestion and biogas generation projects. There are currently a number of municipal WtE projects in the planning stage with EJAs for MSW WtE projects being launched by, amongst others, Envirosure and Interwaste. It is worth noting that these initiatives are led by private sector waste companies that collect commercial and industrial waste and operate landfills of their own.

Although South African municipalities do not have WtE projects (other than landfill gas projects of large metropolitan municipalities), many have a number of other initiatives whereby significant volumes of municipal waste are being recovered through various initiatives ranging from household recycling to MRF’s. A few municipalities in SA have already implemented such facilities. Furthermore, the majority of municipalities require the separate disposal of garden waste from household refuse. Accordingly, waste recovery in SA is tending less in the direction of mass burn incineration and more to include composting, anaerobic digestion and refuse derived fuel processes. Processed of remaining waste-to-fuel (for use on or off-site) is a natural extension to existing pre-recovery processes (including MRF’s) that are already in place in the waste management systems of many municipalities. This however does not preclude mass burn incinerators but may make them less attractive.

The opportunity for Dutch WtE companies is to enter the market in the larger municipalities (Tshwane, Johannesburg, Durban and Cape Town) and to start with small-scale projects at landfill sites. The larger municipalities have the capacity to set up WtE plants.

2.6 Waste-to-Energy Industry Technology Groups in SA

Though there is growing interest in WtE technologies, the few facilities that exist in SA are smaller on-site operations that contribute to the on-site power needs utilising their own waste streams (Table 5).
### TABLE 5: Basic Overview of SA WTE Technology Landscape

<table>
<thead>
<tr>
<th>Technology</th>
<th>Examples</th>
<th>Current Application in SA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Technological Landscape</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement Kiln Co-Combustion</td>
<td>Cement kilns using old tires as an alternative fuel source.</td>
<td>Some kilns have been converted to take advantage of this technology.</td>
</tr>
<tr>
<td>Fluidised Bed Co-Combustion</td>
<td>Co-combustion of site specific process wastes.</td>
<td>Two paper companies currently operate fluidised bed boilers where paper recycling sludge and waste bark are disposed off and energy is captured. The best known example is the atmospheric fluidised bed boiler at Mondi Meriebank. Another project concerns the conversion of the Sappi Tugela Pulp and a Paper Mill from a coal fired boiler to a biomass and coal co-fired boiler.</td>
</tr>
<tr>
<td>Landfill Gas Utilisation</td>
<td>Methane of gasses from landfills are captured and combusted to generate electricity.</td>
<td>Landfill gas from the Bisasar Road and Marianhill landfill sites in Kwazulu Natal (KZN). In Johannesburg a project was completed in 2011 that produced 11MW of energy from five landfill sites. Ekurhuleni has installed landfill gas capture systems at Simmer and Jack, Weltevreden, Rietfontein and Rooikraal landfill sites that are currently only used for the flaring of methane gas. However the municipality is in the process of operating pilot projects to test the feasibility of electricity generation.</td>
</tr>
<tr>
<td>Bio-Digestion</td>
<td>Sewage sludge, small-scale farm wastes, digested to combustible gas.</td>
<td>Some small-scale off grid applications used on farms as well demonstration plants.</td>
</tr>
<tr>
<td>Bagasse Boilers (sugar industry waste)</td>
<td>Bagasse cogeneration of steam and electricity.</td>
<td>In general, sugar mills in SA use the bagasse they produce as a fuel source to operate boilers. A number of sugar producers including Tongaat Hollett, TSB and Ilovo have bagasse energy recovery projects planned.</td>
</tr>
<tr>
<td><strong>Near Future Implementation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluidised Bed Boilers</td>
<td>Refuse or processed municipal WTE via combustion.</td>
<td>Used by paper industries for on-site wastes. Other industries, including the agro-processing and cement sectors are becoming increasingly aware of its benefits for on-site waste management.</td>
</tr>
</tbody>
</table>

### Current Technological Landscape

- **Mass Burn Incinerators**

  - Municipal WTE via combustion.

  - Feasibility studies done, interest shown by private investment companies and municipalities alike (Blue IQ undertook a feasibility study on mass burn in the Gauteng province).

  - Laboratory research performed, pilot-scale required. Afro Energy has shown interest in implementing larger sites.

  - Interest shown by various municipalities where high intensity deforestation of invasive species are or will be done e.g. the Western Cape and KZN.

- **Plasma-Gasification**

  - Beautifuels, research done by the South African Nuclear Energy Corporation (NECSA).

  - Laboratory research performed, pilot-scale required. Afro Energy has shown interest in implementing larger sites.

  - Interest shown by various municipalities where high intensity deforestation of invasive species are or will be done e.g. the Western Cape and KZN.

- **Pyrolysis**

  - Pyrolysis of plant wastes from the Working for Water Programme.

  - Interest shown by various municipalities where high intensity deforestation of invasive species are or will be done e.g. the Western Cape and KZN.

<table>
<thead>
<tr>
<th>POTENTIALLY APPLICABLE</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thermal Waste Gasification</strong></td>
<td>Municipal waste and bio-wastes gasification from various sources.</td>
<td>No commercial or demonstration plants have been constructed and bankability of the technology has not been demonstrated in SA.</td>
</tr>
</tbody>
</table>

Typically, the smaller on-site operations are industry specific, e.g. the largest proportion of these on-site operations utilise waste gas streams to generate steam, such as those from closed furnaces used in steel making which are high in carbon monoxide. Fluidised bed boilers have also been used and some companies are considering installing Organic Rankine Cycle heat engines to extract latent heat from their flue gasses showing that the industry is aware of more recent developments and options.

There are also adaptable technologies available in the cement industry. Some cement kilns have already been converted to process alternative fuels and resources such as old tyres.

Interest has been shown for more centralised or at least non-industry specific operations. This is shown in the NECSA waste-to-fuel plasma research called “Beautifuels” (refer to section 2.7). Additionally, both local and district municipalities have shown interest in WTE on a larger-scale with research focussing on feasibility studies and opportunity identification for renewables and WTE.
On-site power generation from solid, liquid and gaseous wastes are more common, though this rarely supplies power back to the grid due to lower tariffs from such operations. Instead they provide power for their own operations or to neighbouring sites. Small third-party operators sometimes identify opportunities to utilise waste streams for energy generation and operate on-site independent of the site owner and sell the generated energy back to them. The technologies used in these cases are site dependent simple gas fired boilers, internal combustion engines and gas turbines or even Organic Rankine Cycle energy recovery units. These are either purpose built or packaged units and can be obtained from a number of suppliers, both local and international.

There is novel research from NECSA aimed at creating a mobile waste processing platform capable of treating almost any waste stream that generates liquid fuels (See Table 5). The modular design will allow for upgrading of various components as new innovative designs or technologies that become available giving the units a longer lifetime and greater flexibility.

Laboratory scale experiments have proven to be successful and the project, called “Beautifuels” is currently in the pilot scale development with funding being the primary limiting factor. The unit is expected to cost R4.5 million and has a running cost of R500 000 per annum. Waste consumption rates are highly dependent on the fuel type which is used to generate energy. Virtually any type of waste can be used due to the sealed processing unit and the diverse capability of a plasma torch (9).
THE CSIR HAS ALSO DONE EXTENSIVE R&D IN THE WTE FIELD. THEIR R&D INCLUDES THE FOLLOWING:

- Wastewater and sludge management with a view to assess the potential use of domestic wastewater in energy generation in rural communities in SA.
- Review of local and international development and trends in the field of wastewater and sludge management with a view of assessing the potential use of domestic wastewater in energy generation with particular emphasis on low-income communities, informal settlements and remote and displaced rural areas in SA.
- Converting WTE through fluidised bed processing.
- Integrated energy and waste water solutions to solve small town municipal service delivery problems in SA.
- Cleantech Small Medium Enterprise Accelerator Programmes (12).
- Unlocking the resource potential of organic waste: a SA perspective.

R&D CONDUCTED BY GOLDER ASSOCIATES IN SA INCLUDES (13):

- A cellulosic ethanol bio-refinery prefeasibility and feasibility study funded by the National Empowerment Fund.
- A study for assessing the municipal wastes of Gauteng and the potential for recycling and the WTE conversion for the Gauteng Growth and Development Agency.
- A due diligence study for landfill gas resource assessments, environmental authorisations and technical commission and performance testing of nine landfills in SA for landfill gas to energy conversion for EnerG Systems (partnership local energy management company and a UK-based renewable energy company).

The Electricity Governance Initiative of South Africa (EGI-SA) research reveals that renewable energy infrastructure creates more short and long-term jobs than coal and nuclear, which is an important factor in the SA context.

8. http://hdl.handle.net/10204/4163
3 MARKET POTENTIAL

3.1 Potential Energy from Municipal Waste Generation

It is evident that there is an abundance of untapped resources available for a WtE industry in SA. The majority of this will come from municipal waste (newly generated waste or landfills).

Estimated energy values from waste figures were generated using the waste generation model from EScience Associates, census and waste generation data. The total waste originating from densely populated areas (>125 people per km²) were compared to income levels to determine the most likely waste stream distribution of plastics, paper and organics (Table 7). According to the DEA Waste Baseline Report the total industrial waste would be equal to 21% of the municipal waste generated (6).

The overall energy content was estimated for both collected and total generated waste with the energy content of each stream estimated from literature values.

<table>
<thead>
<tr>
<th>PROVINCES AND DISTRICT MUNICIPALITIES</th>
<th>WASTE GENERATED (TONNES PER ANNUM)</th>
<th>ENERGY FROM TOTAL WASTE (GJ/ANNUM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASTERN CAPE PROVINCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alfred Nzo</td>
<td>47 713</td>
<td>144 915</td>
</tr>
<tr>
<td>Amathole</td>
<td>167 942</td>
<td>223 246</td>
</tr>
<tr>
<td>Cacadu</td>
<td>13 983</td>
<td>141 982</td>
</tr>
<tr>
<td>Chris Hani</td>
<td>75 683</td>
<td>34 383</td>
</tr>
<tr>
<td>Nelson Mandela Bay Metro</td>
<td>172 568</td>
<td>389 989</td>
</tr>
<tr>
<td>O.R. Tambo</td>
<td>125 610</td>
<td>65 679</td>
</tr>
<tr>
<td>Ushahlamba</td>
<td>33 823</td>
<td></td>
</tr>
<tr>
<td>FREE STATE PROVINCE</td>
<td>367 813</td>
<td>358 009</td>
</tr>
<tr>
<td>Fesile Dabi</td>
<td>61 258</td>
<td>28 125</td>
</tr>
<tr>
<td>Lejweleputswa</td>
<td>81 898</td>
<td>37 040</td>
</tr>
<tr>
<td>Motheo</td>
<td>11 4232</td>
<td>138 365</td>
</tr>
<tr>
<td>Thabo Mofutsanyane</td>
<td>98 738</td>
<td>162 521</td>
</tr>
<tr>
<td>Xhariep</td>
<td>11 687</td>
<td>1 958</td>
</tr>
<tr>
<td>GAUTENG PROVINCE</td>
<td>1 361 038</td>
<td>530 065</td>
</tr>
<tr>
<td>City of Johannesburg</td>
<td>442 061</td>
<td>82 188</td>
</tr>
<tr>
<td>City of Tshwane</td>
<td>360 788</td>
<td>195 649</td>
</tr>
<tr>
<td>Ekurhuleni</td>
<td>372 573</td>
<td>100 409</td>
</tr>
<tr>
<td>Metsweding</td>
<td>21 747</td>
<td>15 026</td>
</tr>
<tr>
<td>Siedibeng</td>
<td>103 465</td>
<td>121 004</td>
</tr>
<tr>
<td>West Rand</td>
<td>80 406</td>
<td>15 792</td>
</tr>
<tr>
<td>KZN PROVINCE</td>
<td>761 535</td>
<td>546 769</td>
</tr>
<tr>
<td>Amajuba</td>
<td>51 142</td>
<td>47 043</td>
</tr>
<tr>
<td>eThekwini</td>
<td>428 020</td>
<td>186 309</td>
</tr>
<tr>
<td>illovo</td>
<td>29 082</td>
<td>14 200</td>
</tr>
<tr>
<td>Sisoneko</td>
<td>5 708</td>
<td>4 021</td>
</tr>
<tr>
<td>Ugu</td>
<td>35 882</td>
<td>55 166</td>
</tr>
<tr>
<td>UMVungundlovu</td>
<td>92 518</td>
<td>104 598</td>
</tr>
<tr>
<td>Umhanyakade</td>
<td>6 962</td>
<td>11 358</td>
</tr>
<tr>
<td>Umzinyathi</td>
<td>11 659</td>
<td>4 581</td>
</tr>
<tr>
<td>Uthukela</td>
<td>34 417</td>
<td>31 749</td>
</tr>
<tr>
<td>Uthungulu</td>
<td>36 589</td>
<td>30 759</td>
</tr>
<tr>
<td>Zululand</td>
<td>29 557</td>
<td>29 085</td>
</tr>
<tr>
<td>LIMPOPO PROVINCE</td>
<td>805 738</td>
<td>2 026 775</td>
</tr>
<tr>
<td>Capricorn</td>
<td>190 753</td>
<td>472 945</td>
</tr>
<tr>
<td>Greater Sekhukhune</td>
<td>139 585</td>
<td>385 414</td>
</tr>
<tr>
<td>Mopani</td>
<td>197 089</td>
<td>511 792</td>
</tr>
<tr>
<td>Vhembe</td>
<td>187 273</td>
<td>482 728</td>
</tr>
<tr>
<td>Waterberg</td>
<td>90 438</td>
<td>173 897</td>
</tr>
</tbody>
</table>
A general nationwide breakdown of combustible wastes from the Baseline Report is indicated in Table 8.

**TABLE 8: GENERAL WASTE GENERATION AND USAGE FIGURES (TONNES) FROM THE DEA WASTE BASELINE REPORT (DEA, 2012)**

<table>
<thead>
<tr>
<th>WASTE STREAM</th>
<th>GENERATED</th>
<th>RECYCLED</th>
<th>LANDFILLED</th>
<th>RECYCLEDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal Waste (non-recyclable portion)</td>
<td>8 062 934</td>
<td>-</td>
<td>8 062 934</td>
<td>0</td>
</tr>
<tr>
<td>Commercial and Industrial Waste</td>
<td>433 040</td>
<td>359 441</td>
<td>973 599</td>
<td>77</td>
</tr>
<tr>
<td>Organic Waste</td>
<td>3 023 800</td>
<td>1 058 260</td>
<td>1 955 340</td>
<td>35</td>
</tr>
<tr>
<td>Sewage Sludge</td>
<td>673 360</td>
<td>172 784</td>
<td>500 508</td>
<td>26</td>
</tr>
<tr>
<td>Paper</td>
<td>1 734 411</td>
<td>988 614</td>
<td>745 797</td>
<td>57</td>
</tr>
<tr>
<td>Plastic</td>
<td>1 308 637</td>
<td>235 555</td>
<td>1 073 082</td>
<td>18</td>
</tr>
<tr>
<td>Tyres</td>
<td>246 631</td>
<td>9 865</td>
<td>236 766</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 8 indicates that 100% of municipal waste in SA is landfilled at the current stage. The majority of organic waste, sewage sludge, plastic and tyres are also landfilled. There is a vast potential for WtE conversion if only the volumes of waste currently landfilled are considered.

**END-USER ANALYSIS**

TYPICAL AND POTENTIAL WTE END-USERS INCLUDE INDUSTRIES, MEDICAL INSTITUTIONS AND MUNICIPALITIES:

- Industrial End Users: sugar mills and pulp and paper mills are becoming increasingly inclined to reduce operational costs by alternative energy processes. These are WtE technologies in processing their waste products to generate electricity which can be implemented rapidly.
- Institutional End-Users: medical facilities generally process hazardous waste material. The incineration of hazardous waste material is currently being fiercely opposed by environmentalists. However, with the relevant equipment, medical waste material can be utilised to generate energy.
- Municipal End-Users: recent and impending changes to environmental, energy and land-use legislation along with energy-based operational costs may incline municipalities to become the most active market end-user. Municipalities have currently demonstrated a preference to biological WtE technologies.

### 3.2 Market Segmentation

The market segmentation focuses on the market that can be derived from the WtE industry. The primary output conceptually prioritised for WtE is electricity. The electricity market can be summarised as follows:

**ELECTRICITY:**

- Household, industrial, infrastructural and economic growth result in an increasing demand for electricity and reliance on reliable energy sources.
- Eskom cannot meet these demands.
Figure 4 demonstrates that electricity demand in SA has consistently increased from 2010 onwards. Currently, SA is in the situation where annual consumption roughly equals annual generation, however the current MW utilised during peak consumption times exceeds the current MW produced with black outs as a consequence.

Decades of robust economic growth, low electricity prices and lack of investment in power generation in SA have placed the national electricity supply grid under severe pressure. The increasing focus on industrialisation, together with SA’s mass electrification programme to take power into deep rural areas also adds to the higher demand. Electricity supply can hardly meet the growing demand for energy (15). In fact, SA’s energy demand is expected to be twice the current levels by 2030.

The DoE estimates that R 107 billion was needed between 2005 and 2009 to meet the country’s growing energy needs. Eskom has already put forward R 84 billion for this purpose, while the remainder should come from IPP entrants.

In an attempt to finance the cost of major infrastructural projects, Eskom proposed an increase in tariffs. NERSA is, however, concerned about the negative impact that such a rapid increase in tariffs would have on inflation in SA. Eskom has raised the tariffs with more than 20% each year from 2008 onwards. NERSA announced in February 2013 that Eskom can raise its tariffs by 8% over five years, half of the 16% the power utility proposed (16).

It must be noted that further increases would affect both the input costs (energy purchased to operate the plant) as well as output gains (energy sold back to Eskom). As can be seen, there is immense opportunities within the South African electricity sector. SA could use the additional energy generated through WtE to market the area as a “city of energy” in support of local industrial expansion projects.

3.3 Distribution Methods

The diverse products of a WtE facility would need to be distributed to the respective markets in a cost-efficient manner. Various options exist, and are discussed briefly in this section.
ELECTRICITY:
A partnership and/or sales agreement is the simplest means of distributing electricity from the WtE facility. Thus, the options for electricity distribution include:

- The energy generated can be sold to Eskom to be added to the municipal grid, and distributed to households and industries. This is a viable and realistic option for Dutch companies.
- Alternatively, the WtE company could apply for a distributor’s license from the DoE and NERSA and become an energy provider within a certain jurisdiction, selling electricity at rates that support the local development objectives and are aligned with NERSA recommendations.

Initially, however, the preferred option is to enter into an equity partnership with Eskom.

METHANOL:
Currently, methanol produced in SA is sold on the global market. Once a local market for methanol is established, the plant could be expanded to include methanol production. Various distribution options would then exist for methanol. These options include, among other, the following:

- sales of methanol to companies such as Ethanol Africa, SASOL or PetroSA
- establishing a company that sources the needed oils from local farmers and produces its own bio-diesel.

Initially, sales to established bio-fuels operations will be preferred.

STEAM:
Steam can be transferred to the neighbouring factories via piping systems. This option is only suitable if the additional heat-to-energy converter is not adopted and piping systems are in place.

OTHER PRODUCTS:
The metals, minerals and slag can be distributed via road and rail transport. The advantage here is that the purchasers of such products are industries and will, likely be situated near major road and rail routes as most existing industries would have existing mechanisms for obtaining materials.

3.4 Future Developments and Local Interest

Local and district municipalities are particularly interested in processing municipal waste, an avenue also investigated by the private sector. The Gauteng Growth and Development Agency investigated the feasibility of operating a WtE plant in the Gauteng province. The waste would feed from two of SA’s largest cities, Johannesburg and Pretoria. An estimated 300 to 400 tonne/annum of waste could be processed generating approximately 114GW of thermal energy (45.6GW electrical).

SA also possesses some unique resources such as biomass waste from the Working for Water Programme to remove invasive and alien vegetation. This has been identified as a fuel source for WtE fuels specifically by district and provincial municipalities with the focus on having mobile treatment or processing plants that can relocate with the deforestation group. Typically pyrolysis is focussed on in these applications as it is a simple process to produce fuels usable by either local communities or the logging camps where there may not be sufficient infrastructure to utilise electricity.

Typical centralised WtE developments are feasible in and around larger metropolitan areas. Significant opportunity still remains in more remote or on-site applications (typical out-of-the-box applications). In these cases smaller capacity units that generate fuels and energy are used as it is quite attractive to local companies.

It is unlikely that cities will pursue other WtE technologies in the short-term, given the viability of and support for landfill gas projects from the REIPPPP. However, should the REIPPPP be made available to these technologies, it is anticipated that they too will enjoy mass implementation in the country. These WtE technologies will most likely be exploited in the medium term by cities in order to promote their renewable energy profiles.
WASTE-TO-ENERGY IMPLEMENTATION IN SOUTH AFRICA

4.1 Possible WtE Private Public Partnership (PPP) Projects in SA

Projects in preparation, registered in terms of Treasury Regulation 16 and municipal projects registered under the MFMA and MSA, March 2013, are outline below.15

<table>
<thead>
<tr>
<th>DEPARTMENT NAME</th>
<th>PROJECT OFFICER</th>
<th>PROJECT</th>
<th>TRANSACTION ADVISORS</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free State Provincial Government</td>
<td>N/A</td>
<td>WtE Processing Plant</td>
<td>Not yet appointed</td>
<td>Inception</td>
</tr>
<tr>
<td>City of Johannesburg</td>
<td>Makhosazana Baker +27 11 587 4255</td>
<td>Alternative Waste Treatment Technology</td>
<td>Vela VKE; Goldier &amp; Assoc. &amp; SPP Solutions</td>
<td>Procurement</td>
</tr>
<tr>
<td>Elundini Municipality</td>
<td>Chuleza Gotoyi +27 45 352 1085</td>
<td>Solid Waste Management</td>
<td>Ardemus Consulting</td>
<td>Negotiations</td>
</tr>
<tr>
<td>Greater Tubatse Municipality</td>
<td>Marcia Mahlase +27 13 231 7331</td>
<td>Solid Waste Management.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overstrand Municipality</td>
<td>John van Taak +27 28 316 3724</td>
<td>Solid Waste Management.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Cape Town</td>
<td>Barry Coetzee +27 21 400 2992</td>
<td>Alternative Service Delivery Mechanisms for Council’s Composting Plants in Cape Town</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drakenstein Municipality</td>
<td>Mr Ronald Brown +27 21 807 4725</td>
<td>WtE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td>Christo Marais +27 82 551 8316</td>
<td>Bio-Renewable Energy Project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>Southern Cape Coastal Plains.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>Bio-Renewable Energy Project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>North-Eastern Cape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>South-Eastern Cape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>Bio-Renewable Energy Project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>Western Cape Coastal Plains.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>Bio-Renewable Energy Project</td>
<td></td>
<td>Procurement</td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>Eastern Cape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>132kV/40MVA Duma Substation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>Management &amp; operation of electricity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td>Upgrade of Electricity Infrastructure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9: National Treasury WtE Related PPP Projects, 2011

15 The info is available online at: http://www.ppp.gov.za/Lists/PPP%20Project%20List%20master/energy1.aspx
### 4.2 Local Training Opportunities

Establishing WtE plants will directly result into opportunities for training in association with appropriate Skills Education Training Authorities (SETAs) and local institutions.

The different SETAs are concerned with education and training and their aim is to help implement the National Skills Development Strategy and to increase the skills of people in their sector. SETAs would provide an ideal opportunity for individuals to obtain training and knowledge in about the WtE sector.

Expansion opportunities could potentially involve other SETAs, for example Transport (TETA), Tourism and Hospitality (THETA) and other industry-specific SETAs. The various SETAs can assist plant management in developing a Workplace Skills Plan that identifies skills as well as shortfalls in the workplace. Further, if accredited training programmes are utilised by, for instance Dutch companies, a WtE plant can claim a grant (funded by the Skills Development Levy Fund) to cover costs of training. In this way Dutch businesses can contribute to skills development and employment in South Africa.

Interested companies should determine which of the SETAs they would fall under, depending on the main focus area of the company and the training it wishes to provide. The next step is to source a training provider who has the relevant accreditation with the SETA to develop the apprentice or learner. These could be a Further Education and Training (FET) college or a university preferably within the location that the company would like to implement a WtE facility.

<table>
<thead>
<tr>
<th>SOME OF THE SETAS THAT COULD BECOME INVOLVED</th>
<th>INCLUDES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ESETA (Energy SETA)</td>
<td></td>
</tr>
<tr>
<td>• LGSETA (Local Government SETA)</td>
<td></td>
</tr>
<tr>
<td>• MERSETA (Manufacturing, Engineering and Related Services)</td>
<td></td>
</tr>
<tr>
<td>• MQA SETA (Mining and Minerals Sector)</td>
<td></td>
</tr>
</tbody>
</table>

### 4.3 Small, Medium and Micro Enterprises (SMME) Opportunities

SMME opportunities will be developed specifically in the waste collection, transport, construction, and manufacturing industries. SMME opportunities might arise in the waste collection field, for example SMMEs specialising in the collection of specific waste such as e-waste, tyres or mining waste.

Some of these business opportunities are described on the next page (18):

<table>
<thead>
<tr>
<th>PRIMARY COLLECTION AND SEGREGATION OF DRY ORGANICS AND OTHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Collection of reusable plastics and metals etc. for sale in local market.</td>
</tr>
<tr>
<td>• Waste processing and sales of refused derived fuel pellets to biomass power plants.</td>
</tr>
<tr>
<td>• Mobilising construction debris for the production of tiles and bricks.</td>
</tr>
<tr>
<td>• Informal sector participants could collect the waste as a form of income.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SEPARATION OF WET ORGANIC WASTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Production and sale of compost to bio fertiliser firms.</td>
</tr>
<tr>
<td>• Biogas based power generation from sludge for selling it to the grid.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECONDARY COLLECTION AND STORAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Maintenance of transfer stations.</td>
</tr>
<tr>
<td>• High throughput screening of materials for recycling, energy recovery and landfill disposals.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RECYCLING OF WASTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Recyclable commodity transactions from transfer stations.</td>
</tr>
<tr>
<td>• Conversion of processed waste to industrial commodities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TRANSPORTATION LOGISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Transporting solid waste from the source to the landfill or to the processing centres for energy recovery.</td>
</tr>
<tr>
<td>• Revenues from automobile manufacturing and sales to corporate bodies and contract holders etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MSW TO ENERGY RECOVERY</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Production of machineries and equipment for energy recovery technologies.</td>
</tr>
<tr>
<td>• Decentralized technology installations.</td>
</tr>
<tr>
<td>• Income from Certified Emission Reductions (CER’s).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MANAGEMENT OF WASTES AT DUMPSITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Design and construction of secured landfills.</td>
</tr>
<tr>
<td>• Urban landscape development at abandoned landfills.</td>
</tr>
</tbody>
</table>

---

4.4 SWOT Analysis

STRENGTHS:
- Significant quantities of landfilled waste and untapped waste resources.
- Access to relatively advanced banking and financial institutions.
- A developing regulatory and legislative system.
- Declining air space of landfill sites in the metropolitan municipal areas.
- Shortages in electricity supply.
- Greenhouse gas reduction initiatives.
- Policy including the NWMS and the DoE IPP programmes that allocated 25MW to electricity to be derived from Landfill gas and 12.5MW to be derived from biomass.

WEAKNESSES/THREATS:
- Bureaucratic challenges when dealing with national, provincial and local government.
- Opposition from environmental and citizen groups that can lead to delays in issuing of environmental authorisations and licences.
- WtE systems require large investments.

OPPORTUNITIES:
- Supply of waste concentrated mainly in the larger municipalities (Cape Town, Pretoria, Johannesburg, etc.).
- Increasing cost of coal and electricity creating a demand for alternative energy sources.
- Households and light commercial waste equal to more than 5 million tonnes per annum (2012).
- Small-scale out-of-the-box WtE solutions implemented on farms/remote areas or in the forestry and mining industries.

The biggest challenge for companies entering the WtE market is the resistance they are likely to face from local communities that are opposed to having a plant located near their settlement (19). The key concerns for communities are the effects of emissions on public health, the odour and pollution associated with transporting waste for incineration.

The challenges for WtE in SA are analysed on the next page:

17 Figures from http://www.ippre-newsables.co.za/#page/303

CHALLENGE | OPPORTUNITY FOR THE DUTCH SECTOR
--- | ---
TECHNOLOGY CHALLENGES | • Introduce a versatile WtE solution for SA.
- Lack of versatility: many WtE technologies are designed to handle only one or a few types of waste.
- Waste-gas clean-up: the gas generated by processes like pyrolysis and thermal gasification must be cleaned of tars and particulates in order to produce clean, efficient fuel gas.
- Conversion efficiency: some WtE pilot plants, particularly those using energy-intensive techniques like plasma, have functioned with low efficiency or actually consumed more energy than they were able to produce.

STRATEGIC CHALLENGES | • Dutch companies may provide cheaper options due to the fact that the WtE industry in the Netherlands is further advanced.
- Regulatory hurdles: the regulatory climate for WtE technologies can be complex. Firstly there are regulations that may prohibit a particular method of WtE. The electrical grid is also still protected by yet more regulations, presenting obstacles to waste-energy producers.
- High capital costs for large scale applications due to unavailable know-how.
- Complex PPP: arrangements required to secure long term agreement to source waste stream.
- Delays in issuing of Environmental authorisations and licences: due to pressure from environmental groupings opposing incineration.
- Zoning and land ownership issues: relating to PPP arrangements.
- Procurement Processes: within municipalities.

GENERAL CHALLENGES | • Dutch companies could introduce their WtE clean technologies. Public relations will be required to raise awareness about advanced technologies.
- Opposition from environmental and citizen groups, because traditional incineration-based WtE technologies can produce significant pollution from the burning of waste, environmental and citizen groups have often opposed such systems.
- Securing long-term power purchase agreements with municipalities.
- Landfill disposal is still the cheapest and easiest option but not the most sustainable.

DUTCH COMPANIES INTERESTED IN SA SHOULD CONSIDER THE FOLLOWING:
- Determine whether to pursue a small installation on farms or factories or a larger installation as part of a clean-up at landfill sites.
- Get more information on the legislations and regulation with regard to the specific installations.
- Plan according to the strategic challenges with regard to WtE in SA, and allow time for the possible delays.
5 TENDER PROCESS

5.1 Private Sector Procurement Process

The private sector in SA is not obliged to follow a tendering procedure; therefore, the process is relatively flexible. The tender procedures for private entities may differ slightly from one to the other as they are not governed by any legislation and are subject to the tendering processes approved by businesses themselves. The private sector rarely advertises tenders in the media. In most scenarios, either specific companies are invited to tender for a certain project/study/service, or an individual company is selected disregarding the tendering process. In this instance, the companies seeking to tender for projects advertised by the private sector should directly communicate with the local engineering and consulting companies, as well as property developers and management companies or check their respective websites.18

5.2 Public Sector Procurement Process

Government in SA uses the public procurement process as one of the instruments to achieve its socio-economic objectives. As such, this process is governed by the legislative environment primarily through the promulgated Preferential Procurement Regulations in terms of section 5 of the Preferential Procurement Policy Framework Act (PPPFRA) 2000. These Regulations are applicable to public entities listed in Section 2 and 3 of the Public Finance Management Act (PFMA) 1999, which include major public entities, national public entities, national government business enterprises, provincial public entities, and provincial government business enterprises. Government has also released detailed guidelines that outlined the approach followed in the evaluation of tenders.22

On local government level, public procurement is governed by the Local Government: Municipal Finance Management Act No. 56 of 2003 (MFMA). Each municipality needs to formulate and implement the supply chain management policy, which prescribes among others the process of tendering and other competitive type bidding.

Generally, the following should though be considered:

- Goods and services between R10 000 and R200 000 (VAT included) can be procured by municipalities through formal written quotations from a list of prospective providers of goods and qualities maintained by municipalities.
- Goods and services for over R200 000 (VAT included) and long-term contracts must follow a competitive bidding process.

The outline of the tender procedures provided in Table 10 is applicable to tender applications for the public sector. Importantly, these processes will be similar within the private sector tendering procedure whereby entities are progressively emulating government processes.
TABLE 10: TENDER PROCEDURES WITHIN THE SA BUSINESS ENVIRONMENT

**INVITATION TO TENDER**

An invitation for tenders is made to the public by means of an advertisement in local and/or national newspapers. Public Sector contracts can be identified by the following sources:
- Following up contract notices published in newspapers and trade magazines.
- Receiving the government tender bulletin.
- Searching department websites.
- Other online tender notification systems.

**REQUIREMENTS FOR THE SUBMISSION OF TENDERS**

- The tender must include applicable information substantiating the requirements as set out in the advertisement.
- Tender documents must be typed, printed and/or completed in black ink.
- All tender documents with annexes must be signed by a properly authorised signatory of the tenderer.
- The tenderer must confirm that its signatory has the authority of the legal entity to sign the applicable documents by attaching a certified copy of the relevant resolution of the legal entity. Completion of the Supplier Application Form is compulsory. Failure to complete this form will disqualify a bid.

**SPECIFICATIONS AND PRICES**

- No tender will be considered unless it is accompanied by adequate or certified documentation indicating that the goods/services offered comply with the specifications.
- Tenderer must indicate clearly whether prices are firm, are subject to escalation or subject to a particular rate or exchange. In the absence of such information, prices will be regarded as fixed for the full duration of the contract.
- All prices must be quoted in SA currency and must be in accordance with VAT legislation.

**DELIVERING A TENDER**

- Completed tender documents must be submitted in a sealed envelope.
- Tender documents must be posted in the tender box as stipulated in the advertisement, on or before the stipulated cut-off time and date.
- At the delivery point, tenders are opened and respondents are allowed to join the tender opening process. All business tenders in SA are opened in public where the name of the company is announced with the tender prices and associated costs.

**EVALUATION PROCEDURE**

- The tender evaluation criteria and point allocation process are approved by the Tender Committee prior to advertising of the tender.

**CONTRACT AWARDED**

- If awarded the tender, the business is required to respond to the client by confirming their letter of appointment.
- If not awarded the project, the entity can query the reasons against their selection.

**WITHDRAWAL OF A TENDER**

- Tenders must be valid for 60 calendar days, calculated from the closing date of the tender. During this period, a tender may not be withdrawn by the company.
- If a tender accepted by the Tender Committee is withdrawn, the tenderer will be liable for the difference between his/her tender price and that of the next tender that is accepted.
- Any contract awarded on account of false information furnished by the tenderer in order to secure a tender may be cancelled at the sole discretion of the company, without prejudice to other remedies the company may have.
In dealing with the public sector and often in cases with the private sector, companies tendering for projects need to comply with the Broad-Based Black Economic Empowerment (B-BBEE) policy. B-BBEE is an important policy instrument aimed at broadening the economic base of the country and subsequently at stimulating further economic growth and creating employment. The Code of Good Practice that emerged in 2007 provides a standard framework for measuring Black Economic Empowerment (BEE) and requires all entities operating in SA to make a contribution towards BEE objectives.

In general, private companies wishing to do business with any government enterprise or organ of state (i.e. tender for business, apply for licences and concessions, enter into public-private partnerships, or buy state-owned assets) are required to apply the codes and thus obtain a B-BBEE certification. The areas which are measureable for the scorecard of the Code of Good Practice are Ownership, Management, Employment Equity, Skills Development, Preferential Procurement, Enterprise Development and Socio-Economic Development. Each of these is assigned a set of points which are used to determine the B-BBEE rating. A higher number of points assure a higher B-BBEE rating.

The Broad-Based Black Economic Empowerment Act No. 53, 2003 does not contain any specific exemptions for foreign companies doing business in SA. Foreign companies that plan to do business with the South African Government will need to do so through a registered branch office or through a subsidiary. In such a case, the local branch or subsidiary will be subject to B-BBEE legislative and regulatory requirements. When dealing with SA private firms, foreign companies might also experience an increasing pressure to be B-BBEE accredited.

Companies with annual revenue of more than R35 million per annum will be subject to all seven criteria. However, some flexibility is allowed for foreign multinational companies that do business in the country. The Code of Good Practice acknowledges that global practices of some foreign multinational companies might prevent them from complying with the ownership element of the scorecard through the traditional sale of shares to Black SA citizens. In this case, the Codes allow for “equity equivalent” contributions that then count towards the ownership element of B-BBEE. Equity equivalents are approved public programmes or schemes initiated and implemented by the multinational companies, which have been approved by the Minister of Trade and Industry as entitling the multinational companies to indicative points under the ownership segment of the balanced scorecard.

Although no specific exemptions are available to foreign companies, the following should be noted:

- Enterprises with annual revenues of less than R5 million automatically count at a Level 4 B-BBEE contributor.
- Enterprises that earn between R5 and R35 million may rate themselves using only four out of seven scorecard criteria. This means that foreign companies can still score highly in B-BBEE by focusing on human resource development and employment equity, affirmative procurement and social development.
FUNDING OPTIONS AND SUPPORT

6.1 Type of Business Venture

6.2 Bankability of Renewable Energy Projects

A number of funding and support programmes are provided by the SA Government and various organisations. A range of these can be viewed on www.investmentincentives.co.za. The ones that are most applicable to the WtE industry are outlined below.

TABLE 11: FUNDING OPTIONS

<table>
<thead>
<tr>
<th>TABLE 11: FUNDING OPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KZN GROWTH FUND</strong></td>
</tr>
<tr>
<td>A debt-fund, structured as a unique public-private partnership between the provincial government, and DBSA, Standard Bank and the Infrastructure Fund of SA.</td>
</tr>
<tr>
<td>PO Box 1817, Durban 4000</td>
</tr>
<tr>
<td>T: +27 (0) 31 372 3720</td>
</tr>
<tr>
<td>F: +27 (0) 31 305 2547</td>
</tr>
<tr>
<td><a href="http://www.kzngrowthfund.co.za">www.kzngrowthfund.co.za</a></td>
</tr>
<tr>
<td><a href="mailto:info@kzngrowthfund.co.za">info@kzngrowthfund.co.za</a></td>
</tr>
</tbody>
</table>

**LOCAL AND REGIONAL ECONOMIC DEVELOPMENT (LRED) FUND**

The aim of the LRED fund is to provide support to local entrepreneurial partnerships, working in collaboration with local government and other support institutions, to create new economic opportunity that will enable new and better jobs, as well as the promotion of an environment for innovation and enterprise development in the local economy.

www.dedae.gov.za

**SA GREEN FUND**

Lay the basis for the SA economy to make a transition to a low carbon, resource efficient and climate resilient development path delivering high impact economic, environmental and social benefits.

T: +27 11 315 5050
www.sagreenfund.org.za
enquiries@sagreenfund.org.za

**KGN GROWTH FUND**

A debt-fund, structured as a unique public-private partnership between the provincial government, and DBSA, Standard Bank and the Infrastructure Fund of SA.

**GREEN ENERGY EFFICIENCY FUND (GEEF)**

The GEEF supports the introduction of energy efficiency and renewable energy technologies and will ultimately continue contributing to global climate protection while supporting SA economic development and growth.

www.idc.co.za/development-funds/geef
geef@idc.co.za
T: +27 11 315 5176

**PUBLIC PRIVATE PARTNERSHIPS (THE NATIONAL TREASURY)**

A contract between a public sector institution/municipality and a private party, in which the private party assumes substantial financial, technical and operational risk in the design, financing, building and operation of a project.

www.ppp.gov.za
Bridget.Morake@treasury.gov.za
T: +27 12 315 5176

**CENTRAL ENERGY FUND (CEF)**

The CEF includes financing for appropriate energy solutions to meet the future energy needs of SA.

www.cef.org.za
T: +27 11 201 4700

**REIPPPP**

The REIPPPP has been designed to contribute towards the target of 3 725MW and towards socio-economic and environmentally sustainable growth, and to start and stimulate the renewable industry in SA. In terms of this Procurement Programme, the bidders will be required to bid on tariff and the identified socio-economic development objectives of the DoE. The tariff will be payable by the buyer pursuant to the PPA to be entered into between the buyer and the project company of a preferred bidder.

www.ipprenewables.co.za

**GREEN TECHNOLOGY AND RESOURCE EFFICIENCY IMPROVEMENT**

One of the production incentive grants offered under the Manufacturing Competitiveness Enhancement Programmes (MCEP). The incentive offers a cost-sharing grant of 30%, 40% and 50% of the investment to be payable at production up to a maximum of 850-million.

www.investmentincentives.co.za
TMakgothi@thdti.gov.za
T: +27 12 394 1644

27 More info on: http://www.ipprenewables.co.za/#page/303
SOUTH AFRICAN RENEWABLES INITIATIVE (SARI)

SARI has been established to support the rapid and ambitious scaling up of renewables in a manner that delivers economic, social and environmental benefits without incurring unacceptable domestic cost burdens. SARI was launched as an International Partnership by the Government of SA together with the Governments of Denmark, Germany, Norway and the UK, and the European Investment Bank on 7 December 2011 in Durban, during UNFCCC COP17.

THE RENEWABLE ENERGY MARKET TRANSFORMATION PROJECT (REMT)

REMT is a GEF/World Bank funded project launched to help SA eliminate barriers to renewable energy development as it strives to reduce the country’s GHG emissions and reach the renewable energy target of at least 10,000GWh contributions to final energy consumption by 2030. The DoE is responsible for implementing this project and has designated the Development Bank of South Africa (DBSA) as the implementing agent.

THE MANUFACTURING COMPETITIVENESS ENHANCEMENT PROGRAMME (MCEP)

The Manufacturing Competitiveness Enhancement Programme (MCEP) offers a new suite of incentives for existing manufacturers that is designed not only to promote competitiveness in the manufacturing arena, but to ensure job retention in this sector.

ESKOM INTEGRATED DEMAND MANAGEMENT (IDM) SMALL-SCALE RENEWABLE ENERGY PROGRAMME

Small-scale renewable energy interventions have been successfully implemented internationally to promote efficient and sustainable use of energy. The Eskom IDM programme in consultation with NERSA, is piloting the inclusion of small-scale renewable energy solutions to further broaden the scope of optimal energy usage.

Detailed programme resource plan matched to existing resources and gaps impeding programme delivery identified is illustrated in Diagram 3:

**Diagram 3: Green Economy Mechanism**

National implementing agents of Green Economy programmes (matching programmes to funding sources and gaps impending programme delivery identified)

<table>
<thead>
<tr>
<th>INTERNATIONAL DONORS</th>
<th>PUBLIC FINANCE</th>
<th>CAPITAL MARKETS</th>
<th>CLIMATE FINANCE INSTRUMENTS</th>
<th>EQUITY AND VENTURE CAPITAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDC</td>
<td>COMMERCIAL BANKS</td>
<td>DBSA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SARENEWABLESINITIATIVE.wordpress.com
Adele Faassen
info@sari.org.za
T: +27 21 857 6600


Contact pre-ea@minbuza.nl
Contact zuid-afrika@info.agentschap.nl.
6.1 Type of Business Venture

PARTNERSHIPS COULD BE FORMED ON TWO LEVELS:
- Larger stakeholders are included as partners in the holding company, a WtE company in SA.
- Smaller stakeholders could be included as partners on individual plants, for example local municipalities, waste-management companies and local development agencies would be brought in to finance and help manage local plants as the technology is replicated.

PPP (MANAGED BY NATIONAL TREASURY WWW.PPP.GOV.ZA)
SA law defines a PPP as a contract between a public sector institution/municipality and a private party, in which the private party assumes substantial financial, technical and operational risk in the design, financing, building and operation of a project.

OBJECTIVE: encouragement of the private sector to invest in infrastructure in partnership with the public sector.

APPLICABILITY: grants received by the Government and utilised by the tax-payer to effect improvements to state owned property, in pursuance of the terms of the relevant lease agreement with the state.

BENEFIT: the receipt of qualifying government grants is exempt from tax. In addition, a tax allowance is available in respect of such improvements actually effected by the tax-payer. The allowances are 25 years or spread over the period of the project.

TWO TYPES OF PPPS ARE SPECIFICALLY DEFINED:
- The private party performs an institutional/municipal function.
- The private party acquires the use of state/municipal property for its own commercial purpose. A PPP may also be a hybrid of these types.

7.2 Bankability of Renewable Energy Projects

The various role-players in the renewable energy market seem to agree on the importance of bankability but there is no common understanding of its meaning. While banks typically emphasise the impact of stable cash flows on the project’s long-term debt service, equity investors tend to focus on their expectations on investment returns, possible tax incentives and their portfolio strategies. Yet, to ensure a project’s soundness, diligence in legal, technical and economic matters is imperative for both stakeholders.

THE BANKABILITY OF PROJECTS IN TERMS OF THE KEY FEATURES ARE SUMMARISED BELOW:
- Key commercial and legal requirements including fuel/waste supply agreements (requiring a PPP where local authorities are involved).
- Off-take power purchase agreements (PPAs).
- Steam off-take agreements in the case of combined heat.
- Power projects and electricity wheeling arrangements where electricity is sold to a third party via national or municipal grids.

FOUR KEY FEATURES OF A BANKABLE RENEWABLE ENERGY PROJECT:
- Proven technology.
- Reliable fuel supply.
- Revenue certainty.
- Grid connection on reasonable terms.
Financial backing from a renowned bank usually signals dependability to installers and commercial investors and it also gives companies financial security. However, to achieve this greater degree of financial security, manufacturers have to be considered as ‘bankable’, ideally not only by one financial institution, but by a number of banks. The risk focus of banks is rightfully on each product brand and that brand’s ability to manufacture a high-quality product, not on the industry as a whole or a specific category.

<table>
<thead>
<tr>
<th>BANK</th>
<th>INTENTION TO INVEST IN RENEWABLE ENERGY</th>
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<tbody>
<tr>
<td>Investec</td>
<td>Investec’s sector specialists and credit committee will evaluate projects in accordance with additional investment criteria set by the European Investment Bank to ensure that projects deliver environmental benefits and abide by certain businesses, environmental, social and labour practices.</td>
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<tr>
<td>Nedbank</td>
<td>Nedbank is committed to funding several renewable energy projects from landfill gas, to solar and wind turbine power. Nedbank provided the financial backing for approximately 37% of the more than 1.200MW worth of energy capacity represented by all the bids submitted in the first phase of South Africa’s Renewable Energy IPP programme.</td>
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<tr>
<td>ABSA</td>
<td>According to local banks are looking to put together R40bn to R50bn to fund projects for both round one and two of the South African Renewable Energy Initiative (SARI). While Standard Bank gave an underwriting commitment of R19.1bn for the renewable project, Absa Bank also decided to give an underwriting commitment of R10.1bn.</td>
</tr>
<tr>
<td>Standard Bank</td>
<td>Standard Bank Group has signed an R20bn funding support agreement for renewable energy projects in SA with the Industrial and Commercial Bank of China (ICBC) in March 2013 (16).</td>
</tr>
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The major role-players are envisioned to be the waste management sector that currently undertake landfilling and treatment operations and are thereby best situated to take advantage from WtE projects. The three largest waste management companies in SA are Enviroserv, Interwaste Holdings and Wasteman.

Government role-players are the DEA that sets environmental and waste legislation, the DoE who governs the energy policy and the DTI who promotes more energy efficient programmes within various industries. Metro and district municipalities with large population groups could also be included due to the large volumes of waste these municipalities generate. These include for example, Cape Town, Johannesburg, Durban, Pretoria, etc.

There are also numerous smaller role-players involved in on-site WtE generation, general environmental and waste management services provided from feasibility studies up to implementation. The contact details of some of these role-players are listed in an annex which can be obtained through the Netherlands Embassy in Pretoria.
The WtE market is still in its infancy stage in SA due to low landfill costs and high capital investment required for WtE plants. Opportunities exist for Dutch businesses that offer advanced clean technologies that correspond well with the SA context. Differentiation needs to be made between public and private sector WtE projects as waste types, technologies, project structuring and drivers to implement WtE differs.

PPPs are important in developing WtE projects that involve municipal waste typically collected by local authorities. SA has advanced environmental legislation that governs WtE both in terms of waste management requirements as well as air emissions requirements. WtE initiatives, however, still face challenges such as public opposition due to a fairly strong anti-incineration lobby. The Netherlands is a world leader in WtE technologies, with experience and know-how in offering environmentally friendly and clean WtE solutions.

Anaerobic digestion of waste materials and other biomass streams are becoming more conventional in the SA market. Thermal treatment coupled to energy recovery is currently dominated by private sector initiatives that generate suitable volumes of waste. As landfill space continues to decline, land suitable for development of landfills are increasingly sought after by other economic activities, an increased shift towards recycling and thermal treatment is clear. WtE is an ideal solution to generate energy from the waste currently in landfills, and the Dutch companies, with their relevant experience and know-how, should partner with relevant SA companies to implement WtE in large South African municipalities.
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