# BIOGAS

*Conversations* around challenges and opportunities

## A report on the first National Biogas Conference

30 - 31 October 2013

Vulindlela Academy, Midrand

energy
Department:
Energy
REPUBLIC OF SOUTH AFRICA

DBSA
Development Bank of Southern Africa

SABIA
SOUTHERN AFRICAN BIOGAS INDUSTRY ASSOCIATION

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# BIOGAS NATIONAL CONFERENCE 2013 – SUMMARY REPORT

## Introduction and Background to the Conference

On 30 and 31 October 2013, the first South African National Biogas Conference took place in Midrand, Gauteng Province, South Africa, under the auspices of the Department of Energy (DoE), Southern African Biogas Industry Association (SABIA) and the Development Bank of Southern Africa (DBSA).

The purpose of this ground-breaking conference was two-fold – firstly, through the deliberations to better inform the South African market of the significant potential of biogas as a renewable energy source; and furthermore to share the experience and knowledge on biogas between international and local experts. The intention was to develop a platform for all stakeholders to promote the biogas industry and increase public awareness about the significance of biogas for the South African economy and its role in the development of Southern Africa.

Ms Nomawethu Qase, from the Department of Energy explained in her introductory remarks, that the Department, would like to establish consensus on the steps that need to be taken to raise the profile of biogas technology, focusing on the roles of Government, Industry, Academia, Research institutions and the Media. She tendered apologies for the Minister of Energy, the Deputy Minister and senior government officials who were out of the country at the time on official business. She extended a special welcome to international guests from India and Thailand.

She explained that the Department has chosen to use the conference route to also assist with launching the Southern African Biogas Industry Association as a first action step towards raising awareness on the potential of biogas technology in South Africa & increasing its uptake. Nomawethu Qase underscored that biogas technology needs to be promoted and incorporated into mainstream energy provision in a sustainable and successful manner. She emphasized that "All South Africans need improved access to energy and it is important that the variety and potential of renewable energy options is acknowledged."

Mr Cyprian Marowa, General Manager Infrastructure and Finance, DBSA delivered the main opening address. He concurred that the main outcome of the conference should be a shared agenda regarding biogas and a commitment to


promoting it. He said it is clear that biogas as a renewable energy source has received little attention, especially when compared to other energy sources.

There has been valuable support from both the World Bank and the DBSA through the renewable energy market transformation programme and it is timely to collaborate with SABIA to convene this critical conference with a focus on raising awareness of biogas as a potential energy source.

In 2010, the South African government embarked on an extensive consultation process of reviewing the national energy supply-demand balance. This was in response to challenges experienced in maintaining adequate and stable energy supply. The role of Renewable Energy (RE) was acknowledged more specifically wind, solar, biomass, landfill and biogas.

The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) requirements were announced by government in 2011 with the intention of complementing the country's existing energy profile, which until now has largely been generated by fossil fuels (mostly coal). This resulted in capital investment of around R110 billion for Renewable Energy initiatives for bidding rounds 1, 2 and 3.

However, it is concerning to note that biogas as a renewable energy source has not been afforded the attention it deserves due to a myriad of reasons discussed later in this report. Thus the Department of Energy in collaboration with SABIA and the DBSA undertook to convene a conference with a focus on raising awareness of biogas as a renewable energy source. Biogas has a significant potential to contribute towards: improving energy security, environmental protection, carbon emission reduction, expanding access to modern energy services as well as the overall South African economy, in respect of job creation, green skills development and local content manufacturing industries.

It is important to know that biogas forms an important component of the overall energy mix in many countries, particularly in parts of South East Asia and Europe, and its technology has advanced significantly. These experiences and technologies can be harnessed by the South African biogas industry in important ways, and draw on the expertise of a wide range of stakeholders such as government, academia, the corporate sector and the media.

The approach to energy provision in South Africa is informed by the Integrated Resource Plan (IRP) 2010-2030 which will be updated on an ongoing basis to reflect the changing needs of South Africa and to learn from the technological and economic changes internationally. The primary aim is to determine long term electricity demand and propose how the demand can be met. In doing so, the IRP needs to find a balance between the various objectives which include affordability; reduction of carbon emissions; water conservation; localisation; and regional development. The Ministerial Determination of 2010 was undertaken in consultation with the National Energy Regulator of South Africa (NERSA) regarding the required New Generation Capacity in accordance with the IRP2010. The first determination provided for procurement of 3725 MW by 2016 across different technologies and includes provision for 100MW Small Projects. The main objective is to ensure private sector participation in energy provision. The Second Ministerial Determination issued in 2012 provides for an additional 3200MW to be procured by 2020. However, the main challenges raised by project developers revolve around a number of factors which fail to stimulate the biogas uptake such as

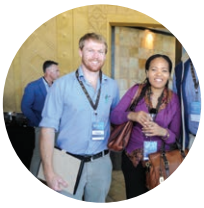
**(i)** the low tariffs offered compared to solar PV/CSP and wind (i.e. R0,94c/kWh versus R2,76c/kWh for Solar PV or R1,15c/kWh for wind,

**(ii)** the fact that the minimum size of projects under the REIPPPP is 1 MW as the average size of a biogas plant would fall between 0.3-0.5 MW, and

**(iii)** the high cost of compiling the bid documents due to the stringent regulatory framework regardless of the project size.

Biogas technology should be incorporated into mainstream energy provision in a sustainable way since the potential benefits include free thermal energy; reduction of greenhouse



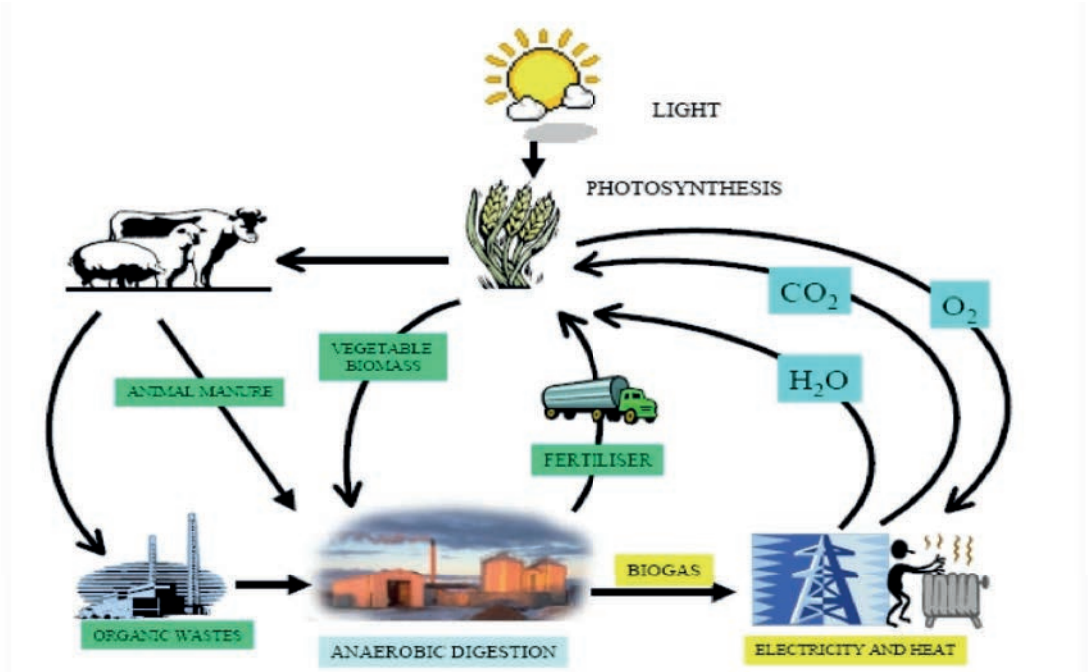




gases and generation of carbon credits. Biogas offers a huge potential for manufacturing and job creation; green skills development and skills transfer and its application stretches from rural households, commercial, agricultural and municipal sectors for heat, electricity and transport. It can be conveniently applied as a modern energy service for off-grid solution.

## What is Biogas?

Biogas, also known as anaerobic digestion, is not a new technology and the first industrial use dates back to 1895 in England. Mr David Cilliers, a representative of Ennovation gave a presentation on biogas basics, explaining that *biogas is an odourless and tasteless methane-rich gas that is generated from waste using a natural cycle, and can also be generated from specially produced crops.* It can be used to replace fossil fuels and is also known as marsh or swamp gas. Most organic wastes when decomposed produce biogas. The benefits of biogas include not only generation of a renewable fuel and source of energy but also responsible waste disposal (sanitation), and production of nutrient-rich by-products for use as fertilizer. The above is particularly true for rural areas, where the use of biogas can result in health and environmental benefits when compared to burning wood for cooking. Anaerobic digestion (AD) is the biological process which produces biogas in tanks also known as digesters. AD occurs in four main phases namely: Hydrolysis, Acidogenesis, Acetogenesis and Methanogenesis. These scientific terms are explained as follows:

- Hydrolysis is the process of reducing proteins, carbohydrates and fats into simple molecules such as amino acids, fatty acids and simple sugars using water. This step is required so that bacteria have the necessary food available to them to perform their functions throughout the different phases.
- Acidification is a process in which bacteria further breaks down organic matter into various acids and ammonia. However, the completion of this step is still not sufficiently suitable for Methane production so one further process called Acetogenesis is required.
- Acetogenesis - is a process where the acids created in Acidification (carbonic acids, alcohol and volatile fatty acids) are further broken down into Acetic Acid, Carbon Dioxide and Hydrogen. Acetic Acid is a product that is suitable for the production of Methane.
- Methanogenesis is a process in which bacteria consume Acetic Acid and produce Methane and Carbon Dioxide which are the two main gasses in Biogas. Some of the intermediate products from the previous steps are also consumed here, whilst other intermediate products will be present in the final gas.




The key process control parameters to consider include temperature, pH, loading rate of organic material, the time spent in the digester, constant solid content as required by the digester, degree of mixing and Carbon-to-Nitrogen (C:N) ratio. Digesters can be installed below or above ground.

## Current South African Context

The first experiment in producing biogas took place in 1957 by Mark Fry. Anaerobic digestion was introduced in waste water treatment facilities in the 1980s. In South Africa there has been only limited market interest when compared to other countries and currently there are only about 300 digesters in operation compared to Germany with over thousands of commercial installations, and India with millions of domestic installations.

Waste management still largely relies on landfills which is the cheapest waste disposal option due to low fee rates and availability of land. However, with the increasing costs of fossil fuel and electricity, there is a growing interest for biogas as a source of cheap and renewable energy, as well as an effective waste management method.

The biogas industry has encountered challenges to its expansion in various forms. For example, securing long term contracts with municipalities is a challenging process and can take several years to finalise due to the complex municipal procurement process. For this reason, many project developers are currently using waste streams generated from the private sector such as farms, abattoirs, etc. Outside of the REIPPPP, the tariffs offered for feeding biogas-produced electricity into the national electricity grid are relatively low, and this reduces the viability of producing commercial biogas.

The costs of environmental and legal compliance are high, over and above the considerable cost of setting up biogas-to-electricity infrastructure, estimated at between R25 million and R40 million per MW. Finally, obtaining financing for biogas projects is challenging because the regulatory framework needs to be made clearer and government commitment to be well defined.

*Professor Harro von Blottnitz, from the University of Cape Town, presented that "the latest biogas technology is readily accessible in South Africa and there are many important opportunities within the economy, particularly in rural areas."* Biogas has many environmental and social benefits aside from direct finance implications, including potentially clean water supply.

## The Regulatory Environment

SABIA on behalf of the industry explained the desire to promote safe and efficient use and supply of biogas within the Southern Africa through focusing on the safety environment and the development of industry standards. It was noted that a new Act that will govern the gas industry is in process, and new norms and standards are being developed for biogas that will ensure safe and efficient use.

Section 28 of the Gas Act No. 48 of 2001 requires the registration of activities, in which a license is not required, with the Gas Regulator at the National Energy Regulator of South Africa. Schedule 1 which is attached at the end of the Gas Act clearly outlines all activities that are exempted from obligation to apply for and hold a licence. For example, small biogas projects in rural communities that are not connected to the national gas pipeline are among the activities listed in schedule 1, therefore they are exempted for an application for a license but these projects must still be registered with the National Energy Regulator of South Africa. Regulation 9 of the Piped Gas Regulations provides timeframes for furnishing such information.

The conference noted that biogas is a renewable resource, and is produced at atmospheric pressure; therefore adopting other fuel standards strictly for biogas would be inadequate. While the biogas industry is relatively new it is growing rapidly and is important for the expansion of renewable energy in South Africa. Biogas, unlike other renewable energy technologies such as wind and solar, can provide base load power. Mr Eddie Cookie, a representative of SABIA, argued that *"ensuring that the highest international standards of safety and efficiency are met will do much to promote the industry and its contribution to national economic imperatives."*

The proposed guidelines are based on current norms and standards of the South African Bureau of Standards (SABS). Compliance with the National Environmental Management Act 1998 (Act No. 107 of 1998) as amended and the National Environmental Management Waste Act 59 of 2008 is also necessary. The conference was advised that the National Environmental Management Waste Act is being amended to simplify the licensing process. It was noted that previously the issuance of a waste license could take up to two years. However, it is important that licenses are granted as quickly as possible as lengthy processes increase the project development costs and discourage investors.

Regulatory compliance is also required for equipment certification, installations practice, sector classification, training and education, international standards, government policy, industry strategy, SABS and SANS standards, and equipment standards, all of which are based on international standards.

Every biogas plant needs a Certificate of Compliance. Because the industry is in its early stages, this provides a unique window of opportunity to contribute to the promotion of an enabling environment. Having good industry regulations in place will ensure that the sector is seen as being credible and will also assist projects to obtain finance.

It is envisaged that ISO standards will be adopted. The SABS already has direct access to ISO standards but can also draw on European and American standards. Standards are also being developed for vehicle fuel from biogas which presents important opportunities for growth particularly in public transport.

## The Importance of Biogas for the South African Economy

There is significant energy potential in biogas which can contribute to meeting energy needs in South Africa, including via simple installations in rural areas that will produce enough energy for cooking and heating. Community based or commercial biogas generation is also possible.

The two kinds of opportunities identified for biogas are 1) rural and/or homestead installations; and 2) large commercial and industrial installations including municipal use. It can be noted that about half of the urban solid waste generated in South Africa is organic by nature and can be amenable to biogas treatment. The applications for biogas production are wide-ranging. For example, there is a significant potential to process agricultural waste including cellulose substrate with AD.

Biogas presents the opportunity of not only generating a renewable source of energy, but also a method to address the needs for sanitation and/or organic solid waste management. Biogas will also mitigate greenhouse gas emissions, as the waste would have previously been disposed off in landfills.

Biogas projects have worked well as public-private partnerships and show that joint social and business innovation can work well, such as in Thailand, Nepal, India and Germany. Mark Tiepelt, from SABIA estimated that the potential value of biogas in South Africa and the monetary value in relation to the market that is presently available is around R30 billion, most of it an investment in the green economy.

According to Raoul Goosen, vehicular biogas also provides an important waste management opportunity since one ton of biowaste is equal to 1000 litres of petrol equivalent and 1000km of $CO^2$neutral drive. Green fuels are well developed in Sweden and India, where many taxis are run using gas bottles.

An important advantage for South Africa would be the potential to create jobs. However, the capital expenditure costs are high and private-public partnerships would be necessary. European Union studies indicate that biogas can work and South Africa is well along the continuum with biogas already being used in some taxis and buses in Gauteng province.

*"From to compost to thermal energy is a process that has significant potential for industrial use."* Biogas can be used to treat any organic wastes such as growing crops, processing crops and agricultural processing. The effluent sludge from the digester is a nutrient rich material which can be used as a fertilizer depending on the level of contaminants in the original wastes treated.

In Denmark for example, certain towns have established co-operative biogas plants that fertilise 80% of agricultural land with effluent from the plant.

Then electricity is sold and heat is pumped to the local town for the central heating system, providing overall thermal efficiency of 90%. This approach is widespread in Europe.

Probably "the most important consideration when promoting the biogas industry is its potential for job creation in South Africa" at a range of levels. A recent Greenpeace Africa study on opportunities for job creation in renewables compared the government's current pathway based on the Integrated Resource Plan for electricity (IRP), published in 2011, to the Green Peace **Advanced Energy [R]evolution.**

The outcome was that the IRP will result in 111 000 direct jobs by 2030, compared to 149 000 direct jobs in the Advanced Energy [R]evolution scenario. In summary, the conclusion is that the transition to clean energy will clearly provide more direct jobs by 2030 in the electricity sector than the continuation of South Africa's current carbon-intensive path.

Biogas has the potential to create jobs mainly in processing the waste, operation and maintenance of the plant as well as through downstream opportunities such as manufacturing of parts/components, and servicing the industry. Economies of scale, as well as a clear regulatory framework are needed that will open up large markets in manufacturing and promote further job creation.

## The case for biogas industry in SA

The South African Department of Environmental Affairs (DEA), and other government departments all have important roles to play in promoting renewables and green energy holistically. DEA has embarked on a Waste-To-Energy flagship programme to evaluate the mitigation potential of waste-to-energy projects in line with South Africa's commitment to reduce its GHGs emissions by 34% by 2020. The Waste-To-Energy flagship programme aims to also focus on the importance of socio-economic development and job creation as these factors cannot be overlooked.

The DEA is keen to work with the biogas industry in promoting opportunities to grow the contribution of the waste sector in support of a green and less carbon intensive economy. The DEA aims to develop a waste management flagship framework with the emphasis on large projects, and information around how biogas can be utilized. Until now the biogas industry has been relatively silent and a collective voice was much needed. Flagship programmes require modelling work, auditing of the current landscape, mechanisms to move to a greener economy, and drawing on green technologies.

*"The biogas industry should conduct a comprehensive audit of what already exists in the country and who the key role-players are."* Current government legislation is important as this will influence project development. Good practice and operating guidelines should be developed, links to municipalities promoted, and a cost-benefit analysis done, drawing on the many international case studies that exist.

DEA has also established the Green Fund as a unique and newly established national fund that seeks to support green initiatives. The Green Fund promotes work around climate change response, waste management, and transition to a green economy. It received an allocation of R800 million from the National Treasury and 2012 proposals contained 20 relevant biogas projects including a project from the Council for Scientific and Industrial Research (CSIR). The intention is to support initiatives with catalytic impact on the sector and that are replicable and scalable. It is important to support knowledge development and the growing knowledge base of the biogas sector is of broad interest, including new biogas legislation.

Ms Puleng Botlhole, from the Department of Trade and Industry (the dti) explained the various grant opportunities offered by the dti. Firstly, *the Manufacturing Competitiveness Enhancement Programme (MCEP) provides green technology and resource efficiency improvement grants suitable for biogas development* to a maximum of R50 million. There is also a grant for Enterprise Level Competitiveness Improvement that requires the business entity to adopt world-class manufacturing practices. The dti supports feasibility studies and is keen to promote collaboration between similar companies and address shared challenges such as supply chain problems.

## International Context

## The United States of America (The US)

There is widespread application of methane from landfill projects. Many American companies get into beneficiation use projects mostly for direct use. The price of natural gas is low in the United States compared to South Africa. The US has more than 600 operational landfill gas (LFG) projects. The US landfills tend to be large and an average of 10 000 tons a day is processed as the US has one of the highest level of waste generated per capita.

Market drivers include low price of natural gas due to oversupply as shale gas has become sought after in the past few years. European market drivers do not apply. Therefore a mix of revenue sources is required.

Current industry drivers include the renewable fuel standard where companies are required to generate a specified minimum percentage of their energy requirement from a renewable energy source which is referred to as Renewable Portfolio Standard (RPS). Offset credits known as Renewable Identification Numbers (RINS) can be traded and biogas qualifies for those offsets in respect of vehicle fuel. This is driving biogas in the direction of vehicle fuel provision. The industry is largely driven by California regulations which are now undergoing revisions.

The US remains a big landfill country compared to elsewhere in the world including South Africa where strong regulatory support is needed for the industry.

## India

Dr A D Karve from Samuchit Enviro Tech, India gave an international perspective on biogas usage in India.

He indicated that India has the oldest biogas industry which started in 1859 near Mumbai. After the Indian independence in 1948, the government propagated biogas technology with generous subsidies on capital expenditure, mainly via a rural programme. There are now 2-3 million plants working in rural areas, which means about two percent of 160 million rural families are using biogas. Reasons for the low uptake are that dung-based biogas is inefficient, since one kilogram (kg) dry dung produces 4000 kilocalories (kcal) if burned directly, but only 200kcal if turned into biogas. Furthermore, dung cakes can be sold easily, whereas biogas has a limited market. In addition, many communities are not keen to use biogas as there is extensive use of Liquefied Petroleum Gas (LPG) in cities which villagers want to emulate.

A domestic digester needs 40 litres of water each day which women have to fetch and this adds to their overall daily burden. Women also often prefer to collect wood to burn as this is done communally and is thus viewed as a social activity and an opportunity to exchange local information.

The experience of biogas in India has shown that to produce biogas from dung is not efficient. However, producing biogas from plant matter can be done successfully – for example 40kg of dung is needed to produce 1 kg biogas, while only 10kg leaves is needed to produce 1 kg biogas. Water is changed every three months, and the undigested leaf matter is used to make briquettes for domestic fuel. These are being installed in hotels, canteens and hospitals, where there is a lot of food waste to be processed.

Domestic digesters also work very well and subsidies are available to promote household uptake. The household can plant 49 square metres of green plants and harvest 1 square metre a day; by the end of 49 days the first metre has regrown for use.

## Thailand

Mr Joost Siteur, Clean Energy Advisors, Thailand gave an international perspective on large scale commercial biogas application in Thailand.

Since the early 1990s Thailand has consistently supported energy efficiency and rural energy and is keen to stimulate energy conservation. Mr Joost Seteur presented that "Thailand has few fossil fuel resources so its government took measures to secure energy supply." The Thailand Energy Conservation and Promotion Act (ENCON) was established in 1992 in order "to support entities in the energy consuming sector in conducting energy conservation measures "The (ENCON) Act requires plants producing more than one megawatt(MW) per annum to undergo an energy audit. Nearly 200 industrial biogas plants were built within ten years as a result of this Act. Biogas has therefore increased energy efficiency and competitiveness for the starch and palm oil mills and financing is readily available.

There is a high level of public awareness as well as education on appliances and labeling so consumers are well informed. The ENCON Fund was established with income from the petroleum fund with the aim of off-setting the import of fossil fuels. Energy must be generated through indigenous resources and there is a 30% subsidy programme via the ENCON Fund, for biogas promotion; tax incentives for companies where for the first eight years a project pays no income tax and for six years 15% and then the regular 30%.

Local banks provide loans for biogas. The Energy Efficiency Revolving Fund (EER) is supported to operate soft loan programmes with commercial banks. The commercial banks then on-lend to their clients. Banks are motivated to participate in this programme in order to retain existing customers and also to become involved in a new income stream of Renewable 10 11 Energy and promote themselves as a green bank.

Mr Joost Seteur, reported that it is important to be aware that *"carbon offset credits currently have limited use"* as the international financial carbon market is no longer accepting proposals "because of the challenges experienced in making carbon revenue from the Clean Development Mechanism (CDM) bankable." Therefore a range of incentives is required.

Biogas can significantly reduce energy costs and mitigate environmental impact. A 2003- 2004 commercial biogas project (Build Own Operate Transfer (BOOT)) required capital expenditure of $4.5 million and provided fixed savings of 20%. There is also an option to switch between biogas fuel and heavy fuel options. This has been very successful and since 2003, 50 plants were installed at starch mills and 60 plants at palm oil mills. There is a sharp increase in biogas power sales. Palm oil mills are energy self-sufficient and there is a constant flow of energy into the grid. Financing was done initially with government grants and the local banks then became involved when start-up funding reduced. There is an estimated investment of $400 to $500 million to date. Driving factors that pushed this development were an enabling regulatory environment and incentives from government as well as a favourable investment climate with political stability and good infrastructure.

Risks to be mitigated relate to feedstock as a crucial element and the quality and assured supply of waste water. Technology designs are important and their relative strengths and weaknesses must be assessed. The system must be able to tolerate fluctuating volume and quality of waste water supply.

Mr Joost Seteur, emphasised that Industrial biogas in Thailand and elsewhere is a mature, viable and bankable technology that is suitable for agro-industries with *"high energy demand, operating within a favourable regulatory environment."*

## Cambodia

Small scale Independent Power Producers (IPPs) in Cambodia provide a strong case for localization in South Africa. When Cambodia emerged from a long civil war in the early 1990s and with limited infrastructure, electricity was not easily available. In the smaller towns and the villages, large numbers of rural energy entrepreneurs using diesel generators sold electricity to their communities and even where the price was relatively high people were always keen to buy. The Cambodia infrastructure improved and government encouraged small independent power producers to formalize their role. They began to license the small producers and regulate the tariffs, which reduced the tariffs over time, and where the grid was being extended they provided access to qualifying entrepreneurs with concessions for their areas, who then bought off grid and sold on. The key point highlighted was that entrepreneurs need stability and long term prospects. People are willing to pay for electricity if they are assured of a long period in which to recoup the investment. Since it is small scale, the regulatory process must be as simple as possible and avoid inhibiting emerging entrepreneurs. Finance issues are important, such as licenses, tax rebates, and exemption from import duty where applicable.

## An Enabling Environment is Required

Mr Michael Federer, a representative of Bio2watt (Pty) Ltd. presented that "Landfill gas projects offer an important opportunity in South Africa to provide renewable energy and to potentially create much needed jobs." It is important that the regulatory environment supports these aims. The biogas sector must speak with one voice. This has been an effective approach with regard to wind power, where the South African Wind Energy Association (SAWEA) has been successful at leveraging both higher tariffs and capacity allocated to wind energy in the REIPPPP. The current start-up period for renewable energy projects in South Africa is 5-8 years which is excessive especially when compared to countries like Thailand.

Biogas is a key sustainable development strategy and does what few other renewable energy technologies do, which is to integrate waste and energy technology. Moreover, biogas could supply heat requirements, and also be fed directly into a natural gas network. This is its key benefit with regard to the national sustainable development framework. The biogas industry needs to dialogue with Government regarding clear and realistic MW allocations in the REIPPPP in order to attract investment and to secure the future of the biogas industry throughout the procurement process. This means that, even if there are no successful biogas projects in the initial bidding rounds or stages, the allocation for biogas will remain available.

At present, NERSA sets prices for various renewable technologies and the DoE set the framework for procuring energy from independent power producers. For example, it is mandatory to have 2,5% of community ownership of a project but these are high capital factors and not factored in when prices are set. Open participation processes are needed to ensure transparency around all possible costs.

Long term assurances are needed such as subsidies, Renewable Energy Feed in Tariff (REFIT) and Renewable Energy Bidding processes based on a 10-15 year horizon since it takes between two and three years to get a project to bankable feasibility. The biogas industry requires a champion that will push its interests more broadly, and SABIA has established itself as that champion for Southern Africa.

There are useful lessons to be drawn on from other countries. In Germany there is an obligation to buy any feed-in RE into the electricity grid. In Asia, there was a bottom-up push to include small IPPs and develop the smaller entities. In South Africa, however, the current local bidding process favours large corporates with strong balance sheets because of the many onerous compliance requirements. For the above reason many project developers have focused on large scale wind and solar PV projects.

*Mr Michael Federer, stressed that "it is of particular importance that the small scale providers are given dedicated support, since this is where the greatest number of new job opportunities will come from."* For example, the DoE is presently re-examining rural electrification. This provides a valuable opportunity to start small-scale local distribution networks with the option of linking to the main grid later. Biogas should be viewed as an exciting option for rural consumers. Eskom should be flexible in its planning so as to ensure that Eskom provision can easily be synergized with off-grid electricity production in the future.

There is a particular need for a large-scale simplified support system for installations below 1MW and a viable industry model must be developed. Alternative ways are needed to support the industry that will be complementary to what is already in place. There is support from government and international donor agencies.

It must be recognized that a high uptake on biogas is unlikely other than with landfill where the risk can be mitigated and profit is guaranteed. Mr Michael Federer, added that *"the rollout of biogas in South Africa is most likely to be stimulated by the real potential in the sector below 1MW."* Yet there are presently fewer than 20 projects to show the viability of the sector in South Africa, and make the banks more familiar with the work of the industry, as happened in Thailand. Banks are currently only interested in 50MW and above due to the onerous regulatory framework.

It is important to shift the negative perceptions and incorrect perceptions that biogas is not a viable business sector. Eskom's greater support for the industry is essential. Funding sources should be consolidated and managed with a very high level of good governance and accountability.

Many projects are too small to be considered for mainstream funding under the REIPPPP programme. Yet start-up costs are high, and even a 1MW project can require up to R30-40 million in investment before production commences.

In contrast, Thailand had a revolving fund where the Development Finance Institutions (DFIs) participated and put together a fund for smaller projects. If everyone contributes to a small generation fund, to fund a cluster of small projects that are similar, this would be more feasible in South Africa.

It may be viable for the biogas industry to combine forces with other Renewable Energy technologies that might have the same developmental issues and common challenges that can be jointly addressed via a small power producer forum.

What is *"unique to biogas is that it is the only renewable energy technology that can be used for all three energy requirements – transport, heat and power"* and it is thus essential to expand its reach.

Project finance is difficult to source unless shareholders provide adequate security. A fund is required that supports administrative start-up costs for the whole biogas industry and takes new projects to feasibility stage. Clear financial models are needed as this will provide the market with some certainty and encourage long term investment. The conference delegates emphasized that there should be a dedicated fund for small scale renewable energy projects. Early on in the Asian processes, many start-ups were short of similar funding and dedicated support was made available in Thailand that supported start-ups to reach feasibility stage.

## South African Case Studies of Biogas Projects

### Community Projects in Giyani

Ms Jotte van Ierland, a representative of Mfuneko Community Support (Pty) (Ltd) presented a case study on the work done in rural villages of Giyani and Richards Bay. The Mfuneko Community Support project provides household biogas as a triple bottom-line non-profit organisation. The products are in line with market demands and work efficiently. The main objective is rural development and Dutch support has made it possible to make the ready-to-cook biogas concept scalable and reproducible. This is currently a pilot project in two municipalities. The digesters are constructed from cement and bricks and are installed below ground. Experience has shown that building individual digesters for each household works best rather than building communal digesters.

At the level of empowerment, the project has created training and skills development opportunities in construction skills, building world class digesters, making tools and it uses locally sourced materials as far as possible. Support from the Energy and Environment Partnership Programme (EEP) which is funded by Finland, the United Kingdom (UK) and Austria has provided opportunities for rural villages to learn skills and provide for their energy needs.

The main advantages are seen in providing cooking opportunities to many poor people, business opportunities, job creation, and where cooperatives are set up there are business opportunities as a group such as billing households for their gas and maintenance.

There is a range of job opportunities available and positive outcomes include improved health, better nutrition and improved food security. Ms Jotte van Ierland, emphasized that even *where the poorest people in a community cannot afford to buy gas,* and have no assets, they are not excluded as they contribute through providing their labour.

### A 3MW Commercial Biogas Digester located in a livestock farm in Bronkhorstspruit

In Bronkhorstspruit near Pretoria, a bio-digester will be built near a large feedlot. The project's aim is to produce a biogas from manure to generate 3 MW of electricity. Expenditure to date reached R135 million and it includes own equity and substantial funding from the Industrial Development Corporation (IDC). The IDC provided 70% debt funding and equity from investors provided the remaining 30%. Wheeling agreements were negotiated with Tshwane Municipality and Eskom and because this this is a new area of work, the negotiation process was quite complex.

It took two years to secure the environmental requirements. Licenses and permits took an additional two years to obtain because the requirements between different departments are not always synergized. There were a number of policy challenges and the legal costs were high. Eight different regulators had to be engaged. Importantly large amounts of money had to be available upfront to ensure that performance guarantees are met. In the end, a power purchasing agreement has been signed for ten years with an independent off-taker.

The Department of Energy (DoE) provided support to this project in various ways and donor funding, for example from the Energy and Environment Partnership Programme was of great assistance in meeting some of the project development challenges.

Mr Michael Federer, a representative of Bio2watt indicated that it is advisable to have skills in project finance, legal assistance, funds for legal advice, and some familiarity with the policy landscape. Mr Federer, concluded that *"the lesson learnt is that the various regulators must consider reducing license costs and simplifying application processes. The industry needs to be supported via a strong policy framework and not through ad hoc subsidy programmes".* Initially it is expected that 12 jobs will be created through the Bronkhorstspruit Biogas Project and this will expand to around 28 jobs.

## A 100KW Biogas Digester in an Abattoir in Jan Kempdorp in the Northern Cape Province

In Jan Kempdorp, near Kimberly in the Northern Cape Province, a biogas plant was built at the local abattoir. Mr Otto Haeger from iBert delivered the presentation. The technology used was developed in Austria and it has been tested over forty years. The main driver behind the technology choice was that the equipment must be convenient and easy to maintain. The system has controlled biological mixing and heating and therefore, there is no cleaning required because it is naturally filtered. The abattoir at Jan Kempdorp has a digester which processes 10-20 tons of slaughter waste a day. On the whole, the system runs on bovine blood, bovine stomach content, bovine slaughter waste and dung waste streams produced at the abattoir.

Extensive on-site training was required for staff to be able to operate and maintain the equipment. The biggest challenge is unstable electricity supply, wherein when the power goes down it damages the sensitive equipment such as the generators.

The cost of setting up the biodigester in Jan Kempdorp was R6 million recoverable over four to five years. The ratio of solid feed to water (or loading rate) is important and the only feed used is abattoir waste. It is very important with all bio-gas projects to ensure that what is constructed works well and there is no reputational risk for the technology.

## Landfill Biogas

Landfill biogas systems are similar to a biodigester but do not involve water as landfills are essentially used a digesters, and 1000 tons of domestic waste per annum generates 1MW of power. Drilling is done into landfill mass and the methane-rich gas is extracted underground. However, any biogas project has some uncertainty about the extent of gas to be extracted because of the variables such as the age of the landfill, the porosity and the original landfill design.

Collecting gas is simple and projects often use a manifold pipe installation. There are also flares or chimneys installed at some sites where the gas is not collected to generate electricity. The gas/energy produced can be used on-site or sold to neighboring users. For example, Alton in Richards Bay sells to BHP Billiton.Plants require minimal supervision once constructed and can be web managed.

*With reference to financing options for biogas projects, Mr David Cornish from Energy Systems acknowledged that South Africa has the highest carbon emissions level in Africa* largely due to the fact that power industry relies largely on coal. China is the largest emitter but per capita emissions are much lower than South Africa. Biogas projects, due to the fact that they are using methane gas, have a potential to be a source of environmental revenue, apart from their other function of reducing waste and energy generation.

Initially methane was sold at 11 Euros per ton, but the current price has decreased to between 30 and 60 European cents per ton. Carbon tax from the South African National Treasury is expected from 2015-7 and could provide an additional revenue stream, but at present carbon credits are not considered bankable in South African financial institutions. There remain many anomalies in the financing of carbon credits and biogas projects.

Landfill gas projects are relatively expensive to set up, and there are more requirements for heat recovery, such as piping and additional heat exchanges and modifications, depending on capacities of scale. An electrical connection can cost R15 million to make it viable, so it is important to conduct many studies at the start of the project to determine feasibility.

Natural compressed biogas also offers a tremendous opportunity as it could be fed into an existing gas network but the existing infrastructure needs to be developed for the potential consumer. Although biogas is an evolving industry, it must evolve at the rate at which the enabling environment evolves.

Currently, the policy and legislative environment is not conducive to promoting landfill gas projects. The policy requirements are onerous and finance deals are complex. The bid process is equally complex. Expensive legal opinions are required even for a stage one bid. Ultimately, these requirements all restrict emerging businesses from entering the biogas industry. The South African government urgently needs to develop a more enabling model.

## Biogas from sewage sludge/waste water treatment works'

The City of Joburg has a bio-digester installed at the Northern Waste Water Treatment Works site which is the only one of its kind that is operating in the country. The combined heat and power (CHP) plant was launched in August 2013, as the first Waste Water Treatment Plant to use anaerobic digestion. Three biogas generators are installed and produce about 1.2MW of electricity. The digester receives effluent sludge from both the primary and secondary tanks where the wastewater is treated and it then makes gas which must be collected to be used, in a closed loop system. The gas is used to generate electricity and the heat generated are for own use.

Some treatment is required before using the gas. The only step to treat the gas is scrubbing or cleaning of hydrogen sulphide ($H_2S$) which can be done for example with iron filings and sawdust, through to biological processes with bacteria.

*Mr Jason Gifford, a representative from WEC (Pty) (Ltd) presented that "Joburg Water spends R100 million a year on electricity"* and if this cost can be offset through own power generation this reduces the electricity bill by 50% and provides an immediate saving of 25% per annum.

Infrastructure required for this process includes digesters, engines such as generators/combined heat and power (CHP), instrumentation and civil works. The digesters which are already in place in most of the water treatment works in South Africa comprise 50% of the capital expenditure. Cleaning waste water is energy-intensive and requires a power supply. Generating power for own use with the sludge generated is a good opportunity to reduce the costs of electricity at municipal level and other industrial/commercial enterprises where there is a significant amount of waste.

The main challenges that occur at waste water treatment works (WWTWs) relate to the fact that biogas production can be highly variable depending on the efficiency of the WWTWs. This requires individual analyses to identify the most appropriate reactor conditions. Biogas plants also require a high level of technical maintenance which is a set of skill that is not necessarily available in many municipalities. A further challenge relates to feeding into the Eskom grid and how to interface between Eskom and own infrastructure when dealing with power after outages.

## Financing Biogas Projects

**The Industrial Development Corporation (IDC)** is one of the institutions that plays a crucial role in financing biogas and other renewable energy projects.

*Mr Raoul Goosen, an IDC official told delegates that the IDC provides developmental finance in alignment with government's imperatives and priorities* although the usual financing terms and conditions apply. The Green Industries Business Unit was established in April 2011 and includes a renewable energies cluster.

The product development life cycle includes concept, first prototype, pre-production prototype, and final product. The IDC provides support from an early stage and there is also an opportunity to link up with the Venture Capital Unit if a proposal has merit.

Project development phases include assessing whether the project lies within the IDC mandate with strong potential for viability. The IDC can also help to take a project to bankable feasibility. This includes pre-assessment, due diligence and then approval of a project.

The three requirements that a biogas project has to satisfy in order for it to be considered for financing are feedstock security, the process for conversion to product, and a demonstrated mandate/market to sell the product. Typical costs range from R15-35 million per MW.

Local challenges include electricity prices being relatively low and limited market for heat and biogas thus being unable to compete, particularly since the lack of access to the grid impacts on uptake opportunities. Project developers tend to have limited experience since the projects are complex and the industry is fairly new. Even for small projects worth around R10 million, having to contribute the required 30% can present a challenge for emerging entrepreneurs. There is also a lack of infrastructure to develop the biogas market for vehicle fuel as a result this market is limited in South Africa. Cost overruns are a challenge and hard to avoid. There are operational challenges often linked to the lack of appropriate skills.

The recommended focus for the IDC is to generate biogas electricity only in peak periods, and not into the grid (in other words for own-use). This includes provision for on-site use such as abattoirs and alternative uses such as vehicles. Hedging strategies are needed, as some of the cost overruns are linked to foreign exchange. The IDC is able to offer a range of schemes of concessionary funding that can be drawn on.

## Eskom's Demand Side Management Initiatives: Standard Offer Programme (SOP)

Funding was provided by NERSA to support small scale renewable pilots until May 2013 and this was ring-fenced funding within Eskom. Eskom would pay project developers R1,20 per kilowatt hour (kWh) generated from a renewable energy source for own-use . The projects are currently being evaluated for viability and it is unclear whether further funding will become available to continue with the projects. The first window of SOP funding was closed when the 20 MW allowance was reached.

There are six specific biogas projects that were selected for support and are in the process of compliance with localization and supply criteria, with a quality plan to be submitted. Once a contract is signed the funds will be committed. Total value for the six projects was R34 million – this leaves R42 million still to be used. Verification is done by the independent audit body of Eskom to assess the output of the projects. Eskom pays only for electricity that is generated.

The Eskom infrastructure can manage this type of initiative and funding model, so if further funding becomes available the project can continue. It was not yet clear at the conference proceedings whether the fund would be continued and what model would be used.

A representative from WEC (Pty) (Ltd) projects, said that *Eskom is able to consider biogas energy as a standard off-grid buyback.* If a producer undertakes more extensive production and sells to grid it can apply for grid access and sell back at the standard NERSA tariff. This is encouraged since the country needs energy and Eskom is keen to supplement.

## The Energy & Environment Partnership Program (EEP) for Southern & East Africa

The EEP programmes around the world promote renewable energy and energy efficiency (EE) projects. The intended outcomes are inclusive innovation, regional renewable energy and energy efficiency projects with market acceptance, business development support, knowledge production and regional networking. The aim is to influence policy formulation in the region and strengthen the regional work of the renewable energy sector.

The Southern and East Africa EEP program operates in thirteen African countries in alignment with the energy imperatives of each particular country in providing support to the private sector but not to government.

The EEP in Africa contributed 25 million Euros in Phase 1 and 35 million Euros in Phase 2, which is being administered by KPMG. It received 1000 applications to five calls for proposals and 108 projects were selected successfully in the portfolio with a total grant allocation of 17,3 million Euros.

The technical viability of the model and business plan is considered in the selection process, but the selection process is stringent because donor funding is being used and must be accounted for. Ms Anne, Councilor of Natural Resources and Energy, Embassy of Finland, emphasised that “the point of the EEP is to support good innovation to begin to entrench a broader approach to renewable energy provision.”

It is viewed as start-up funding, which includes pre-feasibility studies and pilot approaches. It supports new technology as well as provides funding access to the Non-governmental Organisations (NGOs) as part of a business model. It will consider funding global companies but they must have a local partner.

All aspects of energy efficiency and renewables are eligible for support. Biogas and biomass have been the biggest sectors of support. Kenya has the highest number of projects, followed by South Africa, where eight projects are being funded.

To date, the EEP has also supported municipalities as well, and has an interest in promoting public-private partnerships.

The DTI’s Manufacturing Competitiveness Enhancement Programme (MCEP) offered by the Department of Trade and Industry.

The MCEP forms part of a key industrial policy action plan as a financial instrument to assist South African manufacturers to grow the economy. It aims to promote enterprise competitiveness and crucial job retention by funding existing manufacturing entities. The MCEP invests in capital equipment, upgrading of production facilities, and competitive processes and products. This includes greater investment in green technology that will lead to cleaner production and resource efficiency.

*Ms Puleng Botlhole, from the dti, said that competitiveness must be enhanced through skills development and improved information technology systems* that are part of the manufacturing process. The MCEP also funds feasibility studies that are likely to lead to bankable project plans thereby contribute to new investments. It encourages collaboration amongst cluster firms in order to increase productivity and international competitiveness, and offers preferential interest rates.

Challenges identified in the manufacturing sector include increased domestic costs such as electricity and labour, especially when in competition with cheap imports and outdated production methods and machinery.

The size of grant is influenced by the entity size, however, the MCEP can offer up to a maximum of R50 million in grant awards. Bonus funding can be given on the basis of additional jobs being created or 50% local procurement. The criteria for application are stringent in order to ensure the highest level of good governance.

## Summary: Taking the Biogas Industry Forward

The different sources of biogas from waste water treatment works and abattoirs were examined and a wide range of applications (domestic, industrial, transport and municipal) were shared. All the indications are that biogas is a versatile and important technology.

*The international experiences were very informative and therefore important to consider when developing biogas projects in South Africa. At the same time it was clear that* even local experiences can be expanded into other projects, such as biogas use in abattoirs.

There are many different technologies for biogas but the key question to be considered is the development of norms and standards for managing the emerging renewable energy technologies. It is necessary to separate small-scale domestic sector technology relative to larger industrial applications.

Broadly, renewables have a central role to play in the South African economy with all kinds of positive spin-offs. Stakeholders should collaborate to promote and protect the technology and the industry.

Specific areas that must be collectively taken forward include the importance of changing perceptions; funding mechanisms; long term government commitments and the creation of an enabling environment and the creation of a special purpose vehicle as an industry platform.

The key outcome of the conference is the establishment of the National Biogas Platform. Delegates agreed that the GIZ will be requested to facilitate this initiative and provide a central convening point to take forward the learnings and decisions of the conference. The overarching objective is to collectively stimulate and promote biogas as an industry.

It is hoped that the conference can become an annual event that will not only serve to provide a platform for the industry but also the opportunity to assess progress over time in developing this industry that has such massive potential.

## The National Biogas Platform

The Deutsche Gesellschaft für Internationale Zusammenarbeit GIZ is a government-owned entity that promotes sustainable development projects worldwide for the German Federal Government and other public and private-sector clients. It operates in 130 countries and has been in South Africa since 1994. Its main areas of focus are Governance and Administration, Human Immuno-deficiency Virus/Acquired Immune deficiency Syndrome (HIV/AIDS), Energy and Climate. The GIZ has undertaken to support the biogas industry as part of its work around Renewable Energy and Energy Efficiency, which includes projects related to waste-to-energy production; solar Photovoltaic (PV); RE technologies; and the technical aspects of RE integration of renewables into the national grid.

*Ms Sofja Giljova, a representative of GIZ, presented that Bio-waste to energy is important to support because of the potential for job creation and rural employment. Appropriate business models are needed* and the issues that have been raised at this conference are all relevant to taking this work forward.

GIZ is an independent institution with extensive international experience in convening platforms and can adapt international good practice to meet local requirements.

Ms Sofja Giljova, highlighted that GIZ supports the establishment of *a National Platform at the national level that includes stakeholders from both the public and private sectors.* The role of this group will be to address the challenges and barriers that presently exist with regard to biogas project implementation, drawing on lessons learned from the existing projects. It will assess current and future regulatory requirements in order to make the regulations proactive and conducive for the development of the industry. There is no intention to create a separate or permanent institution.

GIZ aims to be a facilitator not a driver, to co-ordinate and document the processes, and to assist in convening regular meetings that will take forward the discussions and outcomes of this conference. The Interim Steering Committee will have the responsibility of drafting a Scope of Work and defining and agreeing on roles and responsibilities of this platform.

## Conclusion

In conclusion, this first national biogas conference which was initiated and hosted by the Department of Energy in partnership with SABIA and DBSA saw encouraging participation from a wide range of stakeholders who engaged proactively with the important issues around biogas. The attendance showed a growing interest on the technology and its potential contribution to the energy mix and development goals within not only in South Africa but also within Southern Africa.

The key outcome of the conference is the establishment of the multi-stakeholder National Biogas Platform to be hosted by GIZ that will provide a central convening point to take forward the learnings and decisions of the conference.

The conference acknowledged that there is a need for an industry body with a mandated constitution, standards and clear goals to work with government to take the industry forward. To this end, SABIA representatives thanked government for initiating this collaboration.

The overarching objective is to collectively stimulate and promote biogas as an industry.

It was explained that the SABIA is a voluntary association and it welcomes the participation of all interested stakeholders. The Association was formed by a core group of interested and affected parties out of a common need for active representation of the biogas industry in Southern Africa. Until recently there has been no single body to represent the interests of the members of this diverse industry segment. That will soon change, and to this end, Mr Mark Tiepelt invited delegates to the first SABIA Annual General Meeting which would also be used to select its nominated representatives to the Executive Committee. It was emphasized that the main goal is to grow the membership significantly.

Since inception, a Steering Committee (Steercom) has been appointed and tasked with directing the association towards the goals of its members. Based on the members feedback, the main focus areas for SABIA will be:

a. Policy and regulation aimed at interacting with Government at all levels to ensure that biogas is correctly managed within the South African context, and not forced into accepting regulations that are not intelligently and specifically designed for biogas.

b. Education & training – aiming at educating both potential users and practitioners to ensure that SABIA establish & maintain a benchmark for the quality of biogas systems in South Africa.

c. Marketing – SABIA aims to increase the awareness of the many benefits that biogas systems offer to the economy, both directly and indirectly.

The Steercom was organized into “nodes” each tasked with a specific area of responsibility based on the above. The various nodes are Regulations and Technical, Administration, Marketing, Public Relations, Website and Market Research

A process was agreed to take the outcomes of the conference to the next level. All the partners affirmed their commitment to take this initiative forward.


DRESSER


BIOGAS

ANNEXURE 1:

## Highlights of Conference Discussion and Comments

**Day One:** **Wednesday 30 October 2013**
**Facilitator:** **Ms Nomawethu Qase, Department of Energy**

1. Hurdles are placed in the way of project development. Speaking as a United Nations auditor for carbon credits, carbon tax is $1-20 per ton escalating 10% per annum to 2019 and waste is not being taxed in the first period, so credits generated can be sold and used as offset to other companies who need a tax reduction.
2. UCT: Costs are very high. Medupi costs R150 billion for 5000MW then they have to buy the coal. Biogas capital expenditure is R15-25 million per MW which is high. What about the value of compressed biogas as fuel, what is the value? If one has a unit of biogas and sold it as electricity what is the differential between those two options? Response: Biogas set up costs are not too high at R35 million per MW and higher but this is not excessive for a waste fuelled plant. It is important to look at R40 million per MW. There are also surrounding factors that reduce that R40 million per MW – such as carbon tax, environmental issues, job creation and fertilizer creation. There is more to it than only electricity generation.
3. On compressed biomethane, there is a concern about the special infrastructure that will be needed. You could not simply go to a regular filling station and fill up a car. Response: The infrastructure needed to make that viable, including upgrades to vehicles must be considered, this is the long term plan. But the point is to learn from countries where this has been done successfully.
4. Gracia: Electricity is one product to get from biogas, there are also energy and cooking benefits. For example if part of the City of Joburg or the Department of Energy can run off-grid this can only be helpful. But electricity is only one product from biogas. Given the recent historical challenges, and global shifts in thinking, biogas is becoming a cheaper source of electricity than Eskom coal at the moment. So context informs.
5. DBSA: Given the high capex of installing plant, and the added benefit of carbon mitigation and waste management, is there a model that one can plug costs into to provide true investment cost in this technology? Response: The biggest problem is carbon credits. That makes it interesting, but not bankable if a project is working only because of carbon tax and credits. A model exists, and we are keen to plug in costs, and need to quantify the benefits to be derived from biogas. The biggest challenge is that regimes were put in place that are now not viewed as bankable. A model of environmental accounting is needed to indicate the financial benefit of adopting biogas in a particular context such as the City of Joburg.
6. GPI Energy: On the sourcing of components from local companies, is the equipment locally manufactured or imported? Response: There are local companies manufacturing digester tanks, for example, but a lot of equipment is imported, although all those manufactures have a South African presence. The technology is readily accessible. There are many expanded opportunities for the South African economy.
7. Regarding the high start-up costs, there is also a challenge in the many variables that play a role in determining the cost of production and cost of plant. Solar panels, for example, are easy to quantify, whereas biogas has many variables, including location, design, linking into the grid and what the feed will be. These factors all impact on determining the overall costs of installation and uptake. This presents a challenge in promoting the product, as there is no generic solution, and every single project is assessed on its own merits. It also makes it difficult to do comparisons.
8. Carbon credits have variable cost structures, and can contribute to a higher cost in relation to renewables. A current large project in the United Kingdom indicates that one way of calculating value is to take the tipping fee as the first income, then power generation which is easily sold in the United Kingdom as there is privatization, then add carbon income on the top, plus waste streams that are being sold. These are good bankable projects when audited.
9. Incoming tools and models need to be assessed and a cost-benefit analysis done. Beneficiation costs should be considered. The first step would be to do a comparison between different types of energy. Biogas has many environmental and social benefits aside from direct finance implications, including - critically - clean water supply.
10. EMBO environmental solutions: Digesters can also be used to fertilise crops in rural settings but what would the impact of pathogens be on crops. These are pathogens that would be found in human waste. Response: This depends on what waste was used and what temperature was reached. A sufficiently high temperature will mitigate pathogens, and one of the benefits of the digestion process itself is to reduce pathogens in waste. Therefore slurry can safely be used on crops without further sterilization needed.
11. Gracia: How good the compost is that is used for land and agricultural use depends on what is put into it at the beginning. Therefore users need to control what they put in, for example no heavy metals as these contaminate. Europe has strict standards on land application of compost for agricultural production. Regarding pathogens, running the digester above 60 degrees Celsius for a certain period will eliminate pathogens but this must be carefully managed. The main thing is to control what goes in.
12. Eslom Consulting: It was mentioned that two jobs are created from every ton of waste sorted at source but this is not adequate information for obtaining mainstream financing. There is presently a limited link to job creation. Response: There are huge benefits that are not sufficiently marketed and that is one of the important areas that this conference should address.
13. University of Venda: It is important to talk about pathogens. While working in rural Limpopo communities to disseminate biogas technology, this is a common question in using effluent as fertilizer and how safe it is, especially human waste. There is also a concern about digesters in rural communities, where compressing gas is expensive, so there would be exposure to hydrogen sulphide smoke. What are the safety issues here? Response: It is too expensive for rural digesters to have a separate cleaning process, but the quantity of sulphide is not large and this is in any event a gas deemed as non-toxic to humans. So small amounts of emissions are not a problem.
14. Eslom Consulting: Biogas projects are well suited to municipalities – for example, Durban has a natural gas project that has drawn on a Public-Private-Partnership (PPP) model. The private sector and international partners should also be involved.

15. University of Fort Hare: Regarding pathogens, current studies where cattle waste rather than human waste is used indicate that most are destroyed in the digestion process. Above 90% of pathogens in the system are destroyed.
16. David Oldfield: Working in school sanitation and rural biogas in the Eastern Cape, there is a big difference in an agricultural digester for rural applications and sanitation requirements in a more urban setting. In schools and public places it may be possible to use own night soil, but when considering mixing the sources of effluent there are licensing issues that require agricultural digesting to be done separately.
17. On UCT presentation: what innovations have emerged from the research to influence biodigester development and address the output concerns based on the variables? Response: South African renewable energy technology lags 20 years behind the rest of the world, and this can also be said for environmental matters generally. Current local problems were solved elsewhere decades before. South Africa spends only 0,1% on Research and Development. Regarding slow innovation – 80% of the risk in business relates to innovation, and how this is marketed, with 20% of risk on the technical side. Innovation is not invention – innovation is socially influenced. Older models of linear technology-driven innovation were expected to be replaced by an organic system of innovation, which is globally regarded as being more appropriate, but this has not happened locally. Biogas is an opportunity to show that joint social and business innovation can work well. Draw on learnings from Thailand, Nepal, India and Germany and make it work locally. The necessary tweaks will happen by speaking to people on the ground.
18. What is the potential value of biogas in South Africa and the monetary value in relation to the market that is presently available? Response: R15-35 million/ MW must be spent to capitalize a project. If the South African government is putting out a call for 1000MW this indicates investment potential of R30 billion which is good for the economy because it is green money.

**Panel Discussion**

**Moderator:** Mark Tiepelt, SABIA
**Panelists:** Mr Raoul Goosen, Industrial Development Corporation; Mr Jan du Preez, BioGas SA and Mr Lovell Emslie - CAE

19. The rural small scale biogas market carries a range of benefits. One good spinoff is improved food security but massive government support is needed in order to implement, similar to the support that has been given to promoting solar heating in new builds. Ways of using the energy must be promoted – the more you use the more efficient the plant will be.
20. Packages in Europe provide combined heating power and both heat and cooling. There are many ways to integrate thermal and electrical power into a good client mix. For example, abattoirs use both cooling/heating and electricity. Start-up costs are high but there are many good models to draw on. For example, effluent and thermal energy can be combined where a large municipal plant would have an excess of heat. The problem with sludge is that heat will reduce volume through evaporating the water.
21. Municipalities are a key stakeholder. What kind of support is the IDC providing to promote biogas? Response: The IDC has prioritized biogas as a key sector and six projects are being funded. Most are below 1MW and there is no secure electricity off-take so this is own-use electricity. Eskom has helped to make these projects work. A combination of heat and power revenue is needed to make a project viable. There are some low interest rate green funding options available including the DBSA Green Fund which finances mostly smaller projects. It is important to find ways to scale up to the bigger projects. The financial viability of projects is often marginal and one needs support of Green Funds and similar. It is a long process yet there must be profitability.
22. Where is the greatest potential for job creation? Response: Biogas is unique because there are many opportunities in maintenance as well as downstream opportunities in agriculture. If agricultural waste is used as a feed stream or crop residue, this also creates opportunities, improves the quality of soil in the country and increases yields. This will not influence food security negatively because only the residue is being used. Work is being done to promote innovation in localization of equipment along the spectrum but more must be done on localization to create jobs. Once rural biogas is rolled out and economies of scale are being achieved that will open up large markets in manufacturing which will influence job creation.
23. How does the IDC consider projects for applicable fuel funding and what are the environmental issues to be considered when applying digester to crops? Response: The IDC requires payback of loans, is flexible on debt, but must ensure that money put in will come back so that can be used to assist others. The social criteria are also important. If the project creates jobs or supports the environment then the interest rate can be reviewed. Furthermore, greener projects create more jobs and the rural biogas digesters and use of product are thus of interest. Of the six projects financed thus far related, five were in South Africa and one in Namibia. There is high potential in neighbouring countries, but in South Africa projects will need to compete with lower electrical costs.
24. Applied Economic Power Solutions: Localization is not practical, but why? The UCT presentation noted that there is a disjuncture between importing the best technology while also needing to localize. Response Lovell: Localization is possible depending on the project. There are also different levels of localization. There is a need to be innovative and develop solutions suitable to the economics in South Africa. It is not always possible to pay back technology that is imported in full because of differences in economies, where income from renewables is higher than in South Africa. However, most projects can achieve 75% localization in South Africa without difficulty.
25. Regarding the kind of digestate, when treating water there is still hazardous waste and some problems are inevitable. This is well managed in Europe but it has taken a decade to develop mechanisms to apply this. Technical updates are needed for farmers who wish to undertake this and specialized equipment will be required. Response: Even in dry areas there is a lot of waste water that can be recycled. Take the effluent out of the water and add necessary chemicals. It would be a challenge if there was no water at all available but there will always be water of some kind.
26. Biogas has both electricity benefits and job creation benefits, but each stakeholder will have different interests and requirements of the sector. How can these be properly managed? For example, when doing waste water treatment,

how is the project defined – whether electricity or sanitation, since each of these will accrue different benefits. Weighing it up against the electricity price only is not enough. There is presently a suite of benefits. Response: This is a challenge in South Africa and we need to promote the technology through education and promotion of benefits. There is no single approach and it must be a group effort.

27. MOG Environmental Solutions: What benefits are derived in rural communities where the biggest challenges other than electricity are sanitation and water? To achieve the anaerobic conditions of the biodigester water is needed but many rural areas are water-scarce. The trend will be to use human waste and agricultural waste, but would the yield be enough to address electricity challenges? For example, if you have 10 households, with a bulk digester, will that suffice? Response: The quantity of biogas is proportionate to quantity and quality of feed stock. Very small applications will not work, and a good number of houses is needed to be involved, for example 100 houses will provide off-grid for about 20% of them.
28. Which biodigesters are most applicable in South Africa? Response: There are so many variables, and no generic answer, as they also need to weigh up the cost of installation relative to expected outcomes and whether the application is industrial or domestic.

### Case studies

### Biogas in Rural South Africa; 3MW Biogas Plant in Bronkhorstspruit and the Abattoir Biogas Plant in Jan Kemp Dorp

29. There is much interesting information about dealing with finance, communities and technologies and how to make big energy models sustainable. Who owns the digesters? Is there a lease programme? Can you start your own digester or are you always dependent on donors? Response: On ownership, Mfuneko is a separate organization working in a local community, the local partner organization is the owner of the digester. Local users pay the lease fee monthly and if we do not get a lease fee we can intervene, that is why it is important to remain in control. As owners there is no profit but there is an interest in sustainability. On finances, the local energy base covers operating costs, but cannot cover capital expenditure. However in the future there could be a market for bioslurry and carbon rights that could generate more revenue.
30. Who owns the system at the abattoir?
Response: An SPV that is 60% America, 40% Ireland owned is the overall owner of the abattoir.
31. Has there been an improvement in sourcing of waste supplies, and are local farmers involved? Response: This is not an issue in rural areas but more a question of distribution. In the average rural village, 15% of people own cattle, and the other 85% must get its waste from somewhere. From village level enough cow dung can be collected to supply 60% of households, so if the distribution can be improved more households can be supplied. The human factor requires discipline and dedication to make the system work. Cow dung could also be supplemented by agricultural waste as there is no shortage of waste.
32. How did the municipalities overcome the three-year MFMA challenge and how many jobs were ultimately created in Bronkhorstspruit? Response: None yet, but when it comes on line there is likely to be 12 to start and ultimately around 28 jobs.
33. What are the costs to set up and run the bio-digester in Jan Kemp Dorp? Response: R6 million which is recoverable over 4-5 years. The ratio of feed is the important thing. Abattoir waste is the only feed. This is similar to what is done in Germany and Sweden with abattoir slaughter feed since dry dung will block the digester.
34. In Giyani, community members pay digester owners R120 a month – how did you come to that amount as it could be more expensive than subsidized electricity? Response: A feasibility study was done in 2007 where it was established that Giyani households spent R170 a month on energy cost for cooking and hot water. The calculations exclude half of households because they do not pay anything, and this project targets those households already paying for energy needs. R170 was not correct but if it was they would save R50 a month.
35. If biogas is shared between households and each has 1 cubic metre daily how is this ensured? Response: There are three households to one digester, and the project will install measuring on single household digesters, there is already funding for this. Only one system has been operational and households manage it themselves with problems. But people are not keen to share and a new approach is needed. One cubic metre a day is adequate, and actual consumption is lower than that. Documentation of lessons learned is needed and is presently being developed.
36. CSIR: Community acceptance is important for rural projects. How long did it take from engaging with the community and how long was the engagement process. Response: it started when living in the area and saw a need. Working For Energy came on board and started a project to build 55 digesters. After community meetings and education, the buy-in improved. I then lived in the community and got to know all the dynamics and tensions. The project then moved to another village that isolated. The promoter there has taken three months to set up 12 digesters which is a good rate of success. It is very important to ensure that what is constructed works well and there is no reputational risk.
37. SABIA acknowledges the important initial work done to establish biogas projects in challenging circumstances and this must be highly acknowledged and appreciated. It is helpful to share these experiences and learn from them.

### Biogas at municipalities

38. Biogas can be used for electricity generation but the process seems complicated. For example, how is the hydrogen sulphide managed? Is it feasible to use biogas? Response: Scrubbing or cleaning of hydrogen sulphide from gas does not need to be complicated, and can use, for example, iron filings and sawdust, through to biological process or ambient air in the roof of the digester which allows the bacteria to work. The approach is project-specific and determined by size of project and the intended use of the outcome. There are many variables Siloxosanes can be chilled or frozen or combined with activated carbon. These processes cannot be detected in the water.

39. What is the biogas quantity that can be obtained from a specific quantity of human waste and what is the correlation? Response: This depends on the food that is consumed. Lots of beans will make lots of gas. In the waste water industry there is a formula of total of volatile solids within the sludge, determined by geographic makeup of sewage flow. For example, if sewage flow is industrial and not residential this will affect the percentage of volatile solids, and it is economically feasible to destroy all of them. However, a reasonable percentage must be removed.
40. Enviro Solutions: What is the point of cleaning the gas component to use it? Response: Gas is flared to claim carbon credits and to assist the municipality in reducing gas migration from landfill sites from an environmental perspective.
41. Is electricity the most beneficial use? Response: The most beneficial is what will bring the biggest economic reward, from a waste water perspective. Joburg Water spends R100 million a year on electricity and if they can offset that through their own power generation that halves their electricity bill. That is a 25% saving immediately per annum which makes sense for them. However, a landfill project will have its own cost savings options to be explored.
42. EnerG: With seven years of experience working with government, it is important to note that the policy and regulations present real challenges to overcome. Vehicle fuel is doable but will also require an enabling policy environment if it is going to be viable for the private sector to consider the fuel generation option.
43. Landfill gas contains between 20 and 30 million ww per MW installed, and there are more requirements for heat recovery, such as piping and additional heat exchanges and modifications, depending on capacities of scale. An electrical connection can cost R15 million to make it viable, so it is important to conduct load studies at the start of the project. It also links to the need to upgrade substations and replacing switchgear. Any system comes down to economics and convenience and whether it is viable or not. Natural compressed biogas must be convenient to the consumer. Biogas will make less money from compressed gas for fuel but the necessary framework must be in place to support this. It is an evolving industry but must evolve at the rate at which the enabling environment evolves.
44. The biological process involves a sulphur breathing bacteria, the bacteria breaks the hydrogen sulphide bond and it then bonds with the water in the system and produces $H^2O$. Hydrogen reacts with what is available. There is no avenue to capture free floating matter inside the molecular structure as this will just take it back to being dirty water.
45. UJ: Why was landfill gas selected since yield would be more from a cattle source? Response: Landfill gas is already there and cheaper to set up. Landfill gas seven years ago was low-hanging fruit, but landfill sites are not accessed that have millions of tons of waste that will produce gas for the next 20 years even if no further waste is added to that site. Anaerobic digesters digesting municipal solid waste will become a reality, such as compressed natural gas for fuels. As the market grows the industry must move with the market.

## Highlights of Conference Discussion and Comments

**Day Two: Thursday 31 October 2013**
**Facilitator: Mr Merlyn Adams, Development Bank of Southern Africa**

1. SABIA: There is a lot of double compliance needed – such as Certificates of Compliance (COCs) which in fact are not applicable if less than 50kpa, if you have a digester and are not using the gas with pressure less than 50m but if above that then a COC is required. Response: This relates to pressure but not to the valve. For example with LPG in a vapour state this will move to a higher pressure, but if there is a digester and nothing flowing out of that and no valve involved then a COC is not required. However, with storage and production of that biogas from a NERSA perspective, where pressures are regulated, even if below 50kpa, then a COC is required and the equipment must be registered.
2. Every biogas plant needs a COC. The standards must be interrogated so as to avoid overbuild. For example, with biogas in industry a stainless steel pipe is needed but if this is in a domestic installation it will be unaffordable. Therefore the industry must work to amend the standards that can benefit the industry.
3. With domestic LPG installation, costs have reduced, this is also linked to improving technologies.
4. Who can issue a COC for biogas? Response: At present no-one can because standards are not decided. Safe engineering principles must be applied in the period while standards are being developed because it links to the industry's reputational risk.
5. The industry must be given its rightful place in South Africa. However, government does not provide an enabling environment at all and this inhibits growth. Everyone must be involved in developing norms and standards as this is key to get the industry to develop and prosper A SABIA mandate is to look at how to be involved in developing regulatory frameworks for local biogas industry. This industry is in its early stages and this provides a unique window of opportunity to contribute to the promotion of an enabling environment. For example it takes three weeks to get a biogas licence in Thailand and three years in SA. The industry regulations being in place will also strongly influence the potential for finance being obtained.
6. How can the SABS be involved in testing equipment or accepting ISO standards, and where will equipment be submitted? Response: ISO standards will be adopted. The SABS has direct access to ISO standards but can also draw on other country standards such as the European and American when writing the standards. For testing there are three test houses in South Africa but only for appliances and not equipment. The manufacturing certificates and international test houses apply.
7. DBSA: From the municipal point, there is a lot of purchasing being done of rapid transport buses and this is an opportunity to ensure the buses are open to use of natural gas. Response: It is a case of compressed biogas or natural gas, at this stage it is a chicken and egg situation. If 100 buses undertake to use biogas then filling stations can be provided but on the other hand, the bus companies want assurance that the filling stations are in place before they go for biogas

options. Any metro will have biogas which can be used for vehicle fuel if cleaned and that could override the distribution challenges. Standards are already being drafted including the point and extent of purification for vehicle fuel. In Europe biogas is cleaned to pipeline quality then put back into the grid and used elsewhere. The gas pipe monopoly ends in March 2014 and this provides an opportunity for biogas use.

8. What is the timeline for meeting agreed regulations. Response: For practitioner installation standards, June 2014 to complete standards. Usually to develop a standard takes 2 years.

**Panel Discussion**

**Moderator:** **Mr Joel Houdet, SABIA**
**Panelists:** **Mr Tony Nkuna, Industrial Development Corporation (IDC); Agricultural Sector Manager Eskom IDM; Ms Anne Tarvainen, Counsellor of Natural Resources and Energy, Embassy of Finland, Pretoria**

9. There was mention made of high legal fees that are incurred during registration of biogas companies. This presents a challenge. Response: Such high fees are the exception rather than rule, and related to a complex project structure. The industry is still developing and greater guidance is needed. The legal fees would not be related to the IDC requirements alone but also to statutory requirements. The IDC can only work on information it is given and it always consults extensively. It is likely that one challenge was the fact that the contractor did not want to accept 100% liability because of how it was structured, so the IDC as a financier cannot lend R100 million without collateral from the contractor. For example, if the contractor builds the plant and it doesn't work what will the IDC have as recourse? This is important because the IDC operates with public funds. The problem could have been mitigated if the developer had obtained quotes with detailed terms of agreement that explain the liability levels being proposed. Often contractors want to undertake a project but don't want to comply with documents related to the project and this can lead to discrepancies within the compliance environment. The IDC can give capital support but cannot ensure operation if there is insufficient compliance. Furthermore, the industry should acknowledge the IDC contribution, since projects would most likely not have been funded by a commercial bank.
10. It is suggested that Eskom should liaise better with NERSA and request funds for various activities within Eskom. Persuade the Regulator that there is a broad need although funding can also come from sources other than public funds. However, the appropriate infrastructure is needed to properly manage the funding.
11. The cost of electricity via biogas is lower than offered by Eskom – what is the lowest PPA that would be acceptable, based on experiences with the six projects funded thus far? Response: One project was in Namibia and five in South Africa, and they are different types –piggery, abattoir, waste, but PPAs cannot be disclosed because of client confidentiality. The PPA was at a premium compared to what the buyer was paying from the municipality.
12. The Eskom SOP programme is an exciting development in the biogas industry and could play a strong role in initiating rollout especially with regard to own use on site – there are many such opportunities in South Africa and the industry welcomes this. If 20MW was approved for projects and it cut off in May 2013 because the 20MW ceiling was reached, there should be sufficient funds to support those programmes further. There seems to be little consistency in the funding application market, so projects apply and then money runs out. This also applies to incentive schemes running out of money. Response: A multi-year determination for funding ended in May 2012. As far as other projects are concerned, there is presently no funding as the assumption was made that SOPs would get more funding than they received. Funding from the Regulator is limited and what can be recovered via tariff is also limited. No money is spent on an initiative until a signed contract is in place. People often make this mistake. Although there is a funding allocation, nothing is confirmed until a contract is signed. The 6 biogas projects were approved earlier this year, and those criteria have still not all been met. There are currently many pipeline projects but if the money is not obtained then projects are put on hold until further funding. We know we will get money at some point and therefore park projects in the meantime but cannot commit funds which cannot be recovered. It is not possible to anticipate what NERSA or Treasury will do.
13. SOP is one vehicle via Eskom. What other options are available to apply for small scale renewables, such as selling direct to the grid. Response: For biogas there is standard off-grid buyback of energy. If a producer goes into big production and sells to grid it can apply for access to grid and sell back. NERSA has a standard tariff. This is encouraged. The country needs energy and Eskom is keen to buy.
14. GIZ supports feasibility studies for waste to energy and biogas, but is the EEP directed at the private sector, or is it also directed to the municipal sector – and can it change for the second phase of the programme? Response: This is a long process and the intention is to reduce direct participation for the next phase, there are changes to hosting of programmes that will speed up processes, with stronger private sector involvement. EEP has supported municipalities as well, but have not yet decided to keep that option open in phase 2. It links to PPPs and the discussion is open and ongoing. In India, there were challenges with digesters in rural areas including issues around water and women's work. Did the implementation model contribute to those challenges? The Giyani model seems to have worked because of consultation – if the model rolled out in India had been different there could have been less resistance. Response: Previously there was enough cattle and dung available, but there was a big shift to the cities, so there are now 50% of the population in urban areas and fewer farmers. There is a lot of mechanization taking place and tractors take the place of cattle, so there is a shortage of dung. The government installed 12 million plants but only 2-3 million are still working. Lack of dung is a problem hence the new design of a plant that works with leaves. Plant 49 square metres of green plants and harvest 1 square metre a day and by the end of 49 days the first metre has regrown for use.

### International Experience

15. In India there were challenges around use of cow dung as feedstock – but are there challenges also in domestic waste since it is acidic? How can the household feedstock be controlled? Response: Other options are high digestible, other than water comes out and this water contains microorganisms as well as gases. What remains behind is the slurry, and those who recycled water saw increased output of biogas, whereas those using fresh water saw less efficiency, so recycling water is the best way to use the biogas system. Furthermore, biogas based on dung produces a lot of slurry which fertilizes the farm – but this is not necessary because soil naturally has enough minerals in it, and only small quantities are needed to be applied to the soil. Thousands of farmers are now using this system of not applying compost but only high calorie non-composter organic matter. This is applied once every three months and yield increases. But there is no guarantee around household waste because the menu changes every day. As people become familiar with using the biogas system, they can predict the outcome better. In India, the flour mills have lots of product falling on the ground, which is sold for animal feed, and we tell people to buy that also so that when there is less material to feed into domestic biogas plants they can put handfuls of flour in to compensate for the lack of material going into the plant.
16. How many jobs are produced in Thailand per MW on commercial digesters? Response: The first commercial project from 2004 employed 60 people, although it could be different for those projects being run in the factories themselves. The factories operate 24/7.
17. On the challenge of converting cow dung directly through burning, and then using this to produce biogas, how efficient is this? It seems to be low efficiency but energy produced is higher, but when converted to biogas it might compensate for the lower calorific energy that is obtained. Response: If you burn dung – 1 kg dung give 4000 kcal per kg, and doing biogas only 200kcal which is almost one twentieth of the energy. But if slurry coming out is mostly green and this can be dried this will also be burnable after further processing.
18. Is it difficult to source the components of the biodigester plant – are components manufactured in the country such as commercial gensets? Response: In India it is fortunate that we manufacture all that is needed and at good cost, there are few imports other than large aircraft. Thailand has a lot of materials available other than gensets and specialized equipment is all available locally. There is also import duty exemption on the equipment for RE projects.
19. Regarding the lagoon cleaning system in Thailand, with the introduction of biodigesters – by what percentage has the lagoon filtration been increased or decreased? Response: In Thailand 99% of organic content of waste water coming out of the factory is used, so there is not a great need for cleansing systems.
20. Regarding the 25% target for 2021 – what is total generation capacity? Response: This relates to use of energy in the country for all uses, currently half of that is being achieved but there is still charcoal use.
21. DOE: In Thailand the CDM route produces a renewable stream, but what were the challenges and barriers experienced? Response: The process of qualifying a CDM project is long and run by the United Nations. There are lot of requirements around standards, so project development had to hire consultants and lawyers to ensure requirements were met. Simultaneously, as biogas took off in the country, the rules changed and projects that had previously qualified for CDM no longer qualified. Conditionality in CDM means you must prove that without CDM revenue your project is not feasible, and CDM carbon revenue is not bankable, as part of a proposal since it is not possible to guarantee or quantify. CDM is now no longer accepting proposals because of international financial market challenges making it non-viable.

### Biogas and small scale renewables

22. DBSA: There is little funding for small hydropower yet there is potential for that in South Africa. Many projects are too small for the DBSA to support. Finding people with a 1MW project that is bankable is difficult. 1MW is R30-40 million in investment before production commences. In Thailand there was a revolving fund, where the DFIs can participate and put together a fund for retail funding access for smaller projects. If everyone contributes to a small generation fund, to a cluster of small projects that are similar, this is more feasible.
23. Combine forces with other RE technologies that might have the same developmental issues. Bigger players have the balance sheet and investment interest will move away from wanting to invest in small South African projects. They will have common problems that SABIA and other small organizations can jointly address via a small power producer forum. The more unique issues will then get attention if the cross-cutting issues like reducing transaction costs are addressed. What is unique to biogas is that it is the only renewable used for all three requirements – transport, heat and power. It is essential to expand the voice of the broader sector.
24. DTI: In the government space and the funding space, there are a lot of different initiatives out there, even within government departments, and most people are not aware of them all. It would be valuable to conduct an audit to identify all of them. Government departments could present funding options to biogas players and generally interested parties and help to identify opportunities. Furthermore, engagement with Treasury will help to identify other opportunities and green initiatives – SABIA as a green initiative and also a job creator needs a platform to engage with Treasury. It would also be important to identify the synergies between the various incentives. Response SABIA: SABIA is very keen to get the biogas industry functioning well. There is a difference between the technology and the business opportunities, but the broader the voice and input the better. Until now, the biogas industry has not had a voice so it has been marginalized. There is extensive scope to include other technologies but at this point it is important to first strengthen the biogas role-players and then collaborate more.

25. DTI: The MCEF grant is a key opportunity but there are also other pots of funding available. For instance, if biogas is used on a dairy farm, there is no MCEF grant if it is selling milk in bulk, but if the dairy is pasteurizing its own milk then there is scope to apply for the MCEF grant, which could be a large amount. It could be up to one-third of project costs, which is significant support from government. It may be useful to convene workshops to share this kind of information.
26. DTI: It is difficult to get project finance support from the regular banks. IDC funds support a range of projects and the transaction costs for a bank on a billion Rand is the same as for a R50 million project. This is a key challenge for the sector. Project finance can therefore be difficult to source unless shareholders provide adequate security. This is why the SOP is a very important offering – there is scope to look at a fund that supports administratively the costs associated with funding for biogas projects to feasibility stage. With regard to the carbon tax, Eskom collects a 3c levy for carbon initiatives. There must be consistency between NERSA, Eskom and the DOE as to how revenue streams will be treated. Furthermore these revenue streams need to be in place for at least ten years. Clear financial models are needed as this will provide the market with some certainty and encourage long term investment.
27. There should be a dedicated fund for Renewable Energy projects. Early on in the Asian processes, many start-ups were short of similar funding. Pre-feasibility are studies need to be done to get to bankability stage and these are costly. There are a number of associations in Thailand that assist with this. ESCO works on a variety of projects and it is also a useful tool to begin to expand the voice of the industry. This is the kind of process that SABIA could lead.
28. Support is needed for smaller projects and there are already initiatives in the country of revolving funding. These could potentially consider the more specific projects that are not revolving. There are a number of good suggestions that have been made on how to take the sector forward within a more enabling environment.

**Waste to Energy Flagship Programme led by the Department of Environmental Affairs**

29. SABIA: The criteria for flagships are important and will provide a useful basis for discussion. Response: For example, eThekwini Metro has a potential flagship programme around biogas in its LFG to electricity programme. The criteria for flagship programmes include high impact, a good site, and high impact institutional arrangements that can be duplicated. At the core is projects or programmes with known technologies that are immediately useable.
30. Gracia: Regarding flagship programmes, the concern is that there is a lot of bureaucracy around these, and limited support for the industry. There is a need to put together a fund that project developers can access. Can the flagship programme have access to such a fund? Response: It is hoped that one of the outcome from the current programmes will be an analysis of the problems and challenges and interrogation of the existing policies. This needs to happen within all three spheres of government in order to ensure transition to a green economy.
31. What was the outcome of the Green Fund? Response: Funds were allocated but not all projects met the requirements. LFG to electricity projects in particular are a strong focus.
32. Does the DEA see itself as champions rather than energy experts in relation to waste-to-energy programmes? Response: We are not champions in this space, but the DOE plays a central role, and we have a strong interest based on three key points – climate change response, waste management, and transition to a green economy.
33. Green Fund representative: Regarding proposals to the Green Fund there was an Update for 2012. The proposals received contained 20 relevant biogas projects including a CSIR project. The intention is to support initiatives with catalytic impact on the sector and that are replicable and scalable. Only one biogas initiative was funded. It is also important to support knowledge development and the growing knowledge base of the biogas sector is of broad interest. There are also links to biogas legislation. R800 million was allocated by Treasury and Round 1 of applications was completed. It is important to have an appropriate governance structure for a government advisory panel. The DEA and other government departments need to fully play their respective roles. The intention of the Green Fund is not to fund something that can get money elsewhere, so there is a need to be fully cognizant of the environmental finance landscape. Even so, there is still very often duplication between funding pots. There is also a need for organizations that will fund in the small scale space. Many people working at the Green Fund were naïve about the landscape and only later realized the complexities of governance and required finance management.
34. Prof. Von Moltitz: There are different mandates – the sustainable development mandate is one, where the DEA is custodian of the national development framework. However, the National Development Plan may have overtaken this strategy and framework. To contextualize the comments, biogas is a key sustainable development strategy and does what few other technologies do, which is to integrate, whether waste or energy technology. This is its key benefit with regard to the national sustainable development framework. SABIA must define the mandate that it requires to drive the work in an integrated way.
35. DEA: The green economy and sustainable development are within one cluster in the DEA – but if these two are examined in detail, then the green economy is different from sustainable development but forms a strong component thereof.
36. DOE: How were the five municipalities selected for the pilot project? Response: SALGA assisted, as the most important aspect was that the municipalities themselves needed to make a commitment to the process.
37. People have mentioned barriers being raised by the requirements of the MFMA. Treasury recently attended a workshop that was convened on matters related to waste to energy where they stated that Treasury views this as misinterpretation. They provided information on how such projects can be undertaken in municipalities based on 3 and 5 year terms and the specific requirements.
38. UCT: What is the theoretical grounding for the proposed platform that GIZ will provide? Response: GIZ is an independent institution with extensive international experience on platforms, and can adapt international good practice to meet local requirements.

39. Large scale projects should be considered and not just up to 5MW. There should be an incentive to invest long term, since it might be feasible to pay back loans over ten years but what about potential income generation over time? Regarding the point made by Treasury about the MFMA restrictions, there are also funding restrictions between private entities and municipalities and Treasury input will be required to mitigate this. Therefore the DOE needs to be engaged by the industry. For example, SOP was offered to the solar water heater industry four years ago, yet to date not a single project has been awarded under SOP. Those who are going to be independent power producers each need to apply for a licence and become a small Eskom. Eskom is by default owned by us all as taxpayers and we should have the right to tap into the grid as happens elsewhere in the world. We should not continue to be held to ransom by Eskom. It is not viable to do a biogas project at 70c per kw. Response: In the current context, Eskom is key to grid integration – especially when outside the reticulation area of municipalities.
40. Gracia: The Department of Economic Development is also integral to work being done in provinces and via the Treasury –the MFMA can be a constraint although this was most likely not intended. Smaller municipalities have limited capacity and their ability to manage their funding is constrained and the PFMA mitigates these challenges. The industry needs to make a strong stand and show how biogas can work beneficially. However, it is important to be aware of the many municipalities where there are capacity constraints and limited resources to deploy. How biogas is located within the whole spectrum of waste management must be clear. It is likely that implementing biogas provision on a small scale for dairies or farms can work at this stage.

## ANNEXURE 2:
## Attendance Register

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|---|---|---|
| Akinwale Aboyade | UCT | akinwale.aboyade@uct.ac.za |
| Alexander James Jenkinson | SAVPO | swine1@worldonline.co.za |
| Alistair McMaster | Dept Economic Development, EC. | alistair.mcmaster@deaet.ecape.gov.za |
| Alwyn Smith | SAAEA | alwyn@saaea.org |
| Anathi Stofile | Lerumo Holdings | a.stofile@lerumoinvestments.co.za |
| Andre du Preez | Ozonenet PTY Ltd | adupreez950@gmail.com |
| Andreas Stubel | Airgas Compressors | astubel@airgas.co.za |
| Anita Burger | Technology Innovation Agency | anita.burger@tia.org.za |
| Anselm Umoetok | Department of Public Works | anselm.umoetok@dpw.gov.za |
| Ben Du Plessis | SANParks | ben.duplessis@sanparks.org |
| Beverley Terry | University of Johannesburg | bev@naca.org.za |
| Blake Schraader | SANParks | blake.schraader@sanparks.org |
| Cornelius Lauwrens | Netzsch | cornelius.lauwrens@netzsch.com |
| Daniel Mataruka | Private | fungai.daniel@gmail.com |
| David Oldfield | Finishes Of Nature | david@finishesofnature.co.za |
| David Tinarwo | University | dtinarwo@yahoo.co.uk |
| David Mahuma | SANEDI | davidm@sanedi.org.xza |
| David Peinke | VentuSA Energy (Pty) Ltd | david.peinke@ventusaenergy.com |
| David Cornish | ENER-G Systems (Pty) Ltd | dcornish@gessa.co.za |
| Edison Muzenda | UJ | emuzenda@uj.ac.za |
| Elena Antoni | University of Johannesburg | ElenaAntoniEU@gmail.com |
| Erika Schutze | AEPS | erikaschutze@gmail.com |
| Eugenia Masvikeni | DBSA | eugeniam2@dbsa.org |
| Faith Afolabi | Polokwane Technical Institute | doctorphait@yahoo.com |
| FaithMabindisa | City of Tshwane | faithmab@tshwane.gov.za |
| Freddy Makgahlela | BiogasSA | rutando.homes@gmail.com |
| Given Mbara | City of Johannesburg | givenmb@joburg.org.za |
| Gordon Ayres | AT&D | gordon@atnd.co.za |
| Graham Hartlett | WEC Projects (Pty) Ltd | graham@wecprojects.co.za |
| Hans-Peter Stoll | Caterpillar | Stoll_Hans_Peter@cat.com |
| Harrovon Blottnitz | University of Cape Town | Harro.vonBlottnitz@uct.ac.za |
| Hein Fourie | EnviroServ | heinf@enviroserv.co.za |
| Hugh Moore | BioPower Corp SA | hugh@biopowercorp.co.za |
| Ingo Stinnes | IND | ingo.stinnes@gmail.com |
| Jabulane Frans Kekana | City of Johannesburg | jabulanik@joburg.org.za |
| Jaco Cilliers | Deltabec | jaco.cilliers@deltabec.com |
| Jaco Uys | Aveng Engineering | jaco.uys@e-pc.co.za |
| Jan Du Preez | BiogasSA | jan@biogassa.co.za |
| Jason Gifford | WEC Projects | jason@wecprojects.co.za |
| Jeanne-Marie Fatti | Development Bank of Southern Africa | jeanne-marief@dbsa.org |
| Jeffrey Magida | REMT ISU | jeffreym@dbsa.org |
| Joel Houdet | SABIA | j.houdet@iss-za.com |
| John Kesi | University of Johannesburg/ Dept of Agriculture and Rural Development | kesimj@yahoo.co.uk |

| | | |
|---|---|---|
| John Howell | Pipecam | jhowell@lantic.net |
| Jude Nwachukwu | Polokwane Technology | professorjude@gmail.com |
| Julie Clarke | DBSA | juliec@dbsa.org |
| Laureen Bertin | Laureen Bertin & Associates | laureen@lbassociates.co.za |
| Kabelo Ledwaba | UNISA | kabmike@tsamail.co.za |
| Karl Juncker | WEC Projects | info@wecprojects.co.za |
| Keith Kirby | VentuSA Energy (Pty) Ltd | keith.kirby@ventusaenergy.com |
| Kenny Masobe | SABIA | kenny@biopowercorp.co.za |
| Kevin Foot | BusinessRisk | kevfoot@me.com |
| Lebogang Mokgatle | University of Johannesburg | lebogang.mokgatle18@gmail.com |
| Letladi Maisela | Kumba Iron Ore | letladi.maisela@angloamerican.com |
| Linda Mhlongo | SANParks | linda.mhlongo@sanparks.org |
| Linus Naik | SLR Consulting | lnaik@slrconsulting.com |
| Lizette du Preez | Ozonenet Pty Ltd | ldupreez1967@gmail.com |
| Lou van Niekerk | BioPower Corporation (Pty) Ltd | lourens@biopowercorp.co.za |
| Louisa Dean | Western Cape Government: Provincial Treasury | louise.dean@westerncape.gov.za |
| Lovell Emslie | Cape Advanced Engineering (Pty) Ltd | ldemslie@mweb.co.za |
| Lucy Chege | DBSA | Lucyc@dbsa.org |
| Luke Dillon | Renen | luke.dillon@renen.co.za |
| Madalo Minofu | DBSA | madalom@dbsa.org |
| Manie Magnus | Deltabec | manie.magnus@deltabec.com |
| Marie Blanche Ting | Department of Science and Technology | blanche.ting@dst.gov.za |
| Mark Tiepelt | SABIA | mark@biogassa.co.za |
| Marten Beckedorf | Beckedorf BioEnergy GmbH | info@beckedorf-bioenergy.de |
| Matthew Hayden | Trade plus Aid | matthew@tradeplusaid.co.za |
| Mel Raath | CA Components | info@cacomponents.co.za |
| Michael Marler | DBSA | mikem@dbsa.org |
| Michael Koettner | GERBIO | koettner@gerbio.org |
| Mike Smith | University of KwaZulu-Natal | mikesmith@live.co.za |
| Mmabyalwa Rebecca Sebola | University of Johannesburg | sebolarebecca@yahoo.com |
| Moroasereme Ntsoane | Khumba Energy | MNtsoane@khumbaenergy.co.za |
| Mpho Mokwele | DBSA | mphom2@dbsa.org |
| Murray Nel | Excalibur Finance | murray@excaliburfinance.co.za |
| Najma Mohamed | Green Fund, DBSA | najmam@dbsa.org |
| Nalen Alwar | Barloworld Power | nalwar@barloworldpower.com |
| Neil Townsend | Just Energy | neil@just-energy.org |
| Nomsa Zondi | Development Bank of Southern Africa | nomsaz@dbsa.org |
| Nonku Hlongwa | Surya Power | projects@suryapower.co.za |
| Ntobeko Boyana | Embo Solutions | ntobeko@embosolutions.co.za |
| Olympus Manthata | DBSA Green Fund | OlympusM@dbsa.org |
| Paul Cohen | Rucore | paul@rucore.org.za |
| Phillip Ninela | Department of Trade & Industry | PNinela@thedti.gov.za |
| Phillip Strauss | EnviroServ | phillips@enviroserv.co.za |
| Phillip Spencer | Biogas SA | phil.trish@arrabon.co.za |
| Pieta Visser | University of Pretoria | pieta93@gmail.com |
| Raashida Khan | Indigo Marketing | raashida@indigo.co.za |
| Rethabile Melamu | University of Cape Town | mlmret001@myuct.ac.za |
| Retsilisitsoe Khamali | Maletswai Local Municipality | khamalir@maletswai.gov.za |
| Rob Short | Sustainable Transactions | rob.short@sustainabletransactions.co.za |
| Rob Cloete | Selectra | rob@selectra.co.za |
| Robert Kigozi | University of Johannesburg | 201339835@student.uj.ac.za |
| Robin Thomson | AGAMA Biogas | robin@biogaspro.com |
| Rodgers Musiyarira | Gauteng Cooperative Governance & Traditional Affairs | rodgers.musiyarira@gauteng.gov.za |
| Ruan Kruger | DBSA | ruank@dbsa.org |
| Rynhardt Vermaak | Stellenbosch University | rpvermaak@cae.co.za |
| Sampson Mamphweli | University of Fort Hare | smamphweli@ufh.ac.za |
| Samson Masebinu | University of johannesburg | masebinity@gmail.com |
| Saphira Patel | DBSA | saphirap@dbsa.org |
| Sascha Thielmann | | sascha.thielmann@giz.de |
| Shanel Pillay | Indigo Marketing | reception@indigo.co.za |
| Simphiwe Molefe | Barloworld Power | SMolefe@barloworldpower.com |
| Soeren David | GIZ | soeren.david@giz.de |
| Sofja Giljova | GIZ | sofja.giljova@giz.de |
| Tebogo Snyer | SANEDI | tebogos@sanedi.org.za |
| Thapelo Letete | Department of Environmental Affairs | tletete@environment.gov.za |
| Themba Monnye | City of Johannesburg | temba@thegolf.co.za |

| | | |
|---|---|---|
| Anne Tarvainen | Embassy of Finland | Anne.Tarvainen@formin.fi |
| Thembi Khoza | DBSA | thembisilek@dbsa.org |
| Thilivhali Eugene Rasimphi | University of Venda | eugenethilivhali@yahoo.com |
| Tommy Tesner | CA COmponents | tommy@cacomponents.co.za |
| Tony Cummings | ENER-G Systems (Pty) Ltd | tonyc@gessa.co.za |
| Tshepo Marumule | Tshepo Merafong Environmental Solution | tshepo.marumule@gmail.com |
| Uwe Nicklbauer | Pipecam | john@ppipecam.co.za |
| Val Goodspeed | Goodspeed Environmental Services | cgoodspeed@mweb.co.za |
| Vhutshilo Nekhubvi | University of Venda | mulanga.alvis@gmail.com or vhutshilo.nekhubvi@univen.ac.za |
| Victor Maxwell | | maxwellvictor@yahoo.com |
| Victor Manavhela | NCPC | VManavhela@csir.co.za |
| Vijandren Naidoo | Applied economic power solutions | vijandren.naidoo@aeps.co.za |
| Warren Confait | Renen | warren.confait@renen.co.za |
| Willem Du Preez | BBEnergy(Pty)Ltd | wdupreez@bbe.co.za |
| Wim Jonker Klunne | CSIR | wklunne@csir.co.za |
| Xolani Tsotetsi | Self Employed | zwanewp@gmail.com |
| Yvette Kulik | Kumba Iron Ore | yvette.kulik@angloamerican.com |
| Anni Korhonen | Natural Resources and Energy | anni.korhonen@kpmg.fi |
| Heta Pyhalati | Head of Trade Center Johannesburg | heta.pyhalahti@finpro.fi |
| Raoul Goosen | IDC | |
| Tony Nkuna | IDC | TonyN@idc.co.za |
| Rentia Van Tonder | IDC | |
| Thilivhali Rasimphu | University of Venda | eugenethilichali@yahoo.com |
| Heta Puhalahti | Embassy of Finland | heta.puhalahti@finpro.fi |
| Antonio Ruffini | ESI | 4RUFFINI@WTAFRICA.ORG.ZA |
| June Matlala | Green Steam | june.matlala@gmail.com |
| David Maisela | DBSA | Davidm5@DBSA.org |
| Siphiwe Mahunu | DBSA | siphiwem3@dbsa.org |
| Jotte Van Irland | Mpfuneko CS | Jotte@mpfuneko.co.za |
| Mahommed Tilly | DBSA | mahommedt@dbsa.org |
| Horst Unterlechiver | IBERT | Horst@ibert.co.za |
| Letsatsi Melato | NERSA | letsatsimelato@nersa.org.za |
| Mfundo Xulu | Department of Public Works | mfundo.xulu@dpw.gov.za |
| Maoto Monde | Business Day | maotom@bdfm.co.za |
| Gordon Kernick | SLR Consulting | gkernick@slrconsulting.com |
| Shuntelle Gow | CSIR | sgow@csir.co.za |
| Edwin Maitho | DBSA | EdwinM@dbsa.org |
| Ian-Wilhelma Krebs | GIZ | Jan-wilheim.krebs@giz.de |
| Aurelie Ferry | GIZ-SALGA | aurelie.ferry@giz.de |
| Mariette Maritz | Green Steam | mariettemaritz@ovaton.co.za |
| Nomawethu Qase | Department of Energy | Noma.Qase@energy.gov.za |
| Valerio Bui | Coop Cellini South Africa | valeriob@coopcellinisa.co.za |
| Richards Beningfield | Energy Systems | richardb@gessa.co.za |
| Thierry Revert | Magic | tar@planetac.co.za |
| Andrew Etzinger | Eskom | EtzingA@eskom.co.za |

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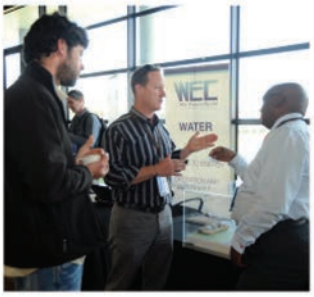
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