



Netherlands Enterprise Agency

Renewable Energy Market Study

Zimbabwe 2017

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RENEWABLE ENERGY MARKET ENTRY STUDY REPORT – ZIMBABWE

FINAL

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RVO,
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Executive Summary

Background and Justification

Zimbabwe is currently facing energy supply challenges. Less than a quarter of the population in the rural areas has access to clean energy. Electricity supplies cannot meet demand as the electricity grid is in a poor state due to inadequate investment in the sector, leading to erratic supplies. This has forced Zimbabwe to have to import expensive power from its neighbours, mainly South Africa and Mozambique. With an average access to electricity standing at 21% in the rural areas and 80% in urban areas, the need for alternative energy supplies to meet the energy supply deficit cannot be overemphasized. Yet the country has abundant renewable energy resources which are barely exploited.

The Netherlands on the other hand, has vast experience and expertise in renewable energy technologies, and some Dutch companies are keen to invest in renewable energy in Zimbabwe. With the current international drive on climate change, renewable energy presents a most viable and welcome opportunity to supply energy without harming the environment.

This project was therefore launched to explore the opportunities for Dutch companies interested in investing in renewable energy in Zimbabwe. The study can be used as a guidance tool for Dutch companies who are or would like to become active in the renewable energy sector in Zimbabwe.

The major outputs of the study include:

- Identification of renewable energy investment opportunities (**projects**) that Dutch companies can invest in;
- Assessment of the potential market for Dutch renewable energy companies;
- An indication of the viability potential of investing in RE in Zimbabwe;
- Requirements that any investor must meet to invest in RE in Zimbabwe;
- Identification of potential investment partners (or competitors) in the RE subsector; and
- An elucidation of the political, economic regulatory climate for investment in renewable energy sector in Zimbabwe.

Zimbabwe's Renewable Energy Resource Base

Zimbabwe's renewable energy resource base is made up of vast solar energy radiation (20 MJ /m²/day); hydro; municipal solid waste; municipal sewage biogas; agricultural waste; forestry waste. With the recent completion of the Tokwe Mukosi dam, in May 2017, an additional 25 000 hectares of land will be put to irrigation possibly for more sugar cane for the production of more ethanol for blending with petrol and bagasse for power production through cogeneration. The dam is equipped to generate 15 MW for export into the grid. (See Annex A1 for figures).

Policies Promoting Renewable Energy Development

Zimbabwe has a number of policies that promote the adoption and wider use of renewable energy. The country's national development blueprint, the ZIMASSET, recognizes the central role that renewable energy can play in meeting the energy needs of the country. This view is further strengthened in more sector specific policies which include: the National Energy Policy; the National Energy Policy Implementation Strategy; the National Renewable Energy Policy; the Zimbabwe Biofuels Policy; the Independent Power Producers framework and the Renewable Energy Feed in Tariff. These policies all work together for better promotion of renewable energy.

Major Players in Renewable Energy Development

The Ministry of Energy and Power Development is the lead Government agency in renewable energy development. Its mandate includes policy and program formulation as well as oversight for the sector. The Zimbabwe Electricity Supply Authority is responsible for the electricity subsector with subsidiaries Zimbabwe Power Company responsible for power generation and the Zimbabwe Electricity Transmission and Distribution responsible for the transmission and distribution network. Other Government Ministries such as Agriculture, Mechanisation and Irrigation Development are also key players in aspects of renewable energy value chains with agro based feedstock such as sugar cane, jatropha curcas and cassava.

The Zimbabwe Energy Regulatory Authority (ZERA) is the overall regulator for the energy sector. ZERA's mandate is to regulate the procurement, production, transportation, transmission, distribution, importation and exportation of energy derived from any energy source and to exercise licensing and regulatory functions in respect of the energy industry. ZERA also sets energy prices and tariffs.

The Rural Electrification Agency's main focus is to spearhead rapid electrification of Zimbabwe's rural areas where access to electricity and other clean energy forms is still very low. This helps to improve the quality of life of the rural folk, improve services at health and educational facilities and enable implementation of economic activities such as irrigation, welding and other cottage industries in rural areas.

The Rural Electrification Agency administers the Rural Electrification Fund, derived from a 6% surcharge on electricity consumption.

Private sector players, both local and international, are also active along the whole value chain of renewable energy development from manufacture, importation, distribution, wholesale, retail, installation and maintenance of renewable energy installations. The Renewable Energy Association of Zimbabwe is the largest grouping of private sector players in the industry.

Regulatory Framework for Renewable Energy Development

The Energy Regulatory Act is the supreme law guiding the energy sector. It provides for the licensing of all players in the sector, the development and enforcement of equipment standards as well as the

setting of energy prices and tariffs. The electricity subsector is further governed by the Electricity Act and other subsidiary regulations such as the National Grid Code.

The Environmental Management Act of 2012, provides for the protection of the environment in accordance with global commitments and sets the requirements for environmental impact assessments for new projects.

New Investment Potential

In addition to the vast renewable energy resources cited elsewhere, the following statistics illustrate the magnitude of the potential investment opportunities in renewable energy in Zimbabwe:

- 63.5% of all households in Zimbabwe depend on fuel wood for their cooking requirements. This presents a vast opportunity in clean energy technologies for cooking and heating.
- 5 300 institutions (schools and clinics) are unelectrified, also providing an opportunity for decentralised minigrids; and
- 10 000 other facilities (pumps etc.) are unelectrified.

The potential market for Dutch companies and Dutch products in Zimbabwe extends along the whole value chain in the delivery of renewable energy services: consultancy services, system design and engineering, installation, maintenance, and project development; manufacture, wholesale, retail and distribution. It also includes products such as solar water heaters, solar water pumping equipment, solar electric grid systems; and components such as CFL and LED lights, batteries, inverters, wind power generation equipment, biogas etc.

This is summarised in Table ES1 below.

With the huge demand for electricity and clean energy in Zimbabwe's rural areas, the future for renewable energy looks bright.

The Government has put together a number of incentives for investing in renewable energy. These include: negotiable tax holiday, duty-free importation of renewable energy equipment and exemption from paying withholding tax.

Recommendations

As a way forward, it is recommended that, depending on the interest shown by the prospective Dutch investors, a shortlist of the potential projects be prepared, more detailed assessment be carried out, serious credible local partners be identified where necessary and potential sources of funding identified and pursued.

Table ES 1: Market Potential for Projects

Market Segment	Needs	Strategy	Source of Funds
Rural Institutions: schools, clinics	Essential power needs: lights, water pumping, water heating, medical refrigeration. Power for appliances /telecoms (computers, etc)	Mini-grids, Roof top Solar Water Heaters	Donors – EU, USAID, OXFAM
Urban Private Households	Solar Hot water, Solar PV Lights, power for appliances (TVs, radios, charging cell phones)	Stand-alone roof top solar PV, solar water heaters, ethanol gel stoves	Private
Small /Medium Enterprises	Power for productive use (water for irrigation, welding, sewing machines)	Mini-grids at growth /service centres. Stand-alone	Private
Independent Power Producers	Power for sale to the grid.	Minihydro, solar minigrids,	Private banks
Telecommunications Industry	Power for transmission /booster towers in remote areas.	Solar PV /batteries/inverters	Private. (banks)
Local Authorities	Street lights /traffic lights	Mast top mounts	Private, donors
	Power from biogas	Harness biogas from sewage treatment works	Private. Multilateral banks (AfDB)
	Power from Municipal Solid Waste	Appropriate management of MSW to generate power	Private. Multilateral banks (AfDB)
Rural Households	Energy for cooking, lighting, small appliances (radio, TV, cell phones)	Improved cook stoves, biogas /Roof top solar PVs /batteries /inverters. Solar lighting Portable units	Private. donors
National Electricity Utility	Strengthen the power grid		Multilateral banks (WB, AfDB). Private banks

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ACRONYMS AND ABBREVIATIONS

CFL	compact fluorescent lamp
CIA	Central Intelligence Agency
CUT	Chinhoyi University of Technology
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GWh	Gigawatt Hour
GWh/a	Gigawatt Hour per Annum
HIT	Harare Institute of Technology
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
kWp	Kilowatt Peak
LCOE	Levelised Cost of electricity
LPG	Liquefied Petroleum gas
m/s	Metres Per Second
m ²	Square Metre
MEPD	Ministry of Energy and Power Development
MJ	Megajoule
NEP	National Energy Policy
NEPIS	National Energy Policy Implementation Strategy
NIERP	National Integrated Energy Resource Plan
NUST	National University of Science and Technology
PV	Photovoltaic
PZL	PetroZim Line
RE	Renewable Energy
REA	Rural Electrification Agency
REAZ	Renewable Energy Association of Zimbabwe

REFIT	Renewable Energy Feed-in Tariff
RERA	Regional Electricity Regulators Association
SADC	Southern African Development Community
SAZ	Standard Association of Zimbabwe
SIRDC	Scientific and Industrial Research and Development Centre
SWOT	Strengths, Weaknesses, Opportunity, Threats
UN	United Nations
UNDP	United Nations Development Program
USAID	United States Agency for International Development
UZ	University of Zimbabwe
VAT	Value Added Tax
W	Watt
WB	World Bank
ZERA	Zimbabwe Energy Regulatory Authority
ZESA	Zimbabwe Electricity Supply Authority
ZIA	Zimbabwe Investment Authority
ZIC	Zimbabwe Investment Centre
ZIMASSET	Zimbabwe Agenda for Sustainable Socio-Economic Transformation
ZIMRA	Zimbabwe Revenue Authority
ZIMSTAT	Zimbabwe Statistics
ZINWA	Zimbabwe Water Authority
ZPC	Zimbabwe Power Company

RENEWABLE ENERGY MARKET ENTRY STUDY REPORT

1.0 Introduction

1.1 Objective of the Study

This report was prepared in response to an invitation from the Royal Dutch Embassy in Harare to prepare and deliver ...'One market entry study that can be used as a guidance tool for Dutch companies who are or would like to become active in the renewable energy sector in Zimbabwe'.

The study identifies opportunities in the renewable energy sector in Zimbabwe that can be exploited by Dutch companies interested in investing in the country. It also clarifies the investment and policy climate and requirements for any company interested to invest in Zimbabwe.

The following are the major outputs on the study:

- An identification of renewable energy investment opportunities (**projects**) that Dutch companies can invest in;
- Assessment of potential market for Dutch renewable energy companies;
- An indication of the viability potential of investing in RE in Zimbabwe;
- A list of requirements that any investor must meet to invest in RE in Zimbabwe;
- Identification of potential investment partners (or competitors) in the RE subsector; and
- An elucidation of the political, economic regulatory climate for investment in renewable energy sector in Zimbabwe.
- Recommendations on the way forward

1.2 Context and Justification

Access to energy has been shown to be a necessary requirement for socio-economic development. The use of fossil fuels has been blamed for global warming and climate change. However, the use of renewable energy (RE) can accelerate access to energy, particularly for the 1.4 billion people worldwide without access to electricity and the additional 1.3 billion people using traditional biomass worldwide without causing much harm to the environment. Use of renewable energy can also reduce vulnerability to supply disruptions and market volatility and has been shown to have tremendous environmental and health benefits.

The impacts of global warming are likely to be "severe, pervasive and irreversible", a major report by the UN has warned. As part of the Paris Agreement on Climate Change, countries

have pledged to cut greenhouse gas (GHG) emissions. A rapid switch to renewable energy can put the Paris climate goals within reach. For instance, scaling up renewable energy to 36% of the global energy mix by 2030 would provide about half of the emissions reductions needed to hold warming to 2°C. Energy efficiency could make up the rest (IRENA 2016).

Zimbabwe is well endowed with renewable energy resources especially solar radiation. The country also has a long history of solar energy utilisation, having participated in the Global Environment Facility (GEF) Funded Solar Home Systems Project which saw about 10 000 45W solar PV systems (1995 - 8) being installed in the rural areas of Zimbabwe. This project publicised and popularised solar energy; and today there are several small dealers and installers of solar equipment in the country.

Concurrently, access to electricity in both rural and urban areas of Zimbabwe is low and the potential for renewable energy to fill this energy gap is tremendous. In urban areas, the rate of new settlements is moving much faster than the electricity grid can service their needs. In addition, currently Zimbabwe is experiencing electricity supply challenges and many residents connected to the national electricity grid have had to buy standby generators – either diesel powered or solar for when the power is not available.

On the other hand the Netherlands has a long and illustrious record in renewable energy development and use in such areas as wind energy, solar, solid waste to energy and biogas. Dutch investors in renewable energy are eager to set up business in Zimbabwe. So the grounds and opportunities for collaboration between the Netherlands and Zimbabwe to meet the energy gap exist. Such collaboration would meet not only the energy needs of communities in Zimbabwe's rural and urban areas but also address the objectives of the Paris agreement on clean energy and climate change.

1.3 Approach and Methodology

The general approach adopted by the team involved stakeholder consultations and interviews as well as literature search. The stakeholders consulted included people from policy and regulation (Government and relevant quasi-governmental institutions), implementers (importers, installers, traders of renewable energy equipment, non-Governmental organisations) and financiers. (The list of institutions and persons consulted in this study is included in the Annex to this report, Annex A5).

The literature consulted included Government policy, planning and strategy documents and legal instruments. The internet was also used extensively. (The list of documents consulted for this report is included in the Reference Section of the report.).

There was also strong collaboration with the local Dutch Embassy in Harare for general information on Zimbabwe and doing business in Zimbabwe, as well as on available

instruments of the Dutch government institution, Netherlands Enterprise Agency (RVO), which falls under the Dutch Ministry of Economic Affairs.

The team also worked with a Dutch consultant who gave the Dutch side of investment interests. He assisted in the final stage of the market study, specifically identifying key opportunities for Dutch businesses amongst the opportunities highlighted in the study.

The Dutch consultant was also responsible for drawing up a preliminary list of Dutch companies with interest in the Zimbabwean renewable energy sector based on the findings of the market study.

2.0 Situational Analysis

This section of the report gives the background information on Zimbabwe in general and the state of affairs with respect to renewable energy deployment and investment in the country.

Zimbabwe has a population of 16.2 million in 2017 (IECONOMICS, 2017). Almost 67.6% of the population lives in the rural areas where they eke a living mostly from tilling the land. However, there is rapid urbanisation (2.3%pa, CIA), with people moving to the urban areas in search of better living, where they add to congestion and exerting more pressure on the already overstretched amenities in most towns, such as housing, health, education, transport....

The country's economy depends largely on agriculture and mining. With an annual Gross Domestic Product (GDP) of US\$ 13.9 billion, the per capita GDP per annum is US\$891. The economy has not been performing as expected due to weaker mineral prices on the international market, erratic electricity supplies and difficulties that the country is facing to access external credit.

The major energy sources for Zimbabwe are shown in Fig.1 below:

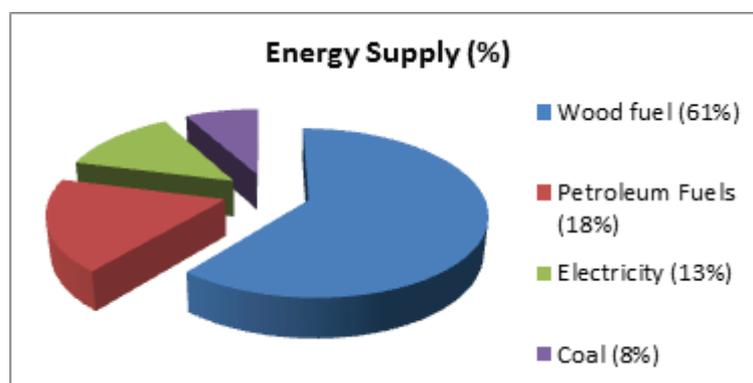


Fig.1 Energy Supply for Zimbabwe (2012)

Zimbabwe has an installed capacity of about 2000 MW, of which 58% is thermal and 37% is hydro, mainly from the Kariba South Power Station. Bagasse based cogeneration (Green Fuel, Triangle and Hippo Valley) and mini hydro generation installed capacity total 114 MW, but most of the generation is for own use and only 12 MW is supplied to the national grid.

The total demand for electricity is 2029 MW against average available supply of 1200 MW. Most of the generation units (except for Kariba) are old and inefficient. For instance, although Hwange Power Station has an installed capacity of 920 MW it averages 400 – 500 MW. The old coal fired power stations of Harare, Bulawayo and Munyati have a total installed capacity of 370 MW but most of the time they are not generating. In addition, Zimbabwe has a contractual obligation to export 150 MW to Namibia. To meet the electricity supply deficit, Zimbabwe has to import expensive power from its neighbours, mostly South Africa and Mozambique. (See Fig. 2 below)

Generation and transmission infrastructure in the country is also rundown as a result of lack of investments and needs urgent rehabilitation to restore lost capacity.

Access to electricity is 21% in rural areas and 80% in urban areas (RERA /EU, 2013).

Electricity supplies have been erratic, due to poorly maintained infrastructure and drought that has affected hydrogeneration from Kariba, leading to frequent load shedding. As a result, many consumers have bought /installed standby supplies such as diesel generator sets and solar PV systems for lighting and other minor loads as well as solar water heaters. In a 2010-11 survey, 18% of Zimbabwean households owned a solar panel (ZIMSTAT, 2012). More and more households have now resorted to using imported liquefied petroleum gas (LPG) for cooking and lighting. About 63.5% of all households in Zimbabwe depend on fuel wood for their cooking requirements (ZIMSTAT 2013). People in rural areas continue to depend on fuel wood for their cooking requirements using inefficient open fire technology (with attendant health risks), although Government through the MEPD is also promoting the use of biogas. A market based National Domestic Biogas Program was launched in 2013 in selected Districts by MEPD. It involves NGOs (HIVOS, SNV). 70 builders have been trained. 1385 biogas units constructed.

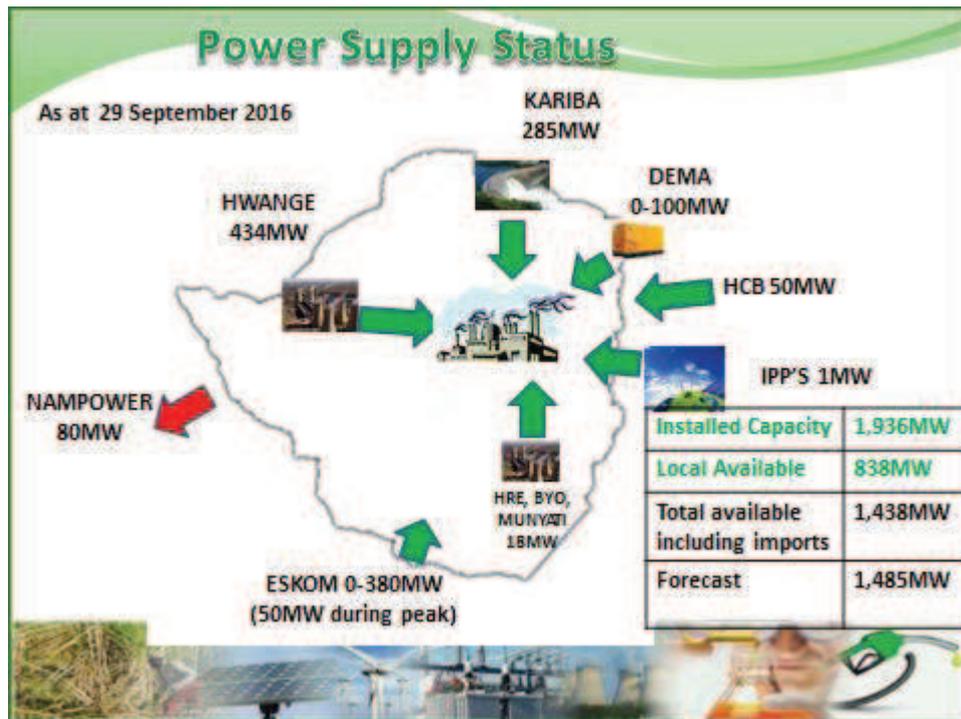


Fig 2 Power Supply Situation (September 2016)
Source: ZETDC /ZPC Generation Report

3.0 Zimbabwe’s Renewable Energy Resource Base

Zimbabwe’s major energy resources are dominated by coal (with proven reserves based on exploration work carried out to date standing at 12 billion metric tonnes), most of it found in the north western part of the country.

The country also has vast renewable energy resources. The hydro potential is mostly on the Zambezi River (shared with Zambia) and on some inland rivers and dams. Hydro potential is estimated at 18600 GWh per annum on the Zambezi River and about 120 MW on internal rivers (mostly in the Eastern Highlands) and dams. Zimbabwe’s water supply is vulnerable to the impacts of climate change and climate variability, also affecting hydro generation.

The country derives around 80% of its hydro-power needs from Lake Kariba Dam on the Zambezi River.

Solar radiation averages 20 MJ/m²/day. The map below (Fig. 3) shows the geographical distribution of solar irradiance over Zimbabwe. Solar radiation varies from an average of about 16MJ/m²/day in winter to about 22 MJ/m²/day in midsummer.

Wind speeds over Zimbabwe are generally low, averaging 3 m/s, although there are some areas where the wind speeds are slightly higher (Bulawayo Airport (4.35 m/s), Gweru (3.9 m/s)). Generally, wind has been used more for water pumping than electricity generation.

Efforts are underway through the Zimbabwe Energy Regulatory Authority to assess wind potential at heights of 80m.

Biomass energy resources are from bagasse from sugar cane waste, forestry residue (70 000 tons/a with an energy potential of 150 MW) and sawmill dust (14000 GWh/a).

Although geothermal potential has been observed, this has not yet been fully characterised.

Bioethanol is produced from fermentation of sugar cane, with current production being made up of 40 million litres per annum from Triangle /Hippo Valley and about 54 – 100 million litres per annum from Green Fuel’s Chisumbanje Plant, both in the Lowveld of Zimbabwe. . Currently there are efforts to produce biodiesel from jatropha curcas.

Biogas Production from Municipal Waste

In addition to biogas generated from animal waste, Zimbabwe also has several municipal sewage plants that produce biogas from the anaerobic waste digesters. These plants are in Harare, Mutare, Bulawayo, Masvingo, and Gweru but only Harare collects the gas but most of it is flared into open air.

Of Harare’s five sewage treatment works, only two (Firle and Crowborough) have biogas digesters. Some of the gas produced at the two plants is used for heating digester sludge which has to be maintained at a suitable temperature of 35 – 37⁰ C for the digestion process to proceed satisfactorily. The rest of the gas is currently being flared as waste gas.

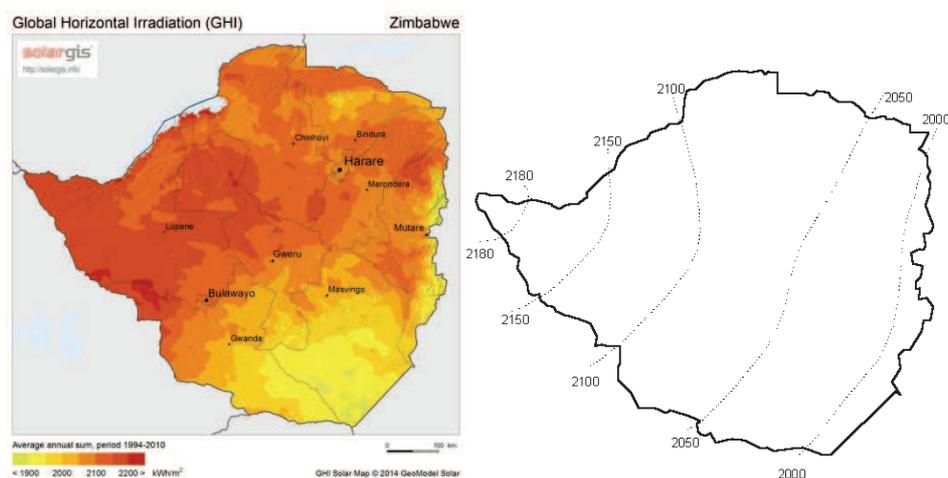


Fig. 3 Mean Annual Irradiance on a Horizontal Surface in Zimbabwe (kWh/m²) (1kWh = 3.6 MJ)

The Table below summarises the renewable energy resource potential for Zimbabwe.

Table 1: Summary: Zimbabwe's Renewable Energy Resources

Resource	Quantity	Comments
Solar radiation	20 MJ/m ² /day	
Wind	3 m/s	Higher speeds expected at higher levels#.
Minihydro	>120 MW on inland rivers and dams	Over 20 mini hydro sites identified still to be developed
Hydro	18600 GWh on the Zambezi	750MW installed. Plans to add 300 MW to the Kariba hydro power plant. 1720MW potential on the Zambezi River still to be developed
Biomass		
Fuel wood*	5654000 tons/a	
Forestry Residue*	2300000 tons/a	
Sawmill waste*	750 000 tons/a	
Bioethanol	100 – 140 million litres/a,.	currently being produced
Animal waste*	4481000 tons/a	
Crop residue*	10862000 tons/a	
Municipal Solid Waste**	957 000 tons/a	Total for Harare, Chitungwiza, Bulawayo, Gweru , Mutare (details in Annex)
Biogas From Municipal Sewage Works		
Chitungwiza+	2.6 tons/day	
Firle+	19.6 tons /day	
Crowborough+	7.6 tons /day	
Biogas Potential – Domestic and Institutional ***		
	Number of Biogas Units	
Subsistence farmers	63 564	4 -20 m ³
Abattoirs	36	4 – 20+ m ³
Piggeries	470	4 – 20+ m ³
Dairy	106	
Primary Schools	566	
Secondary Schools	224	

*Jingura et al (2013)

**Using World Bank (Urban Development Series,) MSW Index of 0.8 kg/capita/day)(A Global Review of Solid Waste Management, 2012

Hove T and Madiye, L (undated) – Wind Resource Mapping for Zimbabwe. (Wind power varies from about 15 W/m² (Kariba) to 115W /m² (Gweru) at 50m hub height#)

+ Manyuchi M (2016)

The recently completed 1.8 billion m³ Tokwe Mukosi Dam has the potential to irrigate a further 25 000ha of farm land for more sugar cane and other crops.

***MEPD/ REA 2012

4.0 Government Policies and Programs in the Renewable Energy Sector

Zimbabwe has adopted renewable energy (RE) as one of the pillars of its development strategies. The country's national development blueprint, the Zimbabwe Agenda for Socio-Economic Transformation (ZIMASSET) (2013 to 2018) recognises renewable energy development and increased use of renewable energy (bio digesters, minihydro, solar energy, solar water heaters, bioethanol and biodiesel) as an essential development strategy for the country.

Developments in the energy sector are also guided by the Vision of the Ministry of Energy and Power Development (MEPD). The Vision of the MEPD, is to achieve universal access to sustainable energy in Zimbabwe by 2030.

The National Energy Policy (NEP) (2012) encourages the development of renewable energy.

On renewable energy the NEP has the following objectives:

Increase usage of renewable energy;

- Promote renewable energy as an environmentally friendly form of energy;
- Diversify supply options; and
- Increase access of modern energy in rural areas. (MEPD, NEP 2012)

The **National Energy Policy Implementation Strategy (NEPIS)** envisages the establishment of a Rural Energy Fund to promote renewable energy such as promoting alternative cooking fuels for use in rural areas, the development of regulations to mandate solar water heaters in new homes and development of a renewable energy market in Zimbabwe. A Rural and Renewable Energy Act would be enacted to promote the general development and utilisation of renewable energy technologies for sustainable development and to facilitate the provision of electricity and other modern energy services in rural areas. The NEPIS envisaged a Rural Energy Fund and a Rural Energy Agency as successors to the Rural Electrification Fund and Agency.

A **Renewable Energy Policy and Strategy** is scheduled for presentation to Parliament during its 2017 session.

The renewable energy policy is expected to address the following aspects that were not addressed in the main NEP:

- Identifying a nodal agency for renewable energy development
 - Procurement models for renewable energy such as competitive bidding, Feed-in-Tariff, third party access, etc.
 - Renewable energy portfolio standards / Targets for different technologies
 - Incentive and financing mechanism
 - Integration with national grid
 - Decentralized generation
- (Deloitte, May 2017)

A National Biofuels Policy was also developed in 2015 and is awaiting official approval and adoption. The draft policy advocates the blending of ethanol from sugarcane with petrol and biodiesel production from jatropha curcas. For bioethanol, a 10% blending mandate is to be enforced with immediate effect, and a market for high-blend ethanol (E85) will be actively developed. For biodiesel, a target 2% blend starting in 2020 is proposed, which could be raised to 5% by 2025.

To develop the high-blend market, the following measures will be investigated:

- Duty-free importation of flex-fuel cars;
- Support for distribution and installation of flex-fuel converter kits;
- Shifting of government vehicle fleets to E85 as a demonstration tool (MEPD, Draft National Biofuel Policy).

A Renewable Energy Feed –In Tariff (REFiT) developed in 2013 also awaits final Government approval and adoption. REFiT is primarily aimed at fast-tracking smaller-scale projects covering initially solar PV, small scale hydro, biogas and biomass and wind power. The REFiT study proposes feed-in tariffs for various project sizes. It would be implemented through an annual call for proposals.

Table 2: Updated LCOE 2015

Technology		Tariff (US\$)/kWh 2016	Tariff (US\$)/kWh 2013
Hydro	100kW ≤ 1MW	0.142	0.153
Hydro	1 < 5MW	0.125	0.134
Hydro	5 < 10MW	0.111	0.118
Biomass	100kW ≤ 10MW	0.115	0.137
Bagasse	100kW ≤ 10MW	0.096	0.111
Biogas	100kW ≤ 10MW	0.106	0.127
Solar PV	100kW ≤ 1 MW	0.138	0.186
Solar PV	1 MW < 5 MW	0.131	0.178
Solar PV	5 MW < 50 MW	0.118	N/A
Wind	100kW ≤ 5MW	0.103	0.148

Source: ZERA (2017)

Net Metering Regulations meant to govern the generation of electricity from small scale, grid tied renewable generators like solar PV generators on rooftops have been drafted by ZERA and await official approval and adoption. The regulations stipulate a cap of electricity 100kW generating capacity. Above the threshold REFiT is applicable.

An Independent Power Producers Policy framework is being developed. An initial **Independent Power Producers (IPP)** draft policy found the following to be critical success factors for IPPs:

- The necessary regulatory and competitive environment is introduced before IPPs can come in.
- A credit worthy, financially and technically strong counterparty for IPPs.
- IPP programs must be an integral part of the national development program and the system expansion plan.
- A clear policy framework and regulation must be present.
- Comprehensive and coherent power sector planning clearly showing the role of IPPs and an IPP project pipeline that shows the sequence, timing, size and technology (coal, hydro etc) of the IPPs.
- No corruption and bribery.
- A favourable investment climate which must include ease of doing business must be present.
- Competitive bidding procurement process ensures that the cheapest IPP is contracted.

The necessary legislation for the promotion and development of IPPs is still to be developed.

Zimbabwe has started the process of developing a **National Integrated Energy Resource Plan (NIERP)**. According to the call for proposals issued by the Ministry of Energy and Power Development, *'The objective of the NIERP is to examine available energy resources and determine the least-cost energy supply options, evaluate the security of supply options while providing information on the opportunities for investment into new energy projects... It also examines specific public policies, including those on security of energy supply and risks associated with the current system'* (MEPD).

Rural Electrification

Rural electrification is a major pillar in the country's development strategies to benefit rural communities.

Funded by the Rural Electrification Fund, the Rural Electrification Program (REP) not only addresses access to electricity but also empowers the rural communities socio-economically by promoting productive use of electricity such as irrigation and cottage industries. The REP also promotes use of renewable energy such as minihydro and solar energy. **A Rural Energy Master Plan** has been developed by the Rural Electrification Agency and is set for operationalisation in 2017. According to the Rural Electrification Agency, *'Rural Energy Master Plan (REMP) is a blue print for the development of technically, financially, environmentally and economically viable on-grid rural electrification and off-grid renewable energy'*

Incentives for Renewable Energy

Solar panels, inverters, solar lights, solar geysers, energy saving bulbs and tubes, electrical motors and generators can be imported duty free and surtax free into Zimbabwe. However, a value added tax (VAT) of 15% is still charged (ZIMRA).

Indigenisation and Empowerment Policy

Although in general, the Indigenisation and Empowerment Act requires that for any new investment indigenous Zimbabweans shall own at least 51% of the shareholding, for non-resource sectors of the economy such as manufacturing, financial services, tourism, construction and energy, the Line Minister may prescribe that a lesser share than fifty-one per centum or a lesser interest than a controlling interest may be acquired by indigenous Zimbabweans in any business but in so doing he or she shall prescribe the general maximum timeframe within which the fifty-one per centum or the controlling interest shall be attained.

For non-resource sectors like energy, the policy is relaxed to allow the line ministry to decide if an investment can go ahead without the 51% shareholding by a local. It is worthwhile noting that already there are foreign companies, including IPPS, that have teamed up with local firms and are developing infrastructure projects including RE projects without fulfilling the 51% shareholding by locals. The revised Indigenisation and Economic Empowerment Framework of December 2015 states:

‘A non-indigenous business may hold the majority shareholding for a period ranging up to 5 years (except for the energy sector which can go up to 20 years), which period may be extended upon application....’

The Indigenisation and Empowerment law will be amended during the 2017 Parliamentary session to make it more investor friendly. For non-resource sectors like energy, the 51% share for local partners will be relaxed.

Zimbabwe’s Climate Change Response

The Government of Zimbabwe has developed a National Climate Change Response Strategy to guide national response measures in addressing the impacts of climate change. For the energy sector the strategy encourages the development of renewable energy as it aims to:

- Introduce policies and regulatory frameworks for renewable energy, energy conservation and energy efficiency.
- Strengthen energy planning, research and development.
- Promote low carbon energy provision and use.

In conclusion, it can be seen that there is a lot of initiatives taking place at the same time that are aimed at the development of renewable energy in the country. It is important that all these efforts be effectively coordinated and streamlined to bring synergy between them and produce a properly synchronised result.

5.0 Institutional Arrangements and Major Players for the Renewable Energy Sector

The Ministry of Energy and Power Development (MEPD) has overall responsibility over the energy sector in Zimbabwe and is responsible for policy and strategy formulation, sector planning and oversight on the energy parastatals (ZESA, Rural Electrification Agency (REA) in the electricity subsector; and the Zimbabwe Energy Regulatory Authority (ZERA)); NOIC, PetroTrade and PetroZim Line (PZL) in the petroleum sub-sector; and the Zambezi River Authority with responsibility over the hydro resources on the Zambezi River, which it administers jointly with the Zambian Government. Administratively, coal, although an energy resource, falls under the Ministry of Mines.

The Department of Renewable Energy and Energy Conservation in MEPD is specifically responsible for renewable energy development.

The Ministry of Agriculture also plays a crucial role for biofuels feedstock production and development of appropriate feedstock varieties as well as in the promotion of other agro-biomass based energy sources such as biogas and agricultural waste.

Regulation of the whole energy sector is the responsibility of the Zimbabwe Energy Regulatory Authority (ZERA). ZERA's terms of reference include among others: licensing of all operators, setting and approval of energy prices and tariffs and setting the terms and conditions for operators.

The Rural Electrification Agency (REA), established under the Electricity Act (13:20) which also established the Rural Electrification Fund (REF) is responsible for promoting rural electrification through grid extension as well as stand-alone mini-grids. REA is also championing renewable energy for the rural areas. The REF is funded through the Rural Electrification Levy charged on the electricity bill at a rate of 6% of the energy bill as well as by fiscal endowments provided for by government.

Research and development of renewable energy is done by the Scientific and Industrial Research and Development Centre (SIRDC) established under the Research Act of 1986 and a number of tertiary institutions such as the University Of Zimbabwe, Harare Institute of Technology (HIT) and the National University of Science and Technology (NUST) and others. Agricultural research for biofuels feedstock production is carried out by the various agricultural research institutions such as universities, Research and Specialist Services of the Ministry of Agriculture and the Sugar Cane Research Institute.

Private sector players in the renewable energy sector have organised themselves under the Renewable Energy Association of Zimbabwe (REAZ). REAZ membership includes researchers, installers, traders and marketers of renewable energy equipment.

There are several non-governmental organisations that are very active in renewable energy. These include some with international links such as Practical Action, HIVOS, SNV, Power for All, Plan International, etc.

There are also a number of independent private sector players who play key roles as independent power producers using minihydro and bagasse for power generation as well as importers and traders of renewable energy equipment. The producers of bioethanol for blending with petrol are private sector players. About 26 solar companies are registered with the Zimbabwe Energy Regulatory Authority.

Some international companies and agencies active in the renewable sector include the **Chinese** companies (Chint, ZTE) working on the ZPC Solar Projects plants, Rhino Green Energy of **UK** working on the 50 MW Solar PV plant near Marondera and the **Indian** company (Angelique International) working with the Rural Electrification Agency on minihydro projects.

Oxfam and the EU also fund solar projects in rural areas through their program ‘Rural Sustainable Energy Development’.

Again, with so many diverse players in the sector, the Ministry of Energy and Power Development has the task to coordinate their various activities and give direction.

Table 3. Summary of the Institutional Framework for Renewable Energy in Zimbabwe

Function	Institutions / major players
Policy and Strategy Formulation, sector oversight	Ministry of Energy and Power Development. Department of Renewable Energy and Energy Conservation responsible for renewable energy development.
Regulation of the Sector	Zimbabwe Energy Regulatory Authority. Environmental Management Agency, Zimbabwe National Water Authority.
Rural Energy Access	Rural Electrification Fund, Rural Electrification Agency, Ministry of Agriculture, Ministry of Energy and Power Development
Research and Development	Scientific and Industrial Research and Development Centre, Tertiary institutions (UZ, CUT NUST, HIT), Research Council of Zimbabwe.
Implementation and Value Chain Development	Ministry of Energy and Power Development, Ministry of Agriculture, Private Sector companies (see Annex)
Promotion and Advocacy	Renewable Energy Association of Zimbabwe, NGOs (Practical Action, HIVOS, SNV, Power for All, etc.)
Financing	REF, Government of Zimbabwe, Bilaterals and multilaterals (UNDP, EU, Oxfam), microfinance organisations, private sector.

6.0 Legal and Regulatory Framework for the Renewable Energy Sector

Zimbabwe has a number of laws that affect renewable energy development, some lying within the jurisdiction of the parent Ministry (MEPD) and others in other ministries. There is therefore need to ensure that these laws talk to each other and that there is no conflict.

Currently the most all-embracing legislation for the energy sector is the Zimbabwe Energy Regulatory Authority Act which established the Zimbabwe Energy Regulatory Authority (ZERA) and defines the regulatory framework for the procurement, production, transportation, transmission, distribution, importation and exportation of energy derived from any energy source. The Zimbabwe Energy Regulatory Authority Act sets overall regulation of the whole energy sector. There are other subsidiary laws such as the Electricity Act which is specific to the electricity subsector. There is also a corresponding Petroleum Act for the petroleum subsector.

Under the Electricity Act are other subsidiary laws which include the Rural Electrification Fund Act, the Electricity Licensing Regulations, the Grid Code, etc.

The Zimbabwe Energy Regulatory Authority Act (2011) gives ZERA the mandate to license all operators; set and approve energy prices and tariffs and set the terms and conditions for operators.

The Electricity Act (2002) guides operations of the electricity subsector. It established the Zimbabwe Electricity Regulatory Commission, forerunner to ZERA and provides for the licensing of independent power producers.

The Rural Electrification Fund Act (2002) established the Rural Electrification Fund (REF) to facilitate the rapid and equitable electrification of rural areas using grid and off-grid technologies.

The Electricity (Licensing) Regulations (2008) provides for the issuance of generation, transmission and distribution licences by ZERA, including detailed application guidelines.

The Electricity Licensing Guidelines and Requirements (2013) provide guidelines on the licence application process including the required documentation.

The Zimbabwe Electricity Grid Code (2005) establishes the obligations of the electricity supply industry participants and defines the minimum technical requirements for network service providers, generators and load customers, in order to ensure system integrity.

There are other pieces of legislation not administered by the MEPD but which have an impact on the energy sector. These include:

- **The Environmental Management Act of 2012**, which provides for the sustainable management of natural resources and protection of the environment in accordance with global commitments and sets the requirements for environmental impact assessments for new projects.

- **The Water Act of 1998** regulates the development and utilisation of water resources within Zimbabwe such as for inland dams with potential for hydropower generation in addition to their primary purpose of irrigation and urban water supply.
- **The Zimbabwe National Water Authority (ZINWA) Act** of 1998 established ZINWA which is required to undertake and publish the results of research and hydrological and geographical surveys and to develop and maintain a database on hydrological issues of interest for the development and exploitation of water resources in Zimbabwe. Hydrological data is required for planning hydro generation systems on inland dams and perennial rivers.
- **The Communal Land Forest Produce Act** of 1982 regulates the exploitation of and provides for the protection of natural forests within communal land and State plantations.
- Also important to mention are laws proposed by MEPD contained in the NEPIS document but which have not yet been developed. These include the **Energy Management Act** which *shall include legal provisions to empower the Minister of Energy to have oversight over all energy resources and energy related cross-cutting issues such as energy pricing, product and service quality, energy efficiency and demand side management (NEPIS Document p.39), and the Energy Research Act to provide for policy defining target budget and funding for energy related research and development.*

The regulatory Framework is summarised below:

Table 4. Summary of the Regulatory Framework for the Energy Sector in Zimbabwe

Law	Application
Zimbabwe Energy Regulatory Authority Act (2011).	Overall regulation of the energy sector. Controls licensing of energy players and the setting of tariffs and energy prices. Provided for the establishment of the Zimbabwe Energy Regulatory Authority (ZERA).
Electricity Act (2002)	Guides operations of the electricity subsector. Established the Zimbabwe Electricity Regulatory Commission, forerunner to ZERA. Provides for the licensing of independent power producers.
Rural Electrification Fund Act (2002)	Provides for the establishment of the Rural Electrification Fund and Rural Electrification Fund Board to accelerate access to electricity and clean energy in rural areas
Electricity Licensing Regulations	Gives guidelines on electricity licence applications
Petroleum Act (2006)	Provides for the licensing and regulation of the petroleum industry in Zimbabwe, fuel quality and mandatory blending of petroleum fuels.
Environmental Management Act	Provides for environmental protection and the requirements for environmental impact assessments for new projects.
Water Act (1998)	Regulates water use for irrigation and hydropower generation.
Zimbabwe National Water Authority (ZINWA) Act (1998)	Established ZINWA which is required to develop and maintain a database on hydrological issues of interest for the development and exploitation of water resources in Zimbabwe.

7.0 State of Renewable Energy Development in Zimbabwe

Zimbabwe has been involved with renewable energy technologies for many years now especially solar water heating, biofuels (including biogas, bioethanol blends) and solar photovoltaics. Over the years, the Renewable Energy Technology (RET) industry has been going through peaks and troughs. At one time the country was assembling solar photovoltaic panels from imported cells and making solar water heaters to Standards Association of Zimbabwe (SAZ) standards before the country was flooded with cheaper imported substitutes.

Over the years, however, the number of companies that have joined the renewable energy bandwagon has also increased tremendously and so has the range and complexity of services and products that they offer.

Renewable energy companies in Zimbabwe are found in manufacturing, import and export, wholesale, retail and distribution. They offer the following services: system design, manufacture, installation /maintenance /repair; project development and engineering; and research. A very wide range of products are on offer: solar water heating systems, solar water pumping; solar electric power systems, backup systems, charge controllers, dc/ac inverters, solar batteries. For instance, Chloride Zimbabwe is making solar batteries that meet the ZERA specifications. A list of some renewable energy companies and their products is given in the Annex.

7.1 Major Renewable Energy Installations /Projects in Zimbabwe

This section gives the major renewable energy projects and installations in Zimbabwe for the various RETs: minihydro, biofuels, solar minigrids, bagasse and wind energy.

7.1.1 Biomass

Bioethanol Production

Zimbabwe has a history in using ethanol/petrol blends of up to 20%, the ethanol being produced from sugarcane. The blend ratio has been varying depending on the availability of ethanol.

Bioethanol is produced from Triangle /Hippo Valley (40 million litres/annum) and Green Fuel (Chisumbanje)(variously estimated at between 54 and 120 million litres per annum (2014 -2015)). There is potential for more ethanol production and Green Fuel are projecting 450 million litres per annum by 2020 (Green Fuel). With the completion of a major irrigation dam (Tokwe-Mukosi) end of 2016, sugar cane production in the Lowveld of Zimbabwe is expected to receive a boost and Zimbabwe could become a hub for bioethanol, supplying the region.

An important by-product from ethanol is the **ethanol gel** which is currently being sold in shops as a fuel for cooking. Cooking stoves specially designed for use with ethanol gel have been developed.

Biodiesel Production

A Reserve Bank of Zimbabwe funded biodiesel plant at Mt Hampden near Harare with a capacity of producing 100 million litres per year using *jatropha curcas* is currently lying idle due to lack of suitable feedstock.

Plans are under way as part of the National Biofuels Policy to promote production of *jatropha curcas* under different strategies including small holder out growers and plantation type.

National Domestic Biogas Program

A market based National Domestic Biogas Program was launched in 2013 in selected Districts by MEPD. It involves Ministry of Agriculture, Irrigation and Mechanisation and NGOs (HIVOS, SNV). 70 biogas digester builders have been trained and 1385 biogas units constructed in the districts of Goromonzi, Insiza, Chegutu and Mvuma.

Cogeneration Using Bagasse

Cogeneration units using bagasse from sugar cane waste have been installed at Triangle, Hippo Valley and the Green Fuel Plant at Chisumbanje in the South Eastern part of the country.

The power plants at Triangle and Hippo Valley have a combined installed capacity of 81.5 MW electricity. The power generated is for their own use as well as feeding into the grid.

The Green Fuel plant has an installed cogeneration capacity of 18 MW and will export 10MW of electricity to the national grid during operational months.

Power Generation from Wood Waste

Over 16 MW can be generated using wood waste from various sawmill sites. A 500 kW system under Border Timbers is already operational. The Nyanga Sawmill Wood Residue Project; which is situated at a Wattle Company site has been estimated to have generation capacity of about 3.5 MW. Chimanimani Sawmill Wood Residue Power Project situated at a Forestry Commission site has a capacity of 3 MW, and the Charter Sawmill Wood Residue Power Project situated at the Border Timbers site has a capacity of about 10 MW (Jingura RM et al, 2013)

7.1.2 Power from Minihydro

A total of almost 7 MW of mini-hydro power generating units have been installed in the Eastern Highlands of the country.

Table 5: Mini Hydro Sites in Eastern Highlands

Minihydro Scheme	Installed Capacity (MW)
Duru	2.2

Nyamingura	1.1
Pungwe A	2.75
Rusitu*	0.75
Total	6.8

Source: SADC-RERA (2013)

*The Rusitu Plant is currently out of action due to flooding.

There is also a total of almost 350 kW installed capacity of micro hydro schemes in the Eastern Highlands of the country.

7.1.3 Solar PV Systems

Solar Powered Irrigation Schemes

An estimated 32 kWp solar powered irrigation schemes have been installed countrywide. The schemes range in size from 2 kW to 20 kW.

Solar Powered Systems at Institutions

The Rural Electrification Agency has installed a total of 372 solar powered systems of 0.9 kW each to provide power to limited essential services at schools and clinics. They represent an equivalent power generating capacity of 334.5kWp.

7.1.4 Wind Energy

A wind powered electricity generation plant was installed at Temaruru in 1999. The scheme stopped functioning more than 5 years ago. This has been attributed to the inverter that had failed and the community could not afford to repair it. After the inverters, the batteries also failed. The community was unable to replace all the failed components as there was no dedicated fund for operation and maintenance. The shop owners who were the main beneficiaries are currently relying on solar and small petrol powered generators (SADC-RERA)

7.2 Comparative Costs of Energy from Different Sources

Table 2 at the beginning of this report gives the levelised costs of electricity from different renewable energy sources.

To give a more complete picture, the cost of electricity from different sizes of diesel generators which have become common as back-up or standby generators as a result of erratic electricity supplies is given here.

The major factors which determine the cost of electricity from diesel generators are:

- Fuel costs;
- Replacement costs. The average life of a diesel generator is about 2000 hours after which it has to be replaced; and
- Maintenance costs.

On average the levelised costs of replacement and maintenance costs is US\$0.40 /kWh (<https://www.youtube.com/watch?v=9e1PJwiWi2l>).

Fig A in the Annex which gives fuel consumption rate in litres per hour for different generator sizes: 10, 20, 60, and 120 kW was used to calculate the cost of electricity from the different generators.

Diesel generators are most efficient when operating at 80% load factor, generally with efficiencies of 30 – 40%.

From Fig A, at 80% load factor, the fuel consumption rates are 2.5; 5.0; 12.5 and 25.0 litres per hour respectively for 10, 20, 60 and 120 kW generator.

Using a calorific value of diesel of 39 MJ/litre and a diesel price of US\$1.20 /litre in Zimbabwe, and for different generator efficiencies of 30% and 40%, the levelised electricity cost from diesel generators in this size range is US\$0.67 at 40% efficiency and US\$0.77 /kWh for 30% efficiency. Considering that most diesel generators in private homes are not even optimised, the cost of electricity from these generators are higher.

Fig 4 below compares the average cost of electricity from different sources. Electricity from diesel generators comes out most expensive, even for large diesel generator like the Dema Power Station near Harare.

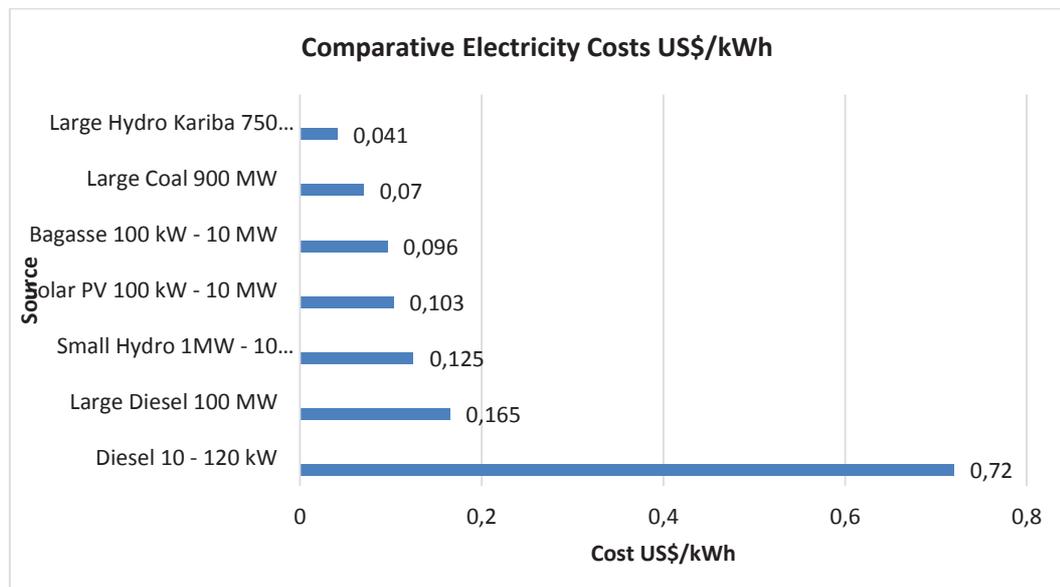


Fig 4. Comparative Electricity Costs from Different Sources
(Sources: ZPC, ZETDC, ZERA)

Prices of Some Renewable Energy Components Available in Zimbabwe

Annex A4 gives examples of prices of some renewable energy equipment and components available in Zimbabwe. For example:

- a) Solar water heaters vary in price from US\$150 for a 50 litre unit to \$470 for a 200 litre unit for thermo-siphon designs while pressure units vary from \$870 for a 150 litre unit to \$1200 for a 250 litre unit;
- b) Solar PV panels vary from \$80 for a 50 W panel to \$340 for a 310 W unit;
- c) Inverters cost from \$150 for a 500 kVA unit to \$300 for a 3000 kVA unit;
- d) Solar batteries cost \$48 for a 40 Ah unit to \$360 for a 200 Ah unit;
- e) Other balance of system components include charge controllers going for \$35 for 20 Amp to \$75 for 60 Amp.

Most components are imported from China and India.

Solar energy equipment are imported duty free but do attract a 15% value added tax.

8.0 Market Potential for Renewable Energy Investment

8.1 Major Market Segments

Different consumers have different needs and therefore different strategies should be used to meet these needs. Also apparent is that different funders have different preferences.

Table 6 below attempts to summarise these segments.

Table 6: Renewable Energy Market Segments

Technology	Market Segment	Needs	Strategy	Source of
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Provider				Funds
Solar PV, Solar Thermal	Rural Institutions: schools, clinics	Essential power needs: lights, water pumping, water heating, medical refrigeration. Power for appliances /telecoms (computers, etc)	Mini-grids, Roof top Solar Water Heaters	Donors – EU, USAID, OXFAM
Solar PV, Solar thermal	Urban Private Households	Solar Hot water, Solar PV Lights, power for appliances (TVs, radios, charging cell phones)	Stand-alone roof top solar PV, solar water heaters, ethanol gel stoves	Private
Solar PV	Small /Medium Enterprises	Power for productive use (water for irrigation, welding, sewing machines)	Mini-grids at growth /service centres. Stand-alone	Private, Donors.
Minihydro	Independent Power Producers	Power for sale to the grid.	Minihydro, solar minigrids,	Private banks
Solar PV,	Telecommunications Industry	Power for transmission /booster towers in remote areas.	Solar PV /batteries/inverters	Private. (banks)
Solar PV	Local Authorities	Street lights /traffic lights	Mast top mounts	Private, donors
Biogas, Municipal sewage		Power from biogas	Harness biogas from sewage treatment works	Private. Multilateral banks (AfDB)
Municipal solid Waste		Power from Municipal Solid Waste	Appropriate management of MSW to generate power	Private. Multilateral banks (AfDB)
Clean cook stoves	Rural Households	Energy for cooking, lighting, small appliances (radio, TV, cell phones)	Improved cook stoves, biogas /Roof top solar PVs /batteries /inverters. Solar lighting Portable units	Private. donors
Electrical hardware	National Electricity Utility	Strengthen the power grid		Multilateral banks (WB, AfDB). Private banks

8.2 Which Renewable Energy Technologies to Focus On

The decision as to which renewable energy technologies to pursue for this study is determined by the coincidence of the Dutch companies' strengths / preferences and corresponding technologies which appear attractive and viable on the Zimbabwean side.

A preliminary list on the Dutch side gives the following technologies (with the number of companies interested):

Biogas (8); Off grid solar (6); Wind (6); Consultancy (4); solar PV (3); engineering (3); Waste water treatment (3); biomass (3); cook stoves (2); biofuels (2); and others (6).

Table 7: Technology Offer from the Dutch Companies:

Technology on Offer	Number of	Most common	Comments
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	Companies	Both Sides	
Biogas	8	Yes	from municipal solid and treatment works, animal waste
Off Grid Solar	6		More on Zimbabwe side
Wind	6		
Consultancy	4	Yes	
Solar PV	3	Yes	
Engineering	3	Yes	
Waste Water Treatment	3	Yes	
Biomass	3	Yes	
Cook Stoves	2	Yes	
Biofuels	2	Yes	
Others	6		

On the Zimbabwean side the biggest demand appears to be for the following: off grid solar PV for community and individual household power needs; minigrids for institutions in rural areas; solar water heating; solar PV for productive uses: irrigation, small scale industry; minihydros for power production and biogas.

From the two sides the most common areas:

- Consultancy and engineering;
- Solar PV – for individual households (lanterns and for charging purposes), and for productive uses (irrigation and for small scale industry);
- Biomass for power production;
- Biogas from solid municipal wastes;
- Biogas from municipal sewage treatment works
- Biofuels;

While not dismissing wind energy, from the wind speed regimes for Zimbabwe, suitable sites for power generation have still to be identified. However, for water pumping applications the wind speeds are adequate and Zimbabwe has a history of using wind mills for water pumping in the farming areas.

8.3 Opportunities for Renewable Energy Investment in Zimbabwe

The potential market for Dutch companies and Dutch products in Zimbabwe extends along the whole value chain in the delivery of renewable energy services: consultancy services, system design and engineering, installation, maintenance, and project development.

It can also include the following business types: manufacture, wholesale, retail and distribution.

Products that can be considered include: solar water heaters, solar water pumping, solar electric grid systems; and components such as CFL lights, batteries, inverters, wind power generation equipment, biogas.

Solar Water Heaters

Government has announced that it intends to ban electric geysers in new domestic and commercial buildings and make it mandatory for all new buildings to use solar geysers.

This will create a huge market for solar water heaters. With a national housing backlog of over one million (World Bank, 2014), even if we assume 10% of these will install solar water heaters, this translates to over 20 000 units, before factoring in natural population growth.

Solar PV Minigrids

Government policy is to increase access to energy in rural institutions which have no electricity. Experience by the Rural Electrification Agency (REA) shows that these institutions (schools, clinics, and small businesses) can be supplied through minigrids which average in size 1kW.

Solar PV Irrigation Systems

The success of horticulture in the rural areas depends on availability of irrigation water. This can be supplied through solar powered irrigation systems.

Experience has been gained using solar powered drip irrigation kits for tobacco farmers on 1 ha plots. In addition, 32kW systems ranging in size from 2kW to 20 kW have been installed in the country.

One of the strategies of the ZIMASSET program under food security is to increase the land under irrigation and have 150 000 to 220 000 ha irrigated. This cannot all be done under large scale irrigation and a substantial part of this will be under small scale irrigation using solar PV.

Minihydro Power Generation Equipment

Zimbabwe will increase its internal power generation using minihydro schemes on rivers and at large dams. The minihydro sites are at varying distances from the national grid. Each site will be treated individually because even the economic circumstances around each are different.

Some of the schemes that have been identified but not yet implemented include:

Potential Minihydro Projects

Table 8: Potential Minihydro Projects

District	Site	Capacity (MW)	Annual Energy Production (GWh)
Mwenezi	Manyuchi	1.4	5.5
Masvingo	Mutirikwi	5	40
Mutasa	Osborne	3	23.6
Bikita	Siya	0.9	5.6
Mutasa	Duru	2.3	6.0
Nyanga	Gairezi	30	70
Nyanga	Tsanga	3.3	8.8
Masvingo	Tokwe Mukosi	15	

(Source: Ministry of Energy and Power Development)

Solar PV Lanterns and Charging Systems

Many households in rural areas as well as unelectrified urban areas have resorted to using solar lanterns to meet their lighting requirements as well as for charging cell phones and for radio and television. Most buy these from distributors in the various urban centres.

A study by Koen van Kuijk of the University of Amsterdam estimated the global market for solar lanterns and solar charging system in Zimbabwe as US\$60 million.

Solar PV Balance of Systems

In addition to supplying solar PV systems there is also the market to supply balance of systems equipment such as batteries, solar inverters, charge controllers etc.

Solar Street Lighting and Traffic Lights for Cities

Government has ruled that all major towns and cities in Zimbabwe should have their street lights solar powered. Harare alone is talking of 10000 units.

Biogas

The potential for commercial biogas projects exists at dairy farms, piggeries and slaughterhouses where there is easy access to abundant feedstock due to a concentration of animals in an enclosed space.

Table 9: Biogas Potential

Category	Potential Number
Domestic	64800
Abattoirs	36
Piggeries	470
Dairy	106

Source: MEPD /REA (2012)

(Feasibility of a National Biogas Program)

Biogas from these facilities can be used for heating or power generation when much larger feedstock volumes are available.

Another opportunity for biogas is at municipal sewage treatment plants like the Firlie and Crowborough Sewage Works in Harare.

Biofuels

Opportunity exists for the production of biodiesel from jatropha curcas. While opportunity exists for ethanol production from sugar cane there seems to be currently major players already active in the area (Green Fuel and Triangle and Hippo Valley).

The demand for biofuels depends on the blending ratios that the country settles on.

The figures below are for two scenarios for ethanol/petrol blend (either 10% ethanol/petrol blend (E10) or 20% ethanol/petrol blend (E20)) and 2% biodiesel blend (B2) for the periods 2020 and 2025. There can be other combinations.

Table 10: Projected Demand for Biofuels (in million litres)

	2020	2025
E10 (Ethanol)	46	56
E20 (Ethanol)	92	127
B2 (Biodiesel)	25.6	71.2

(Source: Draft National Biofuel Policy of Zimbabwe)

The Table below summarises project opportunities using the various renewable energy technologies with potential in Zimbabwe.

Table 11: Summary of Project Opportunities

Technology	Project Opportunities	Comments
Engineering	Consultancies, project development	
Biogas	Biogas from Municipal sewage works	
Solar PV	1. Solar minigrids for rural institutions (clinics, schools, small businesses)	

	<ol style="list-style-type: none"> 2. Solar irrigation systems for horticulture production 3. Solar lanterns and charging systems for households. 4. Supply of balance of systems (batteries, inverters, panels, etc.) 5. Solar Street lights for major towns. 	
Solar Thermal	Supply /installation of solar geysers in urban areas, institutions and industry	
Minihydro	See Separate Table of minihydro projects above	
Wind Energy	Windmills for irrigation and water supply for people and animals (e.g. in National Park areas)	
Biomass	Power generation from agricultural, forestry and sawmill wastes	
Biofuels	Production of biodiesel from jatropha curcas	
Biogas	Power /heat from biogas from municipal; sewage treatment works, piggeries, abattoirs and dairy farms.	
Municipal waste	Municipal solid waste and municipal liquid waste.	Further work to characterise the waste required.

9.0 Future Outlook for RETs in Zimbabwe

Prospects for renewable energy in Zimbabwe are very bright, although a few threats and weaknesses have to be addressed. These are, however, outweighed by the strengths and opportunities that present themselves for exploitation.

The major strengths are found in the huge and diverse renewable energy resource base of solar radiation, especially, minihydro and biomass, municipal solid waste, agricultural and forestry wastes. Land is also readily available for solar plants and other developments. In addition, the country boasts many years of useful experience in renewable energy technologies. The banking and financial services sector is also well developed.

Great opportunities for renewable energy arise from huge unmet needs in unelectrified rural and urban areas for basic needs for health, agricultural and small scale productive applications such as irrigation for horticulture, small scale uses such as welding and other productive uses. In addition, the erratic electricity supplies to those already electrified presents an opportunity for renewable energy applications such as standby supplies.

However, threats posed by cheap low quality imports and foreign currency shortages have to be addressed. With little disposable income, the consumers are very price sensitive and are most likely to go for the cheapest product on the market.

Foreign currency shortages impose delays on imports and may also force importers to go for the cheapest sources, sacrificing quality.

The policy arena has also to be improved. Most of the policies such as the Renewable Energy Policy, the Independent Power Producers framework and the Renewable Energy Feed in Tariff, although favourable to the development of renewable energy, have still to be officially approved and adopted; product quality standards have to be enforced and capacity for system installation and maintenance is still weak.

A SWOT Analysis for Renewable Energy Market in Zimbabwe

Strengths

- Huge and diverse renewable energy resource base (solar radiation, biomass, and minihydro).
- Favourable broad policy framework , e.g. policy banning electric geysers on new buildings and encouraging solar water heaters;
- Many years' experience with renewable energy particularly solar energy and minihydro. Virtually everyone (even in the rural areas) knows about solar energy. Many useful lessons have been learnt which can make any future efforts more successful.
- There are already many international players especially from Europe (Austria, Germany, and United Kingdom etc.), Japan, China and USA active in renewable energy in Zimbabwe. A number of NGOs are also active in the renewable energy sector such as SNV and HIVOS.
- The Netherlands has had a very long trade relationship with Zimbabwe especially in horticulture and many Dutch organisations are familiar with the Zimbabwean business environment.
- Zimbabwe is also strategically located in the Southern African Development Community (SADC) region. An investment in Zimbabwe can benefit from access to markets in the whole of the SADC region with a total population of over 270 million inhabitants.
- Generally highly literate workforce, where they may lack skills they can be trained.
- Peaceful environment which augers well for development programs.
- Highly developed financial and capital market sector comprising commercial banks, development bank, building societies, insurance companies and microfinance institutions and an active stock exchange market. There is also an active mobile / electronic banking system.
- Fiscal incentives for renewable energy development already in place (negotiable tax holiday; duty free importation of renewable energy equipment; exemption from paying withholding tax)

Weaknesses

- High capital /investment costs. Interest rates from banks are still very high although the interest rates have now been capped at 12% p.a. by the Reserve Bank of Zimbabwe.
- Tight liquidity situation affecting availability of working capital;
- Low incomes for target beneficiary groups in rural /urban areas due to low formal employment levels;
- Weak regulation. Most regulations are still to be officially approved: Renewable Energy Policy and Strategy, Independent Power Producers Framework, REFIT regulations etc.
- Tight foreign currency situation.
- No targets for renewable energy set in the national policies /strategies;
- Standards for equipment still to be enforced;
- Most equipment has to be imported with the scarce foreign currency;

Opportunities

- Huge unelectrified population in both rural and new urban areas; the huge housing backlog of over 1 million nationwide is likely to need solar energy for lighting and water heating.
- Huge potential in productive use of renewable energy (irrigation for horticulture, small /medium scale productive use) ;
- Huge electricity supply deficit: - renewable energy offer a viable supply option to meet the deficit such as through IPPs and mini grids;
- The national electricity grid is old and weak, presenting an opportunity for reinforcing the grid.
- Access to the SADC Regional market

Threats

- Cheap / low quality imports which have flooded the market. The ordinary consumer has to be educated about quality.
- Foreign currency shortages;
- The national policies have still to be officially adopted.
- Negative perceptions about the Indigenisation and Empowerment Law although for the energy sector the law is relaxed and allows discretion of the line minister.

10.0 Potential Market Entry Barriers

Potential foreign investors in Zimbabwe can come in using different modes which include: exporting, licensing, joint venture and direct investment.

Potential barriers to entry by an investor in another country depend on many factors including the investment mode that the investor chooses.

- **Country Risk Perception**

In many circles, especially on the international scene, Zimbabwe is perceived as an unsafe investment destination, although in reality the contrary is true. This perception could therefore drive away potential investors.

- **Inadequate information about the RE Market in Zimbabwe.**

Foreign investors are likely not to have adequate information about the Zimbabwean renewable energy market and the general business culture in the country and decisions are sometimes made based on assumptions and half-truths.

- **Economic and Financial Barriers**

- **Cost of capital**

Borrowing rates in Zimbabwe are generally very high for a US dollar based economy. The rates have been hovering around 15 – 18% per annum until recently when the Governor of the Reserve Bank of Zimbabwe had to intervene and cap the interest rates at a maximum of 12% per annum. Interest rates from microfinance institutions are even higher (some as high as 45% per annum). These rates are certainly scary for potential investors who are used to interest rates of 3 – 5% per annum.

- **Foreign Currency Shortages;**

The country is currently facing foreign currency shortages to import equipment and for remittances. Importers may have to wait long queue for approvals from the Reserve bank of Zimbabwe for foreign currency.

- **Tight Liquidity Situation Poor Access to Credit;**

Zimbabwe is also facing a tight liquidity situation which tend to negatively impact availability of working capital.

- **Market size;**

By international standards, with a population of only 15 million, the majority of whom are low income unemployed the potential market for renewable energy may not be as large as some investors might be looking for.

- **Consumer resistance to New Products / Suppliers;**

Consumers tend to resist change and want to stick with familiar suppliers and products. The new supplier would have to try a lot harder to convince them to change.

- **Competition from well established companies;**

There are well established companies with a track record who are likely to offer stiff competition to any new comers.

- **Infrastructure challenges;**

Zimbabwe is currently facing infrastructure challenges in the form of poor roads, poor rail system and erratic electricity supplies. Electricity supply cannot meet demand and the national grid is in need of reinforcement, leading to supply disruptions and intermittent supply.

The poor road network, made worse by the recent heavy rains and floods make many rural areas who are the main targets for renewable energy difficult to access.

- **'Ease of Doing Business'**

Although a lot is being done to improve the ease of doing business, it still takes a while for a new investor to obtain all the necessary approvals. For 2017, Zimbabwe was ranked 161 out of 190 by the World Bank.

Obstacles which potential investors have faced include:

- Delays in securing approvals when starting a business;
- Business registration costs were high;
- Generally high cost environment – labour, rental.
- Liquidity constraints;

11.0 Requirements for New Investors

The Government of Zimbabwe has launched a handbook 'Invest in Zimbabwe' which gives guidelines to be followed by prospective investors in Zimbabwe. In short, the requirements are summarised below.

Investor Protection and Security

Zimbabwe guarantees legal protection for all investors through its constitution, which guarantees the right to private property and prohibits expropriation of private property without adequate compensation.

Project Approval and Registration Procedure

New foreign investment into Zimbabwe has to be approved by the Zimbabwe Investment Centre.

Foreign investments into existing companies require Reserve Bank approval. This is done by submitting an application to the Exchange Control Department of the Reserve Bank of Zimbabwe, through the local partner's commercial bank or merchant bank

Remittance of Dividends/Profits – all companies with foreign shareholding are entitled to remitting 100% after-tax profits that are due to their foreign shareholders.

Double Taxation Agreements: Zimbabwe has double taxation agreements with the Netherlands, among other countries. This means that Dutch companies investing in Zimbabwe will not be subjected to tax in Zimbabwe as well as in the Netherlands.

12.0 Public Procurement System

Government plans to do away with the current State Procurement Board and set up the Procurement Regulatory Authority of Zimbabwe (PRAZ) which will oversee procurement activities of Government, statutory bodies and local authorities. The Bill will go before Parliament in the next session.

Procurement activities will be carried out by the individual entities. By decentralising the procurement, Government is reducing bureaucracy and speeding up the procurement process. The line Ministries and institutions are more familiar with the specifications of the equipment that they intend to purchase.

Bureau Veritas

Since July 2015, Government has introduced Consignment Based Conformity Assessment Certification using Bureau Veritas. Bureau Veritas carries out pre-shipment inspection and certification of goods to ensure and confirm that the client receives what he has ordered.

The program eases clearance procedures, promotes fair competition and fights counterfeiting, thus protecting the consumer and the environment.

13. Recommendations

The report has identified general areas of potential projects. As a way forward it is recommended that further work be done to

- Develop and shortlist concrete projects with owners and promising funding.

From the general list of potential project areas given here in this report, select those areas where there is keen interest from the Dutch companies.

- Assess availability of technical and economic data in the suggested areas;
- Establish a business case
- Develop projects in the selected areas of interest.
- Identify credible local (Zimbabwean) counterparts (if desirable). While it may be desirable to go into partnership with someone who is familiar with the local business environment, this is not mandatory.
- Estimate project costs. The decision to go ahead with a project obviously depends on the estimated cost of the project.
- Identify potential sources of funding.

References

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Jingura RM et al (2013) – A Review of the State of Biomass Energy Technologies in Zimbabwe

Manyuchi M et al (2016) – Sewage Plants' Potential to Produce Biogas for Electricity Generation – Case Study of three Zimbabwe Municipalities (Proceedings of DII Conference)

MEPD /REA (2012) – Feasibility of a National Biogas Program

SADC –RERA – Gap Analysis and National Action Plan – Zimbabwe Case Study

Van Kujik K (2012) – Solar PV Potential in Rural Zimbabwe

World Bank (2012) – A Global Review of Municipal Solid Waste

ZERA (2015) – Updated LCOE

Zimbabwe Investment Authority (2017) – Invest in Zimbabwe Handbook.

ZIMSTAT (2012) – Zimbabwe Population Census National Report

ANNEXES

Table A1: Summary: Zimbabwe's Renewable Energy Resources

Resource	Quantity	Comments
Solar radiation	20 MJ/m ² /day	
Wind	3 m/s	Higher speeds expected at higher levels#.
Minihydro	>120 MW on inland rivers and dams	Over 20 mini hydro sites identified still to be developed
Hydro	18600 GWh on the Zambezi	750MW installed. ZESA has plans to add 300 MW to the Kariba hydro power plant. 1720MW potential on the Zambezi River still to be developed
Biomass		
Fuel wood*	5654000 tons/a	
Forestry Residue*	2300000 tons/a	
Sawmill waste*	750 000 tons/a	
Bioethanol	100 – 140 million litres/a,.	currently being produced
Animal waste*	4481000 tons/a	
Crop residue*	10862000 tons/a	
Municipal Solid Waste**	957 000 tons/a	Total for Harare, Chitungwiza, Bulawayo, Gweru , Mutare (details in Annex)
Biogas From Municipal Sewage Works		
Chitungwiza+	2.6 tons/day	
Firle+	19.6 tons /day	
Crowborough+	7.6 tons /day	
Biogas Potential – Domestic and Institutional ***		
	Number of Biogas Units	
Subsistence farmers	63 564	4 -20 m ³
Abattoirs	36	4 – 20+ m ³
Piggeries	470	4 – 20+ m ³
Dairy	106	
Primary Schools	566	
Secondary Schools	224	

*Jingura et al (2013)

**Using World Bank (Urban Development Series,) MSW Index of 0.8 kg/capita/day)(A Global Review of Solid Waste Management, 2012

Hove T and Madiye, L (undated) – Wind Resource Mapping for Zimbabwe. (Wind power varies from about 15 W/m² (Kariba) to 115W /m² (Gweru) at 50m hub height#)

+ Manyuchi M (2016)

The recently completed 1.8 billion m³ Tokwe Mukosi Dam has the potential to irrigate a further 25 000ha of farm land for more sugar cane and other crops.

***MEPD/ REA 2012

Table A2: Biogas from Municipal Sewage Plants

	Design Capacity (Million Litres /Day)	Biogas Produced (tons /day)	Potential Power (MW)
Chitungwiza	19.6	2.6	0.54
Firle (Harare)	144	19.6	4.2
Crowborough (Harare)	54	7.6	1.53

Source: Manyuchi M (2016)

Table A3 Municipal Solid Waste

Municipal Solid Waste		Population (est.2016)
Harare	1234 tons/day**	1542800
Bulawayo	560 tons /day**	699385
Gweru	117 tons /day**	146073
Chitungwiza	270 tons /day**	340360
Mutare	147 tons /day**	184200

A4.1 SOME EXAMPLES OF RENEWABLE ENERGY EQUIPMENT PRICES

Solar Thermal Water Heaters

		Thermosyhon/Gravity				Pressure		
Capacity	Litres	50	100	150	200	150	200	
US\$		150.00	270.00	370.00	470.00	827.00	978.00	1,209.00

Mostly imported evacuated tube types

		Thermosyhon/Gravity - Flat Plate (local manufacture)					Pressure Flat plate (local m	
Capacity		50	100	150	200	300	50	100
US\$					1,870.00	2,546.00		

Geyser Element

US\$		35
------	--	----

Solar System Components

Solar Panels

Capacity	W	50	100	150	210	255	310
US\$		80	115	170	237	282	341

Solar Batteries

Capacity	Ah	40	80	102	200
US\$		48	100	180	360

Inverters

Capacity	kVA	500	750	1000	1500	2000
US\$		150	180	200	250	300

Charge

controllers

Capacity	Amps	20	30	60
US\$		35	50	75

Solar Lantern

US\$	25
------	----

Basic Solar Home Kits with 10-20W panel & inverter (lights/charging phones/radio)

Number	Lights	2	3	4
US\$		80	120	150

Solar Home Kit with 30W panel & inverter (lights/charging phones/radio/TV)

US\$	500
------	-----

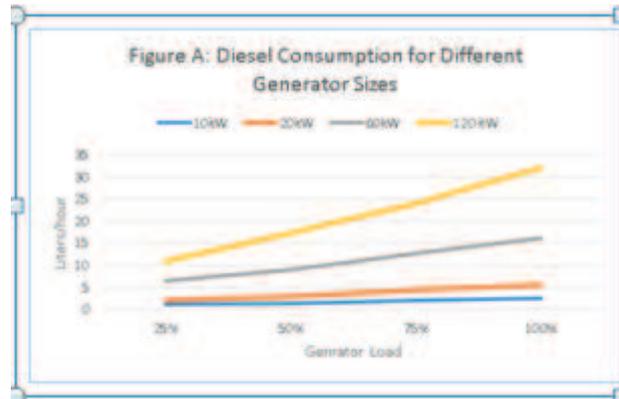
Solar Water Pumping Systems (pump set)

Capacity	120W	24V	25m Head	Capacity	120W	24V
US\$	788.96			US\$	1,495.00	
Capacity	210W	36V	37m Head	210W	36V	90m Head
US\$	812.95			847.95		
Capacity	500W	48V	14m Head	500W	48V	47m Head
US\$	1,144.95			US\$	867.95	
Capacity	1000W	110V	140m Head			
US\$						

Notes:

- Solar panels are imported duty free into the country.
- All components pay 15% VAT
- Prices vary according to quality and country of manufacture.
- As of 2015 there is now local capacity to manufacture both automotive and solar batteries.
- Most components and kits are imported from China and India.
- Components from Europe seem to be of a better quality and they are more expensive too.
- System installation costs vary from \$150 to \$300
- ZENT has been instructed to start local manufacture of solar geysers (various sizes) in the context of the National SWH pro

Annex A4.2 Comparative Costs of Electricity from Diesel



(Source: 1. http://botswanaenergy.blogspot.com/2016/06/diesel-vs-solar-generated-electricity_20.html

2. www.abesales.co.au

3. <https://www.abesales.com.au/source/Diesel%20Generator%20Fuel%20Consumption%20Chart%20in%20Litres.pdf>)

Fig A. above shows diesel consumption rates for diesel generators of different capacities: 10kW, 20 kW, 60 kW and 120 kW. Diesel generators are most efficient at 80% load factor. At this load factor the fuel consumption rates are: 2.5; 5.0; 12.5 and 25.0 litres per hour respectively for 10, 20, 60 and 120 kW generator.

Diesel generators are most efficient when operating at 80% load factor, generally with efficiencies of 30 – 40%.

From Fig xyz, at 80% load factor, the fuel consumption rates are 2.5; 5.0; 12.5 and 25.0 litres per hour respectively for 10, 20, 60 and 120 kW generator.

Using a calorific value of diesel of 39 MJ/litre and a diesel price of US\$1.20 /litre in Zimbabwe, and for different generator efficiencies of 30% and 40%, the levelised electricity cost from diesel generators in this size range is US\$0.67 at 40% efficiency and US\$0.77 /kWh for 30% efficiency.

A5. People /Organisations Met /Contacted

	Organisation	Contact Person	Contact Details
1.	Ministry of Energy and Power Development	B. Mangwende	Barnabas Munemo Mangwende bmmangwende@gmail.com
2.	Ministry of Energy and Power Development	Dr. S. Ziuku	Sosten Ziuku sostenziuku@gmail.com
3.	Rural Electrification Agency	Mr. C. Nhandara	C Nhandara cnhandara@rea.co.zw
4.	Zimbabwe Energy Regulatory Agency	Dr. G. Magombo / Eng S. Zaranyika	gmagombo@zera.co.zw ; snzaranyika@zera.co.zw
5.	Royal Dutch Embassy in Harare	AS Brinks	as. brinks@minbuza.nl
	Partners for Innovation	E. Hanekamp	E. Hanekamp <e.hanekamp@partnersforinnovation.com>
7.	Power For All	Ms. C. Mazaiwana	Chiedza.Mazaiwana@practicalaction.org.zw
8.	Solarhart /Ilanga	Mr. Nhete	
9.	Renewable Energy Association of Zimbabwe	Mr. I Nyakusedndwa	nyakusedndwai@regatta.co.zw
10.	Renewable Energy Association of Zimbabwe		RENEWABLE ENERGY ASSOCIATION Zimbabwe <renewableenergyzimbabwe.reaz@gmail.com>
11.	Thermotec / Impact Solar	Mr. C. Muchenje	Impactenergy@zol.co.zw ; 'muchenjeconsult@gmail.com'
12.	Green Rhino	Mr G. Gogwe	
13.	Zonful	Mr Ponelo	
12.	Ministry of Macroeconomic Planning and Investment Promotion		
13	Zimbabwe Investment Authority	Mr N. Kanyemba, Mr W. Mutero	kanyemba@zia.co.zw

Annex 6: Some of the Renewable Energy Companies Operating in Zimbabwe and the Services they Offer.

Company /Business Type	Products	Services	Contact Details
Alternative Energy Technologies (exporter, importer)	Backup power systems, emergency backup batteries, renewable energy system batteries, solar electric power systems, wind energy system components (small).	System design, specification, installation and maintenance	2 Westview Mansions, Civic Centre, Marlborough T:+263 4 750984
Energyon Pvt Ltd (Bio-climatic Architecture)	Green Buildings & Consultancy. Power inverter chargers (modified sine wave and Full sine wave), Solar systems Domestic & commercial, Solar Street lights	Project engineering, consulting services for solar system installations, design, installation,	20 Gaynor Road Highlands, Harare, T: +263772622036
Impact Solar Energy (manufacturer, importer, distributor)	solar water heating systems, solar water pumping systems, water heating systems, solar electric power systems	design, installation, project development, contracting	1 Conald Road, Graniteside, Harare, T: +263 4 752245/6
Kevin Power Solutions Ltd (manufacturer, exporter)	backup power systems, DC to AC power Inverters sine wave, Batteries, CFLights		T: +91-9999909872, 09720002052
Yandalux GmbH (retail sales, wholesale supplier, distributor),	Photovoltaic systems residential, solar traffic lighting, water pumps, solar water pumping, batteries deep cycle, photovoltaic modules.	consulting, installation, engineering,	T: +49-40-253098919
ZimSolar (manufacturer, retail sales, wholesale supplier, exporter, importer)	solar electric power systems, solar lighting systems, backup power systems, water filtering and purification systems, portable power systems, water filtering and purification systems, solar water heating systems,	consulting, design, installation, engineering, project development	70A Spruit Road South, Hatfield, Harare, T: +44 7901 558 141
Annevor Systems (manufacturer)	Water pumping windmills, water pumping products.	system installation	61B Prices Avenue, Mount Pleasant, Harare. T:+ 2634 308495
Cedarwood Energy Systems (retail sales, importer)	Solar electric power systems, batteries custom, batteries deep cycle, biomass energy systems, hydro energy system components (small), solar panel roof mount.	design, installation, engineering,	22 Westminster Avenue, Sentosa. T:0026377427951 3

Davy-Kress (Pvt) Ltd	Energy biofuel ethanol, biomass energy biofuel, Biomass (Sawdust, wood chips, timber logs).	Project development	35 Mutley Bend, Belvedere, T: +26391769027
Hi-Q Engineering (Pvt)Ltd manufacturer, retail sales, wholesale supplier	Backup power systems, DC /AC inverters, microinverters, batteries lead acid, solar charge controllers, appliances.	consulting, design, installation, engineering, research services	109 Chinhoyi Street, Harare, T: +263 912 381 417
Solar Kings(Pvt) Ltd manufacturer, retail sales, wholesale supplier	Backup power systems, DC lighting, DC to AC power inverters, solar charge controllers, solar lighting systems, batteries.	consulting, design, installation, engineering, project development services, research services	109 Chinhoyi Street, Harare. T: +263 912 629 102, +263 913 812 884,
Techno Consultants manufacturer, retail sales, distributor	Solar water heating systems, batteries deep cycle, photovoltaic systems, DC to AC power inverters, solar electric power systems, solar lighting systems, Charcoal.	consulting	31 Edison Crescent Graniteside, Harare, T: +2634749930
Ultimate Power Solutions manufacturer, retail sales, wholesale supplier, distributor	Solar electric power systems.	consulting, design, installation, engineering, project development services	31 Edison Crescent, Graniteside, Harare, T: +2634749930

A7- Press Cuttings

<http://www.herald.co.zw/17-mini-hydro-power-stations-on-cards/>

Eskom gives Zimbabwe month-end deadline to pay up

Monday 8 May 2017 15:15

ANA



Zimbabwe owes the South African power utility R603 million, of which R119 million is outstanding arrears.(SABC)

TAGS:

Eskom said on Monday that it had given the Zimbabwe Electricity Supply Authority (ZESA) until the end of this month to honour its increasing debt or it would be forced to cut electricity supply to that country.

Zimbabwe owes the South African power utility R603 million, of which R119 million is outstanding arrears.

The amount has increased from R443 million that ZESA owed Eskom for power supply as at December 2016.

Eskom supplies about 300MW of electricity per day to Zimbabwe under a non-binding agreement.

Work starts on Tokwe Mukosi mini-hydro

By ZimSitRep_M | May 4, 2017

0 Comment

Source: [Work starts on Tokwe Mukosi mini-hydro](#) | **The Herald** May 4, 2017

George Maponga Masvingo Bureau

Work on the \$20 million mini-hydro power project at Tokwe-Mukosi Dam has started, with Italian contractor Salini Impregilo in the process of building a power house for the electricity generation plant.

Government and Salini, which constructed the recently completed largest inland dam in the country, recently signed a \$7 million agreement to build the power house.

Local firm secures \$4m funding for rural solar projects

January 9, 2017 in [News](#)

LOCAL solar finance company, Zonful Energy, has secured a \$4 million soft loan from Kiva International to roll out cheap solar lighting systems to several rural communities, which are not connected to the national power grid.

Chitungwiza Strikes Solar Street Lights Deal

*By Zvamaida Murwira
27th December 2016.*

Cash-strapped Chitungwiza Municipality has struck a \$1 million barter deal with a local company in which the firm will install about 300 solar power street lights in return for billboard advertising rights.

The development is expected to go some way in reducing crime in the dormitory town and improve its corporate image to attract investors. Work on the installation of the solar powered street lights have already started at Makoni, along Mharapara Road, after Solarlux signed the agreement recently.

Chinese Companies Leading the Trend in Developing Clean Energy in Zimbabwe

[Manny Salvacion](#) | Dec 02, 2015 07:20 AM EST

Chinese firms have signed agreements to help build Zimbabwe's first large-scale solar power stations. (Photo : www.thezimbabwemail.com)

Chinese companies are taking the lead in developing clean energy in Africa, a continent with huge energy deficit, particularly Zimbabwe, the Xinhua News Agency reported.

Chloride Zimbabwe Launches New Solar Battery

[October 23, 2014Media Centre](#)

By Byron Mutingwende

Amalgamated Regional Trade (ART) subsidiary Chloride Zimbabwe has launched a new solar battery under Exide that is set to meet the energy needs of its different customers in rural, urban, small and big businesses.

Officiating at the launch event, Mike Bimha, the minister of industry and commerce said the innovation was a timely intervention to the energy needs of the country where businesses

were operating under a difficult environment characterized by lack of access to affordable sources of income, depressed demand, inconsistent supply of basic utilities and stiff competition from foreign products.

Solar pump helps herders overcome Zimbabwe drought

The Zimbabwean, 27 December 2016

LUPANE, ZIMBABWE — Communities in one of the most drought-prone parts of Zimbabwe are ditching farming in favor of cattle raising with support from the United Nations and a local NGO.

Affordable solar schemes light way to energy for all in Zimbabwe

Mon Aug 8, 2016 | 9:07am EDT

Pupils use solar-powered computers at Gomba High School in Gutu, Zimbabwe.
TRF/Jonathan Njerere
By [Tonderayi Mukeredzi](#)

Zimbabwe's Rural Communities Embrace Biogas As Alternative Form Of Renewable Clean Energy

By [Wallace Mawire](#) , 23 , Sep 2016 in [Africa News Slider](#)

At least 2 000 bio-gas digesters have been installed throughout Zimbabwe as rural communities embrace new alternative and cleaner renewable energy solutions.

Mangudya speaks on interest rates cap

March 21, 2017 in [Business](#)

Reserve Bank of Zimbabwe (RBZ) governor John Mangudya says the capping of lending interest rates to a maximum of 12% is a step in ensuring they reflect the currency Zimbabwe is using.

BY NDAMU SANDU

In his January monetary policy statement, Mangudya decreed that lending rates should not exceed 12% per annum effective April 1 and that bank charges that include application fees, facility fees and administration fee, should not exceed 3%.

Council seeks partners for Pomona biogas project

September 27, 2016 in [News](#)

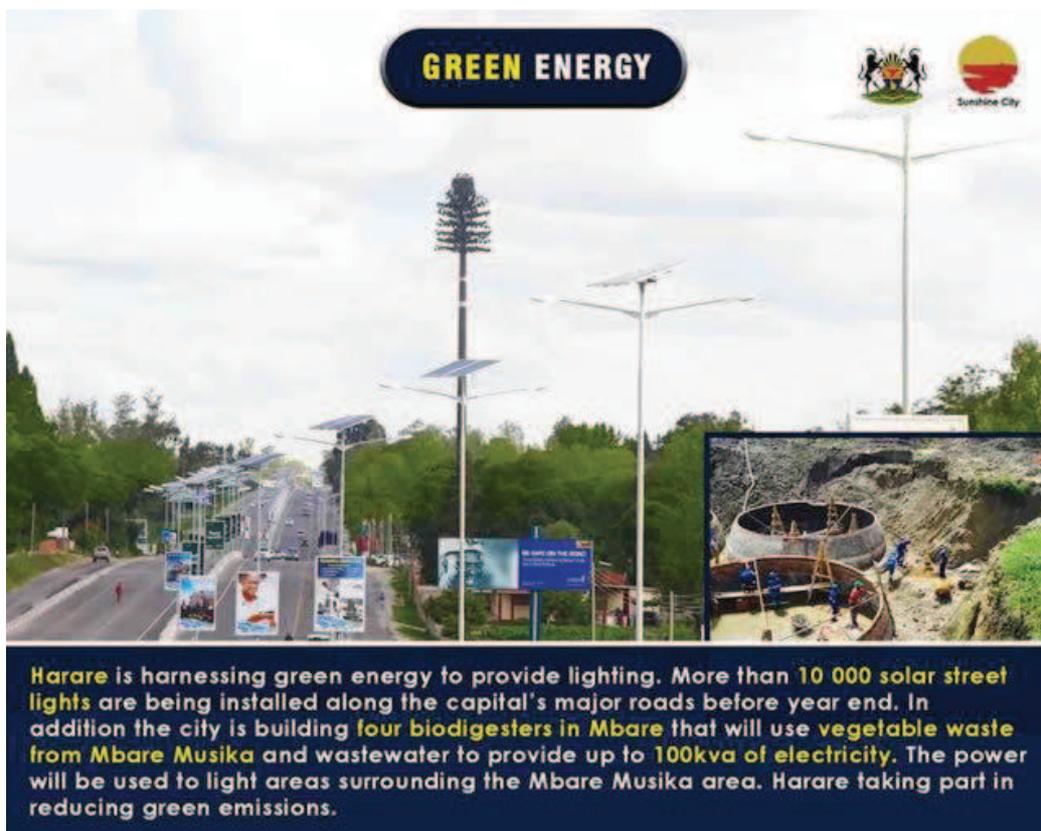
HARARE City Council has invited bidders to set up an energy plant at its waste dumpsite at the Pomona landfill, as the local authority seeks to cash in on its waste.

BY XOLISANI NCUBE

Acting town clerk, Josephine Ncube said the successful bidder would be expected to turn waste into energy and earn the council extra revenue.

Chairperson of the environment committee, Councillor Herbert Gomba, said the project seeks to help the struggling local authority reduce its power bill by generating electricity from waste.

“The aim is for us to create jobs for our young people, as we create electricity for home consumption and reduce the costs that council pays to power utility Zesa. Because we have a lot of unused waste there, we hope to generate enough power to light up a compound and reduce the costs the city is paying to Zesa,” he said.



<http://www.hararenews.co.zw/2014/03/mbare-bio-digester-to-transform-organic-waste/>

Mbare: Putting garbage to good use



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