

# ENERGY

## SECTOR PROFILE



**ZAMBIA DEVELOPMENT AGENCY**

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## 1.0. OVERVIEW OF ZAMBIA'S ENERGY SECTOR

Zambia's energy sources include; electricity, petroleum, coal, biomass, and renewable energy. It is only petroleum which is wholly imported in the country, while the country is basically self-sufficient in all the other energy resources, as it has substantial unexploited reserves of these forms of energy. The country's economy has been growing at an average of 5 percent per annum over the past 10 years and demand for energy has also been rising. The demand for the most important energy source in the country - electricity has been growing at an average of about 3 percent per annum mainly due to the increased economic activity in the country especially in the agriculture, manufacturing and mining sectors, as well as increased activity in the region. Furthermore the country's growing economy has also lead to an increase in the demand for the other forms of energy such as petroleum and coal, as these are key factors of production and operations in most economic sectors. The demand for renewable energies has also seen significant growth in the recent years as the market explores alternative sources of energy, with renewable energies proving to be a viable alternative.

## 2.0. INVESTMENT OPPORTUNITIES IN THE ENERGY SECTOR IN ZAMBIA

There is enormous potential for investment opportunities in the energy sector to meet the country's demand for the various forms of energy. Investment opportunities exist in the energy sector in; electricity generation, petroleum, coal, and renewable energies.

### 2.1. ELECTRICITY

#### 2.1.1 Installed Electricity Generation Capacity - Supply

Hydro power is the most important energy source in the country after wood fuel contributing about 10 percent to the national energy supply. However, there has not been any major addition to the country's generation capacity in the last 20-30 years despite the huge potential in hydro resources. It is estimated that Zambia possesses 40 percent of the water resources in the Southern African Development Community. Zambia has about 6,000 MW unexploited hydro power potential, while only about 2,177 MW has been developed. On the other hand, the demand for power in the various sectors of the economy has grown rapidly over the years.

*Table 2.1: Installed Generation Capacity in Zambia*

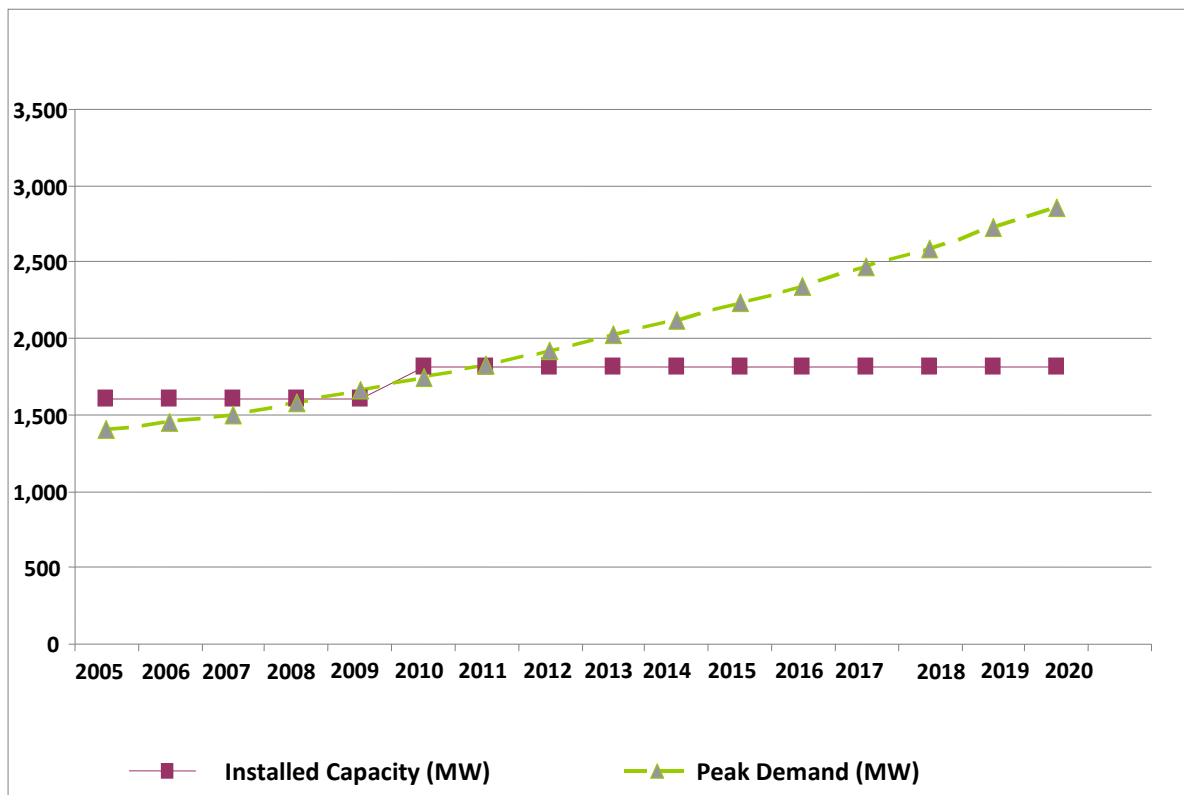
No	Power Station	Installed Capacity	Type of Generation	Operator
1	Kafue Gorge	990	Hydro	ZESCO
2	Kariba North Bank	1,080	Hydro	
3	Victoria Falls	108	Hydro	
4	Lusemfwu and Mulungushi	56	Hydro	Lusemfwu Hydro Corp.
5	Small Hydros - combined	25	Hydro	ZESCO
6	Isolated Generation	8	Diesel	
7	Gas Turbine (stand by)	80	Diesel	Copperbelt Energy Corp.
<b>Total Installed Capacity</b>		<b>2,177</b>		

## 2.1.2 Electricity Demand

### A. Local Demand

Zambia has been experiencing positive economic growth in the recent past with an average real GDP growth rate of 5.1 percent recorded between 2002 and 2009. The Economic Expansion has led to an increase in demand for power. As a result of expansion in economic activities especially in the mines, the peak demand for electricity in Zambia increased from 1,100 MW in 2001 to 1,600 MW in 2009 while the country's installed generation capacity is 2,177 MW. The growth in demand is estimated to be between 150 MW and 200MW per annum. Given these factors, the demand for electricity in the country is expected to exceed 2,000 MW by the year 2015. (Refer to Figure 2.1.2).

*Figure 2.1.2: Electricity Demand Forecast in Zambia (2005 to 2020)*



Source: Ministry of Energy and Water Development (2010)

### B. Regional Demand

Electricity consumption by the Southern African Power Pool (SAPP) is about 50,000 MW per annum. The SAPP has an installed capacity of 55,000 MW and its membership

comprises Botswana, DRC, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe.

The highest consumer of electricity in the region is South Africa with an average growth rate of 3 percent per year. Other leading consumers in the region are Zimbabwe (with a growth rate of 2 percent), Zambia (with a growth rate of 3 percent) and the Democratic Republic of Congo (DRC) with a growth rate of 3 percent. Angola has the highest annual growth rate of 11 percent with a consumption of 593 MW per annum.

The annual growth rate of overall electric power consumption in the SAPP averages 5 percent per annum, and the regional demand is likely to reach 80,000 MW per annum by year 2015.

*Table 2.1.2: Electricity Demand in the Southern Africa Region*

Country	Main Utility	Installed Capacity (MW)	Estimated Annual Demand (MW)	% Growth in Demand
Angola	ENE	1,128	593	11%
Botswana	BPC	132	510	6%
DRC	SNEL	2,442	1,335	3%
Lesotho	LEC	72	114	3%
Malawi	ESCOM	302	303	4%
Mozambique	EDM	2,330	462	7%
Namibia	Nampower	393	476	5%
South Africa	ESKOM	43,061	37,365	3%
Swaziland	SEB	51	251	5%
Tanzania	TANESCO	1,186	793	8%
Zambia	ZESCO	1,985	1,700	6%
Zimbabwe	ZESA	2,045	2,421	2%
<b>TOTAL</b>		<b>55,032</b>	<b>46,062</b>	<b>Ave. rate 5%</b>

*Sources: SADC Today; Volume 11, (2008), Ministry of Energy and Water Development (2010) ZESCO (2013)*

### **2.1.3 Electricity Market Analysis in Zambia**

There are currently three main electricity companies in Zambia – the public utility ZESCO, the Copperbelt Energy Corporation (CEC) and the Lussembwa Electricity Company.

### **2.1.4 Investment Opportunities in Electricity Projects in Zambia**

Following the amendment to the second schedule of the ZDA Act, power generation has now been declared a priority sector. This amendment was in recognition of the need to reduce the cost of developing power plants and attract independent power producers to increase generation capacity in Zambia and meet the growing demand for power for the productive sectors especially mining.

With this amendment, building of power plant to generate power from various sources of energy including hydro, thermal and solar will now qualify for tax concessions under Zambia Development Agency (ZDA) Act.

## **2.2. PETROLEUM**

### **2.2.1 Petroleum Supply in Zambia**

Zambia is self-sufficient in all its energy sources with the exception of petroleum. The country imports all its petroleum requirements. Petroleum contributes about nine (9) percent to the national's total energy requirements. Petroleum plays a crucial role in the running of Zambia's economy particularly in the agriculture, transport, and mining sectors.

All petroleum products in the country are currently imported. The procurement of the petroleum feedstock is done through an international competitive bidding process. The imported feed stock is in the form of spiked crude oil, transported through the 1,705 Km TAZAMA pipeline (jointly owned by the Governments of Zambia 67 percent and Tanzania 33 percent), and refined at the government owned Indeni Petroleum Refinery in Ndola on the Copperbelt Province of Zambia.

The Oil Marketing Companies (OMCs) uplift the refined products from the Ndola fuel Terminal and distribute them for sale to service stations and commercial customers.

### **2.2.2 Demand for Petroleum Products in Zambia**

There is a significant increase in the consumption of petroleum products in the recent years. For instance, the national consumption of diesel grew from an average of 900,000 litres per day in 2006 to 1,500,000 litres in 2007. The current demand for petroleum products in the country is around 52 million liters per month. This demand is projected to grow at average of about 40 percent per annum, mainly due to the growing economy.

**Table 2.2.2 Demand for Petroleum Products in Zambia**

	<b>Type of Petroleum Product</b>	<b>Average monthly consumption (liters)</b>
1	Petrol Premium	12,000,000
2	Diesel / Gas Oil	30,000,000
3	Liquefied Petroleum Gas	190,000
4	JET-A-1	2,900,000
5	Heavy Fuel Oil	5,800,000
6	Kerosene	918,000
	<b>TOTAL</b>	<b>51,808,000</b>

*Source: Energy Regulation Board, 2009*

It is important to note that a number of new investment projects in agriculture and mining which will be completed within the next one to three years, will also significantly increase the demand of diesel consumption in the country.

### ***2.2.3 Petroleum Market Analysis in Zambia***

#### ***i. Role of Oil Refinery***

The Indeni Oil Refinery processes the petroleum feed stock to meet the petroleum product requirements of the market and supply the Oil Marketing Companies, who in turn supply the final products to the consumers on the markets. The refinery consists of a large reforming unit (214,000 MTS per year), a Hydrotreater for desulphurization of Kerosene and lighter fractions, and a Vacuum Distillation Unit (VDU) for specific technical conditions. This facilitates spike crude processing with the aim of minimizing heavy fuel production. The current capacity of the refinery is 850,000 metric tons per year.

#### ***ii. Marketing of Processed Petroleum Products***

Finished products are transferred from the oil refinery via pipelines into storage facilities at the Ndola Fuel Terminal, for loading, transportation (by rail or trucks) and delivery to the Oil Marketing Companies (OMCs). The OMCs place their orders with the fuel terminal, and stock transfers are made to them. There are 21 registered OMCs in Zambia.

### ***2.2.4 Investment Opportunities in Petroleum***

Investment opportunities exist in the petroleum industry in the country with regards to; upstream petroleum projects, as well as downstream petroleum projects.

#### ***i. Upstream Petroleum***

Historically, the country has had two major exploration programs by Mobil and Placid Oil undertaken between 1986 and 1991 within the Luangwa Rift Valley, one was terminated before intersecting the most favorable reservoir horizons. Considerable thicknesses of littoral and continental sediments underlain by carbonaceous rocks with oil generating potential are present within the Karoo-age graben of both the Luangwa and Mid-Zambezi Valleys. Recent exploration work for petroleum covering parts of North-Western, Western and Eastern Provinces of Zambia, using the Microbial Prospecting for Oil and Gas technique, indicated that the Okavango and North Luangwa basins have potential for oil and gas. Government has tendered the oil blocks for oil and gas prospecting by private sector.

#### ***ii. Downstream Petroleum***

The Downstream petroleum sector in Zambia has a deficit in bulk storage of petroleum products. There is currently a legal requirement that mandates all Oil Marketing Companies operating in Zambia to keep an equivalent of 15 days of their working petroleum stocks. Due to the deficit in storage, most of the Oil Marketing Companies have not been able to meet this requirement.

In order to address this situation, the government is looking towards engaging a strategic partner to construct a 50 million litre Petroleum Terminal in Lusaka the capital of Zambia on a Build Operate and Transfer (BOT) basis

## 2.3. BIOFUELS

### 2.3.1 Biofuels Supply in Zambia

The capacity to produce bio-fuels in Zambia does exist. The bio-fuels industry has inclined to a two-pronged bio-fuels production system characterized by feedstock production and promotion on one hand, and biofuels production models on the other. Currently limited quantities of bio-ethanol are being produced from molasses, but not in sufficient quantities to allow for blending with petrol. There is a strong drive towards promotion of jatropha as the main feed stock for biodiesel in Zambia. However, due to the infancy of the bio-fuels industry in the country, productivity and crop husbandry techniques are still largely in the initial stages.

### 2.3.2 Biofuels Demand in Zambia

The Ministry of Energy and Water Development estimates that about 84 million litres of bio diesel and about 40 million litres of bio-ethanol are required by the country per annum (See Tables: 2.3.2.i and 2.3.2.ii).

*Table 2.3.2.i: Estimated Biodiesel Demand in Zambia (2008 to 2012)*

Year	Diesel Sales Volume	5% Blend	10% Blend	15% Blend	20% Blend
<b>Millions of Litres</b>					
2008	379.10	18.96	37.91	56.87	75.82
2009	398.10	19.90	39.81	59.71	79.61
2010	417.96	20.90	41.80	62.69	83.59
2011	436.80	21.96	43.70	64.18	87.42
2012	452.18	22.90	45.80	65.90	90.21

*Source: Biofuels Situation Analysis Survey Report Zambia*

*Table 2.3.2.ii: Estimated Bio-ethanol Demand in Zambia (2006 to 2010)*

Year	Petro Sales Volume	10% Blend	15% Blend	20% Blend
<b>Million Litres</b>				
2006	176.15	17.62	26.42	35.23
2007	184.96	18.50	27.74	36.99
2008	194.21	19.42	29.13	38.84
2009	203.92	20.40	30.59	40.78
2010	203.92	21.41	32.12	42.82

*Source: Biofuels Situation Analysis Survey Report (2010)*

### 2.3.3 Bio-fuels Market Analysis in Zambia



The Bio-fuels industry in Zambia is relatively a new industry, there are currently only about five (5) main companies engaged in the production of bio-fuels in Zambia. The companies have entered into out grower schemes with local communities within their areas of operation to grow and supply the feed stock.

Jatropha is currently the most commonly produced biofuel in the country and there are about 6,000 hectares of land under jatropha production including by the small scale producers.

However a number of companies are now producing electricity from bagasse which is a byproduct of sugar production. More studies are still going into this venture to ascertain its viability.

#### ***2.2.4 Investment Opportunities in Bio-fuels***

Zambia has suitable climate for cultivation of bio-fuel crops. The country has vast land and about fresh water resources for the cultivation of the bio fuel crops. Projections show that only 11 percent of the arable land (about 46,000 square Km) would be required to satisfy the country's diesel consumption of 360 million litres per annum, with bio diesel.

In order to enhance the Biofuels sector Government in process of declaring Biofuels sector a priority sector so that investors can benefit from the Zambia Development agency incentives which include tax waivers on capital equipment. The biofuels sector therefore offers a good opportunity for investment in the Zambian energy sector.

### ***2.4. COAL***

#### ***2.4.1 Coal Deposits in Zambia***

Zambia's current proven coal deposits are located in the Southern Province and estimated to be about 80 million tonnes. Other probable coal reserves are in Luangwa North, Luano, Lukusashi in the Luangwa Valley and Kahare, Chunga and Lubaba in the Western Province – estimated to in the region of 700 million tones, though more exploration work is required to ascertain the exact nature and extent of the deposits.

#### ***2.4.2 Demand for Coal in Zambia and in the Region***

Although current estimated demand for local coal is about 240,000 tonnes per annum, it is possible to develop the local market further by improving reliability of coal supplies from the coal mines. Major domestic customers include the copper mines, the brewery companies, tobacco farmers, and manufacturers. Export opportunities exist in Malawi, Democratic republic of Congo and other sub-regional countries. The current export market is estimated at 15,000 tonnes per month to Tanzania, Democratic Republic of Congo and Malawi.

#### ***2.4.3 Coal Mines in Zambia***

Currently Zambia only has two coal mines - the major one being the former government owned Maamba Collieries Limited, and the other being Collum Coal Mine, both in the Southern Province.

#### ***2.4.4 Investment Opportunities in Coal Energy***

Coal remains an important source of energy for the mines and industry, however despite the large reserves; the country has no coal fired plants. The future of coal fired plants depends on exploration of coal deposits. Most of the exploration for coal undertaken hitherto has been in the Gwembe Valley and in the Kafue Basin.

The Sinazongwe area is being mined currently and more detailed explorations are required within the Gwembe Valley and the other known areas to reveal further coal deposits. There is also potential for Coal Bed methane within the proven and potential coal reserves. With the regional power deficit, Coal could become a major source of power generation especially with improved and more efficient generation technology.

### ***2.5. RENEWABLE NUCLEAR ENERGY***

Although Zambia is endowed with New and Renewable Energy Resources, efforts to harness these resources have been minimal. The government recognizes the need for promoting renewable energy and clearly stated its intentions in the National Energy Policy of 2008. A renewable energy strategy is being devised to assist in increasing the deployment of renewable energy. The country has potential for the following renewable energies;

#### ***2.5.1. Solar Energy***

The country has an average, 2001-3000 hours of sunshine per year but solar penetration has remained relatively low due to high initial cost. As such the PV market in Zambia is dominated by donor funded projects, Government, NGOs and mission institutions for schools clinics, related staff housing and water supply. Through support for an education sector project – the Basic Education Support to Infrastructure Projects (BESIP) and the Zambia Social Investment Fund (ZAMSIF), the World Bank is currently the largest single financing agency of PV sales in Zambia. Annual sales are in the range of US\$ 2 million to US\$ 3 million, with as much as 70 percent being through large donor financed procurements. Sales in the household market segment are small part of the market.

Investment opportunities in this area include local production of solar system components, setting up isolated grid and sale of solar panels and related accessories.

#### ***2.5.2. Wind Energy***

Wind energy in Zambia is relatively low. Wind data collected at 10 meters per second (m/s) above the ground indicate speeds of between 0.1 to 3.5 meters per second with an annual average of 2.5 m/s. These wind speeds are not particularly suitable for electricity generation, but are well suited for water pumping for household use and irrigation purposes. There are specific areas where wind regimes are said to be as high as 6 m/s in the Western Province for Zambia. The Department of Energy has plans to develop a wind atlas to identify areas where electricity can be generated from wind.

Investment opportunities therefore lie in the supply of equipment for wind measurement; production of wind mills for water pumping and more advanced technology that can facilitate the production of electricity.

### **2.5.3. Geothermal Energy**

Zambia has more than 80 hot springs. The Zambian hot springs associated with zones of major deep seated fault and fracture systems along which water of mainly meteoric origin circulate to great depths and is heated through normal geothermal gradients. Of the 80 hot springs, 35 were rated high in terms of surface temperature; flow rate, proximity to power lines; ease of access and relative energy potential. These springs have not been tapped for industrial or energy provision purposes owing in large part to the cost. At present there is only one small geothermal generation plant. The plant was installed, following an initiative with the Italian Government in the mid 1980's. Kapisya hot springs was developed to the extent that 2 x 120 kilo watts turbines were installed in 1987.

Recent estimate indicate that the plant can be upgraded to produce 2 MW of electricity. Efforts are being now being made by the National Electricity Utility - ZESCO to revive the plant. The government is working on making the 22 km access road an all weather road so that construction can commence.

### **2.5.4. Mini / Micro Hydros**

Zambia has a number of potential sites on smaller rivers suitable for local small-scale power generation especially in the Northern and the North-Western parts of the country because of their topography, the geology of the ground, and the highest rainfall in the country.

## **3.0. PRIORITY SECTORS AND INCENTIVES IN THE ENERGY SECTOR**

### **1. ENERGY AND WATER DEVELOPMENT**

- a) **Power:** building, installation of power stations
- b) **Fuel:**
  - I. Building and installation of processing and refinery plants for bio-fuel;
  - II. Construction of petroleum refineries
  - III. Construction of pipelines
  - IV. Construction of rural filling stations
- c) **Water Supply**
  - (i) Construction of Depots;
  - (ii) Construction of Dams
  - (iii) Construction of irrigation canals; and
  - (iv) Construction of water and sewerage treatment plants.

### **3.2 Fiscal Incentives and Qualifying Thresholds**

The Act provides for investment thresholds that have to be met to qualify for fiscal and non-fiscal incentives. Projects that qualify may be new or existing ones undergoing expansion or modernization. These are the categories of investors who can be considered under the ZDA Act.

1. Investors who invest not less than **US\$500,000** in the **Multi Facility Economic Zone, an Industrial Park, a Priority Sector** and invest in a Rural Enterprise under the ZDA Act, are entitled to the following fiscal incentives:

- (i) Zero percent tax rate on dividends for 5 years from year of first declaration of dividends.
- (ii) Zero percent tax on profits for 5 years from the first year of operation.
- (iii) Zero percent import duty rate on capital goods, machinery including specialized motor vehicles for five years.

In addition to fiscal incentives, the above category of investors is entitled to the following **Non- Fiscal incentives**;

- (i) Investment guarantees and protection against state nationalization;
- (ii) Free facilitation for application of immigration permits, secondary licenses, land acquisition and utilities

2. Investors who invest an amount not less than US\$250,000 in any sector or product not provided for as a priority sector or product under the Act. This category of investors is entitled to non-fiscal incentives as follows;

- (i) Investment guarantees and protection against state nationalization;
- (ii) Free facilitation for application of immigration permits, secondary licences, land acquisition and utilities

#### **4.0 LICENCES REQUIRED IN THE ENERGY SECTOR**

Licenses regulate the services provided by the licensed undertakings; stipulate various conditions under which the licensed undertakings should operate

##### ***4.1 The following are the licenses issued by ERB:***

- Electricity
  - *Generation-30 years( irrespective of energy source)*
  - *Transmission -30 years*
  - *Distribution-15 year*
  - *Supply-5 years*
  - *Solar – 5 years*

## 5.0. USEFUL CONTACTS OF AGENCIES RESPONSIBLE FOR INVESTMENTS IN THE ENERGY SECTOR

NAME	ADDRESS	TELEPHONE	FAX	EMAIL
1. Zambia Development Agency (ZDA)	P.O Box 30819, Lusaka	260-211-220177	260-211-225270	info@zda.org.zm
2. Energy Regulation Board (ERB)	P.O Box 37631, Lusaka	260-211-236002	260-211- 226003	erb@erb.org.zm
3. Zambia Environmental Management Authority (ZEMA)	P.O Box 51254, Lusaka	260-211-254130 260-211-254023 260-211-254059	260-211-254164	zema@zema.org.zm
3. Ministry of Mines, Energy and Water Development (MMEWD)	P.O Box 51254, Lusaka	260-211-254686 260-211-251337	260-211-252339 254491	mmewd@mmewd.gov.zm
4. Office for Promoting Private Power Investment (OPPPPI)	P.O Box 36079, Lusaka	260-211-255184	260-211-250456	oppi@zamnet.zm
5. Water Board of Zambia	P.O Box 51059, Lusaka	260-211-251525	260-211-250721	wb@mmewd.gov.zm
7. ZESCO	P.O Box 33304, Lusaka	260-211-361111	260-211-222753	zesco@zesco.co.zm
8. Zambezi River Authority	P.O Box 30233, Lusaka	260-211-227971 260-211-227972 260-211-227973	260-211-227498	zarah@zamnet.zm