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ENERGY SECTOR IN ZIMBABWE

I. Introduction

The focus for this paper will be on the electricity supply industry. The electricity supply industry (ESI) is dominated by a government owned utility ZESA Holdings with its subsidiaries Zimbabwe Power Company (ZPC) managing five power stations while the Zimbabwe Electricity Transmission and Distribution Company operates the transmission and distribution networks. ZETDC also conducts trade regionally through the Southern African Power Pool (SAPP). In addition to these government entities a number of independent power producers (IPPs) are active in power generation in Zimbabwe. For instance the Nyamingura IPP (1.1 MW hydroelectric plant) and the Charter IPP (500 MW co-generation plant) which both sell to the national grid. Other small IPP dispose of their power independently.

Zimbabwe is currently facing an unprecedented energy crisis. The current cause of the power shortages can be attributed to a combination of ageing power plants, and a transmission and distribution network which have suffered years of neglect and minimal maintenance, unsupported and under-performing renewable sector.

II. Policy and regulatory framework

The energy sector in Zimbabwe is supervised by the Ministry of Energy and Power Development (MEPD). The mandate of the Ministry includes:

- Policy formulation,
- Performance monitoring and regulation
- Research and promotion of new and renewable sources of energy and
- Energy conservation.

In addition there is a regulatory board under the Ministry; Zimbabwe Energy Regulatory Authority (ZERA) that regulates any person or private companies operating an electricity undertaking which generates, transmit, distributes, or retail electricity for commercial purposes in excess of 100kilowatts (kW). ZERA issues the following licences subject to applicants satisfying the terms and conditions spelt out in the relevant Acts:

- Generation licence
- Transmission and bulk supply licences and
- Distribution and retail supply licences

III. Electricity sources in Zimbabwe

The power supply in Zimbabwe is sourced from local generation as well as imports. The domestic generation comes from Kariba hydropower, Hwange coal-fired power station and three small thermal power plants. Supplementary power is also imported from Mozambique, Democratic Republic of Congo, South Africa and Zambia.

a. Status of current supply & Domestic generation capacities

Zimbabwe's power stations have a combined installed capacity of **1920MW**. The power stations include Kariba South Hydro, Hwange Thermal, Harare Thermal, Munyati and Bulawayo Thermal. However both the hydropower and thermal power stations are old; the small thermal power plants were commissioned in 1942-57while Kariba was commissioned in 1959-62 and Hwange 1983-87. The most reliable plant has been Kariba power station until recently in 2015 when the capacity was significantly reduced owing to reduced water levels in the Kariba dam. The supply of Hwange thermal power station is intermittent primarily because of the age of the plant and lack of regular maintenance. The operation of the three small thermal power stations has on the other been sporadic because of their generation costs, lack of maintenance and an unreliable supply of coal**.** Below is a table showing the installed generation capacity and actual generation as at 29 February 2016. ZESSA's actual generation on the day totaled only 783 against projected peak demand of 2200MW; thus showing a deficit of 1417MW or 64.4 percent deficit.

Table 1: Power Generation Statistics As At 29/02/2016

Power Station	Installed Capacity	Actual	% of Installed Capacity
Kariba South Hydro	750	,440	58,67
Hwange Thermal	920	268	29,13
Harare Thermal	80	30	37,50
Munyati Thermal	80	30	37,50
Bulawayo Thermal	90	15	16,67
Total	**1920**	**783**	**40,78**

Source: ZEDTC

The national electrification rate is approximately 40 percent, with rural electrification being a little lower than 20 percent.

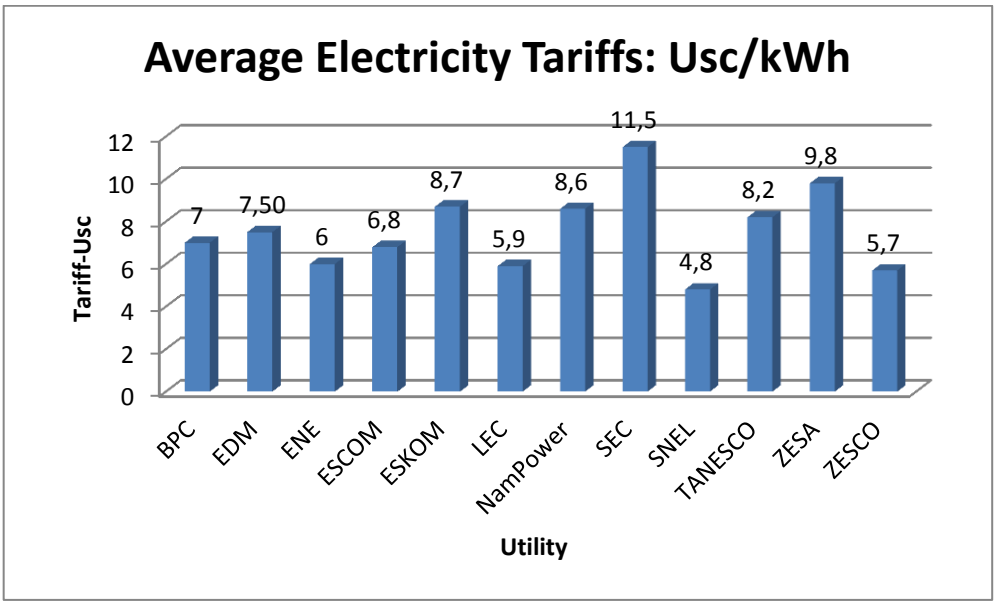
IV. Challenges in the Industry

The electricity industry suffers from unsustainable operations owing to:

- Vandalism of distribution infrastructure

- Loss of skills in the last decade when experienced staff left the country
- Low investment in infrastructure
- Collection inefficiencies
- policy inconsistency, political environment (country risk) therefore not able to attract capital for new investments, no new investments for some time,
- Financial constraints as a result of non-cost reflective tariffs have also been sighted as a major challenge. Table 2 below is a plot of Zimbabwe's (ZESA) tariffs and other utilities in the region.
- Zimbabwe actually has the second highest tariff in the region after Swaziland (SEC)

Table 2: Average Electricity Tariffs -2014/15



Source: SAPP

V. Regional Perspective/ Highlights

The Southern Africa Power Pool (SAPP) has twelve member countries represented by their respective utilities organized through SADC. The 12 countries are; Angola, Botswana, DRC, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe**.**

- **Generation capacity-** SAPP installed a total of **13604 MW** of **new generation** capacity in the last 11 years; thus an annual average of 1237MW of new generation. In 2015 a total of **1999MW new generation** capacity was commissioned of which **83% of that was renewable** energy. Table 3 below shows generation projects planned in the next five years:

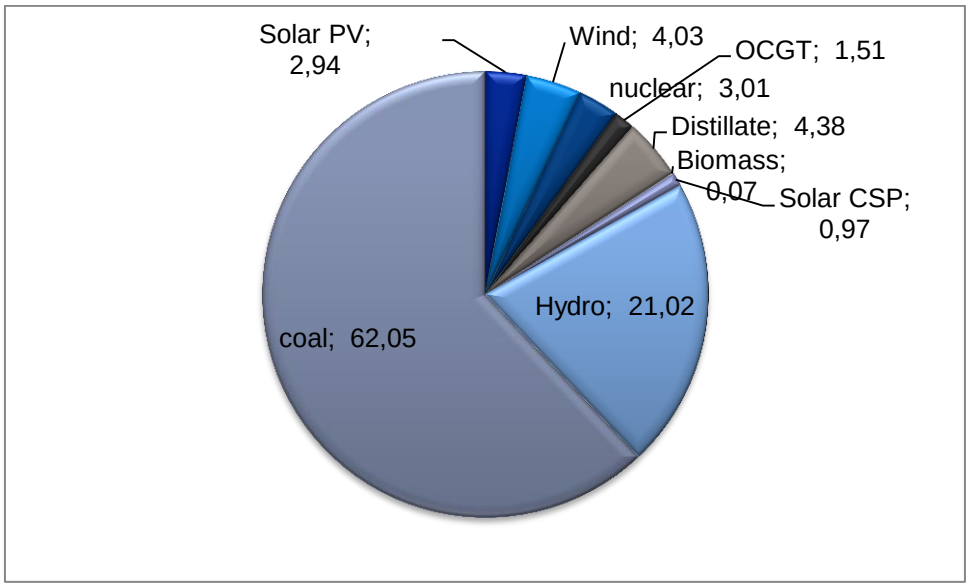
Table 3: Committed Generation Projects Planned

Country	Committed Generation Capacity MW					
	2015	2016	2017	2018	2019	Total
Angola	0	1280	2271	0	0	3551
Botswana	-	-	-	300	-	300
DRC	430	-	150	-	-	580
Lesotho	-	-	-	-	-	-
Malawi	-	-	-	74	300	374
Mozambique	205	40	-	600	-	845
Namibia	-	15	-	-	800	815
RSA	1828	3462	3032	1476	1476	11274
Swaziland	-	-	-	-	12	12
Tanzania	150	-	500	1140	300	2090
Zambia	135	-	300	101	1090	1626
Zimbabwe	15	-	120	1200	1260	2595
Total	**2763**	**4797**	**6373**	**4891**	**5238**	**24062**

Source: SAPP

- SAPP has indicated that the projects that appear in the table above have a high probability that they will be commissioned within the timelines given.
- South Africa is projected to contribute the biggest share of the total planned generation of 24062MW; contributing approximately 47 percent, followed by Angola with about 15 percent and in third position is Zimbabwe with approximately 11 percent.
- **Demand & Supply-** as at March 2015 SAPP had an **available capacity** of **52598MW** against a **demand of 49563MW** that includes peak demand, suppressed demand and reserves. Operating capacity is 46910MW giving a regional capacity **shortfall** of **8247MW.** Electricity **demand** increased by **6.8 percent** in the period April 2014-March 2015. SAPP installed capacity stands at 61859MW distributed as follows by technology: hdryo-13000MW, Coal-38381MW, Nuclear-1860MW, OCGT-936MW, Distillate-2709MW, Wind-2492MW, Solar CSP-600MW, Solar PV-1821MW, Landfill-18MW and Biomass-42mw. Figure 1 shows graphical representation of the generation capacity by technology.

Fig1: SAPP Installed generation Capacity by Technology-2015



Source: SAPP

- **Transmission Projects-** SAPP is implementing several generation and transmission projects across the region and some of the projects are:
    - Zambia-Tanzania-Kenya interconnector
    - Mozambique-Malawi interconnector
    - Namibia- Angola interconnector
    - Zimbabwe- Zambia-Botswana-Namibia interconnector (ZIZABONA)
    - Mozambique-Zimbabwe- South Africa interconnector.

- **Transmission Interconnector Projects Status:**
    - **ZIZABONA-** the four power utilities from Zimbabwe(ZESA), Zambia(ZESCO), Botswana (BPC) and Namibia (NamPower) intend to develop the interconnector project having all signed the joint development agreement (JDA)
    - Consultants were appointed for the following project packages:
        a) Package 1- Transaction and Advisory services would be undertaken by FICHTNER of Germany
        b) Package 2-Coordination and supervision services will be undertaken by PHD capital of South Africa.
        c) Package 3- environmental and Social Impact Assessment of the line route in Zambia will be undertaken by SWECO of Sweden.
    - Funding was released by the AfDB for the project to commence for transaction advisory services as well as the environmental impact assessment in Zambia. The Environmental and Social Impact Assessments

(EISA) were completed in the other countries; that are Botswana, Namibia and Zimbabwe.

- **Zambia- Tanzania- Kenya Interconnector**- feasibility studies were completed for the Tanzania –Kenya portion but the project development funding is still to be secured. The project scope now includes the extension of the transmission line to Kabwe in Zambia. The final preliminary ESIA and resettlement action plan progress reports for Zambia- Tanzania power interconnection study was completed.
- **MOZISA Transmission Project**- transmission project components between Mozambique (MO), Zimbabwe (ZI) and South Africa (SA). The Development Bank of Southern Africa (DBSA) has provided US$4M to prepare the project with the scoping study to be followed by a full feasibility study.
- **Namibia-Angola Interconnector**- Terms of Reference (TOR) were finalized for technical studies and signed in 2014. Funding for project preparation has been allocated. Funding was from the Governments of Norway and Sweden.

VI. Opportunities in Zimbabwe

- **Coal**- Zimbabwe is endowed with a variety of conventional energy sources for electricity generation, of which the main ones are coal, hydro, and coal-bed methane. Coal reserves are estimated at about 10.6 to 26 billion tons in situ in 21 deposits; of which approximately 2 billion tons are considered mineable by opencast methods. Currently 3 million tons per annum is used to generate power at Hwange power plant as well as the small power plants in Bulawayo, Harare and Munyati.
- **Coal bed methane**- the country is also endowed with coal bed methane deposits located in Lupane, Hwange, Chiredzi and BeitBridge estimated at more than 600 billion cubic meters.
- **Other-renewable**- there are other available renewable energy sources that include hydroelectricity, solar radiation and wind. There is hydropower potential on the Zambezi River to be shared equally between Zimbabwe and Zambia; estimated at 37TWh per annum of which 10TWh per annum have been harnessed. Another opportunity exists in solar energy; solar radiation is available at an average of 2000KW per hour per square kilometer per annum, spread roughly over 3000 hours per annum. At this rate, photovoltaic cells could generate the current total electrical energy consumption of 10000 GWh with efficiency of 10 percent and by installations covering 1.3 percent of Zimbabwe's total surface land area.

VII. Current and Future Projects

The Zimbabwe government has indicated that **US$482 million** has been earmarked for the energy sector in 2016 for power generation, transmission, distribution and rural electrification projects. The provision of US$482 million investments in the energy sector will be financed through:

- ✓ Loan financing, US$351.3 million;
- ✓ ZETDC's own resources, US$89 million;
- ✓ Development partners, US$9.1 million;
- ✓ Statutory funds, US$27.1 million; and
- ✓ Tax revenues, US$5.5 million.

a) **Kariba South Extension** -the government has indicated that the project remains on course for **completion in March 2018**, with the contractor having already completed excavations on Adits 1 to 6, including Concreting of Crane Beam and Access Roads, whilst manufacturing of both Electrical and Hydro-Mechanical Equipment is in progress. Expenditures to date amount to **US$171 million**, of which US$120.1 million was a drawdown from the loan facility, and US$50.9 million was from ZPC's own resources.

b) **Hwange 7 & 8 Expansion** –Government currently in negotiations with China Exim Bank for the financing of the Hwange 7 & 8 Thermal Power Station Financial Closure is expected before the end of 2016. This project is expected to cost US$1.45 billion, and entails the construction of a 600 MW power plant, and a new transmission line from Hwange to Marvel, through Insukamini. Already, a total of US$3 million has been invested towards such preparatory works as Topographical and Geo-Technical Surveys.

c) **Diesel generator plants/Emergency Power Plant--** the deficit arising from reduced generation output from Kariba Hydro Power station and the low reliability of Hwange Thermal Power station has seen government calling for emergency power supply interventions to augment supplies into the economy. Government is looking at options of procuring **rented diesel power**, with potential to **generate 200MW** at short notice to augment the subdued capacity. The government awarded Zimbabwean company **Sakunda Holdings and** Glasgow based partner **Aggreko 2**00MW electricity tender. The plant to be located in Dema Growth Point (about 45km from Harare) was expected to start supplying electricity to the national grid by end of February 2016. However there have been reports that the project is being delayed by a tariff dispute as ZESA is said to be unable to sign the take-off agreement in the absence of a new tariff. Another tender for a **120MW** power plant was also

won by Zimbabwean company Helcraw Electrical and Italian partner Ansaldo Energia. The latest report is that the project has secured US$120 Million from African Import and Export Bank for the construction of the plant.

d) **Batoka Plant-** the Zambezi River Authority CEO has been indicated that costs for the **2400MW** project have doubled. The project was conceived in 1993 and expected to be completed in 2001 but because of poor funding the project has been delayed. The CEO has also reported that current feasibility studies being done are indicating project costs to be approximately **US$4.5 Billion** up **from US$2.5 Billion** in 1993. The feasibility study is expected to be completed by end of July 2016. A South African company is undertaking the ESIA. The project status has also been changed from a Build Operate and Transfer (BOT) to a Public Private Partnership (PPP).

e) **Biogas Energy –**the government is pushing for the use of biogas and other renewable energy sources for rural electrification. The government through the Rural Electrification Agency (REA) has constructed and commissioned 18 institutional biogas digesters at rural schools and mission hospitals in 2015.

- **Solar Power**- Zimbabwe Power Company (ZPC) has signed Engineering Procurement Construction (EPC) contracts for the construction of **Insukamini and Gwanda solar plants** with potential to generate **100MW** each. The parastatal is undertaking feasibility studies, necessary for the mobilization of funds for the projects.

VIII. Concluding remarks

A substantially improved performance of the power industry is of critical importance for sustained economic recovery in Zimbabwe. It is therefore necessary for the Zimbabwean government to improve the regulatory and investment framework for the power sector to lay foundations of large amounts of private capital in new generation capacity.

Sources: Ministry of Energy and Power Development, ZESA, ZETDC, SAPP and Africa Development Bank (AfDB)